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THE MANAGEMENT OF BURN WOUNDS BY NURSES

Ethel Althea Andrews

A thesis submitted to the Faculty of Health Sciences, University of the Witwatersrand, in fulfilment of the requirements for the degree of Doctor of Philosophy

Johannesburg, 2015

DECLARATION

I, Ethel Althea Andrews declare that this thesis is my own work. It is being submitted for the degree of Doctor of Philosophy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

.....

.....day of .....May.....2015

DEDICATION

I dedicate this thesis to my family both living and departed. I truly stand on the shoulders of giants. A special feeling of gratitude to my husband, anchor and soulmate Enver, my wonderful and talented children, Teneale and Taylan and my loving parents, William and Janette, whose words of encouragement, unfaltering believe in me and love carried me through this journey. I will always appreciate all the sacrifices made, inconvenience endured and all they have done. You have been my greatest cheerleaders.

I also dedicate this work to my grandfather, my in-laws, siblings both biological and chosen as well as my aunts and uncles.

ABSTRACT

A standardised approach to wound care is vital if a positive outcome is expected. The positive outcomes of standardisation and evidence based wound care protocols have been well documented, yet nurses in South Africa do not have a standard that informs burn wound management. The purpose of this study is to describe the best available evidence for management of burn wounds and to explore nurses' current practices in a single burns unit with the aim of developing guidelines to inform nursing practices.

A QUAN (quantitative dominant)► QUAN+ QUAL (quantitative and quantitative concurrently), a non- experimental explanatory sequential descriptive design was used. The process was divided into three phases: Phase One involved the search for quality evidence through an integrative review. The main review question was: ***"What new knowledge or information related to non-surgical management of burn wounds has emerged in the literature between 2000 and 2014?"*** Eleven sub questions were used to guide the literature search according to the themes of the nursing process of: Assessment, Diagnosis, Intervention, Outcome and Evaluation. The review process included a problem identification stage, literature search stage, data evaluation stage, data analysis stage and presentation stage. The included literature was based on a hierarchy of evidence. The search strategy included: multiple electronic databases, hand searching, reference lists of relevant articles, comments of experts, textbook chapters compiled by experts and guidelines. The final sample consisted of n= 354 studies. A qualitative descriptive approach was used to synthesise the research findings. Phase Two involved the study of current practice through structured observation and semi-structured interviews.

The purpose of Phase Two was to obtain first-hand information in a naturally occurring situation to identify the strengths, weaknesses and gaps in current practices. Purposive sampling was undertaken and included all nurses providing care to patients with superficial to partial thickness burn wounds. A total of n= 303 dressings were observed and eight interviews were conducted.

Phase Three was the verification of findings from Phases One and Two by experts in the field using the AGREE II instrument. Conclusions drawn from observations and interviews were integrated and synthesised with the conclusions from the integrative review. These conclusions were used to develop guidelines for the management of burn wounds by nurses.

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CHAPTER ONE
ORIENTATION TO THE STUDY

1.0 INTRODUCTION

This chapter is intended to orientate the reader to the significance of this study. The background of the study, research problem, research questions that arose, purpose of the study and the objectives are all clearly explained and defined. Provided is a rationale for the study, description of the central theoretical framework that guided the study and the researcher's assumptions. The reader is also orientated to technical definitions in burn wound management. A brief description of the context, the research design and methodology is provided. Measures used to ensure trustworthiness are briefly described and ethical considerations are taken into account.

1.1 BACKGROUND

1.1.1 Management of burn wounds by nurses

Nurses, are expected to be competent in wound management, which is a second level skill taught as part of the undergraduate general nursing curriculum. The South African Nursing Council (SANC), which is the nursing regulatory body, is very clear that on completion of training nurses, as independent professionals, should be competent in the management of wounds (SANC, 1984: R2598, Chapter 2, subsection (j) Act 50 of 1978). Competence is more than just knowing "what is" (knowledge) and 'how to" (skill). Competence is knowledge, skill (behaviour), attitude (interpersonal) and values; a deliberate exercise of judgement based on knowledge and understanding (Bruce, Klopper & Mellish, 2011: 176). In addition, knowledge provides the basis for informed decision-making and the framework to develop and maintain competence (Benbow, 1992). Nurses therefore have a responsibility to be competent on the principles of burn wound management.

Unlike other areas in nursing, such as intensive care, midwifery or education, the SANC does not recognise wound management as a speciality and therefore no standard of care exists. In other countries, wound care is a speciality.

For example, in the United States of America, nurses specialising in wound care are known as Wound, Ostomy and Continence (WOC) nurses, (WOC nurses, 2003), Tissue Viability Nurses in the United Kingdom (Tissue Viability Society, 2015) and Clinical Nurse Specialists (CNS) in Europe (National Council for Professional Development of Nursing and Midwifery, 2008).

Specialisation is the hallmark of Clinical Nurse Specialists (CNS) and is a division of a more general area of practice (Fulton, 2005: 105). Specialisation is defined as a concentrated area of expert clinical practice with focused knowledge and competencies (American Nurses Association, 2004; National Association of Clinical Nurse Specialist, 2004). The classification of a speciality is according to either the population: for example, orthopaedics; the type of problem, such as wound care or stoma therapy; the setting, for example an emergency room or theatre and type of care; in the case of palliative care; disease or pathology such as oncology and diabetes (American Nurses Association, 2004; National Association of Clinical Nurse Specialist, 2004). Specialisation is necessary because the nurse moves from a generalist practice (undergraduate) to an advanced practice (postgraduate), where clinical nurse experts are equipped to apply their advanced knowledge and skills to a specific group of patients. For example, a CNS with a speciality in wound care would be able to understand the aetiology of wounds, the principles of wound bed preparation and apply evidence-based nursing interventions. Yet, despite the need for wound care specialists in South Africa, the SANC has not yet recognised wound care as a speciality with clear guidelines or standards of care.

The South African Burn Society (SABS) recently put guidelines in place regarding the management of burn wounds (SABS, 2012), but in spite of this, variations in practice have been observed in the management of burn wounds even in 2014. Whilst these guidelines are in the public domain, the majority of nurses working in burn units do not have access to these guidelines, as access is only available to registered paid members of the SABS. The 2007 burn stabilisation protocol (Karpelowsky, Wallis, Madaree, et al., 2007), is freely available on the internet and the focus is on emergency management of the burn patient and not wound care as such. However, the protocol still advocates the usage of Silver Sulfadiazine (SSD), which is outdated.

The SANC, in a personal communication, confirmed that no standards were in place for the management of burns and that wound care, including burn wound management, and is institutional. Consequently, many factors contribute to the variations in wound care: wound care therefore cannot be evaluated since no standards of care are in place.

The number of patients burned annually is alarming. Globally it has been reported that fire related injuries account for 265 000 deaths per year, the vast majority being in low and middle income countries (World Health Organization, Fact sheet number 365 of 2014). The highest number of reported deaths were in South East Asia (57 %), followed by Africa (12, 2%) and low and middle regions in the Eastern Mediterranean (11%) according to the World Health Organization (WHO, 2002). The WHO (2008), reported that the incidence of fire related injuries, which required medical attention per year was 10,9 million globally, with the most affected regions being South East Asia (5.9 million), followed by Africa (1,7 million) and the Eastern Mediterranean (1,5 million).
It follows that the burden of burns is experienced mostly in developing countries where access to health care and resources are limited, which is the case in South Africa. In South Africa an estimated US$ 26 million is spent annually for care of burns from kerosene (paraffin) stove incidents; furthermore the indirect costs such as lost wages, prolonged care for deformities and emotional trauma, and commitment of family resources, also contribute to the socioeconomic impact on the country (World Health Organization, Fact sheet number 365 of 2014).

Reportedly, 3.2% of South Africa's population suffers from thermal injuries annually (Rode & Rogers, 2011). Eight institutions, situated in seven provinces, participated in a surveillance project conducted by the Paraffin Safety Association (PASASA) of Southern Africa. From 1st January 2007 to 30th September 2011, 7 084 records of burn patients have been entered into the database (Swart & Paulsen, 2011). This figure is a work in progress, as it does not include all hospitals that either treat or admit patients with burns. In the PASASA study, 71% of burn victims were admitted into wards, whilst 26% were treated and discharged (Swart & Paulsen, 2011). It should be noted that the wards are not always dedicated burns units, but are often surgical wards used for this purpose. However, many burns patients do not go to hospital but receive treatment elsewhere like at home, from traditional healers, local clinics, local pharmacies, private wound care specialist or their general practitioners.

In the research setting of this study, on average 250 adult burns are admitted to the unit per year (Muganza, 2011). This number might appear low, as admissions to the burn unit depend on bed availability and a common practice is to admit the more severe burns, consequently there is under-reporting of the incidence of burns and under-treatment (Burd & Yuen, 2005).

The high incidence of burns in South African "townships" can be attributed to a past that is still tangible for many citizens in South Africa. Factors that influence the high incidence of burns are the influx of people to urban areas, haphazard urban development, inadequate electrification of homes, paraffin usage as a primary energy source and failure of preventative educational programmes (Rode & Rogers, 2011; Parbhoo, Louw & Grimmer- Somers, 2010; Allorto, Oosthuizen, Clarke, et al., 2009).

The WHO (2014), listed the following risks factors for burns: occupations that increase exposure to fire, poverty, overcrowding and lack of proper safety measures, placement of young girls in household roles such as cooking and care of small children, underlying medical conditions, including epilepsy, peripheral neuropathy, and physical and cognitive disabilities, alcohol abuse and smoking, easy access to chemicals used for assault (such as in acid violence attacks), use of kerosene (paraffin) as a fuel source for non-electric domestic appliances and inadequate safety measures for liquefied petroleum gas and electricity.

Urban migration, poverty and the development of slum areas contributes and relates significantly to overcrowding and the risk of burns according to Rode & Rogers (2011). The authors add that the use of faulty kerosene appliances, contaminated fuel, insufficiently regulated supply chains and violation of standard safety principals are additional factors.

The researcher has been involved in the care and management of burn wounds for the past ten years, which afforded her access to nurses in various burn units and wards where burns are nursed in both private and public hospitals. Advances in research over the years has significantly improved the outcomes of burns as seen with the use of antiseptics in the 1960's, increased use of occlusive dressings and early surgery in the 1970's and topical antimicrobial agents in the 1990's (Demling & DeSanti, 2000). Yet, despite these advances, some hospitals still use outdated methods and techniques such as the use of Silver Sulphadiazine (SSD) cream as the standard of care. Newer literature proves that the disadvantages of SSD outweighs the benefits (Opasanon, Muangman & Mamiviriyachote, 2010; Muangman, Pundee, Opasanon, et al., 2010; Caruso, Foster, Blome-Eberwein, et al., 2006; Varas, O'Keeffe, Namias, et al., 2005). Anecdotal interaction with doctors and nurses revealed that a major challenge in the management of burns is the absence of, or limited training received regarding burn wound management as well as the absence of measurable standards of care in South Africa (burns unit discussion). The lack of training of medical doctors was confirmed, with ninety seven percent of participants indicating a need for more training on wound care (Fourie, 2013:24). No study was found on nurses training adequacy or needs in South Africa or in burn wound management internationally. The background described led the researcher to the formation of the research problem.

It is helpful to give the definitions of each subject addressed to avoid ambiguity and to direct the reader along the path of this study. The format will therefore be a definition of the subject followed by an explanation in the context of this study.

1.2 RESEARCH PROBLEM

A research problem is an enigmatic or perplexing condition that can be investigated through disciplined inquiry (Polit & Beck, 2012: 741). A research problem address what researchers perceive as wrong, missing or puzzling, or requires changing (Given, 2008:784).

Most research in the management of burn wounds focuses on the surgical management of the burn with no study focusing on the management of burn wounds by nurses. Burns are currently being managed by nurses; however their clinical practices differ extensively. There are no standards or guidelines in place to inform nursing practice and consequently not all patients benefit from evidence informed burn wound management. In consultation with the SANC in a personal communication, the SANC confirmed that no standards were in place and that wound care including burn wound management is institutional. Institutional care means that each hospital applies a different method of care: some methods being outdated such as usage of SSD, some methods are not evidence informed for example, covering wounds with saline gauze. Furthermore, the access to emergency management guidelines is limited.

The identified research problem led to the research questions:

1.3 RESEARCH QUESTIONS

A research question is a statement of the specific query the researcher wants to answer to address a research problem and it directs a study (Polit & Beck, 2012:741; Brink, van der Walt & van Rensburg, 2012: 65; LoBiondo- Wood & Haber, 2010: 585; Burns & Grove, 2007: 553). The research question therefore designates what researchers want to understand about the research problem (Given, 2008: 786).

The researcher aimed to address the following research questions:

- What is the best available clinical evidence in relation to burn wound management?
- What are nurses' current practices in burn wound management?

In an attempt to answer the research questions, the research purpose was generated from the research problem.

1.4 PURPOSE OF THE RESEARCH

The research purpose summarises the study goals and states the reason for the study (Polit & Beck, 2012:73; Brink, et al., 2012: 54). The purpose of the study encompasses the aims and objectives the researcher hopes to achieve with the research (LoBiondo- Wood & Haber, 2010: 37; de Vos, Strydom, Fouche, et al., 2005:104).

The purpose of this study was to describe the best available evidence for the management of burn wounds and to explore and describe what nurses' currently practice in the management of burn wounds in a single burns unit with the aim being that of developing guidelines for the management of burn wounds by nurses.

In order to achieve the purpose of the study, research objectives were formulated.

1.5 RESEARCH OBJECTIVES

Research objectives are specific accomplishments the researcher hopes to achieve by conducting the study (Polit & Beck, 2012:73; LoBiondo- Wood & Haber, 2010: 37). The objectives indicate whether the variables are to be identified, analysed or described and at times, the focus of the objective includes identifying relationships among variables and differences between two groups regarding selected variables (Brink, et al., 2012:85; Burns & Grove, 2007:553).

Three of the objectives were descriptive and the last objective was to verify if experts in the field concurred with the findings from Phases One and Two. The following research objectives were set in three distinct phases:

Objective 1: Phase One

- Explore and describe the best available clinical evidence in relation to burn wound management by conducting an integrative review.

Objective 2: Phase Two (a)

- Describe the current practice on the management of burn wounds according to the themes of the nursing process through the observation of burn wound dressing procedures with assistance of a quantitative checklist.

Objective 3: Phase Two (b)

- Describe the current practice on the management of burn wounds according to the themes of the nursing process through qualitative semi-structured interviews.

Objective 4: Phase Three

- Verify the findings from Phases One and Two by having a Nominal Group using the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument by experts in the field.

1.6 RATIONALE FOR THE STUDY

The patient with burns is not receiving the full benefit of evidence informed wound management as care is not standardised. To date there are no standards to assess nurses on wound care, consequently evaluation of wound management is unachievable. It is impossible to evaluate nursing practice unless there are clearly identifiable and prescribed standards of care, for without known standards measurement this evaluation is not possible (Searle, Human & Mogotlane, 2009: 58). A standardised approach to wound care training is vital if a positive outcome for wound care is to be expected. The positive outcomes of standardisation and evidence based wound care protocols have been well documented (Bolton, McNees, Van Rijsk, et al., 2004), yet nurses in South Africa do not have a standard that informs nursing practice.

The management of burns patients is overseen by an important multi-disciplinary team, from pre-admission to post discharge. This team includes ambulance staff, nurses, doctors, physiotherapist, dieticians, pharmacist and councillors. The role of each professional is clearly stated in terms of the respective health regulatory bodies for example, the Health Professional Council of South Africa (HPCSA), Act 29/2007 as amended (Health Professionals Act 56 of 1974), determines the responsibility of the doctor and the responsibility of the nurse is guided by the SANC. Regulation 2598 of the Scope of Profession and Practice of nursing (SANC, 1984), states that nurses are responsible for: "the facilitation of the healing of wounds."

Despite this regulation, no standards of care exist, as wound care, wound management and burn nursing are not recognised as specialities in South Africa. This gap in practice leads to confusion about what the functional role is of the nurse in the management of the burn wound.

The patient therefore does not enjoy the full benefit of quality holistic care, where all the members of the multi- disciplinary team understand their respective roles and functions to collaborate, where each individual is performing to the capacity in their respective areas of expertise. Conversely, international policy makers admittedly acknowledge the need for clear standardisation.

The World Health Organization (WHO) together with the International Society for Burn Injuries (ISBI) and several other partners have put a burn prevention, care and recovery plan in place as early as 2007 (WHO, 2008a). According to the plan, the goal was to increase the use of WHO burn guidelines, strengthen burn care quality improvement and increase standardisation of burn centres, amongst others (WHO, 2008a). However, the WHO guidelines for implementation of the recovery plan is questionable, which is evident by the lack of standardisation in the different" burn centres", the shortage of "burn nurses" and "burn surgeons". Staffing a burns unit remains a challenge in South Africa (Makalima, 2011). Even though WHO advocates standardisation and Statistics South Africa reported that smoke, fire and flames account for the fourth highest non-natural cause of death in 2011 (Statistics South Africa, 2014), to date no guidelines or protocols on the management of burns exists at governmental level.

The SABS has recently put updated guidelines in place (SABS, 2012), but these are not readily available for nurses to access and the guidelines are more directed towards doctors.

As a result of the absence of standards of care with regards to wound management by nurses, several private institutions and commercial companies with a vested interest in wound care, offer wound care training to nurses. Certificates are awarded for the different short course and nurses are then seen to be equipped as "wound care nurse specialists" or "advanced wound care practitioners".
However, Circular 2/2007 of the SANC states that the Council no longer recognises short courses that are less than one academic year and neither Act 50 of 1978 nor Act 33 of 2005 makes provision for the registration of short courses (SANC, 1984). Neither the institutions nor the courses offered to the nurses or private companies are listed or recognised by the SANC (2007). The nursing profession needs to develop the standards (norms) and ethics for itself. Thus, unrecognised and unregulated courses take away control of standards from the SANC. Currently only two Universities offer post graduate dedicated wound care courses, but this still does not translate into a registered qualification with SANC (2007).

In the absence of standards of care, decisions regarding the management of burn wounds by nurses is vague, nurses are uncertain of their competence with regards to the management of the burn wounds, wound outcomes cannot be measured, the nursing profession has no control of standards taught and patients do not always receive evidence informed care. This study will identify the best available evidence for the management of burn wounds as well as identify the strengths, weaknesses and gaps in current practice with the aim of developing guidelines for the management of burn wounds by nurses which will act as a standard of care.

The motivation for the study is summarised in a central theoretical statement.

1.7 CENTRAL THEORETICAL STATEMENT

The insight and understanding gained through the description of current practice and the exploration of the best evidence for the management of burn wounds will inform and guide the role and responsibilities of the nurse and put in place standards of care to inform clinical practice.

The researcher's assumptions serve as the framework against which the whole study builds its argument (case).

1.8 ASSUMPTIONS OF THE RESEARCHER

The assumptions of the researcher are to guide the intellectual activity and scientific inquiry in the research process. An assumption is a principle that is accepted as being true based on logic or custom without proof (Polit & Beck, 2012: 720; Brink, et al., 2012: 208; Burns & Grove, 2007: 531). Babbie & Mouton (2007), stated that it is acceptable in the contemporary philosophy of science to make assumptions that are not necessarily tested specifically within a study. The assumptions made in this study by the researcher provide a point of departure for the research.

1.8.1 Meta- theoretical assumptions

Meta-theoretical assumptions are important in a research study as they comprise underlying theories, models or paradigms that contribute to defining the context in which a study is conducted (Babbie & Mouton, 2007). A conceptual model is defined as interrelated concepts or abstractions assembled in a rational and often explanatory scheme to illuminate relationships amongst them (Polit & Beck, 2012: 722; Brink, et al., 2012: 209; Burn & Grove, 2007: 534), acting as a map for the study (LoBiondo-Wood & Haber, 2010:575).

Health is defined by wholeness and as such the nurse's actions with regard to burn patients must be guided by a conceptual model that encourages the wholeness, integrity and unity of all the structures being conserved in the person. Levine's Conservation model fulfils this requirement (Levine, 1991: 3), and was adopted for this study because it includes principles that help explain the key concepts involved in the management of the patient with burn wounds.

In an attempt to explain the conceptual framework the researcher will discuss the components which will include the basic assumptions of Levine's Conservation framework, coupled with the concepts and the relationships that exist in detail. The conservation model includes the meta-paradigm concepts of person, environment, nursing and health and is presented in table 1.1.For a more detailed explanation of Levine's Conservation framework as related to this study refer to Appendix M.

Table 1.1 Meta-paradigm of nursing by Levine applied to the management of burn wounds.

Central concept	Levine's definition	Researcher's assumptions
Person	A holistic being who is emotional, thinking, future- orientated and past- aware (1989).	In this study person refers to both the nurse and the patient. The researcher believes that the person is "bio-psycho-social" being with spiritual elements.
Environment	Each person has his or her own internal and external environment; the internal environment combines the physiological and pathophysiological aspects of the person and the external environment includes those factors that impinge on and challenge the person (1973).	The environment is the total context in which the person exists. The environment refers to the physical, social, cultural, political and economic conditions of the person. In this study the environment is the burns unit.
Nursing	Nursing is "human interaction" (1973).	Nursing is a systematic process whereby the nurse enters into a partnership with the patient to maintain, facilitate and promote health through nursing interventions.
Health	Health is the unity and integrity of the person (1971). Health is wholeness	Health is a dynamic state that ranges from a high level of wellness to a terminal state over time. Health in this study means that the person has adapted and has maintained his or her integrity, i.e. achieved wholeness.

1.8.2 Theoretical assumptions

Theoretical assumptions are testable and offer statements about the research field (Brink, et al., 2012:68). Theoretical assumptions include theoretical models, concepts and definitions that will be used as a point of departure in this study.

1.8.2.1 Definitions

Nurse

A nurse is a person registered with the SANC to practice nursing or midwifery (SANC, 1984: Nursing Act, 2005), and who practises her profession for gain (Searle, et al., 2009:50).

Nursing

Nursing is a caring profession practised by a person registered with the SANC, which supports, cares for and treats a health care user to achieve or maintain health where possible; cares for a health care user so that he or she lives in comfort and with dignity until death (SANC, 1984).

The nursing process

A systematic, problem-solving approach used to identify, prevent and treat actual or potential health problems and promote wellness (Chabeli, 2007).

Evidence-based wound management

The integration of best research evidence, with clinical expertise and patient values (Sackett, Straus, Richardson, et al., 2000).

Burn

A burn is an injury to the skin or other organic tissue primarily caused by thermal or other acute trauma. It occurs when some or all of the cells in the skin or other tissue is destroyed by hot liquids (scalds), hot solids (contact burns), flames (flame burns), radiation, radioactivity, electricity, friction or chemicals (American Burn Association, 2009).

Burns unit

A burns unit is an organised medical system for the total care of the burned patient (British Burn Association, 2002).

Management

The specific treatment of a disease or a condition (Oxford English Dictionary, 2014).

Burn wound management

Burn wound management is the treating of burn wounds. Management starts with an assessment of a burn wound in terms of size, depth and location. Post assessment, the wound is cleaned and dressings applied depending on the depth of the burn wound (Demling & DeSanti, 2004).

1.8.3 Methodological assumptions

Methodological assumptions inform the nature of the research process, including the most suitable method to be used (Mouton, 1996: 124). In this study the methodological assumptions include: evidence-based research, the scientific method and ethical research.

1.8.3.1 Evidence-Based Research

The purpose of evidence-based research is to generate knowledge to inform clinical practice.
Evidence-Based Research (EBR) utilises the best research evidence, which is methodologically sound, clinically relevant research about the effectiveness and safety of nursing interventions; the accuracy and precision of nursing assessment measures, the power of prognostic markers; the strength of causal relationship; the cost-effectiveness of nursing interventions; the meaning of illness or patient experiences (DiCenso, Guyatt & Ciliska, 2005: 4). Consequently, Evidence-Based Practice (EBP), a derivative of EBR, is the conscientious integration of the best research evidence coupled with clinical expertise and patient values and needs in the delivery of quality, cost effective health care (Burns & Grove, 2007; 4; Sackett, Straus, Richardson, et al., 2000). The basis of EBP is therefore on Best Practice Guidelines (BPGs). BPGs are systematically developed statements intended to inform practice decisions and patient decision-making (Field & Lohr, 1990).

EBR is conducted in accordance with the scientific method.

1.8.3.2 Scientific method

The application of a scientific method is geared to make a study applicable, understandable and replicable. The definition of a scientific method is a set of orderly, systematic, controlled procedures for acquiring dependable, empirical information (Polit & Beck, 2012: 742). Since the research questions in this study are multi-dimensional, the researcher elected a mixed method methodology.
Mixed method methodology lends itself to pragmatic methodological assumptions that the scientific method was conducted pluralistically, incorporating both subjective and objective data collection methods. Every step of the research process has been reported in detail, to enable other researchers to evaluate and replicate, or repeat the enquiry where applicable. The research methodology was structured in such a manner that the purpose of the research was achieved by answering all the research questions and addressing all the research objectives. The research study was approached with integrity. The study contains all the research findings, without omitting important data, methods and research designs that affects the interpretation of the data. Abductive reasoning is used with mixed methodology and incorporates deductive and inductive reasoning strategies.
Ethical research is fundamental to the research method.

1.8.3.3 Ethical research

This research is ethical and does not infringe on the rights of nurses or patients. Confidentiality, anonymity and informed consent are critical ethical considerations maintained in this research.
In addition, ethical principles of non-maleficence, beneficence, autonomy, justice and truth telling were maintained throughout. (Refer to Chapter Two for a more detailed description on the ethical considerations).

In order to allow the reader to understand the logic in this study a description of the context is provided.

1.9 CONTEXT

As early as 1974, burns in South Africa were labelled an unrecognised epidemic (Nuss, Davies & van der Riet, 1974), and not much has changed in terms of affording burns the much needed resources required despite the large number of patients that suffer burn injuries annually. Dedicated burn units remain a scarce resource (Allorto, Clarke & Thomson, 2011).

This study was conducted within a public sector tertiary academic hospital in Gauteng, South Africa. This burn unit is one of the few dedicated burn units in Africa and not only does it service a large percentage of the South African population, but also serves as a referral hospital for other parts of the continent. (Refer to Appendix N for a more comprehensive description of the area where the burns unit is located.)

1.9.1 Admission criteria to a burns unit

Due to the limited number of dedicated burn facilities and the limited number of beds available in these facilities, not all patients are admitted to the burns unit. The more severe burn patients are admitted and other less severe burn patients are referred to either surgical wards or general Intensive Care Units (ICU) depending on the patient's condition and the availability of beds.

The referral criteria (admission criteria) to a burns unit for major burns according to the South African Burn Society (2012) are:

- burns associated with inhalation injury;
- burns greater than ten percent total body surface area Total Body Surface Area(TBSA) in children and burns greater than fifteen percent TBSA in adults;

- burns to special areas, hands, face, major joints, feet and genitals;
- full thickness burns greater than five percent TBSA;
- electrical burns;
- chemical burns;
- circumferential burns;
- burns with associated trauma;
- burns in the very elderly and very young;
- burn injury in patients with pre-existing illness or disability that could adversely affect patient care and outcomes;
- suspected non-accidental injury in children and elderly;
- burns in children under the age of 12 months;
- small area burns in patients with social problems, including children at risk;
- burns in pregnant women.

Based on the admission criteria it is clear that patients admitted to burns units require specialised care.

1.9.2 Nursing personnel

The global shortage of nurses means there are fewer nurses available to work in South Africa. This in turn has a negative impact on the remaining nurses, who have to 'bear the brunt' of increased workloads under increasingly difficult circumstances (Ehlers & Oosthuizen, 2011). Consequently, there are fewer nurses available, and the ones that are available are overworked, as concurred by Makalima (2011), who stated that staffing a burn unit is a challenge. To make matters worse, working in a burns unit is demanding both emotionally and physically (Tringali, 1982).

The number of nursing personnel working in this burns unit is twenty one professional nurses, four enrolled nurses and sixteen auxiliary nurses as per the current definitions. These nurses make up four sets of shifts, two shifts for day duty and two shifts for night duty, twelve hours per shift, rotating between day and night duty.

1.9.3 Infrastructure

The burns unit in this setting has an operating theatre; four wards equipped with four beds each, six Intensive Care beds and four High Care beds, dressing rooms with hydro-treatment baths and an open courtyard where patients can sit when they are mobile.

The researcher will provide a summary of the research design and methodology as an introduction to the study. (Refer to Chapter Two for a detailed description).

1.10 RESEARCH DESIGN AND METHOD

1.10.1 Research method

Research methodology can be defined as the entire strategy for the study, from the identification of the research problem to the final plans for data collection (Burns & Grove, 2001:223), and presenting the results. Research methodology is what the researcher utilised to solve the research problems or to answer the research questions (Brink, et al., 2012:199). The research method was used to obtain information on the best evidence used in respect of the treatment and management of burn wounds and current practices relating to the management of burn wounds in Gauteng. The findings were used to describe the evidence on the management of burn wounds and to make recommendations on how to improve clinical practice in the form of Evidence Based Guidelines (EBG).

1.10.2 Study design

A study design is a blueprint for conducting a study including specifications for enhancing the study's integrity (Polit & Beck, 2012: 741; Brink, et al., 2012: 217; LoBiondo- Wood & Haber, 2010:577; Burns & Grove, 2007: 537).

It maximises control over factors that could interfere with the validity of the study. Generally, researchers choose the design that best fits the purpose of the study, is compatible with the resources available to them such as time, money, information, ethical considerations and their personal preferences (Polit & Beck, 2008:66; Brink, van der Walt & van Rensburg, 2006:92). The design is closely associated with the framework of the study and guides planning for implementation of the study.

This study was a mixed methods, QUAN (quantitative dominant) $\longrightarrow$ QUAN+QUAL (quantitative and quantitative occurs at the same time), a non-experimental, explanatory sequential, descriptive design (Polit & Beck, 2012: 608-612; Creswell & Plano Clark, 2011: 104).
This design was chosen to determine what the best evidence is for the management of burn wounds are and to explore and describe the current practice by nurses in the management of burn wounds. This study, conducted in three phases, allowed for a structured approach.

An integrative review collected the data in Phase One; in Phase Two (a), nurses working in the burn unit were observed during dressing changes by means of structured observation using a researcher administered checklist; in Phase Two (b), data were collected through semi-structured interviews directed by an interview schedule. Data in Phase Three was collected through a Nominal Group in which findings from Phases One and Two were verified by a group of experts in the management of wounds, guided by an evaluation instrument, AGREE II.
Each aspect of the design is presented below.

Quantitative research

Quantitative research is the investigation of a phenomenon that lends itself to precise measurement and quantification, often involving a rigorous controlled design (Polit & Beck, 2012: 739). In this study the use of numerical data in the integrative review, as well as the structured observation, attempts to quantify the best evidence on the management of burns by nurses in Gauteng.

Characteristics of quantitative research

Quantitative research has the following characteristics according to Burns & Grove (2007:18),: its philosophical origins are in logical positivism, which means there is a single reality that can be defined through careful measurement; its focus is concise, objective and reductionistic and its reasoning is deductive and logistic. The authors argue that the basis for knowing in quantitative research is through describing variables, examining relationships amongst variables and determining cause- and - effect relationships amongst variables. According to Burns & Grove (2007:18), quantitative research is conducted to test theory.

Descriptive research design

Descriptive research provides an accurate portrayal or account of characteristics or circumstances of a particular person, event, or group in real life situations (Polit & Beck, 2012: 725; Brink, et al., 2012: 211; Burns & Grove, 2007: 537).
The conducting of descriptive research is to discover new meaning, describe what exists, determine the frequency with which a certain phenomenon occurs and categorise information (Burns & Grove, 2007: 537).
The descriptive design was appropriate for this study as it provided both an in-depth description on the management of burns as well the current practice of nurses in dealing with burns in Gauteng. Furthermore, this topic has not been studied before and the researcher attempted to identify and describe new knowledge, new insights and new understanding in the management of burn wounds.

Characteristics of a descriptive research design

Descriptive designs are used where more information is required in a particular field (Polit & Beck, 2012: 226; Brink, et al., 2012: 112; Burns & Grove, 2007: 240). According to the authors descriptive designs observe, describe and document aspects of a situation as it naturally occurs.
Its theoretical focus may be to develop theory, identify problems with current practice, justify current practice, make judgements or determine what other practitioners in similar situations are doing (Polit & Beck, 2012: 226; Brink, et al., 2012: 112; Burns & Grove, 2007: 240).

1.10.3 Study Population

1.10.3.1Population

A population as the entire set of individuals (or objects) having some common characteristics, sometimes called a universe, that are of interest to the researcher (Polit & Beck, 2012:738; Brink, et al., 2012: 216). A population is all elements that meet the sample criteria for inclusion in a study (Polit & Beck, 2012: 274; Brink, et al., 2012: 131; Burns & Grove, 2007:549), and is accessible to the researcher as a pool of subjects for the study.

In this study, the population for both the structured observation and semi-structured interviews included all nurses providing care to patients with superficial to partial thickness burn wounds, admitted to a single burns unit within a public sector tertiary academic hospital. (Refer to Chapter Two for a detailed description).

1.10.4 Sample and Sampling

1.10.4.1 Sample

A sample as a subset of a population, selected to participate in a study (Polit & Beck, 2012: 742; Brink, et al., 2012: 217; LoBiondo- Wood & Haber, 2010:585; Burns & Grove, 2007: 554). De Vos, et al., (2005: 193), furthermore describe a population as setting boundaries with regard to the elements of participants.

In Phase One of this study, the sample consisted of 354 studies. Phase Two (a) consisted of n = 303 dressings observations. In Phase Two (b), eight interviews were conducted. (Refer to Chapter Two for a detailed description).

1.10.4.2 Sampling

Sampling is the process of selecting a group of people, events, behaviours, or other elements that are representative of the population being studied (Polit & Beck, 2012: 742; Brink, et al., 2012:132; LoBiondo- Wood & Haber, 2010:585; Burns & Grove, 2007: 554). Sampling may provide a more accurate picture of the phenomenon under investigation according to Brink, et al., (2012:130).
For this study, the entire population was included in the sample because the population was small enough to allow for this and since all different rankings of nurses are responsible for the dressings, the researcher concluded that including a small sample of a certain rank would not be reflective of the whole population.

1.10.4.3 Sample size estimation

A sample size is the number of subjects, events, behaviours, or situations examined in a study (Polit & Beck, 2012: 742; Brink, et al., 2012: 143; LoBiondo- Wood & Haber, 2010:585; Burns & Grove, 2007: 554). There are no hard and fast rules applicable for the determination of sample size however, the researcher must consider both scientific and pragmatic factors influencing the sample size when deciding on the number of participants to be included in the study (Brink, et al., 2012: 143).

Due to the size and variations in the target population, the researcher decided to include the entire population as the sample - n= 41 - to avoid sampling error. A smaller sample would not have been reflective of the entire population and would not detect all the important aspects regarding nurses' knowledge on burn wound management.

1.11 METHODS OF DATA COLLECTION

Data collection is the identification of subjects and the precise, systematic gathering of information (data) relevant to the research purpose or the specific objectives, questions, or hypotheses of a study (Polit & Beck, 2012: 725; Brink, et al., 2012: 56; LoBiondo- Wood & Haber, 2010: 91; Burns & Grove, 2007:536).

1.11.1 Data collection instrument

A data collection instrument is a device used to collect data such as a questionnaire, test, or observation schedule (Polit & Beck, 2012: 191). The choice of the instrument to be used to collect data depends on the research design (Brink, et al., 2012: 200; Burns & Grove, 2005:421).

In Phase Two (a), a researcher administered checklist was used to collect data during the structured observation (Refer to Appendix S) to assess current practice on the management of burn wounds (Refer to Chapter Two for detailed description). Obtaining data from nurses with different levels of experience and rankings prevented information and selection bias and thus increased the credibility of the study. The aim was to gather first-hand information during the procedure.

An interview schedule was used to direct the data collection during semi-structured informal interviews (Refer to Appendix T) composed of mainly open-ended questions to assess if the observed practice is congruent with the verbalised practice regarding the knowledge of the management of the burn wound (Refer to Chapter Two for a detailed description).

In Phase Three the AGREE II verification instrument was used by experts in the field to verify the findings from Phases One and Two (Refer to Appendix U).

1.11.2 Administration of the data collection instrument

After pre-testing the instruments in a different burns unit in Gauteng, the revised checklist and interview schedule were administered to collect data from the selected sample. The responses from the respondents were documented directly onto the checklist.

Both instruments were administered by the researcher to ensure reliability and validity. (Consistency, conformability, credibility and trustworthiness).

1.12 METHODS TO ENSURE VALIDITY AND RELIABILITY

An overview of validity and reliability is provided (Refer to Chapter Two for a detailed description of validity and reliability).

1.12.1 Validity

Validity refers to a quality criterion indicating the degree to which an instrument measures what it is supposed to measure (Polit & Beck, 2012:745; Brink, et al., 2012:218; LoBiondo- Wood & Haber, 2010: 288; Burns & Grove, 2007:559). There are two measures of validity, internal and external: external validity addresses the ability to apply, with confidence the findings of the study to other people or other situations, whilst internal validity addresses the reasons for the outcomes of the study and reduces the other, unanticipated reasons for the outcomes (Roberts, Priest & Traynor, 2006: 43).

For this study, it was considered that content and construct validity were appropriate measures to ensure validity of the study and are discussed in detail in Chapter Two.

1.12.2 Reliability

Reliability is the degree of consistency or dependability with which an instrument measures the attribute it is designed to measure (Polit & Beck, 2012: 741; Brink, et al., 2012: 216; LoBiondo-Wood & Haber, 2010: 585; Burns & Grove, 2007: 552). A statistician was consulted and a Confidence Index was used to establish reliability (robustness) of the findings from the structured observation (Davies & Crombie, 2009:2). For this study, the use of Lincoln & Guba's (1985:290), model was used to ensure trustworthiness in the qualitative phase of the study (Refer to Chapter Two).

In addition mixed method research was used to gather quantitative and qualitative information on current practices regarding the management of burn wounds by nurses.

The researcher had prolonged field experience, having worked in the burns unit for approximately ten years and a good rapport and relationship existed between the nurses and the researcher. Peer debriefing meant that due to the researcher's privileged position of being in contact with several burn units, hospitals and experts in wound care the researcher could continuously debate and discuss each step of the research process as it unfolded and implement suggestions and address concerns as they arose. In Phase Three, a Nominal Group was held with experts to verify the findings from Phases One and Two.

1.13 DATA ANALYSIS

Data analysis is the systematic organisation and synthesis of research data and the testing of research hypotheses using that data (Polit & Beck, 2012: 725; Brink, et al., 2012: 177; Burns & Grove, 2007: 536).

With the help of a statistician, the data collected in Phase Two (a) was captured and stored on an Excel spread sheet and the Positivity Index (PI) was used for analysis, which comprises the identification of and reason for each activity on the checklist, the kind of answer/s observed either affirmative, negative or not applicable (Refer to Chapter Two for a detailed description).

In Phase Two (b) interviews were transcribed verbatim. Tesch's eight-step procedure was applied for the analysis of the data (Tesch, 1990 in Creswell, 1994:155).

In Phase Three the scoring was done according to the guidelines provided in the AGREE II manual (Brouwers, Kho, Browman, et al., 2010). (Refer to Appendix U). Scores were calculated by summing up all the scores of the individual items in a domain and by scaling the total as a percentage of the maximum possible score for that domain. The following formulary was used:

$$\text{The standardised domain score} = \frac{\text{Obtained score} - \text{minimum possible score}}{\text{Maximum possible score} - \text{minimum possible score}}$$

1.14 PILOT STUDY

A pilot study refers to a small simple study conducted as a prelude to a larger scale study (Polit & Beck, 2012: 583; Brink, et al., 2012: 216; Burns & Grove, 2007: 549).

The pilot study was conducted in a different burns unit in a provincial hospital in Gauteng, chosen because it shares similar patient characteristics as the setting in this study. The findings of the pre-test led to the modification in phrasing of some questions, addition of items for some questions, estimation of time of data collection per-respondent and the estimation of the resources required for the main study (Refer to Chapter Two for a detailed description).

The significance of the study follows to highlight what the contribution is towards the nursing profession, the patient and society overall.

1.15 SIGNIFICANCE OF THE STUDY

The nurse is a vital member of the multi-disciplinary team in the management of the patient with burns and has a significant contribution to make to the patient's care.

The focus of this study was to determine what the best evidence is in the management of burn wounds and describe the current practice of nurses in the management of burn wounds.

The results of this study identified the strengths, weaknesses and gaps in current practice as well as to confirm or disprove that the current practice is evidence-based. To date no such study has been researched or published. The significance of this study to the profession of nursing is to contribute to the body of knowledge available to enable nurses to have their own standards against which to measure clinical practice. This ultimately led to the development of guidelines for nurses in the management of burn wounds.

Furthermore, the study was considered significant for the following reasons:

- From the literature reviewed, it was evident that some of the current practices were outdated and not evidence based. This study will this make available the latest evidence based information on the management of burn wounds.
- The information obtained from this study could help to guide future training of student nurses on the management of burn wounds.
- The findings of this research could help to improve clinical outcomes for patients in terms of faster healing rates and earlier discharge.
- The findings will also allow for informed decision making which will reduce wastage and be cost efficient.

This study is built on sound moral judgement and as such, the ethical considerations taken into account are described for purposes of transparency.

1.16 ETHICAL CONSIDERATIONS

Ethical considerations relate to the moral standards that the researcher must consider in all research methods during all the stages of the research process.

A brief overview of the ethical considerations is provided in 1.8.7 (Refer to Chapter Two for a detailed description).

1.17 THESIS STRUCTURE

The research thesis will take the following structure:

Table1.2 Research design and research method

	Objective	**Data collection**	**Population and sample**	**Data analysis**	**Reasoning strategy**	**Trustworthiness/ Validity and reliability**
Phase One	Explore and describe the best available clinical evidence in relation to burn wound management by conducting an integrative review.	Integrative review Whittemore & Knafl, (2005).	Multiple electronic databases, journals, textbooks, Burn associations websites, expert opinions.	Constant comparison method Whittemore & Knafl, (2005). The coded data were compared and further analysed and synthesised using Miles & Huberman (1994), which consists of four phases: data reduction, data display, data comparison, conclusion drawing, and verification phase.	Deductive reasoning Chinn & Kramer (2008); Schwandt (2007); Rossouw (2003).	QualSyst tool (Kmet, Lee, Cook, 2004).
Phase Two (a)	Describe current practice on the management of burn wounds according to the themes of the nursing process through the observation of burn wound dressing procedures with assistance of a quantitative checklist.	Structured observation using a researcher administered checklist	Nurses providing care to patients with superficial to partial thickness burn wounds	Positivity index (PI) Nonino, Anselmi & Dalmas (2008).	Deductive reasoning Chinn & Kramer (2008); Schwandt (2007); Rossouw (2003).	Construct and content validity; Brink, van der Walt, van Rensburg (2012); Polit & Beck (2012); LoBiondo-Wood &Haber, (2010); de Vos, Strydom , Fouche, et al., (2005); Prolonged engagement, Parahoo (2006).
Phase Two (b)	Describe current practice on the management of burn wounds according to the themes of the nursing process through qualitative semi-structured interviews.	Semi-structured and informal interview using an interview schedule	Nurses providing care to patients with superficial to partial thickness burn wounds	Qualitative content analysis forming themes and subthemes Tesch (1990).	Inductive reasoning Mouton & Marais (1994).	Lincoln & Guba's (1985) model for trustworthiness.
Phase Three	Verify the findings from Phase One and Two by having a nominal group with experts in the field by using the AGREE II instrument.	Nominal Group using AGREE II instrument	Purposive sampling of experts in field	AGREE II instrument. Brouwers, Kho, Browman, et al., (2010).	Inductive reasoning Mouton & Marais (1994).	AGREE II scoring system Brouwers, et al., (2010).

1.18 CONCLUSION

This chapter introduces the study by presenting the following main topics: background to the study, research problems, research questions, purpose and objectives of the research, followed by the rationale for the study. Described was a summary of the context, the researcher's assumptions, along with a brief overview of the research design and methodology. The significance of the study, as well as a summary of the ethical considerations, was provided. Chapter Two will describe the details pertaining to the research design and methodology.

CHAPTER TWO LAYOUT

CHAPTER 2	2.0 Introduction		
	2.1 Purpose and objectives of study		
	2.2 Research design	2.2.1 Rationale for research design	2.2.1.1 Mixed Method Research Design 2.2.1.2 Quantitative research 2.2.1.3 Qualitative research 2.2.1.4 Non experimental 2.2.1.5 Explanatory sequential 2.2.1.6 Descriptive 2.2.1.7 Reasoning strategies
	2.3 Research method	2.3.1 Phase One : Integrative review (IR)	2.3.1.1 Purpose of (IR) 2.3.1.2: Step One: Problem identification stage 2.3.1.3 Step Two: Review question 2.3.1.4 Step three: Literature search stage 2.3.1.5 Step Four: Data evaluation stage 2.3.1.6 Step Five: Data analysis stage 2.3.1.7 Step Six: Presentation stage 2.3.1.8 Validity and reliability 2.3.1.9 Findings from the IR
		2.3.2 Phase Two (a): Structured Observation (SO)	2.3.2.1 Observation 2.3.2.2 Purpose of observation 2.3.2.3 Research method 2.3.2.4 Findings from SO
		2.3.3 Phase Two (b): Semi-structured interview (SSI)	2.3.3.1 Interview 2.3.3.2 Purpose of SSI 2.3.3.3 Research method 2.3.3.4 Findings from SSI
		2.3.4 Phase Three: Verification	2.3.4.1 Verification process 2.3.4.2 Purpose of verification process 2.3.4.3 Research method 2.3.4.4 Verification instrument
	2.4 Ethical considerations		
	2.5 Conclusion		

CHAPTER TWO

RESEARCH DESIGN AND METHODOLOGY

2.0 INTRODUCTION

Chapter One was the orientation to the study and highlighted the background of the study, research problem, questions, purpose, and overview of the design and methodology.

This chapter describes the research design and research methodology used in depth. The study will be conducted in three phases each with its own objective.

The research objectives were stated in relation to the purpose of the study. It includes the methodological approach, design, population, sample and sampling techniques. Data collection and analysis procedures and measures of trustworthiness and ethical considerations are discussed.

A mixed method design was used to develop guidelines for management of burn wounds by nurses. The research design and research methods were structured in accordance with the process required to develop best practice guidelines.

The process was divided into three phases:

Phase One involved the search for quality research evidence, Phase Two involved the study of current practice and Phase Three was the verification of findings from Phases One and Two by experts in the field. Phase One was subdivided into six steps and Phase Two into a further two steps.

Phase One involved the problem identification, which led to the formulation of the purpose of the study, to describe the best available evidence for the management of burn wounds by nurses with the aim of developing guidelines. In the absence of existing standards of care for the management of burn wounds, a search for quality research evidence was initiated. The search for quality research evidence was conducted in six steps as follows:

Step one was the identification of a problem with current practice. Following the identification of a problem with current practice a review question was developed which was Step two. Step three was searching the literature for evidence on the non-surgical management of burn wounds. After the literature was searched the evaluation of the data was carried out in Step four. Subsequently the data were analysed in Step five and Step six was the presentation of the data.

Phase Two was subdivided into two steps.

Step one was the collection of evidence on current practice by means of structured observation of nurses during dressing changes; Step two was the collection of evidence on current practice by means of semi-structured in-depth interviews with nurses.

Phase One addressed the first objective of the study; Phase Two addressed the second and third objectives of the study and Phase Three addressed the fourth objective of the study. The research design and research method for Phases One to Three will be discussed individually below.

An overview of the research design and research method is provided (Refer to figure 2.1) and will serve as a reference throughout the study.

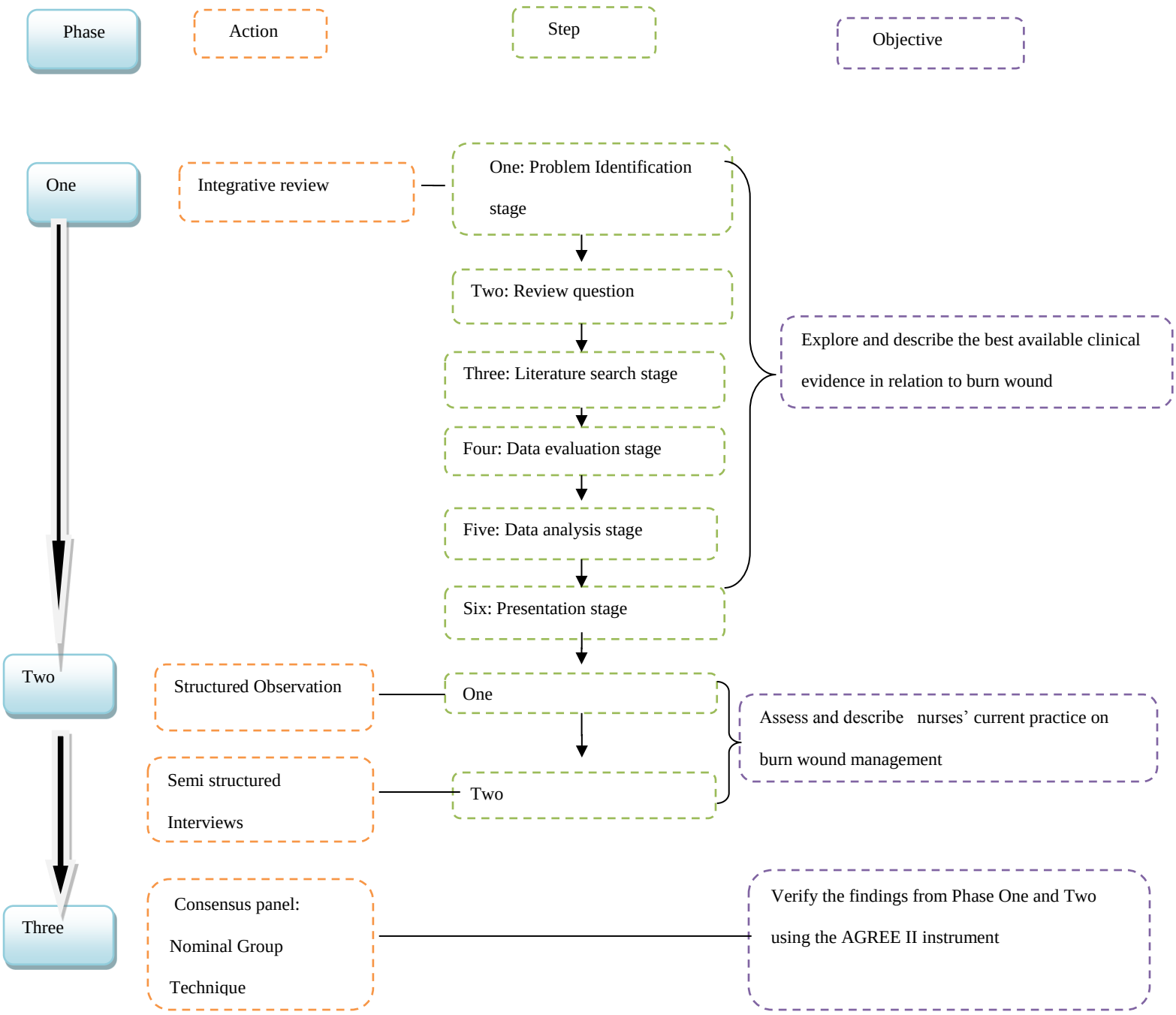

Figure 2.1 Overview of the research design and research method

Similar to Chapter One, the provision of the definition of each subject addressed is explained to avoid ambiguity. The format will therefore be a definition of the subject followed by an explanation in the context of this study.

2.1 PURPOSE AND OBJECTIVES OF THE STUDY

For consistency, the purpose and objectives of the research are repeated:

The purpose of this study was to describe the best available evidence for the management of burn wounds and to explore and describe what nurses' currently practice in the management of burn wounds, in a single burns unit, with the aim of developing guidelines for the management of burn wounds by nurses.

When the purpose of this study was achieved, evidence-based guidelines were developed on the management of burn wounds by nurses with the intention of informing the following:

- nursing practice on the management of burn wounds;
- nursing education on the training on management of burn wounds;
- to support the implementation of the guidelines;
- to create organisational awareness of guidelines.

The purpose of the study was achieved through the following research objectives:

Objective 1: Explore and describe the best available clinical evidence in relation to burn wound management by conducting an integrative review.

Objective 2: Describe the current practice on the management of burn wounds according to the themes of the nursing process through the observation of burn wound dressing procedures with the assistance of a quantitative checklist.

Objective 3: Describe the current practice on the management of burn wounds according to the themes of the nursing process through qualitative semi-structured interviews.

Objective 4: Verify the findings from Phases One and Two by having a Nominal Group using the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument by experts in the field.

The justification of having a research design in a study is to provide an outline of the features, elements and arrangements that would guide the process for generating or validating knowledge which in turn contributes or refines the body of knowledge in the discipline of nursing as a health profession (George, 2011:23; Marshall & Rossman, 2011:71; Fawcett, 2005: 12).

Chinn & Kramer (2008:270), concur and state the research design must be consistent with the intention of the research. The research design used in this study was specifically chosen as it would contribute to the body of knowledge on the management of burns by nurses and thus promote excellence in nursing practice and improve on quality of patient care.

2.2 RESEARCH DESIGN

Research design is described as the "overall plan" for addressing the research questions (Polit & Beck, 2012:741; Creswell, 2009a:3; Parahoo, 2006: 473). The research design directs the researcher in planning and implementing the study in order to answer the proposed research questions (Burns & Grove, 2007:38).

The research design therefore flows directly from the particular research question or hypothesis and from the specific purpose of the study (Brink, van der Walt & van Rensburg, 2012:97). In other words, the research design is the logical steps the researcher takes to answer the research question.

The research questions in this study are multi-dimensional. A holistic approach, that included both qualitative and quantitative research techniques, was selected to explore and describe the research questions without the constraints associated with using a single method (Polit & Beck, 2012: 603; Creswell, 2009a: 203).

The researcher therefore decided to use a mixed method research design. The study's conceptual phase started with exploration of the literature in the form of an integrative review (quantitative), which formed the backbone of the study. The findings from the integrative review formed the theoretical basis of the study which was used to develop the rest of the study in terms of the design of the structured observation (quantitative) and semi -structured interviews (qualitative). Using mixed method research allowed further insight and understanding of the strengths, weaknesses and gaps in the literature and nurses' current knowledge and skills regarding the management of burn wounds.

This study was a mixed methods, QUAN (quantitative dominant) → QUAN+ QUAL (quantitative and quantitative occurs at the same time), a non- experimental, explanatory sequential, descriptive design (Polit & Beck, 2012: 608-612; Creswell & Plano Clark, 2011: 104).

In this design, the researcher first collected and analysed the quantitative data. The quantitative and qualitative data was collected and analysed secondary in the sequence to build on the quantitative results obtained in the first phase. The two phases in turn were connected in the intermediate stage of the study. The rationale for this was that the data obtained in the second phase provided a general understanding of the research (Creswell & Plano Clark, 2011: 104).

Several typologies of mixed method designs exist (Polit & Beck, 2012: 608; Castro, Kellison, Boyd, et al., 2010: 344-345; Johnson, Onwuegbuzie & Turner, 2007: 123-124; Johnson & Onwuegbuzie, 2004: 20-22). A mixed method design was chosen as it allowed a supplementary perspective on the research questions.

The design was sequential as it indicated the timing of data collection (Polit & Beck, 2012: 608; Creswell, 2009a: 206), as the quantitative data was firstly collected, followed by the parallel collection of quantitative and qualitative data. Sequential explanatory strategies are characterised by the collection and analysis of quantitative data followed by qualitative data; weight is given to the quantitative data and informs the qualitative data (Creswell, 2009a: 211; Teddilie & Tashakkori, 2006: 21).

Since no intervention was introduced, the study was non- experimental (Polit & Beck, 2012:735; LoBiondo- Wood & Haber, 2010: 582).

According to Polit & Beck (2012: 725), descriptive research is the research's main objective and is the accurate portrayal of people's characteristics or circumstances and or the frequency in which they occur and as such, this study set out to describe the best evidence and current practice on the management of burn wounds by nurses.

2.2.1 Rationale for the research design

An explanation of each aspect of the design will be described below.

2.2.1.1 Mixed method research design.

The mixed method research design is described as a research design in which the investigator collects and analyses data, integrates the findings and draws inferences using both qualitative and quantitative methods in a single study, or a series of studies (Denzin, 2012:82; Creswell, 2009a:230; Creswell & Plano Clark, 2007: 5). Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone (Creswell & Plano Clark, 2007: 5). Johnson & Onwuegbuzie (2004: 15), explains that mixed method research is research that sits in the middle of a continuum with qualitative and quantitative research on opposite sides, as mixed method research incorporates elements of both quantitative and qualitative research.

Mixed method research is characterised by eclecticism, paradigm pluralism, diversity, rejection of dichotomies and an iterative approach to inquiry (Denzin, 2012: 82; Teddlie & Tashakkori, 2010a:9-10; Johnson, Onwuegbuzie & Turner, 2007:125; Johnson & Onwuegbuzie, 2004:14-26). Each of the characteristics will be discussed individually.

The first characteristic to be discussed is methodological eclecticism.

Methodological eclecticism is a term used to select and synergistically integrate the most appropriate technique to investigate a phenomenon of interest (Teddlie & Tashakkori, 2010a:8; 2010b:274).

This method goes beyond simply combining qualitative and quantitative methods as a means of overcoming the weakness of each method respectively, it entails selecting the best technique available to answer research questions according to the authors cited in the paragraph above. The researcher chose mixed method research as it did not simply “triangulate” the data, which would only validate the findings from the study but not add the required depth. Eclecticism allowed the researcher to choose a method that she perceived to be the best for answering the research questions.

The second characteristic to be discussed is paradigm pluralism.

A paradigm has been described by Denzin & Lincoln (2008: 22), as the net that contains the researcher's epistemological, ontological and methodological premises and is guided by the researcher's set of beliefs and feelings about the world and how it should be understood and studied.

The debate surrounding research paradigms has been on-going for years and has been dubbed "paradigm wars" (Johnson & Onwuegbuzie, 2004:14; Creswell, 1994:176). On one side of the debate are the purists who oppose mixing paradigms and methods and on the other side are researchers who argue, "mixing" is permissible. Purists' debate that quantitative and qualitative methods cannot be combined because of the differences between their underlying paradigms assumptions (Denzin, 2012: 84). However, Johnson & Onwuegbuzie (2004:16), argue that mixed method research attempts to fit together the insights provided by quantitative and qualitative research into a workable solution.

According to Johnson & Onwuegbuzie (2004:15), research is becoming increasingly inter disciplinary and mixed method research will facilitate communication, promote collaboration and provide superior research therefore researchers need to complement methodology. Paradigm pluralism afforded the researcher the opportunity to have an inclusive study that achieved the proposed research objectives.

The third characteristic of mixed method research was diversity.

This diversity was at all levels of the research process, from the broader more conceptual dimensions to the narrower more empirical dimensions. Diversity allowed the researcher to simultaneously address exploratory questions and reach divergent conclusions.

The emphasis on divergent results often provides a greater insight into complex aspects of a phenomenon. (Teddlie & Tashakkori, 2010a:9). The quantitative and qualitative data collected in this study allowed the researcher to explore the literature and obtain a comprehensive understanding of current practice objectively and subjectively allowing for a complete portrayal of current practice.

The fourth characteristic is rejection of dichotomies.

Teddlie & Tashakkori (2010a:10), describe it as an emphasis on continua rather than a set of dichotomies. According to these authors, a hallmark of mixed method research is its replacement of the "either-or" from the paradigm debates with varieties that describe a range of options from across the methodological spectrum. The researcher was therefore not limited to either a positivist or constructivist approach.

The fifth characteristic is an iterative, cyclical approach to research.

This is an approach which includes both deductive and inductive logic in the same study. This cyclical approach to research may be conceptualised in terms of the distinction between the context of justification (associated with deductive logic) and the context of discovery (associated with inductive logic) (Teddlie & Tashakkori, 2010a:10). The cyclical approach in this study started with a quantitative integrative review followed by structured observation and semi-structured interviews.

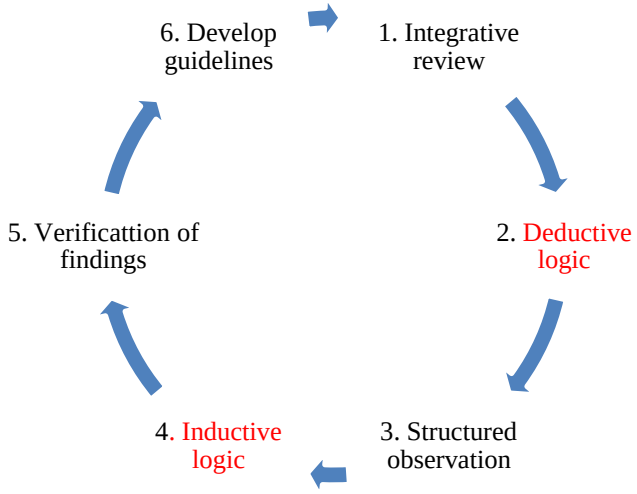

Figure 2.2 Cyclical approach of study

The sixth the characteristic is a focus on the research question (Denzin, 2012: 82; Teddlie & Tashakkori, 2010a:10).

According to Teddlie & Tashakkori (2010a:10), the specifics of the research question will determine the best suited approach. Due to the involvedness of the research questions the researcher decided on a mixed method research approach.

The seventh characteristic is a set of basic "signature" research design and analytical processes (Teddlie & Tashakkori, 2010a:10).

Signature designs give a description of how the mixed method research will be carried out. Below is the signature for this study.
This study was a mixed methods, QUAN (quantitative dominant) $\longrightarrow$ QUAN+ QUAL (quantitative and quantitative occurs at the same time), a non- experimental, explanatory sequential descriptive design (Polit & Beck, 2012: 608-612; Creswell & Plano Clark, 2011: 104).

Mixed method research can therefore be summarised as a research approach that focuses on the research questions that call for real life contextual understanding with multi-level perspectives and influences. It employs rigorous quantitative research assessing magnitude and frequency of concepts with rigorous qualitative research exploring the meaning and understanding of the concepts.

Mixed method research utilises multiple methods of data collection (integrative review, structured observation and semi-structured interviews) to intentionally integrate multiple methods in an attempt to draw on the strength of each and frame the investigation within the philosophical and theoretical positions (Creswell, Klaasen, Plano Clark, et al., 2011:4).

Philosophy of mixed method research

Mixed method researchers use and often make explicit diverse philosophical positions; these positions are often referred to as dialectal stances that bridge post positivist and social constructivist world views (Creswell, et al., 2011:4). Constructivism and post-structuralism are connected to qualitative research and post positivism is connected to quantitative research (Johnson, et al., 2007: 125).

According to Tashakkori & Teddlie (2003a: 20-21; 2003b:713), the central idea of pragmatism is the rejection of "either - or" choices focusing on "what works" in getting research questions answered.

Pragmatist researchers believe that it is the research question that guides the inquiry and that the research question is more important than the methods used (Polit & Beck, 2012: 605; Johnson & Onwuegbuzie, 2004:17). Many mixed method researchers and theorists use pragmatism as a philosophical position, since this offers a practical approach to a problem (Cameron, 2011: 101). Mixed method research is still unfolding and as such there are diverse paradigms associated with it, but Tashakkori & Teddlie (2003a: 20-24; 2003b: 677-680), stated that pragmatism is the main philosophy in the mixed method research.

This study lends its self to a pragmatic perspective as it focuses on using diverse approaches, giving priority to the research problem and the research questions and valuing both objective and subjective knowledge to explore and describe the evidence and current practice on the management of burn wounds by nurses.

Mixed method research is still in its infancy and has come under a lot of criticisms. Gorard (2007:1), asserts that mixing methods is wrong, not because these methods should be kept separate but because they should not have been divided at the outset. Symonds & Gorard (2008:15), argue that by endorsing a mixed method research, paradigmatic separatism is upheld and a world of limitation is created. Giddings (2006:195), concurred, stating that the use of the terms quantitative and qualitative as normative descriptions re-enforces binary positioning and marginalises the methodological diversity between them.

Yet despite the critics, mixed method research is growing in health and social science research. Evidence in published literature, confirms the growing use of mixed method research across all disciplines such as: cardiology (Curry, Nembhard & Bradley, 2009; Riley, Krepostman, Suskin, et al., 2009); pharmacy (Hadi, Alldred, Closs, et al., 2013; Guirguis, 2011); family medicine (Kendall, Mason, Momen, et al. 2013; McIlfatrick, Keeney, McKenna, et al, 2013); nursing (Rickard, Williams, Ray- Barruel, et al., 2011; Wilkins & Woodgate, 2008); mental health (Taggart, Friede, Weich, et al., 2013; Ross, Sawatphanit, Suwansujarid, et al., 2013) and nutrition (Kennedy, McGloin, Nolan, et al., 2008; Strolla, Gans & Risica, 2006).

A growing interest in mixed method research is evident in reviewing the literature. The uptake of mixed method research across the different disciplines has allowed researchers to view problems from multiple perspectives to enhance and enrich the meaning of a singular perspective. The merging of quantitative and qualitative data allows the researcher to develop a more complete understanding of a problem, to develop a complementary picture, to corroborate, validate, or triangulate results (Small, 2011: 63-66; Johnson, et al., 2007: 122; Bryman, 2006: 105-107; Greene, Caracelli & Graham, 1989:259). Another reason is to have one database build on another. When a quantitative phase follows a qualitative phase, the intent of the investigator may be to develop a survey instrument, an intervention, or a programme informed by qualitative findings. When the quantitative phase is followed by the qualitative phase, the intent may be to help determine the best participants with which to follow up or to explain the mechanism behind the quantitative phase (Polit & Beck, 2012:608; Creswell, et al., 2011: 6; Creswell, 2009a: 206-298). In this study the quantitative phase was done first.

For Polit & Beck (2012: 604), qualitative and quantitative approaches are *complimentary* as mixing the two methods allows each method to do what it does best, avoiding the limitations of a single approach. Small (2011:64), and Creswell & Plano Clark (2006:9), argue that the greatest value in combining types of data lies in the ability of one type to compensate for the weakness of the other.

Due to the complexity of this phenomenon it is *practical* to use whatever methodological tools are best suited to answer research questions (Polit & Beck, 2012: 604; Creswell & Plano Clark, 2006:10). Mixed method research often answers questions that cannot be answered any other way.

Researchers agree that mixed method research allows for the simultaneous addressing of exploratory and confirmatory questions, therefore making mixed method research *incremental* (Teddlie & Tashakkori, 2009: 33; Tashakkori & Teddlie, 2008: 101).

Mixed method research *enhances validity* of the results because the findings are supported by multiple and complimentary types of data, according to Polit & Beck (2012: 604). Mixed method research promotes *collaboration* as it allows opportunity and encouragement of qualitative and quantitative researchers working together on a project (Polit & Beck, 2012: 604; Creswell & Plano Clark, 2006:9).

Mixed method research was chosen as it allowed the researcher to achieve the research objectives. It was practical, it allowed simultaneous collection of quantitative and qualitative data that complimented each other and enhanced the overall validity of the study (Polit & Beck; 2012: 604), by providing the range of information needed to capture the depth, breadth, complexity and richness of nurses' current practice on the management of burn wounds.

In mixed method research, researchers intentionally integrate or combine quantitative and qualitative data rather than keeping them separate (Creswell, et al., 2011:5). Six approaches of integration have been discussed in the literature (Creswell & Plano Clark, 2011: 67), that is: convergent parallel, explanatory sequential, exploratory sequential, embedded, transformative and multiphase design.

The **convergent parallel design** occurs when the researcher uses concurrent timing to implement the quantitative and qualitative strands during the same phase of the research process, prioritises the methods equally, keeps the strands independent during analysis and then mixes the results in the overall interpretation (Polit & Beck, 2012: 612; Creswell & Plano Clark, 2011: 70-71; Doyle, Brady & Byrne: 2009: 180). Figure 2.3 demonstrates the convergent parallel design.

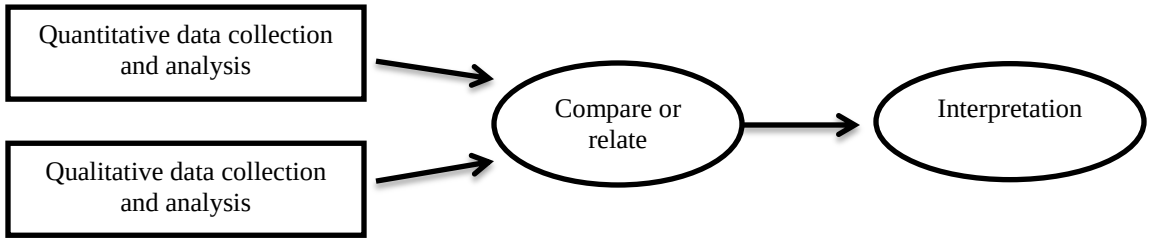

Figure 2.3 Convergent parallel design (Creswell & Plano Clark, 2011: 69).

The **explanatory design** occurs in two distinct interactive phases.
The design starts with the collection and analysis of quantitative data, followed by the subsequent collection and analysis of qualitative data; the qualitative results help to explain the quantitative results (Polit & Beck, 2012: 610; Creswell & Plano Clark, 2011: 71; Doyle, et al., 2009: 181). Figure 2.4 demonstrates the explanatory design.

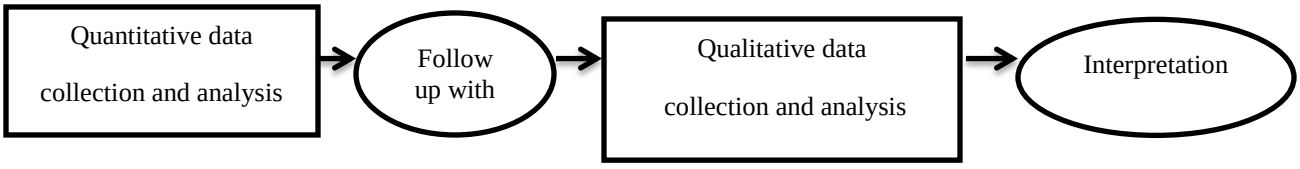

Figure 2.4 Explanatory design (Creswell & Plano Clark, 2011: 69).

The **exploratory design** begins with the collection and analysis of qualitative data in the first phase followed by quantitative phase to test or generalise the findings from the first phase (Polit & Beck, 2012: 612; Creswell & Plano Clark, 2011: 71; Doyle, et al., 2009: 181).

It can also be achieved by transforming one dataset (for example, counting the occurrence of themes in a qualitative dataset) so that the transformed qualitative results can be compared with the quantitative dataset (Sandelowski, Voils & Knafl, 2009:208). The exploratory design is shown in Figure 2.5.

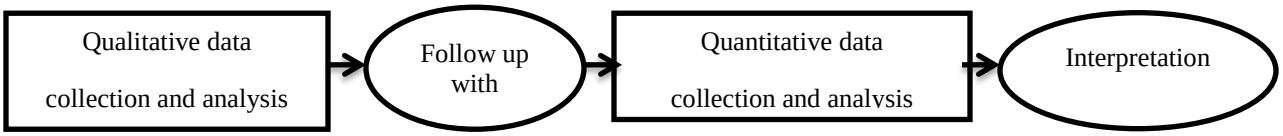

Figure 2.5 Exploratory design (Creswell & Plano Clark, 2011: 69).

The **embedded design** occurs when the researcher collects and analyses both quantitative and qualitative data within the traditional quantitative or qualitative design (Creswell & Plano Clark, 2011: 71-72; Doyle, et al., 2009: 181). In an embedded design, the researcher may add a qualitative strand within a quantitative design and vice versa; this is done to enhance the overall design (Polit & Beck, 2012: 611; Creswell, et al., 2011:6; Creswell & Plano Clark, 2011: 72**)**. Figure 2.6 demonstrates the embedded design.

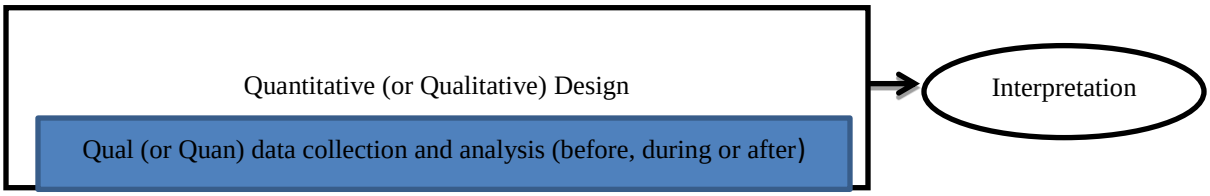

Figure 2.6 Embedded design (Creswell & Plano Clark, 2011: 70).

The **transformative design** is a mixed method design that the researcher shaped within a transformative theoretical perspective. All other design decisions (interaction, priority, timing and mixing) are made within a transformative framework. The important role of the theoretical perspective is highlighted by the dotted line in Figure 2.7 which depicts the possible methods that may have been selected within the transformative design (Creswell & Plano Clark, 2011: 72).

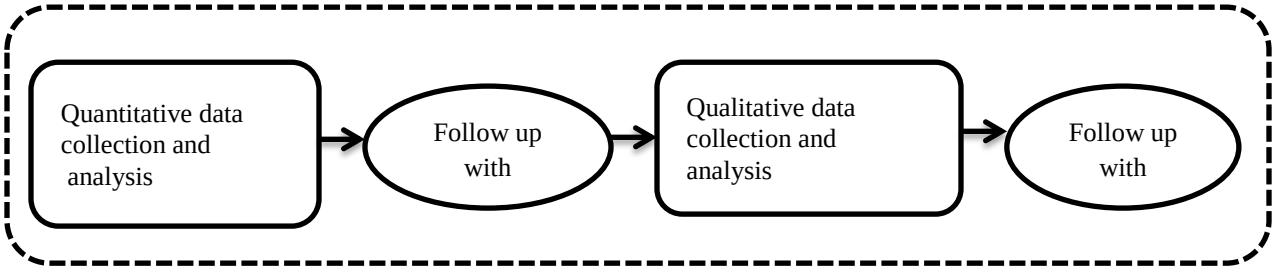

Figure 2.7 Transformative design (Creswell & Plano Clark, 2011: 70)

The **multiphase design** combines both sequential and concurrent strands over a period of time that the researcher implements within a programme of study addressing an overall programme objective (Creswell & Plano Clark, 2011: 72).The multiphase design is demonstrated below.

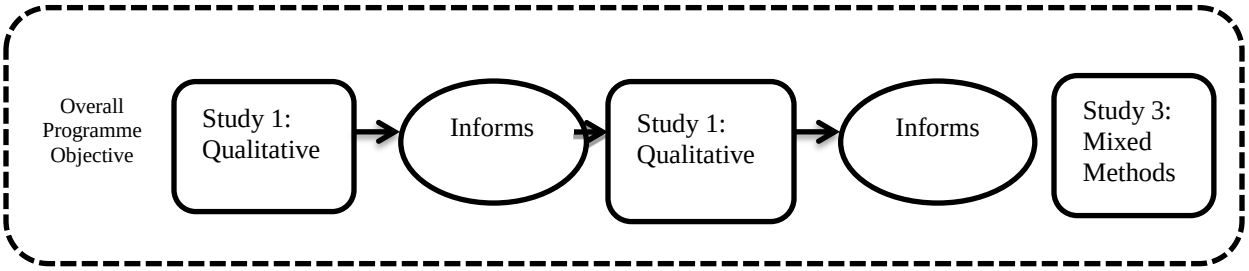

Figure 2.8 Multiphase design (Creswell & Plano Clark, 2011: 70)

The various mixed method designs indicate the varying level of qualitative and quantitative contribution and or sequencing within a specific design (Polit & Beck, 2012: 609).The design decision reflects the interaction, priority, timing and mixing (Creswell & Plano Clark, 2011: 68). Figure 2.9 is a visual diagram of the design used in this study.

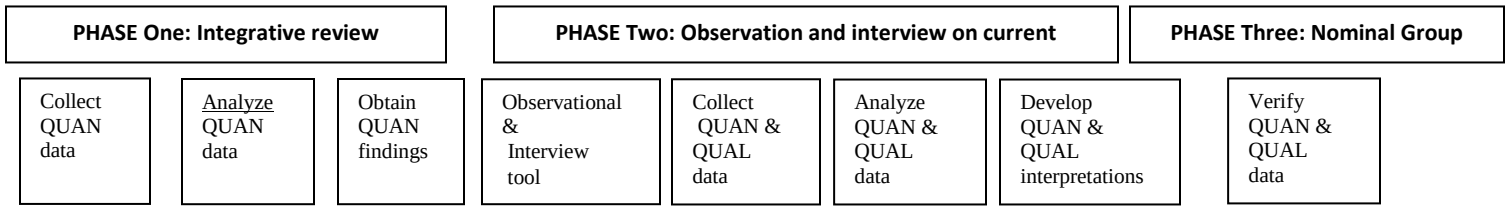

Figure 2.9 Visual diagram of the explanatory sequential design used (Adapted from Polit & Beck, 2012: 610).

2.2.1.2 Quantitative research

Quantitative research is the investigation of a phenomenon that lends itself to precise measurement and quantification, often involving a rigorous and controlled design (Polit & Beck, 2012: 739; Creswell, 2009a: 233). The purpose of a quantitative design is to aid in the systematic solution of the posed research questions and to maintain control (LoBiondo- Wood & Haber, 2010: 159).

Control refers to the measures the researcher uses to hold the conditions of the study uniform and to avoid the impingement of bias or threats to internal validity (Polit & Beck, 2012: 723; LoBiondo- Wood & Haber, 2010: 159).

Quantitative research is a mode of inquiry used often for deductive research to test theories or hypotheses, determine causation (relationships) between variables (characteristics or values that can be changed) and measure the frequency (number) of observations (Polit & Beck, 2012:201- 227; Creswell, et al., 2011:4-5; Fowkes & Fulton, 1991: 1136-1140).

Thus for the purpose of this study, quantitative data was used in the integrative review as well as the structured observation. Quantitative research falls into two classes, experimental and non-experimental.

In experimental research, the researcher actively introduces an intervention; in non-experimental research, the researcher is a "bystander". In other words data is collected without any intervention (Polit & Beck, 2012:55). According to LoBiondo-Wood & Haber (2010: 183), quantitative data can be counted or measured and can be experimental, quasi-experimental or non-experimental.

Experimental research in turn can be randomised control trials, a Solomon Four-Group design or after-only designs. Quasi experimental research are non-equivalent control group designs, after–only non-equivalent control group design, pre-test – post-test designs, time series design. Non- experimental research can be surveys, relationship and difference studies, or methodological, including reviews (LoBiondo-Wood & Haber, 2010: 183).

The main characteristics of quantitative research are pointed out to the reader and a description of how it was applicable in this study is explained.

The focus in quantitative research is *concise and narrow*. Hoe & Hoare (2012: 15-17), describe the hierarchy of evidence for quantitative approaches as systematic reviews, randomised control trials, cohort studies, non- randomised control trials, case-control studies, cross-sectional surveys and case studies.

Systematic review and meta-analyses approaches have made a significant contribution to evidence based practice, but concern has been raised that these review methods do not include the depth and breadth of nursing research as they overemphasise the randomised clinical trial and hierarchies of evidence (Evans & Pearson, 2001: 595; Kirkevold, 1997:979-984).

The integrative review on the other hand is a more inclusive type of literature review. In this study it was chosen as it allowed for the evaluation of the strength of the scientific evidence and identified gaps in current research.

Although quantitative research normally lends itself to numerical analysis, the integrative review does not include statistical analysis (LoBiondo-Wood & Haber, 2010: 212). Therefore, this study focused on the absence of standards of care and described the best available evidence for the management of burn wounds through an integrative review.

Quantitative researchers use a *positivist scientific approach* to conduct research. A positivist scientific approach is built on the traditional scientific approach, which assumes that there is an orderly reality that can be *objectively* studied (Polit & Beck, 2012: 738; Brink, et al., 2012: 25).
For example, in quantitative research the researcher and the research participant/s can remain independent of one another and not influence each another. Thus research is conducted objectively and value free.

Furthermore, with a positivist approach, the findings from the research can be generalised from the study sample to the larger population and knowledge gained from the research benefits a wider audience. The methodology for conducting integrative reviews has been updated with clear steps to be followed throughout the process (Whittemore & Knafl, 2005).

Furthermore many procedures/processes of nursing research is done through observation (Kragelund, 2013: 6-10; Coker, Ploeg, Kaasalainen, et al., 2013: 1-23; Polit & Beck, 2012:537; Brink, et al., 2012: 157- 159; Nonino, Anselmi, & Dalmas, 2008; de Vos, Strydom, Fouche, et al.,2005: 275- 285; Mulhall, 2003:306-313; Muller, 1995:65-85), and interviews (de Vos, et al., 2005:287-299; Hallet, Austin, Caress, et al., 2000: 783-793; Barriball & While, 1994: 328-335), with well-established methodologies. Therefore this study was carried out objectively using sound methodology to research the management of burn wounds by nurses.

2.2.1.3 Qualitative research

Qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2009a:232; Parahoo, 2006: 63), typically in an in-depth and holistic fashion, through the collection of rich narrative materials using a flexible research design (Polit & Beck, 2012: 739).

A significant strength of qualitative research is its focus on the contexts and meaning of human lives and experiences for the purpose of inductive or theory-development driven research.
Understanding, rather than explanation and prediction, is the purpose of qualitative research (Brink, et al., 2012:121; Babbie & Mouton, 2001: 53). Qualitative research is used when little is known about a phenomenon, or when the nature, context and boundaries of a phenomenon are poorly understood and defined (Brink, et al., 2012:120). Qualitative methods facilitate the collection of data when measures do not exist and provide a depth of understanding of concepts. The main approaches in qualitative research are according to (Polit & Beck, 2012:489-500):

- phenomenology which answers the question “what is it like to experience this or that”;
- ethnography which answers how a certain culture interprets “this or that”;
- grounded theory, where the theory that emerges from data is grounded in the observation and interpretation of a phenomenon.

The characteristics of qualitative research are accentuated along with its appropriateness in this study.

In qualitative research the study is conducted in a *naturalistic setting*, which means the researcher goes wherever the participants are (LoBiondo-Wood & Haber, 2010: 86; Patton, 2002: 40-41). All the interviews were conducted within the burns unit, the natural setting for this study.

Qualitative research is *discovery orientated* and is *explanatory* and *descriptive* in nature (LoBiondo-Wood & Haber, 2010: 86). Qualitative inquiry (or research as referred to in the previous sentence) was chosen as it would best describe nurses' current practice on burn wound management from their perspective, with the aim of presenting a complete picture of the current practice on the management of burn wounds by nurses.

The data used are words or text rather than numbers, in order to describe the experiences being studied (LoBiondo-Wood & Haber, 2010: 584). It is therefore appropriate that a qualitative inquiry be used during the interviews and nominal group.

In qualitative research the *researcher is the key instrument* and is *subjectively* involved in the data collection process (Brink, et al., 2012: 121; Creswell, 2009a: 175; Patton, 2002:40-41). The researcher was the key instrument in the qualitative phase of the study.

Due to the researcher's prolonged engagement and interest in wound care, the researcher had a significant base of knowledge and clinical experience in the management of burn wounds, which meant she understood the finer intricacies of wound management.

This allowed the researcher to identify relevant aspects of wound management. However, this very knowledge and experience could have obscured the researcher's perspective and bias. Bracketing is a method used by some researchers to mitigate the potential effect of unacknowledged preconceptions related to research to increase rigor (Gearing, 2004). Malterud (2001), stated that a "positioned researcher", should be aware of the theoretical foundations of their education. The researcher was constantly aware of her role and kept a reflective journal throughout the research process.

To avoid bias the findings were verified with the nurses after the interviews to ensure that the captured data was theirs. Furthermore, a nominal group was conducted in Phase Three of the study using the AGREE II instrument.

Multiple sources of data are collected (Creswell, 2009a:175). The researcher gathered multiple forms of data in the form of individual interviews and a nominal group in order to obtain a *holistic* perspective on nurses' current practice in the management of burn wounds (Creswell, 2009a:176; Parahoo, 2006: 65). Participants were afforded the opportunity to talk about their current practice in totality and were not restricted only to the questions on the interview schedule, as these questions merely served as probes.

Qualitative researchers build patterns, categories and themes from the bottom up, by organising into increasingly more abstract units of information, in other words, in an *inductive nature* (Brink, et al., 2012: 121; Creswell, 2009a: 175; Parahoo, 2006: 64; Patton, 2002:40-41). An inductive approach is the analysis of data and examination of practice problems within their context rather than from a predetermined theoretical base, in other words the approach moves from a specific problem or question to the general (Mosby Medical dictionary, 2008).

An inductive approach was used during the interviews as the researcher was open to ideas which emerged from the nurse participants verbal and non-verbal responses in relation to the research question. The researcher explored the phenomenon of current practice in order to find emerging empirical patterns that could form the basis for the development of guidelines.

The researcher transcribed all recorded interviews verbatim and emerging categories and sub- categories were developed. The researcher read and re-read the transcripts to reflect on the data as well as the researchers understanding of the data.

The focus of qualitative research is to attain the *participants' meanings* of the phenomenon under study, not the meaning of the researcher or the literature (Newton, 2010: 4; Creswell, 2009a: 175; Polkinghorne, 2005: 139). Polkinghorne (2005: 139), recognised that the transcription of participants experience into text might distance the evidence of the experience from the experience itself. However, language (text) is the only access to participants' experiences. During the interviews, the researcher tried to capture the nurses' experience and therefore did not impose words or meaning on the nurses. This is demonstrated by the reporting of the actual words used during interviews. Including verbatim quotations from research participants has become standard practice in much qualitative research (Corden & Sainsbury, 2006:1; Sandelowski, 1994:479).

The purpose of including participants' words or quotations is to provide evidence (interpretation, claim, or conclusion), an explanation of themes identified, to illustrate or provide a more concrete example of an idea, to deepen understanding of participants perspectives, to represent the thoughts, feelings, or moods of the persons quoted, to evoke a feeling or mood, or to provoke a response in members of the audience for the research report (Corden & Sainsbury, 2006: 11-13; Sandelowski, 1994:480).

For example Balin (1988:275-301), used quotes to illustrate different expressions of what sacred dimensions of pregnancy and birth were. Similarly Corden & Sainsbury (2006: 1-35), used quotations to investigate the inclusion of respondents quotations from the perspective of researchers, research users and participants. Newton (2010:4), argued that the extent to which the respondent's opinions are truly reflected rest on the participants' "voice" in communicating their perspectives. The researcher therefore used participants own words in reporting the findings for example, the use of the word "beefy" to describe the appearance of a wound.

2.2.1.4 Non-experimental

Non-experimental research reports are studies in which the researcher collects data, without introducing an intervention, manipulation of the independent variable, nor is the setting controlled; this type of research is also called observational research **(**Polit & Beck, 2012: 735; Brink, et al., 2012: 112; LoBiondo- Wood & Haber, 2010: 582).

Observational, or non-experimental research, is the inquiry in which phenomena are merely observed (Polit & Beck, 2012:736). The variables in this study would be unethical to manipulate, which was the reason the researcher chose to do a non- experimental study.

The researcher was just an observer of current practice in Phase Two of the study. The purpose of non-experimental research is to describe phenomena and explore and explain the relationships between variables (Brink, et al., 2012:112). These variables are measured and yield numeric data that can be analysed statistically. Quantitative data has the potential to provide measurable evidence, to help to establish (probable) cause and effect, to yield efficient data collection procedures, to create the possibility of replication and generalisation to a population, to facilitate the comparison of groups and to provide insight into a breadth of experiences.

Non–experimental research can either be descriptive, correlational or others: surveys, methodological, systematic reviews, meta-analyses, integrative reviews (Brink, et al., 2012: 112- 119; LoBiondo-Wood & Haber, 2010: 196- 217; Burns & Grove, 2007: 240-254). Structured observations of participants were done using a researcher administered checklist. Data from the integrative review and observation were described by means of descriptive statistics.

The main characteristics of a non-experimental design are emphasised and its applicability in this study, explained.

Non- experimental research is clearly distinguishable from experimental and quasi-experimental research as there is *no manipulation* of the independent variable, the *subjects are not randomised* and there is *no control group* (Polit & Beck, 2012:223). Nonetheless the information generated from non-experimental research is critical in developing a base of evidence for practice and may present the best evidence available to answer a specific research question.

This study could not be conducted using an experimental design as it would not only be unethical do to so, but also it would have been impossible to actively withhold or administer an intervention to an experimental group, without contaminating the control group as there are too few nurses working in the unit to do so. Thus the researcher, guided by the purpose and objectives of the study, used a non-experimental design.

2.2.1.5 Explanatory Sequential

The explanatory sequential design (also known as the explanatory design) occurs in two distinct phases (Creswell & Plano Clark, 2011:71).

Explanatory designs are sequential mixed method designs in which quantitative data is collected in the first phase and qualitative data in the second phase, to build on or explain quantitative findings (Polit & Beck, 2012: 727; Creswell, Klaasen, Plano Clark, et al., 2011:8; Creswell, 2003: 223).

According to Creswell, (2003: 227), the qualitative results are used to assist in explaining and interpreting the findings from a quantitative study; with its simplicity being one of its main strengths.

This is a popular approach in the health sciences as the qualitative data helps to explain, in greater depth, the mechanisms underlying the quantitative result (Catallo, Jack, Ciliska, et al., 2013:1-13; Doyle, Brady, & Byrne, 2009: 175; Twinn, 2003: 541-556).

For example, in this study, data collection strategies involved collecting data in a consecutive manner whereby the data collected in Phase One contributed to that collected in Phase Two. The integrative review revealed what the latest advances are in the management of burn wounds. The subsequent structured observation and semi-structured interviews explored current practices to ascertain what the strengths, weaknesses and gaps were in relation to the literature. Results from both phases were integrated during analysis, providing an explanation of the meaning of the findings. The results from this study can be used to inform education material and future planning of training and practice of burn wound management by nurses.

2.2.1.6 Descriptive

Descriptive research is the identification of the characteristics of a nursing phenomenon or the relationship amongst these phenomena (Burns & Grove, 2007: 537). A descriptive design's objective is to accurately portray the characteristics, circumstances and/or the frequency in which a specific phenomenon occurs in particular subjects, groups or institutions, particularly when little is known about the phenomena (Polit & Beck, 2012: 725; Brink, et al., 2012: 211; LoBiondo- Wood & Haber, 2010:198; Parahoo, 2006: 467).

The purpose of a descriptive design is to develop theory, to identify problems with current practice, to justify current practice, to make judgements, or to determine what others in similar situations are doing (LoBiondo- Wood & Haber, 2010:198). The descriptive aspect of the research design was intended to collect accurate information on the management of burn wounds by nurses and describe the core concepts in relationship to the phenomena under study (Marshall & Rossman, 2011:69).

The main characteristics of descriptive research are highlighted along with its pertinence in this study.

Descriptive research examines variables in their *natural environment* (Polit & Beck, 2012: 226; Brink, et al., 2012: 112; Burns & Grove, 2007: 240). A descriptive design describes the current practice of nurses in a single burns unit in Gauteng on the management of burns in the environment in which it naturally occurred. *No manipulation* of variables occurs in descriptive research (Burns & Grove, 2007: 240), and none were manipulated in this study.

In descriptive research there is *insufficient existing literature* describing the phenomenon under investigation (Brink, et al., 2012: 113; LoBiondo- Wood & Haber, 2010: 198). The researcher selected a descriptive design because it allowed her to describe and document the management of burn wounds by nurses, as currently literature does not address this topic. In other words descriptive designs develop new knowledge and add information to the nursing profession.

In this study, a descriptive design was used in order to achieve the study objectives by an integrative review, structured observations and semi-structured interviews. The use of a descriptive design was to describe the concepts of burn wound management, the best available evidence for the management of burn wounds and the current practice of nurses regarding the management of burn wounds.

2.2.1.7 Reasoning strategies

The process of inquiry in this study was done in a systematic and consistent manner. Mixed method researchers believe that research questions can better be explored through a combination of research methods and techniques (Wheeldon & Ahlberg, 2012: 117; Creswell & Plano Clark, 2007: 5).

To enable the arrival of logical conclusions of the observed reality of the management of burns by nurses the researcher used both inductive and deductive reasoning strategies (Wheeldon & Ahlberg, 2012: 8). As mixed method research is evolving, so too is the understanding of its theoretical framework. The emergent pragmatic approach used in mixed method research, is the abductive reasoning process. This approach to reasoning encourages the use of both inductive and deductive reasoning; it can produce stronger measures of association whilst allowing that multiple paths to meaning exist (Wheeldon & Ahlberg, 2012: 8).

However in searching the literature it was evident that this form of reasoning has not been widely accepted in nursing research as yet. In a review done by Lipscomb (2012), eighty nine hits for the search phrase *inductive reasoning*, eighty seven hits for the search phrase *deductive reasoning* and just five hits for the phrase *abductive reasoning* were found. Two of the five located papers on abductive reasoning (Haig, 2008; Richardson& Kramer, 2006), were published in journals that do not specifically target nursing or health and for that reason, they may be unfamiliar to nurses (namely Journal of Theory Construction and Testing and Qualitative Research). Of the remaining three papers, two were by Råholm (2010), and the third, by Gordon, Morton, & Brooks, (2005). According to Lipscomb (2012: 245), the scarcity of information on the topic means that it has "not yet been absorbed by the profession."

The concept of abduction is closely associated with the work of Charles Sanders Peirce (1839–1914) (Lipscomb, 2012: 245; Råholm, 2010: 262; Given, 2008: 1), but the development trail is difficult to follow due to the shortage of literature available in nursing research. Nurse researchers and scholars are relatively indifferent towards the concept of abductive reasoning and this indifference is apparent in nursing research textbooks. Reference lists in Brink, et al., (2012), Polit & Beck (2010, 2006), Bowling (2009), Creswell (2009a), Parahoo (2006) and deVos, et al., (2005), identify entries for induction and deduction, but not abduction. The researcher in line with the evolving nature of mixed methodology therefore used abductive reasoning as the overall reasoning strategy.

Each of the three reasoning strategies and it role in this study are explained below.

Abductive reasoning

Is a process that values both deductive and inductive approaches but relies principally on the expertise, experience and intuition of the researcher.

Associated with mixed method research, through inter-subjectivity of researchers and their understanding based on shared meaning, this approach to reasoning encourages the use of both inductive and deductive approaches to research (Wheeldon & Ahlberg, 2012: 8). Inter-subjectivity refers to shared understanding between two or more subjects and establishing the objectivity of the claim made (Wheeldon & Ahlberg, 2012: 117; Given, 2008: 467; Unger, 2005:3). Drawing on the philosophical notion of subjectivity (meaning is necessarily coloured by one's experiences and bias), inter-subjectivity recognises that meaning is based on one's position of reference and is socially mediated through interaction (http://www.srmo.sagepub.com/view/sage-encyc-qualitative).

Abductive reasoning begins when reviewers understand that a set of seemingly unrelated findings are in fact related and ends with models of relationships that can themselves be formally tested (Sandelowski, Voils, Leeman, et al., 2012: 326). In an abductive model, new ideas emerge by taking various clues and restrictions into account and by searching and combining existing ideas in novel ways (Råholm, 2010: 260).

Abduction is advantageously different from induction and deduction as it reaches beyond a pure extraction of facts (Råholm; 2010: 262). According to Råholm (2010: 261), abduction makes deeper and also new understanding of caring possible. In this study, abductive reasoning was suitable, as the researcher was familiar with the literature on burn wound management and its current practice due to her experience and expertise in the clinical environment. The researcher could therefore channel her existing skills in such a way that would best answer the research questions.

Deductive reasoning

Is the process of developing specific predictions from general principles (Polit & Beck, 2012: 725; Brink, et al., 2012:211; LoBiondo- Wood & Haber, 2010:577; Burns & Grove, 2007: 537).

The nursing process is an example of deductive reasoning in nursing where nurses use the framework to categorise data and define the patients nursing diagnosis. Chinn & Kramer (2008:214), Schwandt (2007:147), and Rossouw (2003:39), describe deductive reasoning as a form of logic whereby reasoning moves from the general to the specific, where the starting point embodies two or more concepts that are categorised in relation to each other in broad terms or descriptions with a conclusion that contains specific concepts or data on the relationship.

In this study, deductive reasoning was used when the summaries of the findings from the integrative review were made on what the best available evidence was for the management of burn wounds as well as during the processing of data from the observation.

Inductive reasoning

Is described as reasoning in statements with data that is specific to statements that have broader and general conclusions (Chinn & Kramer, 2008: 214; Schwandt, 2007:146; Rossouw, 2003: 40).
The data that emerges in the conclusion can be considered in relation to broader events or phenomena in another similar context or system.

Inductive reasoning was used to interpret the statements from nurses during the interviews where conclusions were based on probable support from the statements (Mouton & Marais, 1994: 108-109).

A description of the research methodology follows.

2.3 RESEARCH METHODS

The research methods used in this study comprise data collection methods, the research population, the sample and sampling methods, data analysis and measures of validity, reliability and trustworthiness. Each of the research methods is linked and discussed in accordance with the purpose of the study (Chapter One, section 1.4) and research objectives (Chapter One, section 1.5).

This study allowed for a structured approach and was conducted in three phases.

Data in **Phase One** was collected through an integrative review.

In **Phase Two (a),** nurses working in the burn unit were observed during dressing changes by means of structured observation using a researcher administered checklist. In **Phase Two (b),** data were collected through semi- structured interviews directed by an interview guide.

Data in **Phase Three** was collected through a nominal group in which findings from Phases One and Two were verified by a group of experts in the management of wounds guided by an evaluation instrument, AGREE II with the aim of developing guidelines for the management of burn wounds by nurses.

Before the onset of the study, the researcher conducted a literature review to develop a framework of what was already known in literature and to get a sense of direction of how to embark on the journey of discovery in burn wound management. This led the researcher to a crucial point in making the decision about the type of review to conduct in the study with the choices being between literature review, systematic review and integrative review. Table 2.1 presents the differences between the types of reviews.

Table 2.1 Different review types

Feature	Systematic review	Integrative review	Traditional literature review
Definition	Review that combines the evidence of multiple studies regarding a specific clinical problem (Whittemore & Knafl, 2005).	Review method that summarizes past empirical and theoretical literature to provide a comprehensive understanding of a particular phenomenon (Whittemore & Knafl, 2005).	A written summary of evidence on a research problem (Polit & Beck, 2012).
Question	Focused (LoBiondo- Wood & Haber, 2010; Whittemore & Knafl, 2005; Stevens, 2001).	Broad in scope (LoBiondo- Wood & Haber, 2010; Whittemore & Knafl, 2005).	Broad in scope (Polit & Beck, 2012; Armola, Bourgault, Halm, et al., 2009).
Sources and search	Comprehensive sources and explicit search strategy (LoBiondo- Wood & Haber, 2010).	Comprehensive sources and explicit search strategy (Whittemore & Knafl, 2005; Beyea & Nicoll, 1998).	Usually not specified (Cronin, Ryan & Coughlan, 2008).
Inclusion and exclusion criteria	Rigorous criterion based selection (LoBiondo- Wood & Haber, 2010).	Criterion based selection (Russell, 2011; Ganong, 1987).	Not usually specified (Armitage & Keeble-Allen, 2008).
Appraisal	Rigorous critical appraisal (Centre for Reviews and Dissemination, 2009).	Rigorous critical appraisal (Whittemore & Knafl, 2005).	Variable (Armitage & Keeble-Allen, 2008).
Synthesis	Narrative or statistical (Amorola, et al., 2009, Whittemore & Knafl, 2005).	Do not employ statistics due to heterogeneity of studies (LoBiondo- Wood & Haber, 2010; Melnyk & Fineout-Overholt, 2005).	Often qualitative summary (Cook, Mulrow & Haynes, 1997).

Based on the different features of the different designs, the researcher chose to use an integrative review for the study. In essence, this meant the researcher would use a focused inquiry, but that the studies for inclusion were not limited to randomised controlled trials and would accommodate the inclusion of other types of studies. The integrative review would best answer the research questions on the management of burn wounds by nurses.

Each phase of the study is depicted below.

2.3.1 PHASE ONE: INTEGRATIVE REVIEW

An integrative review is a research method that forms part of the non-experimental quantitative designs (LoBiondo- Wood & Haber, 2010:207- 212).

The integrative review is a specific review method that summarises past empirical or theoretical literature simultaneously to provide a more comprehensive understanding of a particular phenomenon or healthcare problem (LoBiondo- Wood & Haber, 2010: 578; Whittemore & Knafl, 2005: 547; Ganong, 1987:1).

In other words, overall conclusions are drawn from many different studies that reflect the past and current state of knowledge pertaining to a particular subject (Whittemore & Knafl, 2005: 547). According to Russell (2005: 8), integrative reviews have many benefits, amongst these are evaluating the strength of the scientific evidence, identifying gaps in current research, identifying the need for future research and bridging between related areas of work. Due to the inclusive nature of reviews it has the potential to build nursing science, inform research, inform practice, policy initiatives and play an important role in evidence-based practice for nursing (Evans & Pearson, 2001: 595).

A systematic plan was devised for conducting the integrative review and the method is clearly described and accurately documented (Randolph, 2009:6).

An integrative review of all available national and international sources was conducted in order to provide a rigorous review of the quality research evidence, expert practitioners' opinions, patient's preferences and available health care resources to inform evidence based care **(**DiCenso, Guyatt & Ciliska, 2005: 4; Sackett, Straus, Richardson, et al., 2000:1). The integrative review is a critical step in the process of developing guidelines.

The process for conducting the integrative review was applied as described by Whittemore & Knafl (2005). The process for the review included a problem identification stage, a literature search stage, a data evaluation stage, a data analysis stage and a presentation stage (Whittemore & Knafl, 2005). Each stage of the review is depicted to allow critical scrutiny so as to increase the credibility of the study. A credibility assessment of the study requires a careful analysis of the study's methodological and conceptual limitations and strengths (Polit & Beck, 2014: 251).
The respective stages of the review follow.

2.3.1.1 Purpose of the Integrative Review

The purpose of integrative reviews according to Burns & Grove (2007:508-509), is to identify, analyse and synthesise results from independent studies in order to determine the current knowledge for a particular topic. A review of the literature was done for the following reasons: to delimit the research problem; determine new lines of inquiry; avoid fruitless approaches to the study; to gain methodological insights; identify recommendations for further research on the topic and to distinguish what has been done on the topic (Randolph, 2009: 2). Furthermore the purpose was to discover important variables relevant to the topic; synthesize and gain new perspective; to identify relationships between ideas and practice; to rationalise the significance of the problem; identify the main methodologies and research techniques that have been used as well as place the research in a historical context to demonstrate familiarity with developments in the field (Randolph, 2009: 2).

An integrative review was chosen for this study as it allowed the researcher to identify the quality research findings, expert practitioners' opinions and resources necessary for the management of burns by nurses. It enabled the researcher to explore:

1) what is known on the subject of burn wound management;
2) what is the quality of what is known and;
3) what should be known regardless of whether the methodology is experimental or non-experimental.

The integrative review was done as a link in the chain of the model for evidence based clinical decision making. In other words the evidence derived through the review was integrated with the clinical expertise, the South African context, available resources and the patient preferences where applicable as demonstrated in Figure 2.10.

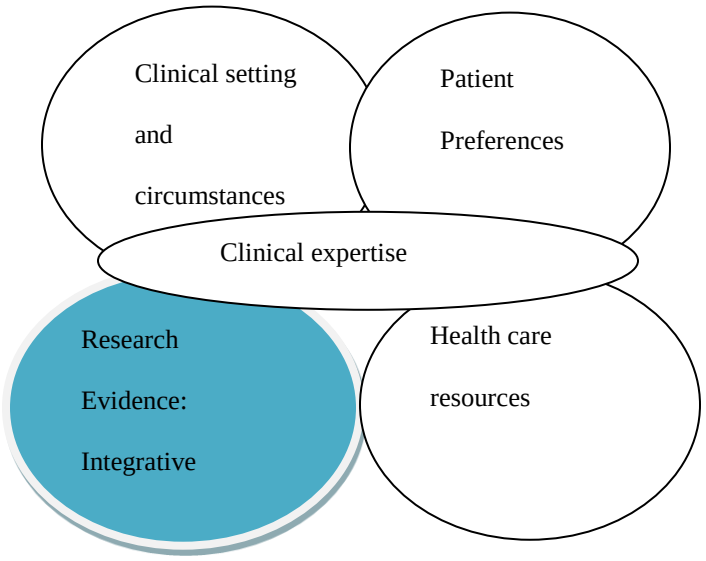

Figure 2.10 A model for evidence based clinical decisions (Taken from DiCenso, et al., 2005: 5).

Conclusions drawn from the integrative review were then used as evidence for the guidelines for the management of burn wounds by nurses.

Following the determining of the purpose of the integrative review, the researcher progressed into the problem identification stage.

2.3.1.2 Step One: Problem Identification Stage

The first step in conducting the integrative review was the problem identification stage. It was evident to the researcher that the variations in practice observed led to variations in wound outcomes. The identified review problem therefore was:

There are no unanimous standards or guidelines in South Africa that informs nursing practice in burn wound management and consequently there are variations in wound care practices with some of the methods and techniques being outdated and not evidence based.

In this step the researcher decided on which questions the review would answer; the purpose of the review influenced the questions. The identified problem then led to the review question:

2.3.1.3 Step Two: Review Question

What new knowledge or information related to non-surgical management of burn wounds has emerged in the literature between 2000 and 2014?

The integrative review's structure was guided by the nursing process. The nursing process is a deliberate intellectual activity by which nurses approach the practice of nursing in an orderly, systematic manner to help them arrive at decisions, to predict outcomes and evaluate consequences (Bruce, Klopper & Mellish, 2011: 46-47). According to Parahoo (2006:106), the nursing process is a problem solving technique that consists of specific steps or stages with its main purpose being to provide care to patients. The nursing process is familiar to all nurses as it is used to structure nursing care in clinical practice.

The nursing process consists of five components namely: Assessment, Diagnosis, Planning, Implementation and Evaluation (Bruce, et al., 2011:47), and therefore this study addressed the following issues related to the management of burn wounds:

Assessment methods and tools used

Assessment refers to the nurses' data collection process and provides the structure for classifying and recording data.

Diagnosis included terminology used

The data collected during the assessment is used to identify significant cues and patterns which are then used to generate the nursing diagnosis; the nurses then states the goals and interventions appropriate to the diagnosis (Bruce, et al., 2011:47).

Planning was omitted as it was apparent during implementation.

Implementation

Cleaning solution, temperature control, technique, open or closed management, ointment or dressings and type of dressings.

After implementing the plan of care the nurse evaluates the results and determines the degree of goal achievement (Bruce, et al., 2011:47).

In order to comprehensively answer the review question it was broken down into tangible secondary review questions. The researcher used the nursing process to structure questions.

Assessment

How should burn wounds be assessed at macro level?

How should burn wounds be assessed at micro level?

Diagnosis

What is the correct terminology for burn wounds?

Interventions

What is the best cleaning solution for burn wounds?

What are the ideal wound / surroundings temperature?

What are the differences between dressings?

Open vs. closed method of dressing?

Ointment vs. dressing?

Outcomes and Evaluation

How is wound healing being measured?

How should pain in burns be managed?

How should the management of burn wounds be recorded?

Following the determining of the review questions, the researcher commenced the literature search stage.

2.3.1.4 Step Three: Literature search stage

The goal of the literature search stage was to conduct an exhaustive review of literature and collect a set of relevant articles that meet specific inclusion criteria.

A systematic plan was devised for data collection and the method of collection clearly described and accurately documented (Randolph, 2009:6). The description of the process of literature search stage includes an account of the type of literature retrieved and methods of literature retrieval to reduce bias. It is generally accepted that evidence based research is restricted to randomised controlled trials and meta-analyses.

However, Sackett, Rosenberg, Muir Gray, et al., (1996:72), stated that the use of randomised controlled trials is not always possible in evidence based research. Evans & Pearson (2001: 595), and Kirkevold (1997: 982), added that systematic reviews and meta-analyses, whilst worthwhile research methods, do not add the richness of nursing research due to its overemphasis on the randomised controlled trials. The integrative review in contrast is a more inclusive type of literature review. For this reason both high quality experimental and non-experimental studies other than randomised controlled trials were included in the integrative review.

The following types of literature were retrieved as per DiCenso, et al., (2005: 34): guidelines; evidence based journals; systematic reviews of multiple, well-designed, randomised, controlled trials; individual randomised, controlled trials; trials without randomisation; well designed, non-experimental studies and qualitative studies; along with the opinions of respected authorities on clinical evidence; descriptive studies; reports; comments of expert committees and textbook chapters by experts.

A well-defined literature search strategy was used to enhance the rigour of the review as incomplete or biased searches could result in an inadequate database with the potential for inaccurate results (Cooper & Hedges, 2007: 12; Whittemore & Knafl, 2005: 548).

All attempts were made to reduce bias in the selection of literature for incorporation in the integrative review by including all literature that met the inclusion criteria according to the hierarchy of evidence. Implementing stringent measures of validity ensured representativeness of the sources used in the literature search stage by applying the following methods of literature retrieval.

Firstly the researcher used multiple electronic databases for literature retrieval. According to Whittemore & Knafl (2005: 548), computerised data bases are efficient and effective, but may only yield fifty percent of results due to inconsistent terminology and indexing problems. Whittemore & Knafl (2005: 548), reported that a comprehensive search for an integrative review identifies the maximum number of eligible sources by using at least two to three search strategies. Due to this limitation, other approaches, such as hand searching, were recommended.

Journal hand searches and reference lists of relevant articles were used to retrieve additional literature (DiCenso, et al., 2005: 34). According to Randolph (2009: 7), the most effective method for locating the remaining literature was through references of the retrieved articles, reading their references and repeating the process until a point of saturation. In addition the researcher sought comments of experts, textbook chapters by experts and guidelines that met the inclusion criteria to augment the retrieved literature.

Inclusion/Exclusion Criteria

A critical appraisal of sources for the integrative review was conducted prior to inclusion in the review. All literature required to meet the criteria for inclusion into the integrative review, was critically appraised, except for the reports by expert committees, textbook chapters by experts and the guidelines. Inclusions of studies were those of a high level of evidence as per DiCenso, et al., (2005:33). In the review, studies were explored according to rank. Guidelines were considered first and if none were available, evidence-based Journals were consulted. Figure 2.11 illustrates the hierarchy of evidence as well as the availability of the studies.

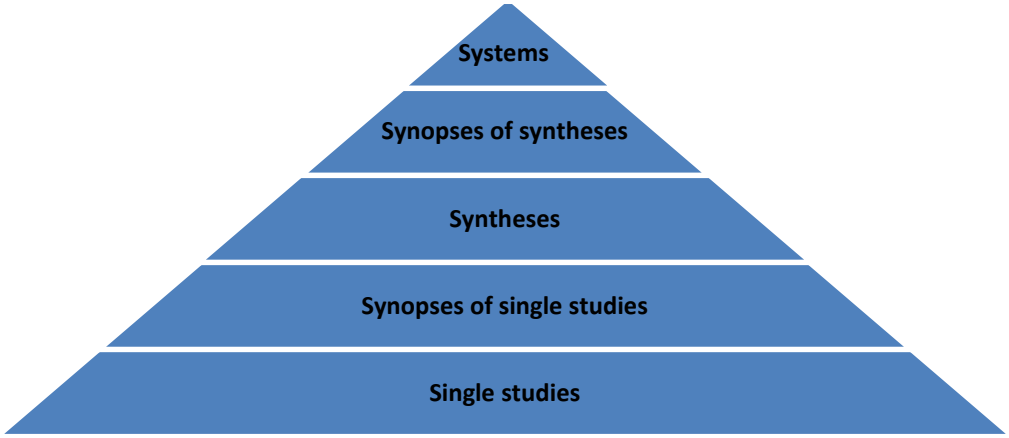

Figure 2.11 A hierarchy of evidence (DiCenso, et al., 2005:34).

Table 2.2 depicts examples of the literature sources in the hierarchy.

Table 2.2: Examples of hierarchy of evidence (DiCenso, et al., 2005:34).

Hierarchy	Examples
Systems	Clinical practice guidelines
Synopsis of syntheses	Evidence based abstract journals
Syntheses	Cochrane reviews
Synopses of single studies	Evidence based abstract journals
Single studies	Clinical queries

This process yielded a large volume of articles (n = 2004). The reviewing of each article title and abstract was reviewed to determine inclusion criteria; if an article could not be eliminated by reading the abstract, it was reviewed in further detail. Refer to table 2.3 for the actual numbers of retrieved literature.

Table 2.3 Reviewed literature

Categories/ Themes	Number retrieved
Guidelines	36
Cochrane Reviews	10
Assessment	10
Tools used for burn assessment	13
Wound cleansing	4
Pathophysiology and definitions	10
Burn reviews	5
Wound bed preparation	12
Debridement	12
Infection	41
Moisture control	4
Burn management	51
Wound healing	6
Dressings	109
Wound healing	5
Pain management	26

Finally, data were extracted from the selected literature sources. The final sample consisted of n= 354 studies.

A discussion of search methods and findings follows.

The following electronic databases were searched for literature:

- Databases of Abstracts of Reviews of Effects (DARE).
- Cochrane Database of Systematic Reviews (CDSR).
- The Evidence for Policy and Practice Information (EPPI) Centre.
- The National Guideline Clearing house (NGC).
- The Joanna Briggs Institute's JBI Connect.
- RNOA best Practise Guidelines.
- MEDLINE.
- PUBMED.
- EBSCO HOST.

Journals published between 2000 and 2014 were selected and hand searched for literature. The reference lists of selected articles from the journals were searched for further literature sources.

The following journals were hand searched for literature:

- Burns.
- Journal of Burns and Wounds (now published as Eplasty).
- Journal of Burn Care and Rehabilitation.
- Clinical Evidence, Evidence Based Nursing.
- The Lancet.
- American Association of Critical Care Nurses.
- Wound practice research.
- Journal of Wound, Ostomy and Continence Nursing and Wound Repair and Regeneration.
- Evidence-Based Nursing.
- Journal of Advanced Nursing.
- British Medical Journal.
- Wound Healing South Africa.
- South African Medical Journal.
- Health SA Gesondheid.
- Curationis.

Textbook chapters by experts were included in the integrative review. The textbook chapters were screened based on inclusion criteria, which were as follows:

- Printed in English.
- Dated no earlier than 2000.
- Textbook chapters on the topic of burns and wound management.
- Textbook chapters were not necessarily evidence based.

Chapters from the following textbooks met the inclusion criteria and were included in the systematic review:

- Sheridan, R.L. 2012. Burns: A practical approach to immediate treatment and long- term care. Manson publishing.

- McQuillan, K.A., Flynn Makic, M.B. & Whalen, E. 2009. Trauma Nursing: From resuscitation through rehabilitation. Saunders. Elsevier.

- Granick, M.S. & Gamelli, R.L. 2007. Surgical Wound Healing and Management. Informa healthcare.

- Krasner, D.L., Rodehaever, G.T. & Sibbald, R.G. 2007. Chronic wound care: A clinical source book for healthcare professionals. HMP Communications.

- Sood, R. 2006. Achauer and Sood's Burn Surgery: reconstruction and rehabilitation. Saunders. Elsevier.

- Howard, J. Theodore. R. & Wittig, P. 2003. Wound care made incredibly easy. Lippincott Williams & Wilkins.

- Mulder, M., Small, N., Botha, Y., et al. 2002. Basic principles in wound care. Pearson Education South Africa.

The following burns associations or societies were searched for existing guidelines:

- South Africa Burn Society.
- Pan African Burn Society.
- British / European Burns Association.
- American Burns Association.
- Australian and New Zealand Burn Association.

Guidelines formulated by the different Burn Associations, hospitals and expert panels and were included in the integrative review. In order to ensure validity and reduce bias these guidelines were screened based on inclusion criteria, which were as follows:

- Printed in English.
- Dated no earlier than 2000.
- Guidelines were related to the topic of the management of burns.
- Guidelines were not necessarily evidence based.

The following guidelines met the inclusion criteria and recommendations made in them were included in the integrative review:

- South African Burns Society. 2012. http://www.saburnsociety.co.za.

- American Burns Association. 2009. White Paper: Surgical Management of the Burn Wound and Use of Skin Substitutes.

- Franz, M. G., Robson, M. C., Steed, D. L, et al. 2008. Wound Healing Society: Guidelines to aid healing of acute wounds by decreasing impediments of healing.
- New Zealand guidelines group. 2007. Evidence Based Practice guidelines: Management of burns and scalds in primary care.
- Alsbjorn, B., Gilbert, P., Hartmann, B., et al., 2006. Guidelines for the management of partial-thickness burns in a general hospital or community setting: Recommendations of a European working party.
- Faucher, L. & Furukawa, K. 2006. Practice Guidelines for the Management of Pain. American Burn Association.
- Gray, D. 2004. Tissue Viability Nurses association: The Best Practice Statement on Pain and Trauma in Wound Management. UK- Wounds.
- Alsbjorn, B.F. 2002. European Burns Association: European Practice Guidelines for Burn Care. British Burn Association.
- The Royal Children's Hospital: Clinical Practice Guidelines. Melbourne. http://www.rch.org.au.

The search terms used were:

- Burns, Burn treatment, Burn management, Acute wound management, Acute wounds, skin burns.
- Wounds, Wound healing, Wound management, Healing rate.
- Infection, Infection rate, Wound contamination, Aseptic technique, hand washing, sterile technique, Infections in wound care.
- Pain in burns, Pain, Pain management, Acute pain management, Burn pains.
- Guidelines for wound management, Guidelines for pain, Guidelines for infection control.

Prior to including retrieved literature in the integrative review, each source of literature was subjected to a critical appraisal.

2.3.1.5 Step Four: Data evaluation stage

A literature search was done on key words in the management of burn wounds. This allowed the researcher to compile a table of titles and abstracts for possible inclusion in the study. This search provided large samples that needed to be refined. Quality of research was evaluated as a screening method for inclusion. Quality was defined in terms of the internal validity of the studies, or the extent to which the design, conduct and analyses minimised errors and biases (LoBiondo-Wood & Haber, 2010:17). It is important to have standard, reproducible criteria to critically appraise the quality of the studies.

The studies in this inquiry were evaluated using a research appraisal tool developed by Kmet, Lee & Cook (2004), (Refer to Appendix Q). A tool was developed by Kmet, et al., (2004), because even though quality checklists for assessing randomised controlled trials (RCTs) were plentiful, no tool was available to assess the quality of diverse study designs. The QualSyst tool was drawn from existing published tools and was tested with high inter-rater reliability. The scoring system provides systemic, reproducible and quantitative assessment of the quality of research encompassing a broad range of study designs, while assisting in the exploration of variation across studies and the synthesis and interpretation of research findings **(**Kmet, et al., 2004: 11).

The limitations of the QualSyst tool include: the use of summary scores to identify high quality studies that can introduce bias into a review of literature; used to exclude lower quality studies; the absence of a "gold standard tool" to compare and inter-rater reliability is limited due to a small number of studies tested with the tool (Kmet, et al., 2004).

Quality screening was important because the effectiveness of interventions may have been masked or exaggerated by poor methodology. If clarity about inclusion could not be obtained from the abstract the entire article was read. The final sample for this integrative review included empirical and theoretical reports. Empirical reports included a wide variety of methods: case study, cross-sectional, grounded theory, phenomenology and instrument development designs.

Measurement metric is advocated by many as the best way to represent data (O'Flynn, 1982:316; McGaw & Glass, 1980:325). The goal in quantitative meta-analysis is to reduce findings to a common measurement however, the aim for qualitative meta-synthesis is quite different, it is to enlarge the interpretive possibilities of findings and deconstruct larger narrative and general theories (Sandelowski, Docherty & Emden, 1997:369).

In this review, as with many reviews, it would be inappropriate, if not impossible to use metric (Jackson, 1980: 446). Due to this diverse representation of primary sources, reports were coded according to two criteria relevant to this review: methodological or theoretical rigor and data relevance on a 2-point scale (high or low). No report was excluded based on this data evaluation rating system; however, the score was included as a variable in the data analysis stage. In general, reports of low rigour and relevance contributed less to the analytic process (Whittemore, 2005: 549).

All relevant studies were retrieved and the references were placed on an Excel spreadsheet to better categorise and sort into themes. All the studies found were included on the spreadsheet. In using a qualitative descriptive approach to synthesise the research findings, similarities and differences in language, concepts and themes from the findings were recorded.

Updating literature searches and current awareness

Because burns are such a dynamic environment literature searches required updating at regular intervals throughout the study. Email alerts from journals were set up as well as continuous checking to see if protocols submitted to the Cochrane Library were completed.

2.3.1.6 Step Five: Data analysis stage

According to Whittemore & Knafl (2005: 550), data analysis in research reviews requires that data from primary sources are ordered, coded, categorised and summarised into a unified and integrated conclusion about the research problem; a thorough and unbiased interpretation of primary sources, along with an innovative synthesis of the evidence are the goals of the data analysis stage.

In the integrative review method, the approach to data analysis is compatible with the use of varied data from diverse methodologies. Webb & Roe (2007: 152), and Whittemore & Knafl (2005: 550), suggested that primary research methods of analysis, developed for mixed-method and qualitative designs, are particularly applicable to the integrative review method because they allow for reproducible comparisons across primary data sources.

The process of data analysis in this review included using a constant comparison method as recommended by Whittemore & Knafl, (2005:550). Extracted data was compared item by item to categorise and group similar data through the identification of patterns, themes, variations and relationships. The coded data was compared, analysed further and synthesised using the method recommended by Miles & Huberman (1994:11), which consists of four phases: Data reduction, Data display, Data comparison, Conclusion drawing and verification phase.

Each of the data analysis phases is described below.

Data reduction phase

The first phase of data reduction involved the determination of an overall classification system for managing the data from diverse methodologies.

Data was divided into subcategories according to the nursing process' assessment, diagnosis, interventions and evaluation steps in answering the secondary review questions. Studies were grouped into a hierarchy of evidence as per DiCenso, et al., (2005:33). The primary sources included in the integrative review were divided into subgroups according to a logical system to facilitate analysis. The initial subgroup classification was based on the type of evidence and analysed sequentially (that is, examining all qualitative or descriptive studies on the topic, then the correlation or comparative designs and lastly any intervention or experimental designs) and analysed by topic.

Subsequently data reduction involved techniques of extracting and coding data from primary sources to simplify, abstract, focus and organize data into a manageable framework. Reliable and valid coding procedures are essential to ensure methodological rigour **(**Brown, Upchurch & Acton, 2003: 206). Predetermined and relevant data of each subgroup classification were extracted from all primary data sources and compiled into a spread sheet **(**Whittemore & Knafl, 2005: 550; Miles & Huberman 1994:11). Thus, each primary source is reduced to a single page with similar data extracted from individual sources (of each subgroup classification). This approach provided concise organisation of the literature, which facilitated the ability to systematically compare primary sources on specific issues, variables, or sample characteristics. Categories that were extracted using the worksheet included the definition of wound management, aspects of wound management such as infection, healing and pain. An appraisal worksheet designed for systematic reviews was used to extract data from the studies (Refer to Appendix P).

Data display phase

The next step in data analysis was data display, which involved converting the extracted data from individual sources into a display that assembled the data from multiple primary sources around particular variables or subgroups. Data were displayed in the form of a table (Appendix R) and set the stage for comparison across all primary sources.

The display enhanced the visualisation of patterns and relationships within and across primary data sources and served as a starting point for interpretation (Whittemore & Knafl, 2005: 551). Different data displays were used for each subgroup classification of the integrative review.

Data comparison phase

The next step in data analysis was data comparison; which involved a reproducible process of examining data displays of primary source data in order to identify patterns, themes, or relationships. From the emerged patterns a conceptual map was drawn that included a majority of the variables or identified themes (Whittemore & Knafl, 2005:551). Similar variables were grouped close to one another and a systematic order was displayed (if appropriate).

Relationships were depicted between the variables or themes. This process of data visualisation and comparison provided some clarity to the empirical and theoretical support emerging from early interpretive efforts.

Creativity and critical analysis of data and data displays are key elements in data comparison and the identification of important and accurate patterns and themes according to Whittemore & Knafl (2005:551).

Elements of data analysis were based on Miles & Huberman (1994:11) which included noting patterns and themes; seeing plausibility; followed by clustering, counting, making contrast and comparisons. The researcher also discerned common and unusual patterns, considered particulars in general and noted relations between variables. Finally the researcher sought to find intervening factors to build a logical chain of evidence (Miles & Huberman, 1994:11).

Conclusion drawing and verification phase

Conclusion drawing and verification was the final phase of data analysis that moved the interpretive effort from the description of patterns and relationships to higher levels of formulating comprehensive concepts by extracting common qualities from specific examples and incorporating the particulars into the generalised (Whittemore & Knafl, 2005:551).
Patterns and processes were isolated, commonalities and differences were identified with a gradual elaboration of a small set of generalisations that encompassed each subgroup database of the integrative review in its entirety. Miles & Huberman (1994:12), advocate the continual revision of the guidelines (conclusions or conceptual models) in order to be inclusive of as much data as possible. The authors propose that all discernment of patterns, themes, relationships, or conclusions require verification with primary source data for accuracy and validity.

Whittemore & Knafl (2005:551), stated that explicit care needs to be undertaken during this process to avoid premature analytic closure (being locked into a particular pattern) or exclusion of pertinent evidence. Addressing conflicting evidence is a considerable challenge, particularly when results are equally compelling and from high quality reports. Vote counting, is proposed as one strategy to categorise and analyse conflicting results, comparing the frequency of significant positive findings against the frequency of significant negative ones. Exploration of confusing influences contributing to variability in findings (that is, sample characteristics) can also be considered. However, conflicting evidence in general, demonstrates the need for further research with the subsequent research question and design aimed at resolving the conflict. The need for this had been identified in the conflicting information on the safety of silver dressings. This subsequently led to a further review question for future research: *Are silver dressings safe?*

On completion of each subgroup analysis, a final step of the data analysis in an integrative review is the synthesis of important elements or conclusions of each subgroup into an integrated summation of the topic or phenomenon (Whittemore & Knafl, 2005:551). A new conceptualisation of the primary sources integrates all subgroups into a comprehensive portrayal of the topic of concern, thus completing the review process.

A record was kept during the entire process of data analysis which documented data analysis decisions, analytical hunches, thoughts, puzzles, alternate hypotheses, or any idea that may be directly related to the interpretation of data (Miles & Huberman 1994:12). Analytical honesty was a priority; the data analysis process is made transparent with rival explanations and false relationships thoughtfully explored.

Whittemore & Knafl (2005:550), suggested that in a review that encompasses theoretical and empirical sources, two quality criteria instruments could be developed for each type of source and scores could be used as criteria for inclusion/exclusion or as a variable in the data analysis stage.

Conclusion drawing and verification moves the interpretive effort from the description of patterns and relationships to higher levels of abstraction, subsuming the particulars into the general. Patterns and processes were isolated and commonalities and differences were identified, with a gradual elaboration of a small set of generalisations that encompassed each subgroup database of the integrative review in its entirety. Conclusions or conceptual models that are developed are continually revised in order to be inclusive of as much data as possible (Miles & Huberman, 1994:11).

2.3.1.7 Step Six: Presentation stage

Conclusions of the integrative review were reported in table form. Explicit details from primary sources and evidence to support conclusions were provided to demonstrate a logical chain of evidence, allowing the reader of the review to ascertain that the conclusions of the review did not exceed the evidence (Whittemore & Knafl, 2005: 552). The review attempted to capture the depth and breadth of burn wound management and contribute to a new understanding on the management of burn wounds. The implications for practice are emphasised in addition to implications for research and policy initiatives.
All methodological limitations of the review are explicitly stated. Quality criteria for review methods as proposed by Whittemore (2005: 61) and Ganong (1987: 1-2), were implemented.

2.3.1.8 Validity and Reliability

Instituting the following measures ensured validity and reliability of the integrative review. The process for conducting the integrative review was applied as described by Whittemore & Knafl (2005).

Stringent measures of validity were implemented to ensure representativeness of the literature sources used by means of utilising an existing QualSyst (Kmet, Lee & Cook: 2004), tool with high inter-rater reliability to screen included studies in the review. The tool consists of fourteen questions with scores being 0-2, with a maximum total score being twenty eight. The score is determined by scoring two points for each yes answer, one point for a partial answer and zero for no answer ("yes"=2; 'partial"= 1; "no"= 0). Items not applicable were marked "n/a" and were excluded from calculation of the summary score. The cut point for inclusion was relatively liberal at 55% (Kmet, et al., 2004:8).

This scoring system provides systemic, reproducible and quantitative assessment of the quality of research encompassing a broad range of study designs, while assisting in the exploration of variation across studies and in the synthesis and interpretation of research findings (Kmet, et al., 2004: 11). The research process is reported comprehensively and tables presenting reviewed studies not only summarise the findings, but all the characteristics as per Ganong (1987:8).

A limitation of an integrative review is that its function is limited to summarising and organising existing writing on the topic of the management of burns. The findings from the integrative review were used as the basis of the rest of the study.

2.3.1.9 Findings of the integrative review

Chapter Three discusses the findings of the integrative review. A description of the second phase of the study follows.

2.3.2 PHASE TWO (a): STRUCTURED OBSERVATION

The second objective was to describe the nurses' current practice on the management of burn wounds at a single burns unit in a public sector tertiary academic hospital, with the intention of providing research evidence for the development of guidelines for the management of burn wounds by nurses. Structured observation of the current practice dealt with the second component of evidence practice, which is clinical expertise; the other two components are best available evidence addressed with the integrative review and patient's values and preferences (LoBiondo-Wood & Haber, 2010:16). Additionally the description of current practice validated the need for this study.

This objective was achieved through two steps. Step one was a through a quantitative, non-experimental, descriptive research design by means of structured observation. This type of design was selected as it best fits the research question: *What is nurses' current practice in burn wound management?* Nursing literature describes many different designs ranging from RCT and cohort studies at the scientific end of the spectrum, through to grounded theory, ethnography and phenomenology at the naturalistic end of the spectrum (Polit & Beck, 2012: 55-56; Mulhall, 1998:6). Data on the current practice was best obtained through structured observation and interviews hence the choice of design. The researcher first wanted to be clear on what nurses do in order to identify the strengths, weaknesses and gaps in the current practice. Step one, the structured observation is expounded below.

2.3.2.1 Observation

Observation is a technique for collecting descriptive data on behaviour, events and situations (Brink, et al., 2012: 150), and does not involve an experimental intervention, in other words it is non-experimental research in which a phenomena is merely observed (Polit & Beck, 2012: 736). Observation is used as a research method in two distinct ways, either structured or unstructured **(**Polit & Beck, 2012: 313, 544; Brink, et al., 2012:150; Mulhall, 2003:306). Mulhall (2003:306), describes the difference between structured and unstructured observation. In positivistic research, structured observation is a discrete activity whose purpose is to record physical and verbal behaviour; observation schedules are predetermined using classifications developed from known theory. In other words, structured observation involves specifying in advance, what behaviours or events are to be observed, how they will be recorded and how data will be recorded, such as categorisation systems, checklists or rating scales (Polit & Beck, 2012: 313-315; Brink, et al., 2012: 150; LoBiondo- Wood & Haber, 2010: 272; Parahoo, 2006: 351).

In contrast, unstructured observation is used to understand and interpret behaviour. Based within the interpretist/constructivist paradigm, it acknowledges the importance of context and the co-construction of knowledge between the researcher and the 'researched.' According to Mulhall (2003:306), psychology uses structured observation extensively and it is from this aspect that many nurse researchers have adopted the method for their own studies.

The selection of structured observation to collect data during dressing changes was used at it was the only method which allowed the researcher to gather the depth and variety of information needed to describe nurses' current practice on the management of burn wounds accurately.

Advantages of structured observation

According to Brink, et al., (2012:152), and LoBiondo-Wood & Haber (2010:273), structured observation has many advantages, the main one being that observation may be the only way for the researcher to study the variable of interest, in other words, observation may be the only way to ensure validity of the findings. Additionally, structured observation allowed the collection of rich descriptive data that would not have been possible with any other technique, allowing for unsurpassed depth and variety of information.

Structured observation gave the researcher an understanding of the situation from the nurses perspective in the context in which they function. Activities and events cannot be divorced from the context in which they are embedded, that is, they emerge out of a context and are given meaning within that context (Muller, 1995:81). Another advantage of observation, in the case of this study, was being in the area where the mainstreams of dressings were changed. Simkiss, Edmond, Bose, et al., (2013:199), and Muller (1995:81), stated that the more time researchers spend in the field, the less likely participants are to alter their behaviour in response to the researcher's presence; over time the participants normalise and accommodate the researcher's presence allowing the observation of phenomena as it occurs.

Disadvantages of structured observation

Structured observation has the following disadvantages.

Data obtained by observation techniques are vulnerable to observer bias and distortion. Ethical issues can occur if the researcher does not obtain consent (Waltz, Strickland & Lenz, 2010: 277). Observation has the risk of the Hawthorne effect occurring (Waltz, et al., 2010: 277).

Observation is time-consuming and can be extremely costly, particularly when observers have to be trained (Brink, et al., 2012:152; Waltz, et al., 2010: 277; LoBiondo - Wood & Haber, 2010:273). Additionally, Parahoo (2006: 355-357), added that limitations of structured observation were that behaviours and activities occurred simultaneously and that the observer may not notice or record all of them or may be distracted in a busy environment.

The researcher elected to use structured observation to collect the data during dressing changes. Even though a questionnaire or a survey could have been used, structured observation was the only method that would give an accurate and comprehensive depiction of nurses' current practice on the management of burn wounds. Structured observation allowed for multiple elements that were predetermined on a checklist to be observed. Therefore structured observation was the only technique that would ensure validity of the findings in a situation where there could be inconsistencies between what nurses say and what they really do.

Structured observation allowed the researcher to remain objective and not contaminate the data with her own preconceptions, whereas unstructured observation with its naturalistic paradigm would make it impossible to separate the researcher from the 'researched'. In order to reduce observer bias an existing instrument (checklist) with predetermined elements, that were to be observed, was used. Consent was obtained from both the nurse and the patient (Refer to Ethical issues in 2.5).

For consistency, the purpose of this phase of data collection is detailed below.

2.3.2.2 The purpose of observation

The purpose of the observation method to collect data on current practice was to get first-hand information in a naturally occurring situation.
A detailed description of the research method is provided.

2.3.2.3 Research Method

The research method included the data collection, data collection tool, population, sample and data analysis.

Data Collection

This part of the study was described as a quantitative, non-experimental and descriptive design. Data was collected by means of direct observation.

The researcher has worked as a marketer involved in promoting products in the burns unit for the past ten years and has established a good rapport with the staff in the unit. This access allowed for a certain level of familiarity between the nurses and the researcher, which allowed for a smooth transition into the role of a participant observer. Insiders are individuals who have a place in the social group under study, before the start of the investigation and outsiders are non-members of the group (Moore, 2012: 11; Bonner & Tolhurst, 2002: 8). It is common for researchers to be part of the social group they are investigating. Consequently, the researcher was already 'a native', 'indigenous' or 'insider' before the study begun. Trust due to familiarity meant that the researcher was "accepted" as part of the group and insisted that nurses not view the research as threatening.

The researcher was a participant observer as she assisted in the dressings as a "student". The researcher chose the classification of a student since the nurses and patients in the unit were accustomed to having students present, as this was an academic hospital. The role of a student furthermore was useful as it allowed the researcher to take up another role, that of "acceptable incompetent" (Muller, 1995:65), which allowed the researcher to experience current practice in a non-intimidating manner.

The benefits of being a participant observer allowed the researcher to obtain detailed information on the current practice being used for the treatment of burn wounds, secondly it allowed the researcher to include the findings from the study into context and thirdly the role of participant observer allowed for the gathering of first-hand information as no such study had been conducted in acute wounds before. Streubert (2011:27), states that bracketing is a cognitive process by the researcher whereby one's beliefs, feelings, thoughts and perceptions are set aside to prevent judgments being made about what one has heard or observed. To achieve this, Carpenter (2011:77) suggests that the researcher has to remain neutral concerning the phenomenon throughout the study process without permitting personal beliefs or disbeliefs to influence the generation of pure description of the phenomenon. To do this the researcher made field notes and kept a reflective journal. Bracketing allowed the researcher to comprehensively recall what was seen and heard and enhanced the contextual understanding of the phenomena which in turn allowed for a better description of current practice.

In studies with relatively little data on the subject field, research has been effectively used to identify research problems and formulate hypothesis (Muller, 1995: 70). The Hawthorne effect was minimised because the researcher was perceived to be a student and not the expert and the nurses were comfortable with the researcher due to the long term relationship that existed. Data collection included observing multiple dressing changes (events) occurring at various points in time during the patients hospitalisation. Points of time selected for measurement were determined by the seasonality of burns, which was post winter for the first observation and winter for the second observation. The researcher conducted the data collection by means of a data collection tool.

Data Collection Tool

Observation methods vary in the amount of structure provided by the researcher. In this study the observation was structured as a checklist and was used to observe specific behaviour.

Checklist

The definition of a checklist is an instrument observer's use to record observed phenomena; the checklist is formatted with the list of behaviours or events and a frequency or duration of an occurrence (Polit & Beck, 2012: 315). Checklists allows the researcher to record whether or not a given behaviour or event occurred (Wood & Ross- Kerr, 2011: 178). A checklist standardises the process to ensure that all elements or actions are addressed (Winters, Gurses, Lehmann, et. al., 2009: 1).

Advantages of checklists

Checklists standardise and improve reliable translation of information (what, when, how and by whom) according to Winters, et al., (2009:1), and simplify data collection and analysis and provide structure to observational studies and allows more subjects to be observed in a shorter space of time (Wood & Ross-Kerr, 2011:178-179).

Disadvantages of checklists

Conversely, with a checklist it is difficult to record unexpected behaviours or events that were not included in the original list of elements and the observer tends to watch for the expected behaviours on the checklist and the unexpected can be easily missed (Wood & Ross- Kerr, 2011:178-179).

The researcher used an existing checklist to structure the observations during the dressing changes as well as to reduce observer bias. Clear operational definitions were clearly stated on the checklist to avoid ambiguity as to whether or not the behaviour or event had occurred (Wood & Ross- Kerr, 2011:178-179). (Refer to checklist in Appendix S)

A checklist adapted from Nonino, Anselmi & Dalmas (2008: 60-61), was used as the data collection tool. The variables and their measures were clearly identified prior to the onset of the study by a checklist. A pilot study, observing n=6 patients, was undertaken to refine the checklist in a burns ward in Gauteng. Nurses were observed during the dressing change and the checklist was completed immediately after the dressing change.

Each activity on the checklist allowed for three answer options: "yes" (when the item is performed correctly), "no" (when the item is not performed), "not applicable" (when the item is not applicable to the situation observed), with a space for additional comments. Patient reports were read and summaries of nurses' entries were made on the checklist. Completing the checklist immediately allowed for all the information to be remembered and transcribed as well as footnotes made on comments and explanations given by the nurses. The researcher chose to collect all the data herself as this ensured consistency in the observation process and controlled reporting on the findings. Written consent was obtained from all patients and nurses and included in the study (Refer Appendix I and J)

The population

A population has been defined as an entire set of individuals having some common characteristics of interest to the researcher (Polit & Beck, 2012:738; Brink, et al., 2012: 216; LoBiondo- Wood & Haber, 2010:583; Parahoo, 2006: 471). A population includes all elements that meet the sample criteria for inclusion in a study (Polit & Beck, 2012: 274; Brink, et al., 2012: 131; Burns & Grove, 2007:549).

The population for both the structured interviews and the structured observation included all nurses providing care to patients with superficial to partial thickness burn wounds admitted to a single burns unit within the public sector tertiary academic hospital. Superficial to partial thickness burns were chosen as these patients wounds were mainly managed by nurses and did not require surgical intervention. The population had varying levels of training ranging from ICU experienced to ICU trained, but none of the nurses in the unit had any formal post basic wound care training.

Nurses working in the burns unit form part of the multidisciplinary team and are responsible for dressing changes done in the ward and as outpatients. Should a patient require surgical intervention the patient is taken to theatre and post operatively nurses in the unit resume wound management. Table 2.4 gives a description of the profile of the population.

Table 2.4 Description of the profile of the population

Qualification	Nurses in burns unit	
	2012	**2013**
Registered Nurses	21	21
Enrolled Nurses	4	4
Auxiliary Nurses	16	16
Student Nurses	0	0
	n=41	**n=41**

Data was collected by observing nurses carrying out wound dressing changes on patients during two separate periods: Period one - August, September, October 2012 and Period two - April, May, June 2013. Period one was chosen, as this was during the less busy season for burns being post winter and the logic behind this was that nurses would not be pressurised and rushed during dressing changes, as is the case when the ward is full. Period two was chosen to augment the number of observed dressings.
Keeping data collection to a short time-frame helped maintain interest in the study by both the researcher and the nurses in the unit and the researcher was more likely to use the same staff over both periods for consistency. Repetitive data collection allowed for accurate, detailed information to be obtained.

Inclusion criteria

Inclusion criteria, also known as eligibility criteria, are those characteristics that restrict the population to a homogeneous group of subjects (Polit & Beck, 2012: 726; LoBiondo- Wood & Haber, 2010: 577).
The inclusion criteria were all nurses that were working permanently in the burns unit at the time of data collection.

Exclusion criteria

An exclusion criterion is the sampling criteria specifying characteristics that a population does not have (Polit & Beck, 2012: 727; LoBiondo- Wood & Haber, 2010: 577). The exclusion criteria for this study were students and nurses not permanently employed in the unit. These nurses were excluded, as the level of knowledge and experience was uncertain, as were nurses that were not on the South African Nursing Council register or roll.

A discussion of the sample size and sampling method will follow.

The Sample

Sampling is the process of selecting a portion of the population to represent the entire population (Polit & Beck, 2012: 742; LoBiondo- Wood & Haber, 2010: 585; Parahoo, 2006: 473); thus obtaining a sample of the population. Sampling is done to gain knowledge and information on a phenomenon (Marshall & Rossman, 2011: 105; Holloway & Wheeler, 2010: 137).

The sampling strategy used during structured observation was purposive sampling. Purposive sampling is a non-probability sampling method in which the researcher selects participants based on personal judgement of which ones will be most informative (Polit & Beck, 2012: 739; Burn & Grove, 2007: 551). Purposive sampling was done on all nurses working in the burns unit because of their experience and exposure to burn wound management. These participants are exposed to patients with burns on a regular basis.

The sample consisted of an average of ten to fifteen dressings per week, observed on Mondays, Wednesday and Fridays over the selected six months. These days were chosen for the following reasons: dressing changes are done either daily or every three days and would for example be changed on Monday, Wednesdays and Fridays; it was convenient for the researcher to follow the progress of wounds on consecutive days during the week and new patients admitted over weekends could be added on Mondays.

Nurses were observed more than once with a different patient. Total dressings observed n= 303.

Data Analysis

Data analysis is the process of summarising, categorising and ordering of data so as to place data into more meaningful terms (Burns & Grove, 2007: 536). Data were explored and described by quantitative means. Descriptive statistics were used to summarise, categorise and order data and thus to put data into more meaningful terms and into an organised visual representation.

The collected data was stored on an Excel spreadsheet to make it easier to manage. Information was analysed as an on-going process, whilst data collection was still in operation, as the anticipated numbers of patients would have made data analysis a very time consuming process. For analysis, the Positivity Index (PI) percentage was used, which consists in identifying, for each activity on the checklist, the kind of answer observed (affirmative, negative or not applicable) (Nonino, et al., 2008:60). After applying the equation below, the percentage of positivity for each instrument item was obtained.

$$\text{Positivity Index (PI)} = \left(\frac{ra}{ra + rn} \right) \bullet 100$$

In which: *ra* = affirmative answers and *rn* = negative answers.

According to Nonino, et al., (2008: 60), the Positivity Index (PI) percentage equal to or higher than 70% can be used as the parameter for dressing quality assessment.

Data were classified as data pertaining to dressing preparation, assessment and diagnosis, dressing execution and outcome and evaluation in accordance with the nursing process.

Validity and Reliability

The following strategies were implemented to ensure validity and reliability of the data collection phase on current practice.

Validity

According to de Vos, et al., (2005: 160), the definition of validity has two parts, namely whether the instrument actually measures the concept in question and whether the concept is measured accurately. Validity refers to the degree to which an instrument is doing what it is intended to do and evidence of validity is provided by several sources. Validity evaluated in this study was construct and content validity.

Construct validity

Construct validity is the validity of inferences from observed persons, settings and interventions in a study to the constructs that these instances might represent with an instrument (Polit & Beck, 2012: 723).
In other words construct validity is the degree to which an instrument measures the construct it is intended to measure (Brink, et al., 2012:210; Creswell, 2009a: 228; Burns & Grove, 2007: 535). Construct validity is important because constructs are the means for linking the operations used in a study to a relevant conceptualisation and to mechanisms for translating the resulting evidence into practice (Polit & Beck, 2012: 248). Construct validity can be viewed as an umbrella term to assess the validity of instruments used because it incorporates a number of other forms of validity such as known groups, convergent and discriminant validity, factor analysis and interpretation of validity (Polit & Beck, 2012: 339-342).Construct validity is thus a process.

In this study construct validity was demonstrated by content validity, multi- method studies and consulting with nurses and doctors working in burns units for review of the checklist.

Content validity

Content validity is an assessment of how well the instrument represents all the components of the variable to be measured (Brink, et al., 2012: 166; Polit & Beck, 2012: 336; LoBiondo-Wood & Haber, 2010: 288; de Vos, et al., 2005: 160).

The content validity of the checklist and interview schedule in Phase Two of the study was informed by the findings of the integrative review on the management of burn wounds in Phase One.
Both instruments were presented to the head of the burns unit for evaluation. Each item on the instrument was evaluated with regard to the degree to which the variable tested was represented as well as the overall suitability of the instrument for use. The instrument was pre-tested during the pilot study in terms of clarity of the items and whether it measures essential aspects of the relevant variables.

Prolonged engagement

According to Parahoo (2006: 357), the observer's presence could affect the validity of data. Due to the researcher's established relationship with the nurses in the burns unit a good rapport existed. The nurses did not have to "get used to" the researcher prior to data collection and her presence was not considered a threat to the validity of the structured observation.

Reliability

Reliability is the degree of consistency or dependability with which an instrument measures an attribute (Polit & Beck, 2012: 741; LoBiondo-Wood & Haber, 2010: 585; Creswell, 2009a: 233). Primarily**,** reliability is not concerned with what is being measured, but how well it is being measured (de Vos, et al., 2005:163).

There are several ways to test an instrument for reliability: stability, internal consistency and equivalence reliability (Polit & Beck, 2012: 331-334; Brink, et al., 2012: 170; Burns & Grove, 2007: 553). Stability refers to the consistency of the instrument over time; internal consistency (homogeneity) is the extent to which all items of an instrument measure the same variable; equivalence reliability is used to determine whether similar tests given at the same time yield the same results, or whether the same results can be obtained using different observers at the same time (Brink, et al., 2012: 170).

In this study repeated observation was used as the same instrument was administered on two separate periods (Period One: August, September, October 2012 and Period Two: April, May, June 2013). A statistician was consulted and a STATA 13.1 statistical program was used to calculate the proportion, standard error and 95% CI in this study. Reliability was further ensured through conducting a pre-test.
Additionally, mixed method research gathered qualitative information on current practice regarding the management of burn wounds by nurses.

During the structured observation, the researcher observed that the nurses were very talkative throughout dressing changes, continuously explaining their actions. This might have been because the researcher was perceived to be a "student" or because of the Hawthorne effect.
It became apparent that nurses were comfortable doing the dressing changes, but were aware of bad habits they might have in relation to wound management. It is for this reason that the researcher implemented the second method of data collection in the form of semi-structured interviews.

2.3.2.4 Findings from structured observation

Chapter Five discusses the findings from the structured observation.

The design and methodology of the semi- structured interview is described below.

2.3.3 PHASE TWO (b): SEMI- STRUCTURED INTERVIEWS

To comprehensively address the third objective of the study, Step two of Phase Two was conducting semi-structured interviews with nurses working in a single burns unit at a public sector tertiary academic hospital, with the intention of providing research evidence for the development of guidelines for the management of burn wounds by nurses. This objective was achieved through a qualitative, descriptive research design.

Step two's explanation follows.

2.3.3.1 Interview

An interview is defined as a data collection method in which an interviewer asks questions of a respondent, either face to face or by telephone (Polit & Beck, 2012: 731; Brink, et al., 2012: 157; Creswell, 2008: 641; Burn & Grove, 2007: 544).

Data- collection interviews are generally classified as either structured or unstructured; however most interviews range between the two classifications and are thus referred to as semi-structured (Brink, et al., 2012: 157).

The semi-structured interview is a data collection method used in qualitative research that has a pre-determined set of questions **(**Polit & Beck, 2012: 537; Parahoo, 2006: 329).
It is semi-structured as the questions are not asked word for word as they appear on the interview schedule (Polit & Beck, 2012: 537; Burns & Grove, 2007: 377). Semi-structured interviews were selected as the means of data collection because of two primary considerations. Firstly, semi-structured interviews were selected to augment the data gathered during observation in order to enhance the researcher's understanding of nurses' current practice on the management of burn wounds as it enabled probing for more information and clarification of answers.

Secondly, the varied professional, educational and experience of the sample group precluded the use of a single method of data collection, in other words just doing structured observation.

Advantages of interviews

Interviews are the most direct method of obtaining facts from respondents (Brink, et al., 2012: 157). Furthermore interviews allow the researcher control over the line of questioning according to Creswell (2009a: 179), and are useful for asking sensitive questions and provide comments that go beyond the initial question (Creswell, 2008: 396). Interviews are a flexible technique that allows the researcher to explore meaning in greater depth than is possible with other techniques (Burns & Grove, 2007: 377). Lastly, one on one interviews have a high response rate (Creswell, 2008: 396).
Conversely, there are disadvantages of interviews.

Disadvantages of interviews

According to Brink, et al., (2012: 157) and Creswell (2009a: 179), the researcher's presence during interviews may bias participants' responses. Interviews also provide indirect information filtered through the views of the interviewees and one must consider that not all people are equally articulate and responsive (Creswell, 2009a: 179). Another major disadvantage is interviews do not protect anonymity of the participant (Creswell, 2008: 396).

Despite the above mentioned disadvantages the researcher conducted interviews in order to obtain and illustrate a holistic picture on nurses' current practice on the management of burn wounds. The interviewing style was semi-structured and was based on a one-page interview schedule, which was used flexibly by the researcher.

The approach was open and followed that of a guided conversation. Participants were given the opportunity to state what was important to them as far as possible during the course of the interview. Barriball & While (1994: 330), have observed that there is a need for a reasonably permissive approach in qualitative research, which should not be based on a rigid format. Participants were asked to describe examples of how wounds were assessed, types of wounds seen and the basis of wound classification (for example, how does a healthy or infected wound look), criteria for dressing choice and what process they typically followed when allocated to do dressings.

They were asked to speak about three different types of scenarios: admission of new patient, routine dressing-change in the ward and post discharge wound care practice. They were asked to speak about dressing preparation, assessment and diagnosis, dressing execution and evaluation of outcomes. The rigour of qualitative research such as this one is determined by the relevance and credibility of the data obtained (Shenton, 2004: 64-69). These interviews were conducted in order to firstly fill in omitted data and to ensure reliability of the data collected.

The purpose of semi-structured interviews is stated for uniformity:

2.3.3.2 The purpose of the semi-structured interviews

The purpose of the interviews was to explore current practice from the nurses' perspective in a flexible, informal manner.

2.3.3.3 Research Method

The research method included the data collection, population, sample and data analysis.

Data Collection

Data collection from a qualitative perspective entailed planning the interviews, selecting participants and conducting the interviews according to de Vos, et al., (2005: 83). Each of the steps is discussed below.

Planning the structured interviews

Planning the structured interviews entailed describing how, where and when the nurses would be selected to participate in the interviews **(**de Vos, et al, 2005:83). Permission to conduct the interviews was first sought from the hospital's research committee (Appendix C), consent was obtained (Appendix D), from the Head of the Trauma (Appendix E) and Head of the Burns unit (Appendix F). Individual letters were sent to the Nursing Service Manager (Appendix G), who subsequently gave permission to contact the participants in the burns unit. Each nurse was then invited to participate in the study and information letter (Appendix H) and consent form for the interview and tape recording was given to the nurses (Appendix I).

Participants were given a broad outline of the purpose and format of the interview, ensured that the interview was confidential and that no names or identifying characteristics would be mentioned as well as the process of the interview would be explained. The researcher arranged for an empty room in the unit that ensured privacy and comfort to facilitate free flow of conversation. The venue was prepared beforehand for all the interviews to commence and proceeded well (de Vos, et al., 2005:84).

Selecting the participants

The Population

The population for the semi-structured interviews was the same population as for the structured observation. Refer to Table 2.4 for details on population.

Sample size and sampling method will now be discussed.

The Sample

Purposive sampling was done to include all the nurses working in the unit. Various authors (Parahoo, 1998: 232; Holloway & Wheeler, 1996:74), describe purposive sampling as sampling where chosen individuals have special knowledge of the topic. These individuals can be referred to as useful informants (Streubert & Carpenter, 2011).

This type of sampling was chosen because this tier of the study is qualitative and an unbiased sample was more suitable than random sampling that might not have been as reflective as total population sample. As the purpose was to explore current practice by nurses and the total population was forty one (n=41), the researcher decided to include all nurses to get a better understanding of current practice. All participants, at the time of this study, were working as full time nurses in the burns unit. Interviews were conducted whilst the structured observation was in progress in the burns unit. The selecting of this period was because the structured observation and interviews were complimentary in the data collection process. All the interviews were conducted in the natural setting.

Planning the interview questions

As the study design was exploratory in nature, the questions were conversational and resulted in trouble-free exchanges (de Vos, et al., 2005: 297). Questions were formulated in a logical sequence (de Vos, et al., 2005: 297), based on the nursing process to cover all aspects of wound management in accordance with the integrative review and structured observation.

The first question was on the dressing preparation and was asked as an introductory question on choices made during the planning phase for dressing procedure. The main purpose of this question was to allow the participants to shift their thinking from general to specifics (de Vos, et. al., 2005: 308). The second question was on assessment and diagnosis. This was a structural question to determine the terminology used by the nurses to describe key concepts during assessment and diagnosis of wounds. The third question was on the actual execution of the dressing procedure, with the purpose of validating the observations made (de Vos, et al., 2005: 298). The last question was on outcome and evaluation of the dressing procedure. The purpose of this question, in line with the nursing process and legal requirements of nursing, was to explore how nurses evaluated their own actions.

The first three questions were planned to allow the participants to interpret the questions according to their understanding. The questions were developed with the intention of providing participants with the open opportunity to describe their interpretation of wound management and the activities they include in practice as part of wound management.

The participants were asked the following questions:

- *I would like to know from you what sort of preparation you do in preparing for a dressing?*
- *Please describe what you look for when assessing a wound?*
- *Kindly describe how you would go about doing a dressing on a patient in the following scenarios:*
  - *on admission of new patient,*
  - *routine dressing-change in the ward,*
  - *Post discharge in out –patients,*
- *Please tell me what you typically do after a dressing change?*

Subsequent probing questions were planned and guided by the discussion. The semi-structured interview, therefore, not only gives interviewers some choice in the wording of each question but also in the use of probes (Barriball & While, 1994: 331).

According to Barriball & While (1994: 331), probing can be an invaluable tool for ensuring reliability of the data as it allows for the clarification of interesting and relevant issues raised by the respondents; it provides opportunities to explore sensitive issues that can elicit valuable and complete information and it enables the interviewer to explore and clarify inconsistencies within respondents' accounts. Probing can help respondents recall information for questions involving memory and probing and it maximises the potential for interactive opportunities between the respondent and interviewer which helps to establish a sense of rapport and reduce the risk of socially desirable answers (Barriball & While, 1994: 331).

Probing questions included:

- *Can you please tell me how one decides which dressing is appropriate for which wound?*
- *I would like to know more about how you would describe the different depths of the burns?*
- *Please explain how do you know if the wound is not getting better?*

See Appendix T for interview guide. This session was ended with a summary and an expression of gratitude for participation.

Conducting the interview

The interview commenced with the researcher reminding the participants of the goal of the interview and projected length of the interview and the topics for discussion. The participants were informed that they were being invited to participate, as they were representative of a group of nurses involved in the management of burn wounds and were assured that their statements would be kept confidential at all times. All the interviews were conducted in the burns unit in an empty office or a boardroom, depending on availability.

The researcher collected field notes, which included what participants said and observations on nuances of mannerisms, facial expressions and attitudes displayed when statements were made (Thompson, 2007:3; Frankel & Devers, 2000:253). Observations were made to collect information that could not be captured on the tape recorder relating to who, when, what and how of all activity (Kvale, 1996:130).

Pauses were denoted with dashes and prolonged pauses or silences were denoted with three dots. Exclamations, laughter, crying or sighs were indicated in the transcript.

The transcripts were typed in single-spacing and a line was left blank between speakers. A generous margin was left on the right hand-side of the transcription for the researcher to add comments. These gestures were reflective of feelings and emotions that accompanied statements and denoted meaning.

As the guiding question for this study is to understand meaning/s, the researcher listened attentively to descriptions and underlying meaning/s provided by the participants.

Words used, content and explanations given were explored through guiding, probing, questioning and encouraging the discussion in a non-directive manner (Rosenthal & Rosnow, 2008:170), to describe and understand the participants' particular situations, experiences and meaning (Saleem, 2010:5; Frankel & Devers, 2000:258).

The average time spent for each interview was 45 to 60 minutes; the average recommended duration of a semi structured interview is 60 to 90 minutes (Walker, 2011:24; Laforest, 2009:3). A reasonable time for the interview ensures participants' concentration and data quality. All the interviews were recorded and transcribed verbatim for preservation. As Rosenthal & Rosnow (2008:169), and Marshall & Rossman (1995: 112), point out the process of preserving the transcribed data increases data efficiency in preparation for data analysis.

After exhausting the broad guidelines of the interview no new content emerged in the discussion. The participants were asked if they wished to say anything further before closure.

The researcher as a data collection instrument

The researcher was the main data collection instrument during the semi-structured interviews. The interviews were recorded and the researcher extracted data from the material after the interview was complete.

The researcher's role was to encourage participants to speak freely about all the topics on the interview schedule and to relay stories in their own words.

Techniques the researcher implemented to allow the interview to progress effortlessly were as per Fox (2009: 25-26): Firstly, **establishing rapport**. Before commencing the interview, the researcher took the time to explain the reason for the interview, including the aim of the research project and what will happen to the interview data. The researcher checked whether the interviewee had any questions before the interview commenced. Questions were asked in a relaxed informal manner so that the interview appeared more like a discussion or conversation. The researcher was aware of the effect of body language in indicating interest, encouraging the interviewee to talk and maintained a non-threatening atmosphere.
Secondly, each interview, **emulated a conversation**. The researcher attempted to make the interview seem, as much as possible, like a normal conversational situation in which people disclose information to others. Thirdly, **listening** to the participants**.** The researcher listened attentively to the participants so as not to miss the nuances of what was being said. Fourthly, being **non-judgmental**. The researcher attempted to ensure the participants felt secure and are not judged for their responses. Fifthly, the researcher **let participants talk**. Open-ended questions were intended to get respondents to enter into a 'stream of consciousness', in which few cues from the researcher were required to keep participants talking. Lastly, the researcher was **attuned to words and gestures from participants** and both verbal and non-verbal clues were observed and recorded. Non-verbal behaviour can often be revealing of lies or distortions and were used to reduce the possibility that a respondent was misleading the researcher consciously or unconsciously.
Description of the data analysis follows.

Data Analysis

As in quantitative research, the purpose of conducting qualitative research is to produce findings according to de Vos, et al., (2005: 333). Qualitative data analysis involves reducing the volume of raw information, sifting significance from trivia, identifying significant patterns and constructing a framework for communicating the essence of what the data reveal (de Vos, et al., 2005: 333). Data analysis is a challenging and a creative process characterised by an intimate relationship of the participants and the researcher (de Vos, et al., 2005:339).

Qualitative data analysis

Qualitative data analysis needs to be conducted with rigour and care (Coffey & Atkinson, 1996: 189). When researchers prepare to attend to the data, the first task is a conceptual one: the clarification of the researcher's own preconceptions of the phenomena under study.

This means suspending, as much as possible, the researcher's meanings and interpretations and entering into the world of the participant interviewee, according to Tesch (1992: 92). The next step in the data analysis process was the transcription of the taped interviews; the researcher transcribed the tape-recordings verbatim. A generous margin was left on the right hand-side of the transcription for the researcher to add comments. Each page was numbered, with interview number and page number.

Data analysis process

Tesch's eight-step procedure was applied for the analysis of the data (Tesch, 1990 in Creswell, 1994:155). A brief description on the procedure follows.

The researcher carefully read through all the transcriptions, making notes of ideas that came to mind.
She then selected one interview and read it to try and get meaning in the information, writing down thoughts coming to mind. After going through the transcripts, the researcher arranged the similar topics in groups by forming columns labelled major topics, unique topics and leftovers. The researcher then abbreviated the topics as codes and wrote the codes next to the appropriate segment of the text. The researcher scrutinised the organisation of data to check if new categories or codes emerged. There after she found the most descriptive wording for the topics and converted them into categories.
The aim was to reduce the total list of categories by grouping topics together that relate to each other. Lines drawn between the categories indicated interrelationship of categories. A final decision was then made on the abbreviation of each category and the codes were arranged alphabetically. The data material belonging to each category was put together in one place and preliminary analysis performed. Recording of the data was done if necessary.

Description

The descriptive stage is very important in qualitative studies. It is the initial phase whereby the researcher becomes familiar with the data (Burns & Grove, 2003: 378).

The researcher used reflexivity, bracketing and intuiting to exclude preconceived ideas about the phenomenon under study. The researcher replayed the tape recordings after the interview to listen to voice, tone, pauses and responses, as well as the entire content (Burns & Grove, 2003: 380). The recorded interviews were then transcribed verbatim.

Following transcription the researcher read the transcripts against the audio-tape from which they were transcribed. The researcher immersed herself in the data, reading and re-reading the transcripts in order to achieve closeness to get a greater understanding of the data (Henning, 2004: 127-128). The process of proofreading allowed the researcher the opportunity to become familiar with the interviews and *'to get a sense of the whole'* (Tesch, 1990 in Creswell, 1994:155).

The questions on the interview schedule were informed from the literature and the identified categories were used to group the responses from the interviews. The researcher sought to determine the underlying meaning of the detail described by the participant in the interview (Tesch, 1990 in Creswell, 1994:155); reflecting various aspects of the participants experience (Leedy & Omrod, 2005: 144).

When satisfied that the text had become accessible to her, the researcher could highlight "meaning units" throughout the interview transcripts and decided which ones were relevant to the research questions posed. The researcher then went on to connect the question with the meaning unit (Tesch, 1992:91). Furthermore, the researcher made notes in the margins of the transcribed interview.

After reading all the interviews, the researcher made a list of all the main emerging topics. Similar topics were clustered as per Tesch (1990 in Creswell, 1994:155): the emerging topics were then abbreviated as codes. Following this process the researcher went back to the transcribed interviews and proceeded with coding.

The researcher read through the transcripts and underlined the main emerging categories. The code was placed in the margin adjacent to the category in the text.
These categories were summarised as key words, written in the margin of the transcribed interview. These descriptive codes, written in the participant's own words, described '*what was going on and how these things proceeded'* (Denzin & Lincoln, 1994:432).

The researcher used interpretive codes after the descriptive codes. By now the researcher was familiar with the interviews and was seeking meaning. A different colour pen was used to write the interpretative codes into the margins.

The third time the researcher reviewed the transcribed interviews was to determine the explanatory codes (Burns & Grove, 2001:599). It was here that the researcher began to link the emerging categories to theories and to identify developing patterns.

The explanation codes involved justifying, giving reasons, supporting or making relationship claims (Denzin & Lincoln, 1994:432). Once again a different colour pen was used to denote the explanatory codes. Descriptive codes, interpretative codes and explanatory codes were once again categorised into themes and sub-themes.

All the data belonging to each category and sub-category were assembled. The data were named according to the interview number and the page number within the interview, so that the researcher could refer back to the original transcript. In addition, the researcher consulted peers, colleagues and literature during the process of identifying the categories.

Analysis

Analysis goes beyond description because data was transformed and extended (Burns & Grove, 2003: 382). In this process there is identification of essential features and description of interrelations among them. The researcher identified categories, subcategories and patterns from the data. The use of coding was to expand, transform and re-conceptualise data, providing opportunities for more diverse analyses.
Memos were also used to record insights and ideas related to notes, transcripts or codes. The researcher recorded any ideas that emerged, even if they were vague. Memos were given dates and titles **(**Tesch, 1992:87).

Data analysis is a mechanism for reducing and organising data to produce findings that require interpretation by the researcher (Burns & Grove, 2003:479). Interpretation focused on the usefulness of the findings for clinical practice. Refer to Chapter Six, for the results and discussion of the findings.
Implementing the following strategies ensured trustworthiness of the semi-structured interviews.

Trustworthiness

Trustworthiness refers to the degree of confidence that qualitative researchers have in their data (Polit & Beck, 2012: 745). According LoBiondo- Wood & Haber (2012: 588), trustworthiness is the rigour of the research in a qualitative study. Qualitative research is therefore trustworthy when the research accurately records the experiences of the study participants.

The use of Lincoln & Guba's (1985:290), model was to ensure the application of trustworthiness in the qualitative phase of the study. This model was chosen because it is well developed conceptually and has been extensively used by qualitative researchers, particularly nurses, for a number of years.

Lincoln & Guba's (1985: 112), model identifies the following criteria for establishing trustworthiness:

Truth value strategy: credibility measure.
Applicability strategy: transferability measure.
Consistency strategy: dependability measure.
Neutrality strategy: conformability measure.

These criteria were used according to its applicability in the context of the study.
Each criterion is described below.

Truth value (Credibility)

Credibility according to Polit & Beck (2012: 585), refers to confidence in the truth of the data and the interpretations of them. According to Lincoln & Guba (1985:80), in qualitative research credibility is obtained from the discovery of human experiences as they are lived and perceived by the participants. In this study the following strategies for credibility were employed according to Lincoln & Guba (1985).

Prolonged field experience: The researcher has been involved in the care and management of burn wounds for the past ten years, which indicates her knowledge of the field. Additionally the researcher had been working closely with the head of department (which served as the expert in the field) for seven years in the unit where the study was conducted, which allowed the researcher to get an in-depth understanding of the phenomenon. The researcher and participants had a good rapport which assisted in gathering rich data.

Referential adequacy: The researcher applied a pilot interview prior to conducting the actual interviews to determine that the interview schedule was practical and understandable. The pilot interview was discussed with the expert.

Peer debriefing: The researcher was assisted by the head of department at the burns unit in the study, a unit manager in a different burns unit and a private nurse practitioner, who does wound care daily, as sounding boards to discuss the methodology, terminology used and progress made in the study.

Member checks: The researcher continuously checked information gathered from the nurse participants to correct obvious errors and to provide additional information. The emerging findings from the study were taken back to the participants in order to confirm and verify findings.

Applicability (Transferability)

Applicability refers to the degree to which the findings can be applied (extrapolated) to other contexts and settings, or with other groups (Polit & Beck, 2012: 585; Lincoln & Guba, 1985: 80). Purposive sampling was done of nurses working in a burns unit. To confirm applicability of the results of the study, rich descriptions of the research design and research methods are given to allow the reader to assess the potential for applicability of results by comparison to other population and samples in other contexts.

Consistency (Dependability)

Consistency refers to the stability (reliability) of data over time and conditions **(**Polit & Beck, 2012: 585). In this study the researcher employed the following strategies to ensure consistency:

A **dependability audit** was done: The researcher conducted semi-structured interviews, which were tape recorded and transcribed verbatim. The researcher provided **a dense description**: Full method of data collection and analysis were explained. In addition **peer debriefing** was done: This strategy was used in the same manner as for credibility. The researcher recorded her thoughts in a reflective journal as part of bracketing to add to the depth of the interview.

Neutrality (Confirmability)

Neutrality refers to objectivity; in other words the potential for congruence between two or more independent people about the data's accuracy, relevance and meaning. This criterion is concerned with establishing that the data represents the information participants provided and that interpretations of the data are not biased by the researcher (Polit & Beck, 2012: 585).

The researcher employed the following strategies to ensure neutrality:

Conformability: Experts (research supervisors) were selected to look at the standards of the research. A **dense description** of data of this study is given to reduce bias. This provides the reader the opportunity to audit the study. Lastly, **referral adequacy**: A copy of the interview transcript is included in this study for auditing (Refer to Appendix V).

2.3.3.4 Findings of the semi- structured interviews

Chapter Six discusses the findings of the semi-structured interviews.

2.3.4 PHASE THREE: VERIFICATION OF FINDINGS FROM PHASES ONE AND TWO TO DEVELOP GUIDELINES FOR THE MANAGEMENT OF BURN WOUNDS BY NURSES

The fourth objective was to verify the findings from Phases One and Two by a consensus panel using the Appraisal of Guidelines for Research & Evaluation (AGREE) II (Brouwers, Kho, Browman, et al., 2010), instrument by experts in the field with a Nominal Group Technique.

2.3.4.1 Verification process

Verification is the process of checking, confirming, making sure, and being certain. In qualitative research, verification refers to the mechanisms used during the process of research to incrementally contribute to ensuring reliability and validity and, thus, the rigor of a study (Morse, Barrett, Mayan, et al., 2002). In this study verification was done by seeking consensus on the findings from Phases One and Two.

Consensus knowledge building is defined as an outcomes design that requires critique and synthesis of an extensive international search of the literature on the topic of concern (Burns & Grove, 2007: 5350). Consensus knowledge building brings experts face to face to gain either further understanding or consensus in a particular field; they are often multidisciplinary and may be composed of professionals, healthcare users or both and panels are used to develop guidelines (Moule & Goodman, 2009: 234; Burns & Grove, 2007: 298-299). According to Moule & Goodman (2009: 235), the consensus technique can be useful in cases where there is a lack of knowledge or understanding on a particular health issue.

It enables healthcare professionals to access the views of experts on aspects of practice, education and research priorities and can be used in developing clinical guidelines and in identifying agreements on health and research priorities. Consensus knowledge building was applied in this study to critique the findings from the integrative review (Chapter Four) in order to deliver evidence-informed guidelines for the management of burn wounds as no such guidelines or standards are available in South Africa. The three consensus methods identified in the literature are: Focus Group Discussions, Delphi and Nominal Group Techniques (NGT). A brief explanation of each of the three methods follows.

Focus group

An interview with a group of individuals assembled to answer questions on a given topic (Jayasekara, 2012: 411; Polit & Beck, 2012: 728; Burns & Grove, 2007: 540).

Focus groups are used to study qualitative issues, analyse policy, assess consumer satisfaction, evaluate quality of care, examine the effectiveness of public health programs, make professional decisions, develop instruments, explore patient care problems, develop interventions and education programs, study various patient populations and gather participatory research projects (Burns & Grove, 2007:379). The key feature of focus groups is the active interaction among participants to explore their views and opinions. This is particularly useful when current knowledge about a phenomenon is inadequate and expansion is important (Jayasekara, 2012: 414).

A critique on the focus group is that it is usually more difficult to arrange, and bringing participants together requires energy, time, and money (Jayasekara, 2012: 414).

Delphi technique/ survey

A technique for obtaining judgements from an expert panel about an issue of concern (Polit & Beck, 2012: 725; 537; LoBiondo-Wood & Haber, 2010:577; Burns & Grove, 2007: 537; Hasson, Keeney & McKenna, 2000: 1009).

The Delphi technique is an iterative multistage process, designed to transform opinion into group consensus without requiring face- to- face discussion (Polit & Beck, 2012:267; Hasson, et al., 2000: 1010). Experts are questioned individually in several rounds, with a summary of the panel's views circulated between rounds, to achieve consensus (Polit & Beck, 2012: 725; LoBiondo-Wood & Haber, 2010:577; Burns & Grove, 2007: 537; Hasson, et al., 2000: 1010).

A critique on the Delphi technique is that it is time consuming (Goodman, 1987), and panel members' cooperation may wane in later rounds (therefore attrition bias is a potential problem). Another concern is how to define consensus (in other words how many participants have to agree before researchers can conclude that consensus has been reached with recommendations ranging between a liberal fifty one percent to a more cautious seventy percent) (Polit & Beck, 2012:267-268).

Nominal Group Technique (NGT)

A structured procedure for gathering information from groups of people who have insight into a particular area of interest (Varga-Atkins, Bunyan, McIsaac, et al., 2011: 4; Carney, McIntosh & Worth, 1996: 1026; Gallagher, Hares, Spencer, et al., 1993: 76).

The term "nominal" group signals that the group is only "in name" a group, in reality, it requires *individual* input from its members (Varga-Atkins, et al., 2011:4). The purpose of the NGT is to generate information in response to an issue that can then be prioritised to achieve consensus and action planning through group discussion (Potter, Gordon, & Hamer, 2004: 126).

The NGT combines aspects of the Delphi technique and focus group. A critique on the NGT is that views of individuals may influence others in the discussion phase, minority disagreement is masked, the timing of nominal group sessions can have an influence on the outcome of the research and that reporting of only the top five items may be considered to be an issue (Varga-Atkins, et al., 2011: 8). Table 2.5 depicts the comparisons between the decision making groups.

Table 2.5 Comparison of consensus decision making groups (Potter, et al., 2004: 127).

Attribute	**Decision making process**		
	Delphi	**Focus Group**	**NGT**
Face-to-face group meeting process	No	Yes	Yes
Generates a large number of ideas	Yes	Maybe	Yes
Avoids focusing on a single train of thought	Yes	Yes	Yes
Encourages equal input from all participants	Yes	No	Yes
Highly structured process	Yes	Maybe	Yes
Meeting time usually 1-2 hours duration	No	Yes	Yes
Avoids 'quick' decision making	Yes	No	Yes
High degree of task completion	Yes	Maybe	Yes
Provision of immediate feedback	No	Maybe	Yes
Measures the relative importance of ideas generated	Yes	No	Yes

A consensus technique may also be carried out by a consensus panel. Consensus panels are groups of individuals gathered to arrive at a consensus regarding an issue such as guidelines for the management of burn wounds by nurses in this study.

There are a number of different types of consensus panels as per (Green & Thorogood, 2014:127):

Delphi groups

In this type of group the participants do not meet, but are mailed a questionnaire to garner views on a given topic. Summaries of the views of the group are then mailed back, with participants invited to change their responses in light of the views of the group. This can be repeated several times until members of the group reach consensus.

Consensus conferences

Is a generic term for workshops or discussion groups where participants come to consensus through debate and interaction in such activities as guideline development.

Consensus panel convened for an NGT

This type of group was developed to enable groups of people with an interest or expertise in an area to generate and rank ideas. Each participant privately and independently writes their comments on the group's question. These are then listed and discussed. Finally points are awarded to the top ideas which are then ranked.

The consensus method used in this study is the NGT and therefore the advantages are highlighted as justification for this selection.

Advantages of the Nominal Group Technique

The advantages of the NGT are grouped under four subheadings: advantages for individual participants, advantages for the group dynamics and participants, advantages for the purpose/task and advantages for the facilitator. Each of these advantages will be discussed individually as per (Varga-Atkins, et al., 2011: 6-8).

Advantages for individual participants

The stage of individual-responses precedes group discussion. This has been proposed to help maintain the autonomy of individual viewpoints and members making their own judgements, it allows equal input by each participant and encourages participants to consider all options, it generates its own issues rather than those prescribed by the researcher.

Advantages for group dynamics

The structure of the NGT helps to value every member's input, even that of shy or reticent members. It helps reduce the influence of members with vocal voices or bias in the group and so promotes equal participation. During a nominal group session, the generated ideas and responses to the question(s) are displayed to the whole group. This visual representation of mental processes has been found to enhance the satisfaction felt by group members in the process. In the last stage, ranking the list is the product of group consensus and provides a direct reflection of the implicit views held by a group, in other words, the achieved consensus.

Advantages for the purpose/task

One of the advantages in terms of the purpose of the research or evaluation itself is that using the NGT produces a greater number of ideas than with other group methods, for example, focus groups or brainstorming groups. The technique allows members to carry out a substantial volume of work in a short time. The prioritisation stage helps decision-making by devolving it to the group.

Advantages for the facilitator

The structure of the session restricts the role of the researcher and avoids allowing the facilitator to express their own inference or interpretation on the group members' input. If the discussion topic is controversial and is likely to end in heated discussions, the structure inherent in the session can act as a control mechanism.

For the same reason, the technique can also be useful in a research setting when participants are seen as having more power than the facilitator, the NGT groups requires little facilitator input or preparation time, although this benefit is not necessarily shared by others.

The purpose of verification is stated for consistency.

2.3.4.2 Purpose of verification

The purpose of the verification process was to deliver evidence-informed guidelines for the management of burn wounds by nurses.

A description of the methodology follows the justification for the selection of a consensus method in the verification process.

2.3.4.3 Research method

Data collection entailed planning the nominal group, selecting participants, and conducting the group. Each process will be described below.

Planning the nominal group

Two things are essential before a nominal group can be held.

Firstly, the researcher must select a sample of people who have experience, expertise and insight into the problem being explored. Secondly, there is a need to develop appropriate questions for the nominal group to address. This may involve preliminary work such as interviewing potential experts or potential participants (Gallagher, Hares, Spencer, et al., 1993: 78).

The participants in the nominal group should qualify for selection based on their expertise on the matter under discussion or because they are representative of their profession and have the power to implement the findings (Potter, et al., 2004: 127).

Experts were handpicked to participate in the verification process based on their expertise and experience in the management of burns and wounds respectively. The nominal group verified the findings from this study and addressed the questions from the integrative review done in Chapter Four.

Selecting participants (Sample)

A list of the multidisciplinary team involved in the management of burns was composed from admission to hospital until discharge. The clinical management team from which the nominal group was likely to be selected included trauma doctors, surgeons and nurses; plastic and general surgeons; intensives specialists; infection control nurses; intensive care nurses; wound care nurses; dieticians; a physiotherapist and an occupational therapist. The suggested size of a nominal group is five to nine participants according to Potter, et al., (2004:126). Nine experts were invited to participate in the group, however, one expert declined due to time constraints and the other was on leave at the time of the verification.Seven participants were recruited, three medical doctors and four nurses. The logic for this was to include one person from the different specialties in burn management.

Though nutrition and mobility are important in burn wound management, the researcher excluded representatives from these specialties as there was no direct accountability between nurses, physiotherapist, occupational therapist and dieticians as the South African Nursing Council (SANC), states that nurses are independent professionals (SANC, 1978: R2598, Act 50 of2005), that practise either independently or under prescription from a medical doctor as described in Section B of the Medical, Dental and Supplementary Health Service Professions Act, 1974 (Health Professions Act 56 of 1974).

The panel included specialist doctors and nurses, heads of departments, academics and opinion leaders in the management of burns, infection control and wound management. Table 2.6 is a list of experts. The panel wished to be acknowledged for their contribution in the development of the guidelines and have given permission for their names and specialties to be documented in the thesis.

Table 2.6 Panel of experts (alphabetical order)

Name	**Speciality**	**Burn or wound management experience/ expertise**
Professor Jaques Goosen	Trauma surgeon	✓
Sister Phindi Lehabe	Registered Nurse	✓
Sister Eva Lekwaba	Private nurse practitioner (wound care)	✓
Doctor Adelin Muganza	General surgeon	✓
Professor Elias Ndobe	Plastic surgeon	✓
Sister Katinka Rheeder	Nursing manager	✓
Sister Karen Swart	Infection control and quality assurance	✓

Conducting the group

A nominal group pack was compiled and given to each member of the expert panel prior to the nominal group. The pack included a covering letter inviting them to participate in the study; the purpose of the study was stated, the methodology which was to be used as well as a description of the process of NGT and their contribution and involvement should they agree to participate. The pack also included an information sheet, consent letter, a user's manual for the AGREE II instrument, the AGREE II (Brouwers, et al., 2010), instrument, a summary of the methodology of the integrative review as per (Whittemore & Knafl, 2005), which included the search methods, selection criteria, methods to assess the quality and strength of the evidence (DiCenso, Guyatt, & Ciliska, 2005: 34), the integrative review findings along with a table of recommendations for guidelines that were to be evaluated by them.

The process of guideline development required the researcher to include reference support to ensure guidelines are evidence based. This provided the experts with current information to use in the discussions and allowed the panel to draw on current knowledge in verifying the guidelines. Only one meeting was held in a pre-booked venue. Experts were not paid (Moule & Goodman, 2009: 234).

The researcher moderated the discussions and took notes. Moderation augmented facilitation of the discussion; this ensured the flow and guided process. The nominal group lasted approximately one hour and forty five minutes; the average recommended duration of a nominal group is up to two hours (Potter, Gordon & Hamer, 2004: 126; Gallagher, Hares, Spencer, et al., 1993: 80).

The nominal group technique process comprises number of stages. Table 2.7 depicts the recommended stages of NGT and the actual stages as implemented in this study.

Table 2.7 Stages of NGT

Stages of the NGT (Varga-Atkins, et al., 2011:11)	**Stages of NGT for this study**
Welcoming statement	Welcoming statement Introduction: purpose of the session ,session structure, review of researchers packs and address queries or concerns
Stage 1 Silent generation of ideas	Stage 1 – Individual responses from AGREE II
Stage 2 Round robin recording of ideas	Stage 2 – Clarification and consolidation: responses are read out, clarified and discussed, consensus reached, recommendations for changes discussed.
Stage 3 Serial discussion and clarification	Stage 3 – Ranking results are calculated and shared with the group as per AGREE II
Stage 4 Preliminary vote on item importance	Stage 4- Each recommended guideline discussed to qualify, refine and further develop the guideline and to ensure it is applicable to the South African context.
Stage 5 Discussion of preliminary vote (optional)	Stage 5- Final vote
Stage 6 Final vote	Stage 6- Revised guidelines send for review by experts
Top five shared with the commissioners of the research	
„Technology" of recording ideas: pen and flipchart, facilitator writes on board as participants dictate. Ranking by paper.	

Next the verification instrument is discussed.

2.3.4.4 Verification instrument

The nominal group used the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument (Brouwers, et al., 2010), to verify the guidelines for the management of burn wounds by nurses.

Before explaining the AGREE II instrument, a background to guidelines are provided as the purpose of the instrument is to assess the quality of guidelines, provide a methodological strategy for the development of guidelines and inform the reader how information ought to be reported in guidelines. Therefore, an understanding on what guidelines are, the benefits and potential harms of guidelines need to be clearly understood.

Guidelines

Clinical practice guidelines (hereafter referred to as guidelines) are statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options (National Guideline Clearing House, 2013), to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances (Brouwers, et al., 2010: 1; Swinglehurst, 2005: 308; Rees & Booth, 2005: 315).
In other words a guideline is a tool with the potential to summarise knowledge in an accessible and usable form. In addition, guidelines can play an important role in health policy formation and have evolved to cover topics across the health care continuum (for example, health promotion, screening, diagnosis).

The purposes of guidelines are to describe appropriate care based on the best available scientific evidence and broad consensus; reduce inappropriate variation in practice; provide a more rational basis for referral; provide a focus for continuing education; promote efficient use of resources; act as focus for quality control, including audit and to highlight shortcomings of existing literature and suggest appropriate future research (OpenClinical, 2014). Furthermore, Wollersheim, Burgers & Grol (2005: 188), added that the aim of guidelines is to improve the quality of care by translating new research findings into practice.

The dissemination of such guidelines has been shown to change clinical practice and improve outcomes for patients (Heath, 2005: 268). The advantages of guidelines are presented in Table 2.8.

Table 2.8 Advantages of guidelines (Woolf, Grol, Hutchinson, et al., 1999: 527-529).

Advantages for patients

- Improve health outcomes by reducing morbidity and mortality and improving quality of life.
- Improve the consistency of care by making it more likely that patients will be cared for in the same manner regardless of where or by whom they are treated.
- Inform patients and the public about what their clinicians should be doing.
- Guidelines empower patients to make more informed healthcare choices and to consider their personal needs and preferences in selecting the best option.
- Guidelines can help patients by influencing public policy. Guidelines call attention to under recognised health problems, clinical services, and preventive interventions and to neglected patient populations and high risk groups.
- Improve the efficiency of health care free up resources needed for other (more equitably distributed) healthcare services.

Advantages for healthcare professionals

- Improve the quality of clinical decisions.
- Offer explicit recommendations for clinicians who are uncertain about how to proceed overturn the beliefs of healthcare professionals accustomed to outdated practices.
- Improve the consistency of care, and provide authoritative recommendations that reassure practitioners about the appropriateness of their treatment policies.
- Guidelines based on a critical appraisal of scientific evidence (evidence based guidelines) clarify which interventions are of proved benefit.
- Alert clinicians to interventions unsupported by good science, reinforce the importance and methods of critical appraisal, and call attention to ineffective, dangerous, and wasteful practices.
- Guidelines can support quality improvement activities.
- Guidelines are a common point of reference for audits of clinicians' or hospitals' practices.
- Researchers benefit from the spotlight that evidence based guidelines shine on gaps in the evidence.
- Clinicians may turn to guidelines for medico legal protection or to reinforce their position in dealing with administrators who disagree with their practice policies.

Advantages for healthcare systems

- Clinical guidelines may be effective in improving efficiency (often by standardising care) and optimising value for money.
- Reduces outlays for hospitalisation, prescription drugs, surgery, and other procedures.
- Publicising adherence to guidelines may also improve public image, sending messages of commitment to excellence and quality.

In contrast, the potential harms of guidelines are presented in Table 2.9.

Table 2.9 Harms of guidelines (Woolf, et al., 1999: 529- 530).

Harms of guidelines to patient • Recommendations that do not take due account of the evidence can result in suboptimal, ineffective, or harmful practices. • Guidelines that are inflexible can harm by leaving insufficient room for clinicians to tailor care to patients' personal circumstances and medical history. • Blanket recommendations, rather than a menu of options or recommendations for shared decision making, ignore patients' preferences. • Reduce individualised care for patients with special needs. • May mislead or confuse patients and disrupt the doctor-patient relationship. • Recommendations against an intervention may lead providers to drop access to or coverage for services • Imprudent recommendations for costly interventions may displace limited resources that are needed for other services of greater value to patients.
Harms of guidelines to healthcare professionals • Flawed clinical guidelines harm practitioners by providing inaccurate scientific information and clinical advice, thereby compromising the quality of care. • They may encourage ineffective, harmful, or wasteful interventions. • Conflicting guidelines from different professional bodies can also confuse and frustrate practitioners. • Outdated recommendations may perpetuate outmoded practices and technologies. • Guidelines are also potentially harmful to healthcare professionals as citable evidence for malpractice litigation and because of their economic implications. • Referral guidelines can shift patients from one specialty to another. • A negative (or neutral) recommendation may prompt providers to withdraw availability or coverage.
Harms of guidelines to healthcare systems • Healthcare systems and payers may be harmed by guidelines if following them escalates utilisation, compromises operating efficiency, or wastes limited resources. • Some clinical guidelines, especially those developed by medical and other groups unconcerned about financing, may advocate costly interventions that are unaffordable or that cut into resources needed for more effective services.

Following on the background of guidelines the verification instrument is explained.

AGREE II instrument

The Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument was used to allocate values to the level of agreement on various aspects of burn wound management.

A brief account of the instrument is given below as per the AGREE trust (Brouwers, et al., 2010).

The AGREE instrument was developed to address the issue of variability in guideline quality. To that end, the AGREE instrument is a tool that assesses the methodological rigour and transparency in which a guideline is developed. It is important to assess the methods used to develop practice guidelines in order to be confident of the resulting recommendations.

The original AGREE instrument has been refined, which has resulted in the new AGREE II. The AGREE II is now the new international tool for the assessment of practice guidelines. The AGREE II is both valid and reliable and comprises twenty three items organized into the original six quality domains, namely: i) scope and purpose; ii) stakeholder involvement; iii) rigour of development; iv) clarity of presentation; v) applicability; and vi) editorial independence. Each of the twenty three items targets various aspects of practice guideline quality. Each of the six domains is explained below.

Domain 1. Scope and Purpose is concerned with the overall aim of the guideline, the specific health questions, and the target population (items 1-3).

Domain 2. Stakeholder Involvement focuses on the extent to which the guideline was developed by the appropriate stakeholders and represents the views of its intended users (items 4-6).

Domain 3. Rigour of Development relates to the process used to gather and synthesize the evidence, the methods to formulate the recommendations, and to update them (items 7-14).

Domain 4. Clarity of Presentation deals with the language, structure, and format of the guideline (items 15-17).

Domain 5. Applicability pertains to the likely barriers and facilitators to implementation, strategies to improve uptake, and resource implications of applying the guideline (items 18-21).

Domain 6. Editorial Independence is concerned with the formulation of recommendations not being unduly biased with competing interests (items 22-23).

Overall assessment includes the rating of the overall quality of the guideline and whether the guideline would be recommended for use in practice.

Findings of verification process

The findings from the verification process (NGT) are discussed in Chapter Seven.
This research was methodologically sound and of high ethical standard.

A discussion on ethical considerations follows.

2.4 ETHICAL CONSIDERATIONS

Ethical research is research that upholds all ethical principles. The ethical research principles according to the Human Sciences Research Council (http://www.hsra.ac.za), are: respect and protection, transparency, scientific and academic professionalism and accountability. Conceptually, the ethical considerations for both quantitative and qualitative research are the same regarding safety and protection of human rights. In order to ensure ethical research, approval was obtained from the Postgraduate Committee, Faculty of Health Sciences from the University of the Witwatersrand and ethical clearance from the Committee for Research on Human Subjects (Medical). The ethics clearance number is M090109.

Permission was obtained from the Hospital Research Committee, Head of department and the Head nursing services at the tertiary academic hospital. A meeting was held with the head of nursing services to present the proposed research. The Unit Manager of the burns unit of nurses received information about the research and their consent was sought. The researcher also obtained written consent from the nurses and patients where observations were done.

Confidentiality was obtained by restricting data to the researcher, statistician and research supervisors.
The verifiers, in other words the panel of experts, wished to be acknowledged for their contribution in the development of the guidelines and have given permission for their names and specialties to be documented in the thesis.

The following individuals received information letters:

- Chief Executive Officer of the Hospital
- Deputy Director of Nursing Services
- Head of Surgery Departments
- Unit manager
- Nurses
- Panel of experts

With regards to copyright, consent was not required in order to use the AGREE II instrument. The document may be used for educational purposes, quality assurance programmes and critical appraisal of clinical practice guidelines without the consent of the developers.

2.5 SUMMARY

Chapter Two described the research design and method in detail. The research design and research method is structured as per the process of formulating guidelines. The study was divided into three phases:

Phase One: was conducting an integrative review. The integrative review was done using Whittemore & Knafl's (2005), framework.

Phase Two (a): was collecting data on current practice through structured observation of nurses during dressing changes.

Phase Two (b): was collecting data on current practice with a semi structured - informal interview directed by an interview schedule.

Phase Three: verification of findings from Phase One and Phase Two with during a nominal group.

Table 2.10 Summarizes the methodology of research methods

	Mixed method research	Quantitative research	Qualitative research	Practical application in this thesis
Scientific method	Confirmatory and exploratory	Confirmatory, researcher test hypotheses and theory	Exploratory, researcher generates or construct knowledge	Corroborate literature was determined best evidence on management of burn wounds Explored and described current practice
Ontology	Pluralism	Objective	Subjective	Researcher sought the objective and subjective reality
Epistemology	Pragmatism	Post Positivism	Constructivism	Pragmatic approach to answer research questions
View on human thought and behaviour	Dynamic	Regular and predictable	Situational	Partially predictable by the use of Whittemore and Knafl (2005) methodology in integrative review, checklist for observation and an interview schedule for interviews
Reasoning strategy	Abductive	Deductive	Inductive	Both inductive and deductive approaches are used with the expertise , experience and intuition of the researcher taking precedence to either
Research objectives	Multiple objectives, multiple perspectives	Numerical description, causal explanation. Objective	Subjective description, understanding and exploration	Four research objectives. Inter-subjective
Focus	Multilens focus	Narrow angle lens	Wide angle and “deep	Multi focus

			angle" examining breadth and depth of a phenomena	
Nature of observation	Study multiple context or perspectives	Study under controlled conditions	Study groups and individuals in natural settings	Multiple factors were studied to develop guidelines
Form of data collected	Multiple kinds of data	Collect quantitative data based on precise measurement using structured and validated data collection instruments	Collect qualitative data such as in depth interviews, participant observation. Researcher is primary data collection instrument	Integrative review with descriptive findings, structured observation and semi structured interviews
Inference from data	Transferability	Generality	Contextual	Multiple paths of meaning
Data analysis	Quantitative and qualitative analysis used separately and in combination	Identify statistical relationship among variables	Use descriptive data, search for patterns and themes	Descriptive statistics
Results	Presentation and integration of multiple dimensions and perspectives	Generalizable findings	Particularistic findings	Subjective insider and objective outsider view points reported
Form of final report	Mixture of numbers and narrative	Formal statistical report	Informal narrative report with contextual description and direct quotations from research participants	Mixture of quantitative and qualitative report

2.6 CONCLUSION

Chapter Two was an expression of the research methodology. Chapter Three describes the Nursing process as foundation for this study.

CHAPTER THREE LAYOUT

CHAPTER 3	3.0 Introduction		
	3.1 Phases of the nursing process	3.1.1 Assessment 3.1.2 Diagnosis 3.1.3 Interventions/ Implementation 3.1.4 Outcomes and Evaluations 3.1.5 Accuracy 3.1.6 Quality 3.1.7 Standardisation	
	3.2 Conclusion		

CHAPTER THREE

NURSING PROCESS AS FOUNDATION OF STUDY

3.0 INTRODUCTION

The nursing process, in relation to the management of burn wounds, is presented in Chapter Three as a framework for this study. This chapter will present the various phases of the nursing process as a map for the findings in Chapters Four, Five and Six. The phases of the nursing process are used as the headings in Chapters Four, Five and Six. Each phase of the nursing process is presented in this chapter followed by a discussion supported by evidence.

An overview of the nursing process follows as background information:

The nursing process is a framework for providing professional, quality nursing care; and directs nursing activities (DeLaune & Ladner, 2011: 79).The nursing process involves a series of overlapping steps that automatically build on each other (DeLaune & Ladner, 2011: 79). Potter & Perry (2005: 279), stated that the nursing process is a dynamic continuous process which allows the nurse to modify care as the client's needs change and it allows nurses to differentiate their practice from physicians and other healthcare professionals. Figure 3.1 illustrates the steps of the nursing process with its interconnectivity.

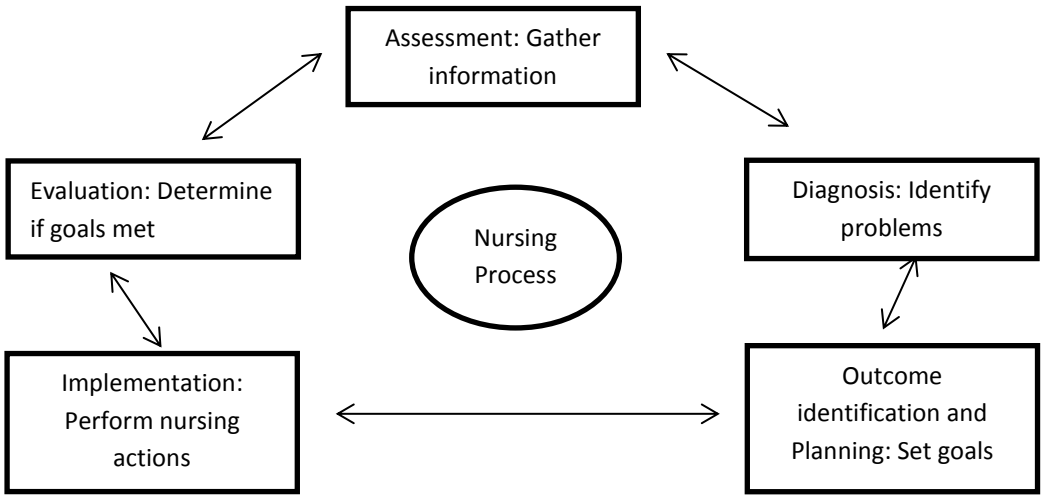

Figure 3.1 The nursing process

The above nursing process model originally contained four steps: assessment, planning, implementation, and evaluation, however in a later version, the nursing diagnosis was included according to Björvell, Thorell-Ekstrand & Wredling (2000:6).

According to the same authors the primary purpose of the nursing process is to relate individualised nursing care to the individual patient rather than generalised care based on routines. Chabeli (2007: 71), concurred stating that the nurse works closely with the patient to individualise care and build a relationship of mutual trust and respect. According to Dowsett (2009: 18), accurate assessment and diagnosis of a patient with a wound is essential for good wound care practice. Evidence from the literature suggests that if the assessment of the wound is poor, the documentation of that assessment will also be poor (Dowsett, 2009: 18), which in turn leads to poor patient outcomes related to wound care.

A critique on the nursing process by Muller- Staub (2006:9), was that the nursing process was described as a relational and problem solving process and as such nursing interventions were based on "nursing problems". These problems were worded in freestyle and the so called "nursing problems" were not accurately formulated. The author added that an inaccurate problem formulation led to inappropriate goal setting for nursing, followed by unspecific nursing interventions. Because classifications were lacking; patient problems were reported to be insufficiently described, and the relations between nursing assessment and nursing interventions was not logical and that the nursing process notes were often deficient (Muller- Staub, 2006:9). This consequently led to uncertainty as to what the documentations referred to, often times resulting in impaired information exchange and discontinuity of care. A need for standardization was consequently identified.

Because this process is well known to nurses - the researcher decided to hang the key concepts of the review and its clinical practice upon the framework of the nursing process. Furthermore the nursing process offers a scientific basis for nursing and thus formed the basis for this scientific enquiry.

A discussion of each of the phases follows.

3.1 PHASES OF NURSING PROCESS

3.1.1 Assessment

Assessment is defined as the identification of the needs, preferences and abilities of a patient; it includes physical, social and emotional needs plus it provides the basis of nursing care (Mosby Medical Dictionary, 2009).

Assessment is the first step of the nursing process and includes the collection, verification, organisation, interpretation and documentation of data and is a very important step in the nursing process as the correctness and completeness of data obtained are directly related to the accuracy of the steps that follow (DeLaune & Ladner, 2011: 79).

Similar to the nursing process, the first step in the management of wounds starts with a wound assessment (Mcquillan, Makic & Whalen, 2009:879; van Rijswick & Catanzaro in Krasner, Rodeheaver & Sibbald, 2007:113; Mulder, Small, Botma, et al., 2002:44).

The next phase of the nursing process is the nursing diagnosis which will be explained below.

3.1.2 Diagnosis

The second phase in the nursing process involves further analysis and synthesis of the data that has been collected (DeLaune & Ladner, 2011: 81). The term diagnosis refers to the reasoning process (diagnostic reasoning) and the product (problem statement) and is called a nursing diagnosis (Kozier, Erb, Blais, et al., 1995:107). Nursing diagnosis is a statement of a health problem or of a potential health problem that a nurse is licenced and competent to treat (Mosby Medical Dictionary, 2009). Furthermore a nursing diagnosis is a clinical judgment about an individual, family or community response to actual or potential health problems or life processes and provides the basis for selection of nursing interventions to achieve outcomes for which the nurse is accountable. It is often used to describe both the process and a product (Herdman, 2008:3; Carpenitito –Moyet, 2006:4-5). In other words, nurses use a reasoning process called nursing diagnosis to produce a statement of a patient's health status or needs. The nursing diagnosis is unique in that it focuses on a patient's response to a health problem, rather than on the problem itself, and it provides the structure by which nursing care can be delivered.

The purposes of the nursing diagnosis are: that it contributes to the professional status of the discipline as it increases professional accountability and autonomy; it provides a means of effective communication as there is a need for a common language in the nursing team and it provides assistance for individualization of care and the development of comprehensive therapeutic nursing interventions (DeLaune & Ladner, 2011: 111-112). North American Nursing Diagnosis Association-International (NANDA-I), concurs and adds that implementation of nursing diagnosis enhances every aspect of nursing practice, from garnering professional respect to assuring consistent documentation representing nurses' professional clinical judgment, and accurate documentation to enable reimbursement (NANDA-I, 2014).

A great deal of work has been done by NANDA-I (formerly North American Nursing Diagnosis Association, but because of its international recognition NANDA, as a brand, was retained, but is now recognised as NANDA-I) for the criteria of nursing diagnosis classification (Muller- Staub, 2006:36). NANDA-I exists to develop, refine and promote terminology that accurately reflects nurses' clinical judgments (NANDA-I 2014).

In 2012, NANDA- I approved more than two hundred nursing diagnoses for clinical use, testing and refinement. NANDA-I compiled a list of nursing diagnosis that covers the various domains of patients' needs. Table 3.1 below lists the diagnoses which are applicable to wound management.

Table 3.1 The 2012-2014 nursing diagnosis by NANDA-I (2014).

Domain 11 Safety/ Protection	**Domain 12 Comfort**
Risk for infection Risk for bleeding Risk for perioperative positioning injury Risk for peripheral neurovascular dysfunction Impaired skin integrity Risk for impaired skin integrity Delayed surgical recovery Impaired tissue integrity Contamination Risk for contamination Risk for imbalanced body temperature Hyperthermia Hypothermia Ineffective thermoregulation	Readiness for enhanced comfort Acute pain Chronic pain Impaired comfort

However, Herdman (2008:4), questions if the current definition of nursing diagnosis is still relevant and poses the question: ***"Nursing Diagnosis: Is It Time for a New Definition?"*** A total of 269 respondents completed the survey, with participants from thirty one countries taking part in this project. Participants were asked the question ***"Is the current definition of nursing diagnosis sufficient?"*** In response 59, 1% of respondents answered that, "no the definition was not sufficient".
It has been reported that a number of participants indicated that the current definition did not reflect nursing practice fully, and called for more discussion of nursing process within the definition of nursing diagnosis. There was also substantial commentary regarding the inter- or multi-disciplinary reality of patient care; there were many participants who felt that this should be addressed within the definition of nursing diagnosis. Comments indicated that the definition neglected the holistic nature of nursing, and needed to address wellness as well as illness in order to reflect the full continuum of nursing practice. Of the respondents surveyed 71% agreed that a new definition was required. It is clear that neither the freestyle method of diagnosis nor the current definition of nursing diagnosis is applicable in the current age. Additionally a number of comments (n= 31) came from those who felt that the current definition of nursing diagnosis was not sufficient regarding the ability of nurses or other health professionals to truly be accountable for the outcomes of care and some (n = 24) respondents stated that the current definition lacked clarity or was too vague to drive nursing practice.

The researcher concurs that the current nursing diagnosis is vague and does not communicate effectively with the multi-disciplinary team. The vagueness of the current nursing diagnosis continues to segregate nurses and does not portray nurses as critical thinkers. Furthermore Fain (2013: 50), argued that even amongst nurses the language differs with nurse researchers and nurse clinicians using different languages to describe or interpret the same phenomena. Nurse researchers are inclined to use the language in the literature, whilst nurse clinicians use common language such as "beefy" to describe granulating tissue. On the other hand, a medical diagnosis is used for the clinical judgement by the physician that identifies or determines a specific disease, condition or pathologic state (DeLaune & Ladner, 2011: 111-112). Nursing and medical diagnosis differs in terms of purpose, goals and therapeutic intervention. Nonetheless, in the world of wound management the most descriptive diagnosis remains the medical diagnosis. All the literature explored in both fields of medicine and nursing made use of the medical descriptive terminology (diagnosis) and not the nursing diagnosis. It might be argued that the rest of the team make use of medical diagnosis, but the vagueness of the nursing diagnoses puts nurses at a disadvantage as critically thinking independent professionals.

A review by Muller- Staub (2006:22), concluded that the NANDA-I classifications should be used in nursing practice based on the evidence. According to Muller-Staub (2006:10), the NANDA-I diagnosis contains a problem description (P= problem statement), pertinent etiology (E=etiology) and the corresponding signs and symptoms (S= signs and symptoms), referred to as the PES format. This format allows for standardization which ultimately leads to consistency and better patient outcomes. The researcher concurs with this recommendation. DeLaune & Ladner (2011: 115), are in agreement and write about a three part statement for nursing diagnosis. The first two components are the diagnostic label and etiology and the third component consist of defining characteristics.
The defining characteristics may assist the nurse in identifying patient goals, measurable patient outcomes criteria and relevant nursing interventions (DeLaune & Ladner, 2011: 115).

The researcher therefore questioned if there is not a place for a tri-diagnosis in the area of wound management? Firstly the diagnosis will have a nursing diagnosis to direct nursing interventions as per NANDA-I (2014). Secondly the descriptive medical diagnosis will be used as stated in the literature (for instance partial thickness burn). Lastly the signs and symptoms that inform the diagnosis will be described.

A nursing diagnosis remains important to the profession, but in the evolution of health care in a multi-disciplinary team, the nurse's contribution is relegated due to the vagueness of the descriptions in the nursing diagnosis. Wound care is multi-disciplinary. The multidisciplinary team approach to efficacy is well documented with nurses forming an integral part of the team (Smart, 2009; Naude & Bruwer, 2006; Gottrup, 2004a; Gottrup, Holstein, Jørgensen, et al., 2001).

The researcher therefore proposes a three part statement as described by DeLaune & Ladner (2011: 115), which is in agreement with NANDA-I PES format (Muller- Staub,2006: 10), with the inclusion of the terminology described in the literature.

See table 3.2 for comparison of different diagnosis.

Table 3.2 Different types of diagnosis

NANDA nursing diagnosis (www.nanda.org)	**Medical diagnosis**	**Proposed Three part statement nursing diagnosis**
Impaired tissue integrity	Partial thickness burn (Devgan, Bhat, Aylward, 2006: 7-15; Watts, Tyler, Perry, et al., 2001:154)	Impaired tissue integrity *RT partial thickness burn *AEB altered epidermis and dermis
Risk for infection	Critically colonized wound (Church, Elsayed, Reid, et al., 2006)	Risk for infection *RT critical wound colonization *AEB delayed wound healing due to an increase pathogenic organisms
Risk for contamination	Large TBSA in deep dermal wound (Devgan, et al., 2006: 7-15; Watts, et al., 2001:154)	Risk for contamination *RT Large TBSA in deep dermal wound *AEB accentuated risk of exposure to environmental contaminants in doses sufficient to cause health effects.
Imbalanced body temperature	Large TBSA	Imbalanced body temperature *RT large TBSA *AEB excessive moisture and heat loss due to skin loss and failure to maintain body temperature within normal range
Acute pain	Superficial partial thickness burn (Devgan, et al., 2006: 7-15; Watts, et al., 2001:154)	Acute pain *RT superficial partial thickness burns *AEB unpleasant sensory and emotional experience arising from tissue damage
Disturbed body image	Full thickness burns (Devgan, et al., 2006: 7-15; Watts, et al., 2001:154)	Disturbed body image *RT full thickness burns *AEB changes in body appearance due to scaring

*RT: related to

*AEB: as evidenced by

The next phase in the nursing process is Outcome. The patient's expected outcome should be specified before the intervention is chosen as it serves as a criterion against which to assess/judge the success rate of the nursing intervention (Bulcheck, Butcher, Dochterman, et al., 2013: 13). However, for the purpose of this study the Outcome has been paired with Evaluation and will be reported on after the discussion on Implementation (Intervention), which follows.

3.1.3 Interventions / Implementation

After assessing the patient and formulating a nursing diagnosis, the nurse sets goals and establishes expected outcomes for each nursing diagnosis. Once the expected goals have been mutually agreed upon, the nurse makes use of a decision making process to select nursing interventions. A nursing intervention is any treatment or action performed by a nurse, based on clinical judgement and knowledge, which helps the patient achieve the results, specified in the goals and expected outcomes (Bulecheck, et al., 2013: 2; DeLaune & Ladner, 2011: 132; Potter & Perry, 2005: 324).
To this end nurses use clinical judgement to improve patients' health, enhance their ability to cope with health problems and to promote a patients' quality of life according to Bulecheck, et al., (2013: 13). Bulecheck, et al., (2013: 13), explained that the selection of intervention is part of the clinical judgement of the nurse and that six factors should be considered when choosing an intervention namely:

1. Desired patient outcomes.
2. Characteristics of the nursing diagnosis.
3. Research base for the intervention.
4. Feasibility for doing the intervention.
5. Acceptability to the patient.
6. Capability of the nurse.

There are three categories of nursing interventions: physician initiated or dependent, collaborative interventions and nurse initiated or independent.

These will be briefly described as per Potter & Perry (2005: 324). Firstly, physician initiated interventions are based on a physician's response to treatment or management of a medical diagnosis. These interventions are in the form of an individual written prescription, a signed treatment protocol or "standing orders". Secondly, collaborative interventions are therapies that require the knowledge, skill and expertise of multiple healthcare individuals. The collaborative multi-disciplinary team approach is very common in wound care. The team approach and collaboration between all health care professionals facilitate high quality holistic care (Gottrup, 2004a:130; Gottrup, Holstein, Jørgensen, et al., 2001: 765). The importance of the nurse's contribution to the team is widely recognised, yet the role of the nurse in burn wound management remains undefined. Lastly, nurse initiated interventions are the independent response of the nurse to a patient's health needs and nursing diagnoses; the nurse is able to act within his or her own scope of practice and intervene on a patient's behalf. The independent function of nursing is important for the development and recognition of the contribution made by nurses to health care.

Autonomous nursing interventions have been a part of nursing since its inception (Nightingale 1859 in George, 2011). Numerous autonomous nursing interventions deemed critical to the health and well-being of patients have been recorded (Snyder, Egan, & Nojima, 1996: 137). The evolution of nursing models changed the nursing practice from reliance on medical models to the use of a nursing model. Consequently the use of the nursing process and care plans provided nurses with a format for planning and evaluating care (Snyder, et al., 1996: 137).

The International Council of Nurses (ICN) initiated the International Classification in Nursing Project (ICNP) to develop a universal language for nursing diagnoses, interventions, and outcomes (ICN, 1993). Following on the NANDA nursing diagnosis, NANDA-I has developed Nursing Interventions Classification (NIC); NIC is a comprehensive, research-based, standardized classification of nursing interventions (NANDA-I, 2014 ; Bulecheck, et al., 2013: 2). These classifications provide a set of terms to describe nursing judgments and treatments. NIC is used internationally by practicing nurses in acute care hospitals, outpatient and ambulatory settings, rehabilitation and long-term care facilities and in patient homes (NANDA-I, 2014).

A brief overview is given as background to the reader taken from Bulecheck, et al., (2013: 2-5).
The NIC is useful for care planning, clinical documentation, communication of care across settings, integration of data, effectiveness of research, productivity management, competency evaluation, reimbursement and curricular design (Bulecheck, et al., 2013: 2). The NIC includes both independent and collaborative interventions and addresses physiological and psychological needs according to the authors. There are 554 interventions and nearly 13 000 activities in the latest edition. The interventions are grouped in thirty classes and seven domains for ease of use. The seven domains are: 1) Physiological: Basic; 2) Physiological: Complex; 3) Behavioural; 4) Safety; 5) Family; 6) Health Systems and 7) Community (Bulecheck, et al., 2013: 2-5). A patient with burns has multiple needs, but for the purpose of this study the focus will only be on the physiological needs, which include wound management.

Wound care is predominantly a physiological need and thus the interventions, which formed part of the implementation phase of the nursing process in this study, addressed the "Physiological: Complex domain" which is the Skin and Wound Management category that includes interventions to maintain or restore tissue integrity (Dochterman & Bulechek: 2004: 112-113).

The final phase of the nursing process is the evaluation phase and this is deliberated on below.

3.1.4 Outcomes and Evaluation

Nursing outcome is defined as the condition of a patient at the end of therapy or a disease process, including the degree of wellness and the need for continuing care, medication, support, counselling or education (Mosby's Medical Dictionary, 2009).

Each expected outcome should be realistic, mutually desired by the patient and the nurse and attainable in a defined time period (DeLaune & Ladner, 2011: 129).

The patient's expected outcome should be specified before the intervention is chosen as it serves as a criterion against which to judge the success of the nursing intervention (Bulecheck, et al., 2013: 13). Furthermore, patient outcomes describe the behaviours, responses and feelings of the patient in response to care provided according to Bulecheck, et al., (2013: 13). There are many variables that influence outcomes including the clinical problem/s; interventions; health care providers themselves; the environment in which care is received; the patient's own motivation, genetic structure, pathophysiology; and the patient's family according to Bulecheck, et al., (2013: 13) .

In addition the authors argued that there are many mediating factors that make it difficult to establish a causal relationship between nursing interventions and patient outcomes and therefore the most effective way to specify outcomes is by use of the Nursing Outcomes Classification (NOC). Just like NANDA nursing diagnoses and NIC, NOC is used to standardise the language of the profession (NANDA-I, 2014). Relatedly, nursing evaluation is the determination of whether expected outcomes were met; in other words measuring the effectiveness of nursing care (Medical Dictionary for the Health Professionals and Nursing, 2012).

Evaluation, as the fifth phase of the nursing process, is a planned, ongoing, deliberate activity in which the patient's progress toward goal achievement and the effectiveness of the nursing care plan are determined throughout the various phases of the nursing process (Chabeli, 2007: 85). According to the author consideration must be given to whether the plan should be maintained, modified or totally revised in light of the patient's health status. We can therefore concur that continuous evaluation throughout the nursing process is vital for effective wound management.

The final stage of the nursing process is documentation and will now be discussed.

It is important that wound assessment is documented on a standardised form to ensure that all relevant areas are covered and should also provide a guide as to what should be covered. Documentation ensures continuity of care and allows for a common language amongst health professionals.

Although recording is generally not regarded as one of the phases of the nursing process, it plays an integral part in the process because it provides effective communication among health professionals and this is necessary for the continuity of care and for the maintenance of quality of patient care (Chabeli, 2007: 87). Nursing documentation is defined as the record of nursing care that is planned and given to individual patients and clients by qualified nurses or by other caregivers under the direction of a qualified nurse (Urquhart, Currell, Grant, et al., 2009: 2-3).

This recorded documentation attempts to show what happens in the nursing process and what decision-making was based on by presenting information about admission, nursing diagnoses, interventions, and the evaluation of progress and outcome (Wang, Hailey & Yu, 2011: 2).

Records are formal, legal documents usually admissible in court as evidence of the patient's care, and thus it is important that the nurse be held accountable for recording accurate information on appropriate documents according to the standards and policies of the institution (Kozier, Erb, Berman, et al., 2004:330). Regulation 387 of the South Africa Nursing Council, "Rules setting out Acts and Omissions", states that the wilful or negligent omission to keep clear and accurate records of all actions which he or she performs in connection with a patient can lead to disciplinary steps to be taken against the nurse (SANC, 1978).

Accurate nursing documentation is thus fundamental to nursing care and is one of the important duties underscoring professional autonomy. This serves at the centre of nursing activities with its immediate worth being that of assisting nurses to apply nursing care plans and nursing theories in the clinical setting according to Cheevakasemsook, Chapman, Francis, et al., (2006: 367). Nursing documentation supports nurses in their ability to continuously reflect and critically think about their patients in order to develop an individual plan of care that will optimize expected outcomes.

Furthermore, nursing documentation serves multiple purposes:

- Ensuring continuity and quality of care through communication (Shepherd & Nixon, 2013:62; Wang, et al., 2011: 2; Paans, Nieweg, van der Schans, et al., 2011: 1; Saranto & Kinnunen, 2009:465; Cheevakasemsook, et al., 2006: 367; Gunningberg & Ehrenberg, 2004: 329; Björvell, et al., 2000: 7).

- The documentation of expert nursing provides an important source of knowledge and a potential instigation of the further development of nursing theory (Saranto & Kinnunen, 2009:465; Cheevakasemsook, et al., 2006: 367; Björvell, et al., 2000: 7).

- Furnishing legal evidence of the process and outcomes of care (Wang, et al., 2011: 2; Chabeli, 2007: 87; Cheevakasemsook, et al., 2006: 367).

- Supporting the evaluation of the quality, efficiency and effectiveness of patient care (Wang, et al., 2011: 2; Cheevakasemsook, et al., 2006: 367; Gunningberg & Ehrenberg, 2004: 329).

- Providing evidence for research, financial and ethical quality-assurance purposes (Wang, et al., 2011: 2; Cheevakasemsook, et al., 2006: 367; Gunningberg & Ehrenberg, 2004: 329; Björvell, et al., 2000: 7).

- Assisting in establishing benchmarks for the development of nursing education and standards of clinical practice (Chabeli, 2007: 87; Cheevakasemsook, et al., 2006: 367; Gunningberg & Ehrenberg, 2004: 329).

- Ensuring the appropriate reimbursement (Munyisia, Yu & Hailey, 2011:116; Cheevakasemsook, et al., 2006: 367).

- Providing the database for planning future health-care (Wang, et al., 2011: 2; Cheevakasemsook, et al., 2006: 367; Gunningberg & Ehrenberg, 2004: 329).

- Providing the database for other purposes such as risk management, learning experience for students and protection of patients' rights (Cheevakasemsook, et al., 2006: 367).

To achieve these purposes, nursing documentation needs to be *accurate*, hold valid and reliable information (in other words *quality*), and be *standardized*. Each of these aspects will be explained below.

3.1.5 Accuracy

Although there is no internationally accepted gold standard for measuring the accuracy of nursing documentation, the stages of the nursing process are internationally acknowledged as having the theoretical elements needed for accurate nursing documentation (Paans, Sermeus, Nieweg, et al., 2010: 2482). It has been suggested that accurate nursing documentation allows nurses to evaluate nursing outcomes as a logical result of nursing diagnoses and interventions as it addresses admission data, nursing diagnoses, interventions, progress and outcome evaluations according to Paans, et al., (2010: 2487). However, Paans, et al., (2010: 2487), noted that even if the structure of the nursing record is based on the stages of the nursing process, the nature of nurses' documentation is mainly chronological and descriptive rather than problem-based. The documentation needs to be coherent, relevant and unambiguous, as well as linguistically correct (Paans, et al., 2010: 2482; Chabeli, 2007: 87).

The accuracy of documentation content in relation to a patient's actual condition and the care administered is an important process feature of documentation quality. If there is no assurance of nursing documentation holding valid and reliable data, there would be no value to discuss its quality (Wang, et al., 2011: 14).

There have been several recent reviews of nursing documentation. A systematic review conducted by Saranto & Kinnunen (2009), covered forty one studies on evaluating nursing documentation and focused on research designs and methods, which were not limited to record audit.
The review provided insights into several audit instruments and issues relating to documentation quality, but quality measures were not fully addressed. Another review was by Muller-Staub, et al., (2006), evaluated the use of nursing diagnosis, interventions and outcomes in nursing documentation. Neither of these concentrated on overall measurement standards and outcomes of nursing documentation itself, although segmental relevant information was found. Wang, et al., (2011), conducted a systematic review where seventy-seven publications were included. Flaws of nursing documentation were identified and the effects of on its quality.

Wang, et al., (2011), concluded that flaws in nursing documentation include lack of documentation on psychological and social aspects of care; insufficient documentation about the steps of the nursing process and lack of specific data in relation to a particular clinical care issue. Approaches to improving nursing documentation include the use of electronic health records, standardized documentation systems, application of specific nursing theories, education and organizational changes (Wang, et al., 2011).

3.1.6 Quality

Quality has been defined by Kelley, Brandon, & Docherty (2011: 155), as the extent to which healthcare services provided to patients improve their overall health status. Hence, effective nursing care depends crucially on access to high quality information. Quality nursing documentation promotes structured, coordinated, consistent and effective communication between caregivers and facilitates continuity and individuality of care and safety of patients (Wang, et al., 2011: 2; Saranto & Kinnunen, 2009: 465). On the other hand inaccurate formulation of nursing diagnoses and incoherence in documentation of nursing process have reflected the nurses' lack of knowledge and skill in clinical reasoning and connecting the reasoning process to nursing the process (Wang, et al., 2011: 14), which is even reflected in nursing outcomes (Saranto & Kinnunen, 2009: 465).

3.1.7 Standardization

"If we cannot name it, we cannot control it, practice it, teach it, finance it, or put it into public policy" (Clark & Lang, 1992: 109). Standardized nursing languages provide common definitions of nursing concepts and allows for theory based and comparable nursing data to emerge (Wang, et al., 2011: 2). In other words, standardized nursing language is a common language, readily understood by all nurses, to describe care, assessments, interventions, and outcomes related to the documentation of nursing care (Rutherford, 2008). Furthermore standardization promotes a shared understanding and continuity of care and makes it possible to use records for research and management purposes (Wang, et al., 2011: 2; Muller-Staub, 2006). In this way, nurses from different units, hospitals, geographic areas, or countries will be able to use commonly understood terminology to identify the specific problem/s or interventions implied and the outcomes observed. Therefore the use of structured nursing terminology promotes the standardization of nursing documentation.

Approaches such as the implementation of standardized documentation systems with pre-structured keywords, standardized nursing terminologies, nursing theories and nursing practice standards or guidelines were shown to help improve the content of nursing documentation (Wang, et al., 2011: 14). Saranto & Kinnunen (2009:474), concurred stating that more positive than negative outcomes were observed when standardisation was implemented. An example of this is the universal acceptance of ICD and DSMIV/V codes in psychiatric practice.

The use of standardized languages is becoming more prevalent in practice and education because of NANDA diagnosis, NIC and NOC. The validation of standardized languages and its use in nursing practice and research is still in its infancy, but it is important to the nursing profession in the interest of evidence-based practice.

3.2 CONCLUSIONS

The purpose of describing the nursing process was to orientate the reader to the framework on which this study was built. By expounding on the nursing process the reader is given insight into the researcher's thought patterns and reasoning techniques which lays the foundation for Chapters Four, Five and Six. In Chapter Four the phases discussed in Chapter Three are used as the headings for the presentation of the findings from the integrative review.

CHAPTER FOUR LAYOUT

CHAPTER 4	4.0 Introduction		
	4.1 Integrative review background		
	4.2 Methodology	4.2.1 Step 1: Problem identification stage 4.2.2 Step 2: Review questions 4.2.3 Step 3: Literature search stage 4.2.4 Inclusion/Exclusion Criteria 4.2.5 Step 4: Data evaluation stage 4.2.6 Updating literature searches and current awareness 4.2.7 Step 5: Data analysis stage 4.2.8 Step 6: Presentation stage 4.2.9 Validity and reliability	
	4.3 Framework from the literature	4.3.1 Quality 4.3.2 Study population 4.3.3 Outcome measure	
	4.4 Findings from the literature/ Results	4.4.1 Assessment	4.4.1.1 Guiding question1: How should burn wounds be assessed at macro level? 4.4.1.2 Guiding question 2: How should burn wounds be assessed at micro level?
		4.4.2 Diagnosis	4.4.2.1. Guiding question What is the correct terminology for burn wounds?

		4.4.3 Interventions/ Implementation	4.4.3.1 Guiding question4: What is the best technique for burn wound management? 4.4.3.2 Guiding question: What are the ideal wound / surroundings temperature? 4.4.3.3 Guiding question 6: What are the differences between dressings? 4.4.3.4 Guiding question 7: Open vs. closed method of dressing? 4.4.3.5 Guiding question 8: Ointment vs. dressing?
		4.4.4 Outcomes and Evaluations	4.4.4.1 Guiding question 9: How is wound healing measured? 4.4.4.2 Guiding question10: How should burn pain be managed? 4.4.4.3 Guiding question11: How should the management of burn wounds be recorded?
	4.5 Gaps in the literature		
	4.6 Conclusion		

CHAPTER FOUR

INTEGRATIVE REVIEW

4.0 INTRODUCTION

Chapter Three laid the foundation for the findings of this study detailing the Nursing process which will be used as a means of guiding the reader in this chapter.

Chapter Four relates to Phase One of the research design and research method and addresses the first objective of the study. An integrative review of all available national and international sources on the management of burn wounds is presented in Chapter Four. The integrative review was conducted in order to provide a rigorous review of the quality research evidence, expert practitioners' opinions, patients' preferences and available resources to deliver recommended care necessary in order develop evidence based guidelines for the management of burn wounds by nurses.

The research method was discussed in detail in Chapter Two; a summary is provided in Chapter Four as a preface to the findings of the review which will be presented in this chapter. This chapter commences with a background to integrative reviews as related to this particular study. A summary of the methodology of the review with the review questions, a description of the findings and continues with an analysis of the data collected from the included studies. The data is examined; discrepancies and gaps in literature are discussed and conclusions are drawn based on the patterns contained in the literature.

For consistency purposes refer to figure 4.1 for an outline of the research design and research method.

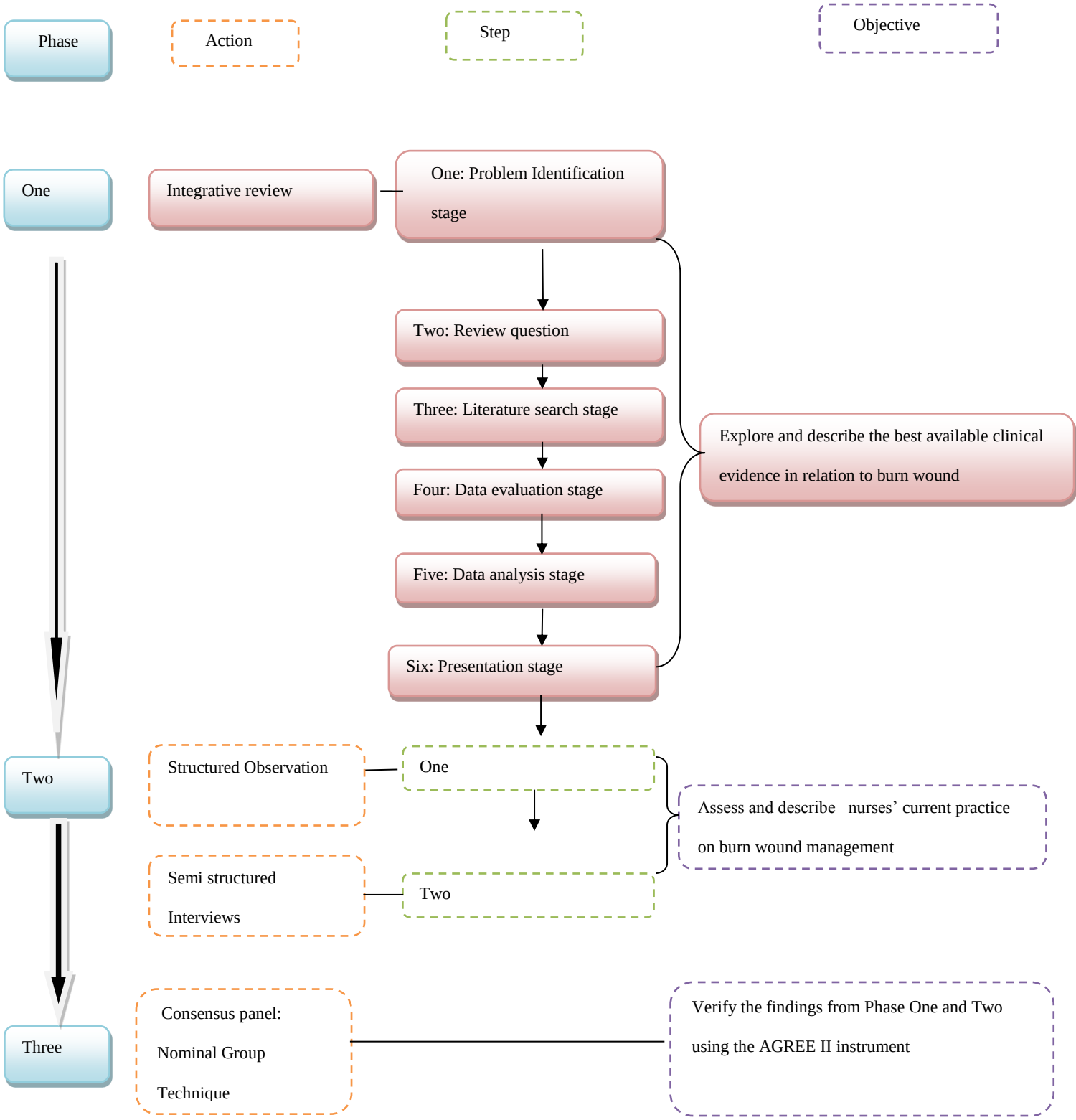

Figure 4.1 Overview of research design and research method

A background to integrative reviews as related to this study follows.

4.1 INTEGRATIVE REVIEW BACKGROUND

An integrative review is a specific review method that summarizes past empirical or theoretical literature simultaneously to provide a more comprehensive understanding of a particular phenomenon or healthcare problem (LoBiondo- Wood & Haber, 2010: 578; Whittemore & Knafl, 2005: 547; Ganong, 1987:1). The integrative review was used as a frame of reference for the design of the data collection tool used in Phase Two. The integrative review formed the foundation of the study and the researcher continuously referred back to the findings from the integrative review as a point of departure throughout the study.

This review was conducted to make a meaningful contribution to a body of knowledge, specifically, knowledge related to burn wound management. The approach was designed to inform rather than overwhelm and to ensure an accurate, objective and thorough analysis of the subject. It is also designed to provide information about the studies reviewed and not to focus primarily on the results (Ganong, 1987:1). Whilst the results from the studies reviewed informed this study, valuable information was obtained from the studies to demonstrate how conclusions were reached. Having not focused on the results exclusively, contributed immensely to the depth of this study.

An integrative review represents a creative process used by researchers to contribute to the organising of a body of knowledge and is conducted and reported as though it were primary research; to illustrate, the subjects are the studies examined, the methods are the reviewing procedures, the data are the elements of the studies, and the results are the conclusions drawn according to (Ganong,1987:2).

The purpose of this chapter, then, is to discuss the current issues pertaining to knowledge in the area of burn wound management through the use of an integrative review of the literature. The specific objectives of this chapter are threefold: (1) to describe the framework used to conduct this integrative review (Ganong, 1987:2); (2) to discuss the evidence in the literature related to burn wound management, and (3) to present the results. These objectives were achieved by way of a methodical analysis and presentation of past empirical and theoretical literature related specifically to burn wound management.

An integrative review of the literature is important as it clarifies the terminology used in burn wound management and thus standardises the concepts for the discipline of nursing.
The review is also relevant for the development and the advancement of knowledge in relation to and practice of, burn wound management for the profession.

The process for conducting the integrative review was applied as described by Whittemore & Knafl (2005). The purpose of the integrative review was to identify, analyse and synthesise results from independent studies in order to determine the current knowledge on the management of burn wounds (Burns & Grove, 2007:508-509). The integrative review was chosen for this study as it allowed the researcher to identify quality research findings, expert practitioners' opinions and resources necessary for the management of burns by nurses. It enabled the researcher to explore: 1) what is known on the subject of burn wound management; 2) what is the quality of this knowledge; 3) what should be expanded on and reinforced regardless of whether the methodology is experimental or non-experimental. The review included a problem identification stage, a literature search stage, a data evaluation stage, a data analysis stage and a presentation stage (Whittemore & Knafl, 2005). Each stage of the review was depicted in detail in Chapter Two. A synopsis is provided below.

4.2 METHODOLOGY

A synopsis of the methodology includes a description of each step that was taken, together with the appraisal of included studies.

4.2.1 Step One: Problem Identification Stage

The first step in conducting the integrative review was the problem identification stage. It was evident to the researcher that the variations in practice observed led to variations in wound outcomes. The identified research problem therefore was:

There are no unanimous standards or guidelines in South Africa that inform nursing practice in burn wound management and consequently there are variations in wound care practices with some of the methods and techniques being outdated and not evidence based.

This identified problem then led to the review question:

4.2.2 Step Two: Review Question

What new knowledge or information related to non-surgical management of burn wounds has emerged in available literature between 2000 and 2014?

In order to comprehensively answer the review question it was broken down into tangible secondary review questions to address all aspects of the management of burn wounds.

The researcher used the nursing process to structure questions and therefore the phases of the nursing process are the headings for the integrative review.

The questions that guided this review are stated in the Table 4.1 and were answered by reviewing the existing literature from 2000-2014 to determine and thereby explore, what knowledge or information related to burn wound management has emerged during the period stipulated.

Table 4.1 Review questions

Assessment	How should burn wounds be assessed at macro level? How should burn wounds be assessed at micro level?
Diagnosis	What is the correct terminology for burn wounds?
Interventions/ Implementation	What is the best technique for burn wound management? What are the ideal wound / environment temperature? What are the differences between dressings? Open vs. closed method of dressing? Ointment vs. dressing?
Outcomes and Evaluation	How should wound healing be measured? How should pain in burns be managed? How should the management of burn wounds be recorded?

Following the determining of the review questions, the researcher commenced the literature search stage.

4.2.3 Step Three: Literature search stage

The goal of the literature search stage was to conduct an exhaustive review of literature and collect a set of relevant articles that meet specific inclusion criteria. The description of the process of the literature search stage, includes an account of the type of literature retrieved and methods involved in the retrieval of this literature in order to reduce bias. It is generally accepted that evidence based research is restricted to randomised controlled trials and meta-analyses. However, Sackett, Rosenberg, Muir Gray, et al., (1996:72), stated that the use of randomised controlled trials is not always possible in evidence based research. Evans & Pearson (2001: 595), and Kirkevold (1997: 982), added that systematic reviews and meta-analyses, whilst worthwhile research methods; do not add to the richness of nursing research due to its overemphasis on the randomised clinical trials.
The integrative review in contrast is a more inclusive type of literature review. For this reason both high quality experimental and non-experimental studies other than randomised controlled trials were included in the integrative review. The following types of literature included were based on DiCenso, Guyatt, & Ciliska (2005: 34), hierarchy of evidence.

Table 4.2: Examples of hierarchy of evidence (DiCenso, et al., 2005:34).

Hierarchy	Examples
Systems	Clinical practice guidelines
Synopsis of syntheses	Evidence based abstract journals
Syntheses	Cochrane reviews
Synopses of single studies	Evidence based abstract journals
Single studies	Clinical queries

The structure of the integrative review was based on the updated methodology for integrative reviews by Whittemore & Knafl (2005).The included literature was based on DiCenso, et al., (2005: 34), hierarchy of evidence. For instance, the first search was for appropriate guidelines. However, the researcher discovered that not all existing guidelines are evidence based but still included them in the study for transparency if it met the inclusion criteria during the literature search stage. If guidelines were found not to be evidence based the researcher then searched for systematic reviews. If a systemic review (s) was identified no further search was done on the review question. If however no systematic review was found, the search continued for individual randomised, controlled trials; thereafter trials without randomisation; then well designed, non-experimental studies and qualitative studies; followed by opinions of respected authorities on clinical evidence; descriptive studies; reports; comments of expert committees; and lastly textbook chapters compiled by experts.

A well-defined literature search strategy was used to enhance the rigour of the review as incomplete or biased literature searches could result in an inadequate database with a potential for inaccurate results (Cooper & Hedges, 2007: 12; Whittemore & Knafl, 2005: 548).

Firstly the researcher used multiple electronic databases for literature retrieval. According to Whittemore & Knafl (2005: 548), computerised data bases are efficient and effective, but may only yield fifty percent of results due to inconsistent terminology and indexing problems.
Whittemore & Knafl (2005: 548), reported that a comprehensive search for an integrative review identifies the maximum number of eligible sources by using at least two to three search strategies. Due to this limitation, other approaches, such as hand searching, are recommended.

Journal hand searches and reference lists of relevant articles were used to retrieve additional literature (DiCenso, et al., 2005: 34). According to Randolph (2009: 7), the most effective method for locating the remaining literature was to utilise references of the retrieved articles, reading these references and repeating the process until a point of saturation. In addition the researcher sought comments of experts, textbook chapters published by experts and guidelines that met the inclusion criteria to augment the retrieved literature.

4.2.4 Inclusion/Exclusion Criteria

A critical appraisal of sources for the integrative review was conducted prior to inclusion in the review. All literature which met the criteria for inclusion into the integrative review was critically appraised. Inclusions of studies were those of a high level of evidence as per (DiCenso, et al., 2005:33). In the review, studies were explored according to rank see Table 4.2.

This process yielded a large volume of articles (n = 2004). Each article title and abstract was reviewed to determine inclusion criteria; if an article could not be eliminated by reading the abstract, it was reviewed in further detail. Finally, data was extracted from the selected literature sources. The final sample consisted of n= 354 studies.

A literature search was done on key words in the management of burn wounds. The search terms used were:

- Burns, Burn treatment, Burn management, Acute wound management, Acute wounds, Skin burns.
- Wounds, Wound healing, Wound management, Healing rate.
- Infection, Infection rate, Wound contamination, Aseptic technique, Hand washing, Sterile technique, Infections in wound care.
- Pain in burns, Pain, Pain management, Acute pain management, Burn pains.
- Guidelines for wound management, Guidelines for pain, Guidelines for infection control.

The next step in the in the integrative review was to evaluate the data.

4.2.5 Step Four: Data evaluation stage

The searched terms delivered numerous articles that allowed the researcher to compile a table of titles and abstracts for possible inclusion in the study. This search provided large samples that needed to be refined. Quality of research was evaluated as a screening method for inclusion.

Quality was defined in terms of the internal validity of the studies, or the extent to which the design, conduct and analyses minimised errors and biases (LoBiondo-Wood & Haber, 2010:17). Quality screening was important because the effectiveness of interventions may have been masked or exaggerated by poor methodology. The studies in this inquiry were evaluated using a research appraisal tool developed by Kmet, Lee & Cook (2004), (Appendix Q). The tool was developed by Kmet, et al., (2004), because even though quality checklists for assessing RCTs were plentiful, no tool was available to assess the quality of diverse study designs.

The QualSyst tool was drawn from existing published tools and was tested with high inter-rater

reliability. The scoring system provides systemic, reproducible and quantitative assessment of the quality of research encompassing a broad range of study designs, while assisting in the exploration of variation across studies and the synthesis and interpretation of research findings **(**Kmet, et al., 2004: 11).The final sample for this integrative review included empirical and theoretical reports. Empirical reports included a wide variety of methods: case study, cross-sectional, grounded theory, phenomenology and instrument development designs.

In this review, as with many reviews, it would be inappropriate, if not impossible to use measurement metric (Jackson, 1980: 446). Due to this diverse representation of primary sources, reports were coded according to two criteria relevant to this review: methodological or theoretical rigor and data relevance on a 2-point scale (high or low). No report was excluded based on this data evaluation rating system; however, the score was included as a variable in the data analysis stage. In general, reports of low rigour and relevance contributed less to the analytic process (Whittemore, 2005: 549). All the studies obtained were included on the spreadsheet. By using a qualitative descriptive approach to synthesise the research findings, similarities and differences in language, concepts and themes from the findings were recorded.

4.2.6 Updating literature searches and current awareness

Because burns are such a dynamic environment literature searches required continual updating at regular intervals throughout the study. E-mail alerts from journals were set up as well to constantly check to see if protocols submitted to the Cochrane Library were completed.

4.2.7 Step Five: Data analysis stage

The process of data analysis in this review included using a constant comparison method as recommended by Whittemore & Knafl, (2005:550).

Extracted data was compared item by item to categorise and group similar data through the identification of patterns, themes, variations and relationships.

The coded data was compared, analysed further and synthesised using the method recommended by Miles & Huberman (1994:11), which consists of four phases: data reduction, data display, data comparison, conclusion drawing and verification phase. Each of these data analysis phases is described below.

Data reduction phase

The first phase of data reduction involved determining an overall classification system for managing the data from diverse methodologies. Data was divided into subcategories according to the nursing process' assessment, diagnosis, interventions and evaluation when answering the secondary review questions. Studies were grouped into a hierarchy of evidence as per DiCenso, et al., (2005:33). The primary sources included in the integrative review were divided into subgroups according to a logical system to facilitate analysis. The initial subgroup classification was based on the type of evidence and analysed sequentially (that is, examining all qualitative or descriptive studies on a topic, then correlation or comparative designs and lastly any intervention or experimental designs) and analysed by topic. Subsequently data reduction involved techniques of extracting and coding data from primary sources to simplify, abstract, focus and organize data into a manageable framework. Predetermined and relevant data of each subgroup classification were extracted from all primary data sources and compiled into a spread sheet (Whittemore & Knafl, 2005: 550; Miles & Huberman 1994:11). Thus, each primary source is reduced to a single page with similar data extracted from individual sources (of each subgroup classification). This approach provided concise organisation of the literature, which facilitated the ability to systematically compare primary sources on specific issues, variables, or sample characteristics. Categories that were extracted using the worksheet included the definition of wound management and aspects of wound management such as infection, healing and pain. An appraisal worksheet designed for systematic reviews was used to extract data from the studies (Refer to Appendix P).

Data display phase

The next step in data analysis was data display. This involved converting the extracted data from individual sources into a display that assembled the data from multiple primary sources around particular variables or subgroups. Data were displayed in the form of a table (Appendix R) and set the stage for comparison across all primary sources.

The display enhanced the visualisation of patterns and relationships within and across primary data sources and served as a starting point for interpretation (Whittemore & Knafl, 2005: 551). Different data displays were used for each subgroup classification of the integrative review.

Data comparison phase

The next step in data analysis was data comparison. This involved a reproducible process of examining data displays of primary source data in order to identify patterns, themes, or relationships.

From the emerged patterns a conceptual map was drawn that included a majority of the variables or identified themes (Whittemore & Knafl, 2005:551). Similar variables were grouped close to one

another and a systematic order was displayed (if appropriate). Relationships were depicted between the variables or themes. This process of data visualisation and comparison provided some clarity to the empirical and theoretical support emerging from early interpretive efforts. Creativity and critical analysis of data and data displays are key elements in data comparison and the identification of important and accurate patterns and themes according to Whittemore & Knafl (2005:551).

Conclusion drawing and verification phase

Conclusion drawing and verification was the final phase of data analysis. This moved the interpretive effort from the description of patterns and relationships to higher levels of formulating comprehensive concepts by extracting common qualities from specific examples and incorporating the particulars into the generalised (Whittemore & Knafl, 2005:551). Patterns and processes were isolated; commonalities and differences were identified with a gradual elaboration of a small set of generalisations that encompassed each subgroup database of the integrative review in its entirety. Vote counting, is proposed as one strategy to categorise and analyse conflicting results, by comparing the frequency of significant positive findings against the frequency of significant negative ones. Exploration of confusing influences contributing to variability in findings (that is, sample characteristics) can also be considered. However, conflicting evidence in general demonstrates the need for further research with the subsequent research question and design aimed at resolving the conflict. This need has been identified in the conflicting information on the safety of silver dressings. This subsequently led to a further review question for future research: Are silver dressings safe?

On completion of each subgroup analysis, a final step of the data analysis in an integrative review is the synthesis of important elements or conclusions of each subgroup into an integrated summation of the topic or phenomenon (Whittemore & Knafl, 2005:551).

A new conceptualisation of the primary sources integrates all subgroups into a comprehensive portrayal of the topic of concern, thus completing the review process. A record was kept during the entire process of data analysis that documented data analysis decisions, analytical hunches, thoughts, puzzles, alternate hypotheses, or any idea that may be directly related to the interpretation of data (Miles & Huberman 1994:12). Analytical honesty was a priority; the data analysis process is made transparent with rival explanations and false relationships thoughtfully explored.

4.2.8 Step Six: Presentation stage

Conclusions of the integrative review were reported in table form. Explicit details from primary sources and evidence to support conclusions were provided to demonstrate a logical chain of evidence, allowing the reader of the review to ascertain that the conclusions of the review did not exceed the evidence (Whittemore & Knafl, 2005: 552). The review attempted to capture the depth and breadth of burn wound management and contribute to a new understanding on the management of burn wounds. Quality criteria for review methods as proposed by Whittemore (2005: 61) and Ganong (1987: 1-2), were implemented.

4.2.9 Validity and Reliability

Instituting the following measures ensured validity and reliability of the integrative review.
The process for conducting the integrative review was applied as described by Whittemore & Knafl (2005). Stringent measures of validity were implemented to ensure representativeness of the literature sources used by means of utilising an existing QualSyst (Kmet, Lee & Cook: 2004), tool with high inter-rater reliability to screen included studies in the review. The tool consists of fourteen questions for quantitative studies and ten questions for qualitative studies, with scores being 0-2, with a maximum total score being twenty eight. The score is determined by scoring two points for each yes answer, one point for a partial answer and zero for a no answer ("yes"=2; 'partial"= 1; "no"=0). Items not applicable were marked "n/a" and were excluded from the calculation of the summary score. The cut point for inclusion was relatively liberal at 55% (Kmet, et al., 2004:8).

The scoring system provides systemic, reproducible and quantitative assessment of the quality of research encompassing a broad range of study designs, while assisting in the exploration of variation across studies and in the synthesis and interpretation of research findings (Kmet, et al., 2004: 11).
The research process is reported comprehensively and tables presenting reviewed studies, which not only summarise the findings, but all the characteristics as per Ganong (1987:8).

The framework from the integrative review follows.

4.3 FRAMEWORK FROM THE LITERATURE

The studies were organized into tables for ease of topic/s recognition. The tables with themes and discussion points were identified according to the various phases of the nursing process. Each topic accompanied a discussion on the associated theme. Given the heterogeneity of the included studies, it was inappropriate to utilise statistical methods of meta-analysis. The literature was therefore synthesised in narrative summaries and significant extracted data was tested in a summary table (Appendix R). This review represents the best available evidence for the management of burn wounds by nurses.

The researcher considered the following points in the selection process of trials: quality, study population and outcome measure.

4.3.1 Quality

Quality refers to the internal validity of studies, or the extent to which the design, conduct and analyses minimized errors and biases (LoBiondo-Wood & Haber, 2010:17). The evaluation of the quality of the literature entails an assessment of the title, abstract, problem statement, review of the literature, methods, design, data analysis, discussion and overall style. Each study that met inclusion criteria was evaluated for quality using the QualSyst tool (Appendix Q).

4.3.2 Study population

This is an entire set of individuals or objects having some common characteristic (Polit & Beck, 2012:738).

All of the studies that met inclusion criteria studied wound management, for the most part; the researcher attempted to focus on burn wounds, but due to the paucity of information chronic and surgical wounds' data that were applicable, were included. These settings ranged from in hospital admissions to outpatients' units and community nursing.

4.3.3 Outcome measure

A term used to refer to the dependent variable, which is the measure that captures the outcome of an intervention (Polit & Beck, 2012:736).

To meet inclusion criteria for this integrative literature review, the studies must have addressed wound care and its assessment, diagnosis, management and evaluation.

To understand the concepts addressed in this chapter, it is important that the researcher define each of the terminologies to be discussed. Where needed background information is provided followed by a

description of the findings from the review. Due to the extensiveness of the review all tables are included as appendices and not placed within the text. Each phase of the nursing process comprised Guiding questions which will be discussed in detail.

4.4 FINDINGS FROM THE LITERATURE/RESULTS

4.4.1 Assessment

The first step in the management of wounds starts with a wound assessment (Mcquillan, Flynn Makic & Whalen, 2009:879; van Rijswick & Catanzaro in Krasner, Rodeheaver & Sibbald, 2007:113; Mulder, Small, Botma, et al., 2002:44).Wound assessment is an important component of wound management as it provides base line information, informs interventions, as well as allows continuous indications of progress or problems. Therefore it is important that wounds are assessed accurately. Even though wound assessment is the first step in the wound management process it is a continuous action.

In order to focus the review, the researcher separated the macro and micro assessment criteria. Many studies addressed the macro level assessments, but none reviewed the validity of the assessment methods. On the other hand numerous literatures were found on the micro level assessment in chronic wounds, none were found on burn wounds. The argument for wound assessment has been validated by Sibbald, Orsted, Coutts, et al., (2006), in their "*Best Practice Recommendations for Preparing the Wound Bed"* review. Having established that wound assessment is important the first guiding question will now be dealt with.

4.4.1.1Guiding question 1: How should burn wounds be assessed at macro- level?

The research and theoretical articles comprising the sample reflect a wide spectrum of terms, themes and/or concepts related to burn wound assessment (Refer to Appendix R). It is vital that burn wounds are assessed accurately as it is an important determinant of the management and healing potential of the wound (Butcher & Swales, 2012: 50). The literature suggests that burn wound assessment should cover the size of the burn and the depth of the burn (Butcher & Swales, 2012: 50; Monstrey, Hoeksema, Verbelen, et al., 2008: 762; Miminas, 2007: 58), in other words burns must be classified.

Classification of burns

A great deal of literature has been written on how burns should be classified. According to Mcquillan, et al., (2009: 866), burns are classified according to their depth and size. Likewise Roberts & Hedges (2010: 692), stated that burns are classified based on depth and size in addition to the source of the burn. Sheridan (2012: 33), included circumferential components along with size and depth. On the whole it can be concluded that the main criteria for classification of burn wounds are the depth of the burn and the size of the burn. The circumference will be included when the size of the burn is considered and will not be addressed as a separate topic in this thesis.

With respect to the classification of burns the depth of the burn and the size of the burn will be discussed separately.

Depth of the burn

The depth of the burn describes the tissue damage according to the anatomic thickness of the skin (Makik & Mann in Mcquillan, et al., 2009: 868). Burn depth assessment is not an exact science and is very subjective and is reliant on clinical assessment. On the other hand biopsy and histology are generally considered to be the gold standards for assessment of burn depth (Riordan, McDonough, Davidson, et al., 2003: 177–186). Although this may be true, biopsy and histology is invasive, painful, produces scars, is expensive, and requires an experienced pathologist and has therefore remained a research tool (Chatterjee, 2006: 123), and is therefore impractical for routine clinical use. According to Hettiaratchy & Papini (2004: 103), the extent and speed of capillary refill is considered the most useful clinical method to assess burn depth. However, testing for burn depth by using pinprick sensation might not be appropriate for all patients such as young children. Moreover, the accuracy of the test is limited (Bennett & Dingman, 1975: 261-272). It has been found that considerable variation between burn depth assessments performed by different clinicians occurred (Milseki, Atiles, Purdue, et al., 2003: 190), with clinical assessments found to only have accuracy rates of 60% to 70% (Monstrey, Hoeksema, Verbelen, et al., 2008: 761; Heimbach, Engrav, Grube, et al., 1983: 65–68; Engrav, Heimbach, Reus, et al., 1983: 1001–1004). This then is translated into up to 40% inaccuracy. In a patient with burns, size estimation informs management of the burn and it predicts outcomes (morbidity and mortality).

Newer technology such as Laser Doppler Imaging (LDI), transcutaneous microscopy, reflectance fluoroscopy, radioisotope studies, ultrasound and thermography promise more accuracy (Jaskille, Ramella-Roman, Shupet, et al., 2010). LDI provides an estimate of perfusion through the burn wound, the assumption being that a lower perfusion correlates with a deeper wound and, therefore, a longer time to heal according to Jaskille, et al., (2010: 152).
In a review done by Jaskille, et al., (2010: 151), it was argued that LDI is one of the most recent and most tested adjuvants to determine burn depth. Its quoted accuracy in predicting which wounds are

not expected to heal within three weeks is between 96% and 100%, and this is predicted in advance of clinical judgment by a median of two days. It is non-invasive, relatively fast, and seemingly simple to use according to Jaskille, et al., (2010: 151), and Monstrey, et al., (2008:7640). Devgan, Bhat, Aylward, et al., (2006: 10-11), were in agreement stating that the accuracy of Laser Doppler Flowmetry (LDF) and LDI ranges from 90% to 97% as compared to only 66% in a clinical evaluation. In a review by Jaskille, Shupp, Jordan, et al., (2009: 944), LDI is listed as Class II and Class III, which means evidence is supported by studies in which clearly reliable data is collected prospectively and/or retrospectively: such studies include observational studies, cohort studies, prevalence studies, and case-control studies for Class II and Class III evidence provided by clinical series, comparative studies, case reviews, case reports, and expert opinion. However, LDI is not without inherent limitations and technical difficulties including instrumental and pathophysiological causes such as the type of equipment used, scanning distance, curvature of tissues and appearance of the wound (Atiyeh, Gunn, & Hayek, 2005: 134). Despite technological advancements clinical assessment remains the most widely practiced method for burn wound depth estimation (Heimbach, Engrav, Grube, et al., 1992: 10 -15). Although more research is needed, LDI has brought technology closer to providing a reliable adjuvant to the clinical prediction of healing.

In light of this discussion, LDI appears to be the most accurate method of burn depth assessment. However, as these technologies are fairly new it is too early to provide strong levels of evidence at this stage. Furthermore is its feasibility in countries with limited financial resources like South Africa is questionable. To date it is not freely available or in use in clinical practice. Therefore, in the absence of LDI, clinical assessment will unfortunately have to suffice (*Level V evidence).*

Apart from the disagreement as to the methodology for measuring burn depth, the terminology used to describe the depth is also in dissensus. A variety of terms have been used to describe burn depth. In the past burn depth was described by degrees, specifically: *first, second, third and fourth degree* (Johnson in Richard & Staley, 1994: 29; Moncrief in Moncrief & Pruitt, 1979:23; Feller & Archambeault, 1973:5).

However, in recent literature there seems to be a shift in the terminology grounded on the anatomic thickness of the skin involved and is based on the increasing depth going from *epidermal to superficial partial thickness, deep partial thickness to full thickness burns* (Devgan, et al., 2006: 7-15; Watts, Tyler, Perry, et al., 2001:154).

And even more recently Monstrey, et al., (2008: 762), observed that burn depth is better defined by the time of healing which is linked to the risk of developing hypertrophic scarring; *superficial wounds*

healing by conservative treatment versus *deep burn wound* healing which requires surgical therapy. The variation in terminology can cause a variation in interpretation and miscommunication.

According to the criteria set out for inclusion in this review, the researcher included guidelines as the highest level of evidence. Guidelines are *"systematically developed statements to assist practitioner decisions about appropriate health care for specific clinical circumstances"* (Thomas, 1999:2). According to Thomas (1999:2), guidelines can be used to reduce inappropriate variations in practice and to promote the delivery of high quality, evidence-based health care; these may also provide a mechanism by which healthcare professionals can be held accountable for clinical activities.

The reviewed guidelines include the American Burn Association guidelines (2009: 11), which defines burn depth as *epidermal (first-degree), partial-thickness (second-degree)*, or *full-thickness (third-degree)*. Burns extending beneath the subcutaneous tissues and involving fascia and/or muscle are considered *fourth-degree* and burns causing such deep tissue destruction that they require amputation or loss of a body part, are termed *fifth-degree*. The Australian and New Zealand Burn Association (2007: 20), refer to burn depth according to anatomical structures involved, in other words *epidermal, superficial dermal, mid dermal, deep dermal* and *full thickness*. The British Burn Association is guided by the European Standards (2002), that clearly depicts the transition in terminology used to describe burn depth from *first, second* and *third degree* to the current *epidermal, superficial partial thickness, deep partial thickness, full thickness* and *full thickness plus*. The South African Burn Society (2012), defines burns as *superficial, partial thickness* or *superficial dermal, partial thickness deep* or *deep dermal and full thickness*. The variation in terminology is more for theoretical value but, due to the interconnectivity of health care professionals. It remains important that a form of standardisation exists so as to avoid misunderstanding.

The researcher noted that, although the different associations have guidelines in place, it could not be confirmed that the guidelines on burn depth were evidence informed as there is little reliable evidence on the assessment of burn depth and definitions used are solely from expert opinion. In the reviewed literature, no studies were found that validated the use of either terminology. Several articles were found using the different terminologies. However, all the literature consisted of essays. No randomised or non-randomised trials were found. The strength of evidence is, therefore, low as the choice of terminology is informed purely on the opinions of individuals. In view of this, the researcher decided to align herself with the most recent and frequently used terminology which is in line with the South African Burns Society (*Level of evidence V*).

On the other hand burn size reliability had been tested by Wachtel, Berry, Wachtel, et al., (2000), and will now be discussed as the second tier in burn wound classification.

Size (extent) of the burn

The extent of the burn refers to the total body surface area (TBSA) of injured tissue; calculated as a percentage of TBSA (Porth, 2011: 1190). The size of the burn is very important as it is used to establish the need for fluid resuscitation, the calculation of fluid requirements, nutritional support, evaluation of prognosis (in other words the morbidity and mortality) and monitoring the progress of healing (Miminas, 2007:58- 60; Wachtel, et al., 2000: 156; Scott-Conner, Coil, Conner, et al.,1986: 123-127; Zawacki , Azen, Imbus, et al., 1979: 1-5).To further understand the estimation of burn size, the methods of calculating the burn size will be expanded on.

Three methods of calculating the size of the burn are commonly discussed in the literature: *Wallace Rule of Nines, Lund & Browder* and *Palmar surface area*. However, a fourth method which is not typically mentioned in the literature is *Berkow*. According to Berkow (1924:148), the method for estimating the extensiveness of the burn in an adult, is founded on the ratio between the head, trunk, upper and lower extremities and the total body surface area; the lower extremities accounting for 38%, the trunk 38%, upper extremities 18% and the head 6%. Lund & Browder found that Berkow's tables were not applicable to all age groups as adult and paediatric body surface areas ratios differ (Lund & Browder, 1944:352- 358).

The Lund & Browder chart subdivides the body into segments and assigns a proportionate percentage to each area based on age, that is, it takes into account changes in the contribution of the head and legs from infancy to adulthood (Sheridan, 2012: 33; Lund & Browder, 1944:352- 358). For example a newborn baby's head is proportionately larger than other parts of its body with the largest percentage allocated to its head. As the child grows the legs are allocated a bigger percentage with the head now being allocated a smaller proportion.

The Lund & Browder calculation method was followed by Wallace's "Rule of Nines" (Wallace, 1951: 501-504). The Rule of Nines uses a rough estimate that assumes adult body proportions divide the body into seven areas that represent multiples of 9%. In other words, the head and neck are roughly 9%, the anterior and posterior chest are 9% each, the anterior and posterior abdomen are 9% each, each upper extremity is 9%, each thigh is 9%, each leg and foot is 9% and the remaining 1% represents the genitalia (Sheridan, 2012: 33; Watchel, et al., 2000:157; Wallace, 1951: 501-504).

The fourth method of calculation is the palmar surface of the hand (Sheridan, Petras, Basha, et al., 1995: 605-606). The palmar surface of the patient's hand (without the fingers) is approximately 1% of their body surface over all age groups; visualizing the patient's hand covering the burn wound

approximates the percentage of body surface area involved (Sheridan, 2012: 33; Butcher & Swales, 2012: 50; Sheridan, et al., 1995: 262).

According to Hettiaratchy & Papini (2004: 101), when calculating the burn size erythema should not be included; this might take a few hours and some size overestimation is inevitable if the burn is measured acutely. For this reason several studies advocate assessment of burns after 48 hours only (Chatterjee, 2006: 123; Hemington-Gorse, 2005: 151-153; Renkielska, Nowakowski, Kaczmark, et al., 2005: 768-775). However, the initial assessment can change after the initial oedema and inflammatory reaction have settled and could present as an increase in severity and depth over the first few days, particularly in areas of poor circulation or infection.

Whilst reviewing the literature, it was found that the American Burn Association uses the Rule of Nines to assess the size of the burn (American Burn Association referral criteria, 2006). The Australian and New Zealand Burn Association (2010:38), and the South African Burns Association (2012), advocate the use of the Lund & Browder chart, the European Burns Association (2002) also uses the Lund & Browder chart supplemented by the palmar surface method.

The evidence suggests that the Lund & Browder charts are more accurate than either the Rule of Nines or palm size in identifying TBSA (Hettiaratchy & Papini, 2004: 101). Inter-rater reliability refers to the ability of a chart to produce similar values of TBSA for the same patient when assessed by different individuals; if these values correlate for a number of patients, then the inter-rater reliability is high (Minimas, 2007: 62). Only one observational study was identified which aimed to assess inter-rater reliability of the Lund & Browder chart and this assessment concluded that the Lund & Browder chart was the most accurate method of assessing burn size (Wachtel, et al., 2000: 168).
Estimates from the Rule of Nine's diagrams were the least precise and it was established that the use of charts based on the Rule of Nine's consistently led to a 3% larger burn estimate (Wachtel, et al., 2000: 166). In the Watchel, et al., (2000), study concurrent validity was not tested statistically.
In contrast to the Watchel, et al., (2000), study a review by Miminas (2007:58- 60), evaluated the liability, concurrent and construct validity, acceptability and readability and weaknesses of the Lund & Browder chart. The review concluded that the importance in various aspects of the management of patients with burns, established primarily through the longevity of the instrument and its relative ease of use, cannot be underestimated.

However the age of the data upon which Lund & Browder is based and the flaws identified, especially in relation to the instruments suitability for everyone, raises issues that can only be resolved with the application of scientific principals and defined protocols both of which needed to be viewed by a team of experts in a more formal approach (Miminas, 2007).

No guidelines or systematic reviews were found on accuracy of the Rule of Nines assessment method. Five observational studies were found comparing the Rule of Nines burn area chart with other methods of estimating burn surface area. The Rule of Nines has been found to provide reasonable estimates for burned body surface area for most children and adults (Kanthraj, Srinivas, Shenoi, et al., 1997:922-923).

However the accuracy of this method decreased for obese patients. Livingston & Lee (2000: 106-110), proposed that for obese patients or those weighing more than 80kg (BMI >30), a Rule of Fives be used. Furthermore, it was proposed that a modification to the Lund & Browder chart be used in larger breasted women as breast burns on these women could be underestimated by as much as 5% (Hidvegi, Nduka, Myers, et al., 2004: 1591- 1597).

The practice of using a person's hand size to approximate 1% body area is a common method used for assessment of burn size, but this method has not been well validated (Amirsheybani, Crecelius, Timothy, et. al., 2001: 726-733; Berry, Evison & Roberts, 2001: 591-594; Perry, Moore, Morgan, et al., 2000: 1338; Nagel & Schunk, 1997: 254-255; Sheridan, et al., 1995: 605-606). Six studies were identified that explored the palmar surface method for determining the size of the burn with each study's mean hand ratio to TBSA found to be around 0.8% (Agarwal & Sahu, 2010: 49-53; Amirsheybani, et. al., 2001: 726-733; Berry, et al., 2001: 591-594; Perry, et al., 2000: 1338; Nagel & Schunk, 1997: 254-255; Sheridan, et al., 1995: 605-606). Agarwal & Sahu (2010: 52), most recently concluded that palmar surface estimation might overestimate the size of the burn and was not an accurate assessment method.

From the above it is clear that Lund & Browder's chart is the most accurate method to determine the size of the burn and is therefore the recommended method from this review (*Level of evidence II*).
The next guiding question examines the assessment of burns at micro level, in other words, it takes a more intimate look at the burn wound.

4.4.1.2 Guiding question 2: How should burn wounds be assessed at micro level?

A holistic assessment of the patient always precedes the wound assessment (Mulder, 2009b: 17; Fletcher, 2007: 462). Wound assessment is vital to establish a diagnosis, set appropriate objectives,

to monitor the effect of treatment, to identify the presence of infection, and to predict the outcome of treatment with accuracy to evaluate care (Fletcher, 2007: 462; Keast, Bowering, Evans, et al., 2004: S1; Schultz, Barillo, Mozingo, et al., 2004: 19-20). Stewart, Bennett, Blokzyl, et al., (2009: 49), Fletcher (2007:462), Doughty (2004: 369), and Schultz, et al., (2004: 19), concurred stating that an accurate and structured wound assessment is a critical component of effective wound management in nursing because it drives the treatment plan. Watret (2005), added that a consistent and structured approach to wound assessment is of value and will reduce variations in practice. In contrast, the absence of a standardised assessment method, including descriptions of drainage, tissue appearance, oedema, wound edges, and the surrounding skin, were found to contribute to wound assessment inconsistencies (Stewart, et al., 2009:50).

Furthermore, the benefits of using a model that structures the approach to wound assessment is the provision of a framework that can be universally understood and documented, it identifies dominant factors which are providing barriers to healing and it may be useful to identify intermediate end points (Fletcher, 2007: 463). The author states additional benefits of using a model are it as minimizes diversity of practice; is user friendly and may be used by clinicians at any level; supports cost-effective care; is educational; auditable; allows process and outcomes to be tracked and it dovetails into wound dressing formularies/ guidelines (Fletcher, 2007: 463).

According to Mulder (2009b: 18), when assessing a wound, the following aspects must be taken into account: classification of the wound; location of the wound; appearance of the wound bed; size of the wound; exudate; odour; signs of infection or critical colonisation and pain.

Each of these aspects will now be discussed individually.

Classification of the wound

Wounds are generally classified as acute, chronic or postoperative wounds (Mulder, 2009b:18; Granick, Boykin, Gamelli, et al., 2006:S1; Schultz, 2003:S1-S6). Wounds are also classified in terms of the depth of the damaged tissue layers. According to Mulder (2009b: 18), acute wounds usually heal in a systematic, orderly and predictable manner whereas chronic wounds take considerably longer to heal and the healing process does not take place in an orderly and systematic manner.

Burns are acute wounds; however, the depth will determine whether healing will occur in the expected time frame. Partial thickness burns are expected to heal in a systematic, orderly and predictable manner if managed correctly.

Location of the wound

The location of a wound may indicate certain potential problems such as contamination, for instance, if the wound is the close to the sacral area (Mulder, 2009b:18).

Appearance of the wound bed

The appearance of the wound bed incorporates a framework for assessment, diagnosis, and treatment of wounds along the continuum toward optimal healing. This framework is based on the concept of Wound Bed Preparation (WBP). WBP is the management of the wound to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic measures (Schultz & Dowsett, 2012: 29; Schultz, Sibbald, Falanga, 2003: 9; Falanga, 2002: 48). Preparing the wound bed was first described in 2000 (Sibbald, Goodman, Woo, et al., 2011:56; Sibbald, Orsted, Schultz, et al., 2003: 24-51; Falanga, 2000: 347-352), and was updated in 2006 and 2011.

The 2006 update of the *Preparing the wound bed* connected the recommendations to the evidence as identified through the Registered Nurses' Association of Ontario's (RNAO) Nursing Best Practice Guidelines; the recommendations are based on the best available evidence and are intended to support the wound-care clinician and team in planning and delivering the best clinical practice (Sibbald, Orsted, Coutts, et al., 2006: 15). The 2011 updated version linked the WBP paradigm to the evidence-based literature, expert opinion, the clinical environment, and organizational context (Sibbald, et al., 2011:56). In addition The International Advisory Board has further developed the framework to help guide the clinician to identify barriers to healing in the wound bed by development of the TIME acronym which provide a structured approach to wound management (Schultz & Dowsett, 2012: 25-26; European Wound Management Association (EWMA), 2004; Keast, et al., 2004:S2; Schultz, et al., 2003: 10).

The TIME framework summarises the four main components of WBP namely: Tissue management; Control of Infection and Inflammation; Moisture imbalance; Advancement of the Epithelial edge of the wound (Schultz & Dowsett, 2012: 25-27; Dowsett & Newton, 2005: 59-70; Falanga, 2004: 2-5; Schultz, et al., 2004: 24-30; Schultz, et al., 2003: 10), and is a useful practical tool used to identify the barriers to healing and to implement a structured care plan to remove the barriers that delay wound healing with the ultimate goal being to promote wound healing. Although WBP and TIME were initially developed for chronic wounds they are very applicable to acute wounds such as burns (Schultz & Dowsett, 2012: 27-28).

An explanation of the TIME framework will now be expounded on in detail. The first component in the TIME framework is Tissue which will now be discussed.

Tissue

The appearance of the tissue in the wound bed holds a wealth of information. The specific characteristics of the tissue within a wound bed play a very important role in the wound healing continuum and therefor an accurate description of the tissue appearance is an important feature of wound assessment and it also informs the treatment plan (Dowsett & Newton, 2005: 60). This involves a description of the colour and texture and noting any deeper tissue structures that are palpable or visible (Keast, et al., 2004:S10).

Based on the aforementioned characteristics, the wound appearance is described as granulation, epithelialization or hyper- granulation tissue, slough, or necrotic, according to the colour the wound bed presents according to Dowsett & Newton (2005: 60), and Keast, et al., (2004:S10).

A red wound bed indicates the presence of granulation tissue, with a bright red, moist appearance indicating healthy granulation tissue and a paler appearance with spontaneous bleeding possibly indicating ischemia, infection, or a co-morbidity such as anaemia (Keast, et al., 2004:S10).

Dark red or beefy-looking granulation tissue may also indicate infection. In addition to the colour, granulating wounds usually have an uneven texture, but significantly raised areas of granulation are referred to as hyper-granulation and may indicate excess moisture in the wound according to Keast, et al., (2004:S10). Hyper granulation tissue can be classed as either healthy or unhealthy. Healthy hyper granulation is closely linked to a prolonged inflammatory response and infection is usually instrumental in the formation of unhealthy granulation tissue (Johnson, 2007:70).

Pink epithelializing wounds represent the final stages of healing. A pink, white, or translucent layer that may be seen overlying a healthy bed of granulation tissue, migrating either from the wound margin or from hair follicles within the wound is called epithelialization (Keast, et al., 2004:S10).

In contrast to the viable tissue described above, the wound bed may also have non-viable tissue on it for example slough or necrotic tissue. Slough is a yellow to grey- green wound bed and is composed of cellular debris and may adhere tightly to the wound bed or be loose and stringy (Keast, et al., 2004:S10). Necrotic tissue appears as black or brown (or white in burns) with a tough, leathery texture and represents full-thickness tissue destruction and is known as eschar (Dowsett & Newton, 2005: 60; Keast, et al., 2004:S10). Necrotic tissue is a result of necrosis. Necrosis has been defined as dead devitalized tissue by Sussman & Bates-Jensen (2007:148).

Non-viable or deficient tissue delays wound healing, provides a focus for infection, prolongs the inflammatory response, mechanically obstructs contraction and impedes re-epithelialisation (Dryburgh, Smith, Donaldson, et al., 2008: 3; Granick, Boykin, Gamelli, et al., 2006: S2; Dowsett & Newton, 2005: 60).

Just as there is a fine line between healthy and unhealthy hyper granulation, so too is there a fine line between inflammation and infection. The second component in the TIME framework is Infection/ Inflammation and will now be discussed.

Infection/ Inflammation

Inflammation is the first stage in the wound healing process and is characterised by the classic signs of heat and redness, pain and swelling, raised temperature and fever (Collier, 2003: 63), and infection is similarly characterised by the same classic signs of inflammation. For this reason it is important that nurses are able to distinguish between infection and inflammation.

The definition of inflammation is a local response to cellular injury that is marked by capillary dilation, leukotic infiltration, redness, heat and pain and serves as a mechanism initiating the elimination of noxious agents and of damaged tissue (Merriam – Webster.com, 2014). Inflammation is the body's immune systems reaction to injury and is essential to normal wound healing (Sussman & Bates- Jensen, 2007:22).

The wound healing process is frequently described as three overlapping phases of inflammation, proliferation, and remodelling (McQuillan, Fynn Makic & Whalen, 2009: 308; Li, Chen, & Kirsner, 2007:9; Mulder, et al., 2002: 23-34). The pathophysiology of wound healing will be described briefly below as background information for the reader.

According to Li, et al., (2007:9-18), the inflammatory phase involves vascular responses characterized by blood coagulation and haemostasis as well as cellular events, including infiltration of leukocytes with varied functions in antimicrobial and cytokine release, which initiates the proliferative response for wound repair. During the proliferative phase, there is a formation of the epithelium to cover the wound surface with simultaneous growth of granulation tissue to fill the wound space. Granulation tissue formation involves proliferation of fibroblasts, deposition of collagens and other extracellular matrices, and development of new blood vessels. Once the new tissue within the wound is formed, the re-modelling phase begins to restore the tissues structural integrity and functional competence. Inflammation, therefore, is the vital first step in the wound healing process.

It is important to note that wounds do not progress instantly from inflammation to infection. It is a gradual occurrence described in the literature as progression on a bacteria continuum. Table 4.3 depicts the bacteria continuum.

In contrast to inflammation, wound infection is defined as the presence of multiplying bacteria that overwhelm the patient's immune system, resulting in associated tissue damage. All wounds contain bacteria at levels ranging from contamination, colonization, critical colonisation to infection (Green, 2012: 48-49; Sibbald, Woo & Ayello, 2008: 31; Healy & Freedman, 2006: 838-841; Dowsett

& Newton, 2005: 63; Schultz, et al., 2003:S14; Bowler, 2003: 44–53). Each aspect of the continuum will be explained briefly.

Table 4.3 The bacteria continuum

Increasing organisms and clinical complications

	Sterile	Colonized	Critically colonized	Infected
Time	Immediately post injury	48 hours	5-7 days	>7days
Type	Nil	Gram positive bacteria	Gram positive bacteria Gram negative bacteria, Yeast	Multiple
Source		Patient's sweat glands and hair follicles	Patients gastro intestinal tract (gram negative), upper respiratory flora and or environment and are spread through heath care worker's hands	Patient, environment, health workers' hands

10 hours post burn injury **Biofilms** develops

(Taken from data from Church, Elsayed, Reid, et al., 2006)

Burn wound surfaces are sterile immediately following thermal injury for a short time (Church, et al., 2006). Humans, however, carry significant numbers of bacteria that quickly contaminates the open wound (Santy, 2008: 54).

Contamination is the presence of non-replicating organisms in a wound (Rowley-Conwy, 2010:52; World Union of Wound Healing Societies (WUWHS) 2008a: 1; Schultz, et al., 2004:25; Sibbald, et al., 2003: 33). Once there is a break in skin the probability for contamination is 100%. Contaminating bacteria are likely to originate from three main sources: (i) the external environment (exogenous microorganisms in the air or those introduced by traumatic injury); (ii) the surrounding skin (involving members of the normal skin microflora such as *Staphylococcus epidermidis*, micrococci, skin diphtheroids, and propionibacteria); and (iii) endogenous sources involving mucous membranes (primarily the gastrointestinal, oropharyngeal, and genitourinary mucosae) (Sibbald, et al., 2003:34; Bowler, Duerden & Armstrong, 2001: 246). If suitable nutritive and physical conditions are not available for each microbial species, or they are not able to successfully evade host defences, they will not multiply or persist; their presence is therefore only transient and wound healing is not delayed (Cooper, In: European Wound Management Association (EWMA), 2005:4).

At this point of the continuum the bacteria present in the wound do not elicit a host reaction and the wound will continue to heal.

Colonisation is defined by Schultz, et al., (2004:25), as the replication of bacteria that adhere to the wound surface, but symptoms of infection are not present (Rowley-Conwy, 2010:52; Santy, 2008: 54; Cooper, In: EWMA, 2005:4).The colonizing bacteria are usually not significantly invasive and do not cause cellular damage to the host and, therefore, do not impair healing. Host resistance is still great enough to overcome the number and virulence of the bacteria. In other words, if the host's immune response is efficient, a healthy balance will be maintained and the presence of bacteria in the wound will be controlled at a level that does not give rise to infection; if on the other hand, the host defences are inhibited and are unable to prevent organisms from increasing in number, colonisation may lead to (covert) infection according to Santy (2008:54).

A subtle point occurs when the bacteria begin to overwhelm the host defences; this is known as critical colonization; critical colonisation describes the situation in which the bacterial burden in the wound is intermediate between the categories of colonisation and infection (Schultz, et al., 2003:S14). Critically colonised wounds do not heal (or are very slow to heal) and do not exhibit the classic signs of infection such as erythema, warmth, swelling, pain and loss of function (Sibbald, et al., 2000: 36).
It is believed that aerobic or facultative pathogens such as *Staphylococcus aureus*, *Pseudomonas aeruginosa* and the *beta-hemolytic streptococci* are primarily responsible for delayed healing and infection in all types of wounds (Bowler, et al., 2001: 246). Critically colonised wounds require treatment which typically includes topical antiseptic agents such as the sustained release silver dressings or slow release iodine formulations (Schultz, et al., 2004:25).

Wound infection is when microorganisms have invaded tissue and elicited a host response (Rowley-Conwy, 2010:52; Sibbald, et al., 2003:36; Schultz, et al., 2003:S14).The progression from colonization to infection depends not only on the bacterial count or the species present but also on the host response, the number of different species present, the virulence of the organisms and the synergistic interactions between the species (Edwards & Harding, 2004: 91; Sibbald, et al., 2003: 36). Sibbald, et al., (2003: 36), expressed it as a mathematical equation, although numerical values cannot be inserted, this formula expresses the relationship between increasing numbers of organisms and virulence which, together, can overcome the ability of the host to contain infection:

Infection= $\frac{number\ x\ virulence}{Host\ resistance}$

Wound infection is the outcome of the dynamic interactions that take place between hosts, a potential pathogen and the environment.
It occurs when host defence strategies are successfully evaded by replicating micro-organisms and results in deleterious changes in the host (Cooper in: EWMA, 2005: 2; Schulz, et al., 2003: S15; Sibbald, et al., 2003:33). It can be deduced that infection will occur when the scales are tipped on the part of the patient, in other words if the patient's host defences and therapeutic measures (including

excision of necrotic tissue and wound closure) are inadequate or delayed. Microbial invasion of viable tissue then occurs, which is the hallmark of an invasive burn wound infection. Figure 4.2 demonstrates the balance.

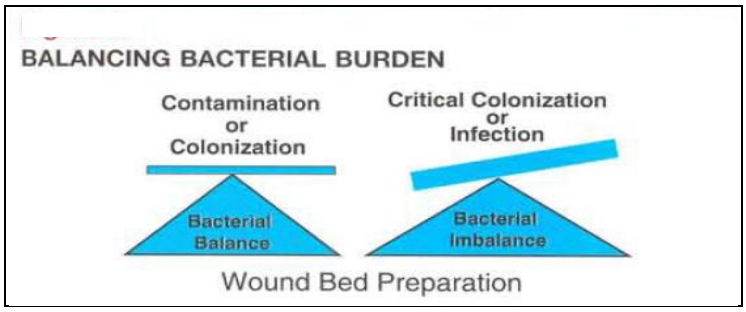

Figure 4. 2 Balancing bacterial burden (Sibbald, Woo & Ayello, 2006:26).

Delayed healing and increasing pain suggest possible progression towards overt infection. At this point, the defence mechanisms become overwhelmed and bacteria multiply, resulting in a response in the local tissues and, often, generalised body responses which may result in patients feeling unwell; for immune compromised individuals (like patients with burns) serious illness may ensue, possibly resulting in death if the wound infection spreads and becomes systemic (Santy, 2008:54).

Because of the similarities Rowley – Conwy (2010:52), recognised the difficulties in distinguishing local inflammation and clinical signs of infection, and stated that, although redness, pain, swelling and exudates are features of both inflammation and infection, when symptoms are disproportionate to the size of the wound, infection should be suspected. However, in the case of a major burn injury it is impossible to differentiate in this way and suggested therefore that clinical signs – such as those listed above – in the first few days after a burn injury can be classed as inflammation and that any subsequent presentation is usually the result of infection.

It is important that nurses working with burns patients are able to distinguish between inflammation and the stages of the bacteria continuum to inform decision making in the burn management process. Work has been done on distinguishing the criteria for infection by Cutting & Harding (1994), and two validation studies have been carried out by Cutting (1998) and Gardener, Franz & Doebbeling (2001). The criteria have further been expanded through a Delphi approach published in the EWMA position document on 'Identifying criteria for wound infection' (EWMA, 2005: 6-9).
The results of the Cutting, White, Mahoney, et al., (2005) study indicate that 'cellulites', 'malodour', 'pain', 'delayed healing' or 'deterioration in the wound'/'wound breakdown' (although individual descriptions differ) are criteria that are common to all wound types. An 'increase in exudate volume'

was identified as an infection criterion in all wound types except for acute wounds healing by primary intention and burns (full-thickness).

This is consistent with clinical observation as full-thickness burns tend to naturally generate large volumes of exudate and acute wounds healing by primary intention do not provide an observable wound bed unless they break down. The participants of the study composed a list of signs of infection and ranked the list according to an importance criterion (0=not important; 9=highly important). The criteria were grouped into three bands according to their scores: 4-5 (important), 6-7 (very important), 8-9 (diagnostic). According to Cutting, et al., (2005: 7), criteria ranked as 8–9 (mean score) were considered to be diagnostic of infection. Criteria achieving lower mean scores (6–7 or 4–5) were perceived to be more subtle clinical indicators or signposts of infection. It would appear that there is a progression from left to right of the table, starting at indicators of infection to cellulites and ecthyma gangrenosum. Table 4.4 depicts the signs of infection below.

Table 4.4 The signs of infection for partial thickness burns from the EWMA document are tabled below (Cutting, et al., 2005:8).

Discolouration	Black/dark brown focal areas of discolouration in burn	Cellulitis
Friable granulation tissue that bleeds easily	Erythema	Ecthyma gangrenosum
Sub-eschar pus/abscess formation	Haemorrhagic lesions in subcutaneous tissue of burn wound or surrounding skin	
Increased fragility of skin graft	Malodour	
Increase in exudate volume	Spreading peri-burn erythema (purplish discolouration or oedema)	
Increase in local skin temperature	Unexpected increase in wound breadth	
Loss of graft	Unexpected increase in wound depth	
Oedema		
Onset of pain in previously pain-free burn		
Opaque exudate		
Rejection/loosening of temporary skin substitutes		
Secondary loss of keratinised areas		

KEY

HIGH Mean score 8 or 9MEDIUM Mean score 6 or 7LOW Mean score 4 or 5

In addition to this challenge of inflammation and infection, an adverse effect on wound healing, caused by the interaction of different microorganisms, has been observed. This phenomenon is the formation of biofilms. Biofilms are complex communities of aggregated bacteria embedded in self-

secreted extracellular polysaccharide matrix (ESP) or slime (Rowley-Conwy, 2010: 54; Church, et al., 2006; Edwards & Harding, 2004: 94). It is formed when bacteria attaches to a solid surface, with subsequent micro-colony formation; mature biofilms develop protected micro environments within polysaccharides which forms a complex structure, including channels to allow transfer of nutrients and waste products (Rowley-Conwy, 2010: 54; Church, et al., 2006; Edwards & Harding, 2004: 94). This allows bacteria to survive in a hostile wound environment and shields them from certain antimicrobials; despite not containing enough bacteria to be considered a true infection. Biofilms delay wound healing and contribute to microbial resistance and therefore need prompt treatment (Rowley-Conwy, 2010: 54). Persister cells within the biofilm are the cells that have remained within the biofilm after treatment with antimicrobial agents and antiseptics; these persister cells temporarily disable their inherent mechanisms of programmed cell death in the presence of harsh environmental conditions and help in repopulating the biofilm, often leading to failure in biofilm eradication (Church, et al., 2006).

In the review done by Church, et al., (2006), it was found that although biofilms are best known for their role in foreign device-related infections, recent studies have confirmed the importance of biofilms in the pathogenesis of burn wound infections. In animals with experimentally inflicted partial-thickness cutaneous burns, mature biofilms develop in forty eight to seventy two hours, while in vitro experiments with *Pseudomonas aeruginosa* strains, recovered from human burn wounds, demonstrate that mature biofilms can form in about ten hours. Factors delaying the formation of biofilms in vivo may be related to the need for microbial nutrient replenishment, exposure to killing by the immune system, and immediate wound cleansing (Church, et al., 2006).

Both inflammation and infection relate to wound fluid and it is therefore fitting that the next component in the TIME framework is Moisture balance. A discussion on Moisture balance follows.

Moisture balance or control

Even though the concept of moisture balance or moist wound healing is widely known and accepted in wound care, no clear definition is found in the literature. Moisture balance is a delicate process with appropriate moisture required to facilitate the action of growth factors, cytokines and migration of cells including fibroblasts and keratinocytes (Sibbald, et al., 2011:69). Earlier studies suggested that epidermal migration appeared to be facilitated in moist conditions (Eaglstein, Mertz & Falanga, 1987:211-216; Hinman & Maibach, 1963:377-378; Winter, 1962: 293-294).
Studies have established moist wound healing (MWH) as the best evidence-based practice (van Rijswijk, 2004: 28-30; Bryan, 2004: 227-228).

According to Schultz, et al., (2003:S14), the occlusion promotes wound healing firstly because the presence of a moist wound healing environment assists epidermal migration, secondly through the alterations in pH and oxygen levels, thirdly through the maintenance of an electrical gradient and lastly through the retention of wound fluid. Conversely, excessive moisture can potentially cause damage to the surrounding skin of a wound, leading to maceration and potential breakdown whilst inadequate moisture in the wound environment can impede cellular activities and promote eschar formation, resulting in poor wound healing (Sibbald, et al., 2011:69; Schultz, et al., 2004: 28).
Excessive desiccation slows migration of epidermal cells and limits epidermal regeneration (Mulder, 2009a: 78; Schultz, et al., 2004: 28; Bryan, 2004: 227-228). Desiccated wound tissue is more prone to complications such as infection, scarring or pain and heals more slowly than moist tissue, placing patients at risk of longer hospital stays or amputations (Bolton, 2007: 23).

All wounds have some amount of exudate present. Due to the loss of skin in relation to its functions it is important that exudate pathophysiology in burns be discussed as a background to understanding the importance of moisture control in burns. Latenser (2009: 2819- 2820), described the process of exudate changes during the first forty eight hours post injury: Immediately after burn injury, the systemic microcirculation loses its vessel wall integrity and proteins are lost into the interstitium.
This protein loss causes the intravascular colloid osmotic pressure to drop precipitously and allows fluid to escape from the circulatory system. There is a marked transient decrease in interstitial pressure caused by the release of osmotically active particles, causing a vacuum effect that sucks in fluid from the plasma space. There is a marked increase in fluid flux into the interstitium caused by a combination of the sudden decrease in interstitial pressure, an increase in capillary permeability to protein, and a further imbalance in hydrostatic and oncotic forces favouring the fluid movement into the interstitium. The outcome is a dramatic outpouring of fluids, electrolytes, and proteins into the interstitium with rapid equilibrium of intravascular and interstitial compartments. What actually changes is the volume of each fluid compartment, with intracellular and interstitial volumes increasing at the expense of plasma and blood volume. Functional plasma volume in burn tissue can be restored only with expansion of the extracellular space. Most oedema occurs locally at the burn site and is maximal at twenty four hours post injury. The oedema itself results in tissue hypoxia and increased tissue pressure with circumferential injuries (Latenser, 2009: 2819-2820).

The amount of exudate produced by a wound is partly dependant on the surface area. Consequently, the larger the surface area, the greater the likely volume of exudate such as burns; the larger the surface area the higher the volume of exudate expected World Union of Wound Healing Societies (WUWHS, 2007a:3).
In addition to the size of the wound, high levels of exudate may be indicative of other underlying causes such as infection, autolytic debridement and liquefaction of necrotic tissue or inappropriate dressing for instance.

Standardisation of terminology is vital to avoid misunderstanding and miscommunication. According to the WUWHS (2007a:6), the exudate on the wound should be described as per table 4.5.

Table 4.5 Terminology to describe moisture levels (WUWHS, 2007a:6).

Status	Indicators
Dry	Wound bed is dry; there is no visible moisture and the primary dressing is unmarked; dressing may be adherent to wound.
Moist	Small amounts of fluid are visible when the dressing is removed; the primary dressing may be lightly marked; dressing change frequency is appropriate for dressing type. **NB In many cases, this is the aim of exudate management**
Wet	Small amounts of fluid are visible when the dressing is removed; the primary dressing is extensively marked, but strikethrough is not occurring; dressing change frequency is appropriate for dressing type.
Saturated	Primary dressing is wet and strikethrough is occurring; dressing change is required more frequently than usual for the dressing type; periwound skin may be macerated.
Leaking	Dressings are saturated and exudate is escaping from primary and secondary dressings onto clothes or beyond; dressing change is required much more frequently than usual for dressing type

The last component in the TIME framework is Edge of the Wound/Epithelial Cell Migration and will now be discussed.

Edge of the Wound

Wound edges can serve as an important parameter to determine whether or not the present wound treatment is effective over time (Mulder, 2009a: 78). The edge of the wound should advance through the process of epithelialisation. Epithelialisation, which is the final stage of wound healing, is the active division, migration, and maturation of epidermal cells from the wound margin across the open wound (Dodds & Haynes, 2004).

Wound healing occurs when the wound edges of a deep wound show signs of new granulation tissue and a superficial wound's edges epithelialize and epithelium islands are visible (Mulder, 2009a:78). Falanga (2004: 4), concurred, and added that effective healing requires the re-establishment of an intact epithelium and restoration of skin function. According to the EWMA (2004: 4), effective

healing requires the re-establishment of an intact epithelium and restoration of skin function. Normal wound healing in an acute wound is highly coordinated with rapid choreographed changes in specific cell populations occurring as the wound progresses from injury through repair, and remodelling to healing (Vowden & Vowden, 2002). Figure 4.3 below depicts the phases of wound healing.

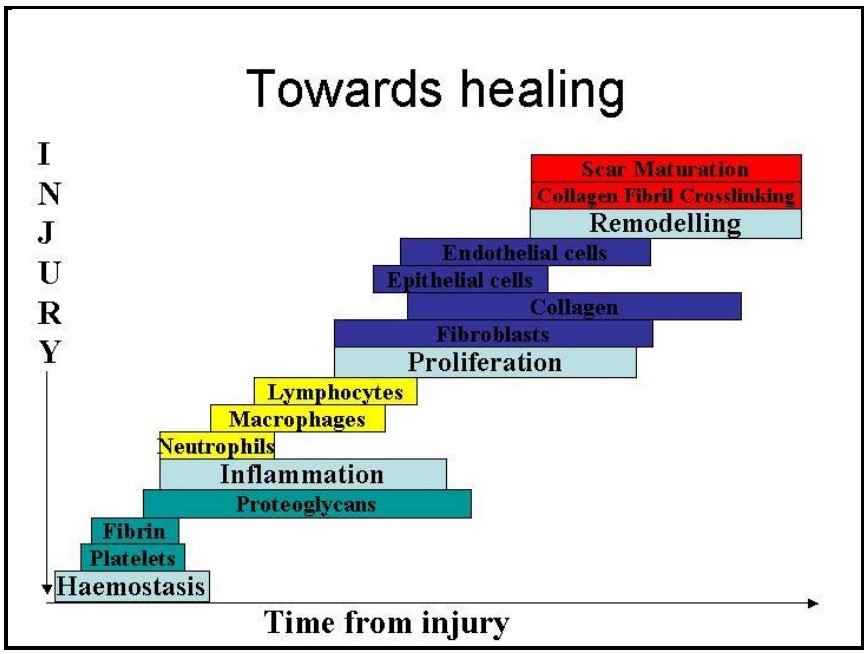

Figure 4.3 Phases of wound healing (Vowden & Vowden, 2002).

The final stage of wound healing is epithelialisation, which is the active division, migration and maturation of epidermal cells from the wound margin across the open wound (Dowsett & Newton, 2005:69). There are many factors which need to be present in order for epithelialisation to take place. The wound bed must be full of well vascularised granulation tissue in order for the proliferating epidermal cells to migrate. This also ensures that there is adequate oxygen and nutrients to support epidermal regeneration. There needs to be a rich source of viable epidermal cells which can undergo repeated cell division particularly at the edge of the wound. Where cells have become senescent the process slows down or stops completely (Dowsett & Newton, 2005: 69). When the edges of a deep wound shows signs of new granulation tissue formation or when the edges of a superficial wound is recolonized by visible epithelial islands, this indicates wound healing (Mulder, 2011:34).

On the other hand when the epidermal margins of a wound fail to migrate across the wound bed or the wound edges fail to contract and reduce in size, consideration needs to have been given to the '**T**', '**I**', and '**M**' first to ensure that all aspects of wound bed preparation have been considered. The edge of the wound will not epithelialize unless the wound bed is well prepared (Dowsett & Newton, 2005: 69). Regular wound evaluation and measurement is an essential element of implementing the '**E**' of

the TIME framework so that non-healing wounds can be identified and treated in a timely manner (Schultz & Dowsett, 2012: 27; Mulder, 2011:34).

Measuring a wound at the start of treatment is regarded as the best practice to enable accurate assessment of the impact of a clinician's intervention; with subsequent measuring to identify whether or not a wound is failing to heal or deteriorating (Dowsett & Newton, 2005: 69). Evaluation is therefore an on-going process throughout the various stages of wound management and is not just a "once off" evaluation.

To summarize the above discussion; classification of the wound has been discussed, followed by the location of the wound and the appearance of the wound in accordance with Mulder (2009b:18). Wound size has been covered in Guiding question one and will be addressed in Guiding question ten again. Exudate has been addressed under Moisture control in Guiding question two. Odour and signs of infection has been addressed under Infection/ Inflammation in Guiding question two. Pain will be explained under Guiding question eleven.

The evidence presented above shows that WBP and TIME is an evidence based approach to wound management that provides a structured approach to assessment and management. (*Level I*).

The next section provides a discussion on identification of a patient's actual or potential health needs and health status in relation to burn wounds.

4.4.2 Diagnosis

The next point of discussion is the diagnosis which led to Guiding question 3.

4.4.2.1 Guiding question 3: What is the correct terminology for burn wounds?

Owing to the multi-disciplinary team approach to wound management with differences in resource availability across all health settings, differences in levels of training on wound management, and differences in access to information, each health professional has a varied knowledge base related to

wound healing and wound management. Key terms such as depth of the burn, wound infection and healing have ambiguous definitions.

New terms frequently evolve, for example; wound bed preparation, necrotic burden and critical colonisation (Bowler, 2003a: 44–53; Falanga, 2002:47; Falanga, 2000: 347-352). According to Flanagan (2005:77), expert opinion varies greatly in different countries and between discrete professional groups, resulting in conflicting advice and different practice recommendations and consequently contradictory findings from different sources present a challenge for wound care. Standardisation, by itself, improved wound outcomes in chronic wounds (Shepherd & Nixon, 2013:62-66; Gottrup, 2004b: 130; Gottrup, Holstein, Jørgensen, et al., 2001: 765-772; Hadcock, 2000:614-624), and is likely to also improve the outcomes in burn wounds. The standardisation of terminology will moreover clarify the communication amongst the multi-disciplinary team.

On the hierarchy of evidence for this review none of the burn societies addressed nursing diagnosis and only referred to medical terminology. One systematic review (Muller- Staub, 2006), was found to evaluate the implementation of a nursing diagnostics.

A three part statement as described by DeLaune& Ladner (2011: 115), is proposed that use of both nursing and medical terminology to ease communication in the multi- disciplinary team, which is in agreement with NANDA-I PES format (Muller- Staub, 2006: 10), and the inclusion of the terminology described in the literature. See table 4.6 for comparison of different diagnosis.

Table 4.6 Different types of diagnosis.

NANDA nursing diagnosis (www.nanda.org)	**Medical diagnosis**	**Proposed Three part statement nursing diagnosis**
Impaired tissue integrity	Partial thickness burn (Devgan, Bhat, Aylward, 2006: 7-15; Watts, Tyler,	Impaired tissue integrity *RT partial thickness burn *AEB altered epidermis and dermis.

	Perry, et al., 2001:154)	
Risk for infection	Critically colonized wound (Church, Elsayed, Reid, et al., 2006)	Risk for infection *RT critical wound colonization *AEB delayed wound healing due to an increase pathogenic organisms.
Risk for contamination	Large TBSA in deep dermal wound (Devgan, et al., 2006: 7-15; Watts, et al., 2001:154)	Risk for contamination *RT Large TBSA in deep dermal wound *AEB accentuated risk of exposure to environmental contaminants in doses sufficient to cause health effects.
Imbalanced body temperature	Large TBSA	Imbalanced body temperature *RT large TBSA *AEB excessive moisture and heat loss due to skin loss and failure to maintain body temperature within normal range.
Acute pain	Superficial partial thickness burn (Devgan, et al., 2006: 7-15; Watts, et al., 2001:154)	Acute pain *RT superficial partial thickness burns *AEB unpleasant sensory and emotional experience arising from tissue damage.
Disturbed body image	Full thickness burns (Devgan, et al., 2006: 7-15; Watts, et al., 2001:154)	Disturbed body image *RT full thickness burns *AEB changes in body appearance due to scaring.

*RT: related to; *AEB: as evidenced by
Muller- Staub (2006) (*Level of evidence I*)

DeLaune & Ladner (2011) (*Level of evidence VI*)

Due to the discrepancies this recommendation was for discussion by the panel of experts. Refer to Chapter Five for the conclusion.

The next step for discussion is Interventions/Implementation.

4.4.3 Interventions / Implementation

The aspects to be covered during this step are: cleaning solution, ideal wound or surroundings temperature, differences between dressings, open vs. closed method of dressing and ointment vs. dressing. Each of these is discussed as a separate review question.

4.4.3.1 Guiding question 4: What is the best technique for burn wound management?

Different terms including wound cleansing, wound cleaning and wound irrigation have been used in the literature to describe the cleaning technique of wound management. Unfortunately these terms have not been standardised in studies and are used interchangeably. For this study the term wound cleaning will be used. Wound cleaning is the use of nontoxic fluids to remove loosely adherent debris, necrotic tissue, wound exudate and metabolic wastes from the wound surface to create an optimal environment for wound healing (Fernandez & Griffiths, 2012: 2; Joanna Briggs Institute (JBI), 2006: 2; Rodeheaver, 1999:80-85). This is in line with the principles of WBP and the TIME framework. Therefore wound cleaning forms a critical part of the management of wounds (JBI, 2008: 35; Khan & Naqvi, 2005:6; Blunt, 2001:33).Yet, the decision on how to clean and with which solution is often based on ritualistic clinician preference.

There are five elements that should be addressed when discussing wound cleaning: the first is the *cleaning solution, secondly is the technique, and thirdly is aseptic field, fourth gloves* and *lastly equipment.*

Cleaning solution

The JBI published a Best Practice information sheet, which has been derived from a systematic review conducted in 2004 (JBI, 2006: 2). According to this recommendation potable (suitable for drinking) water can be used for wound cleaning in the following types of wounds:

Adults with lacerations and postoperative wounds, potable tap water may be an effective cleansing solution. However, the choice of solution should reflect patient preference and a formal economic evaluation. (Grade B).

Chronic wounds in adults may be cleansed using potable tap water if normal saline is unavailable. (Grade B).

Potable tap water may be used for cleansing simple lacerations in children. (Grade A).

Boiled and cooled water is an effective wound cleansing solution in the absence of normal saline or potable tap water. (Grade C).

Irrigation with 1% Povidone-iodine is effective in reducing the infection rate in contaminated wounds. (Grade B). However there is no evidence of the optimal time that Povidone Iodine should be left in place. (Grade E).
Grade A: Effectiveness established to a degree that merits application.
Grade B: Effectiveness established to a degree that suggests application.

Grade C: Effectiveness established to a degree that warrants consideration of applying the findings.

Grade D: Effectiveness established to a limited degree.

Grade E: Effectiveness not established.

(*Level of evidence I*)

Table 4.7 is a presentation on the different cleaning solutions.

The advantages and disadvantages of the various cleaning solutions are presented below:

Table 4.7 Advantages and disadvantages of various cleaning solutions.

Solution	Advantage	Disadvantage
Tap water	Cost effective (Fernandez & Griffiths, 2012: 9). The use of tap water to cleanse acute wounds was not associated with a statistically significant difference in infection when compared to saline and is thus an effective cleaning solution (Fernandez & Griffiths, 2012: 1; Lloyd-Jones, 2012: 397; JBI, 2008: 38). In chronic wound washing is therapeutic and gives the patient a feeling of well-being (Lloyd- Jones, 2012: 397). Easily accessible (Fernandez, Griffiths & Ussia, 2001: 52).	Tap water is not isotonic and could cause tissue damage and pain through osmosis at cellular level (Gannon, 2007: 44; Blunt, 2001: 34). Quality of tap water is variable (Blunt, 2001: 34). If wounds are exposed to water for too long they can absorb the liquid through osmosis, which increases the production of exudates, leading to more frequent dressing changes (Gannon, 2007: 44).
Normal Saline	Relatively inexpensive, available in variety of volumes and presentations and is widely available in hospital and community settings (Carr, 2006:157). Isotonic solution and does not donate or withdraw fluid from the wound (Gannon, 2007:44; Blunt, 2001:34). Isotonic solutions do not impede normal healing, damage tissue, cause allergy or alter the normal bacterial flora of the skin that would allow the growth of more virulent organisms; this is an important consideration for all patients and particularly for immune-compromised patients (Gannon, 2007: 44). Animal studies concluded that normal saline has little or no effect on blood flow in capillaries and is not detrimental to underlying granulation tissue (Gannon, 2007: 44).	Saline is more expensive than sterile water (Gannon, 2007: 44).

Antiseptics	Irrigation with 1% povidone-iodine is effective in reducing the infection rate in contaminated wounds (JBI, 2008: 38). Has been shown to be simultaneously active against gram positive, gram negative, spores, amoebic cyst, fungi, protozoa and yeast (Selvaggi, Monstrey, Van Landuyt, et al., 2003: 243).	There is no evidence of the optimal time that Povidone Iodine should be left in place (JBI, 2008: 38). Povidine –Iodine has concentration dependent cytotoxicity. Since large areas need to be treated in burn patients, risk of systemic cytotoxicity exist (Drosou, Falabella &Kirsner, 2003:149-166). Iodine solutions are deactivated in the presence of organic material, pus, slough and necrotic tissue in the wound (Khan & Naqvi, 2005:8).
Chlorehexidine 2% alcohol solution or 0.5% aqueous solution	Active against gram positive and gram negative organisms, low tissue toxicity (Sibbald, Goodman, Woo, et al.., 2011:58).	

Based on the hierarchy of evidence a search of the literature yielded two Cochrane reviews on water as a cleaning solution for wounds (Fernandez & Griffiths, 2012; Fernandez & Griffiths, 2008). Eleven trials were included in the 2012 review. Seven trials were identified that compared rates of infection and healing in wounds cleansed with water and normal saline; three trials compared cleansing with no cleansing and one trial compared procaine spirit with water. There were no standard criteria for assessing wound infection across the trials, which limited the ability to pool the data according to the authors.

The major comparisons were water with normal saline, and tap water with no cleansing. According to the Cochrane review by Fernandez & Griffiths (2012), preparations with antiseptic properties have been traditionally used, but published research, using animal models, has suggested that antiseptic solutions may hinder the healing process. These guidelines developed by Fernandez & Griffiths (2012), have resulted in changes in hospital practice. Normal saline (0.9%) is the favoured wound cleansing solution due to the fact that it is an isotonic solution and does not interfere with the normal healing process, damage tissue, cause sensitisation or allergies or alter the normal bacterial flora of the skin (which would allow the growth of more virulent organisms). Tap water is also recommended and has the advantages of being efficient, cost-effective and accessible.

However, clinicians have been cautioned against using tap water to cleanse wounds that have exposed bone or tendon, in these cases normal saline is recommended (Lindholm, Bergsten & Berglund, 1999). Fernandez & Griffiths' (2012), findings follow: for chronic wounds, the risk of developing an infection when cleansed with tap water compared with normal saline was 0.16, (95% CI 0.01 to 2.96) thereby demonstrating no difference between the two groups.

The use of tap water to cleanse acute wounds in adults and children was not associated with a statistically significant difference in infection when compared to saline (adults: RR 0.66, 95% CI 0.42 to 1.04; children: RR 1.07, 95% CI 0.43 to 2.64). There was no statistically significant differences in infection rates when wounds were cleansed with tap water or not cleansed at all (RR 1.06, 95% CI 0.07 to 16.50). Likewise, there was no difference in the infection rate in episiotomy wounds cleansed with water or procaine spirit. The use of isotonic saline, distilled water and boiled water for cleansing open fractures did not demonstrate a statistically significant difference in the number of fractures that were infected. The main conclusions were therefor that there was no evidence that using tap water to cleanse acute wounds in adults or children increases or reduce infection. There is firm evidence to support that cleansing wounds as such increases healing or reduces infection (Fernandez & Griffiths, 2012),.

In the absence of potable tap water, boiled and cooled water as well as distilled water can be used as wound cleansing agents. (*Level of evidence I*)

The next element in wound cleaning to be deliberated on is cleaning technique.

Cleaning technique

Swabbing and irrigation are the usual cleansing techniques but bathing or showering is other options described in the literature. According to the JBI (2008), these recommendations were based on six randomised controlled trials (RCT) and three comparative studies with concurrent controls. Of the nine studies, eight involved post-operative patients and one study involved patients with non-contaminated lacerations. According to JBI there were no studies identified that compared the common techniques of wound cleansing such as swabbing and scrubbing. The findings on the technique of the JBI (2008), review are described below.

Whirlpool therapy versus conservative treatment on healing.

According to JBI (2008), only one RCT addressed wound healing as an outcome. The results from this trial indicated that pressure ulcers allocated to the whirlpool therapy group improved significantly faster than the conservative treatment group ($P< 0.05$). However, there was no statistically significant difference in the wounds that healed, deteriorated or remained the same ($P< 0.05$). Another controlled trial without randomisation looked at the effects of whirlpool therapy on healing and pain relief in patients with abdominal surgery. This trial indicated that patients who received whirlpool therapy within seventy two hours experienced decreased wound inflammation and reduced pain (JBI, 2008). Though the Centre for Disease Control (CDC) (2003:67), does not reference a specific study on infection as an outcome it acknowledges the appropriateness of hydrotherapy in certain wounds like burns, it however cautions that the risk factors for infection: (age and sex of the patient, underlying medical conditions, length of time spent in the hydrotherapy water and the portals of entry) should be taken into account. The CDC (2003: 67), argued that wound care is increasingly moving away from hydrotherapy (whirlpools, hot tubs, physiotherapy tanks) in favour of bedside pulse lavage therapy and irrigation as several episodes of health care associated infections have been linked to the use of hydrotherapy equipment. This is especially true for patients with larger surface wound areas. For patients with at increased risk of infection (those with a burn greater than 25%, or with invasive devices) hydrotherapy and common treatment rooms should be used cautiously, if at all (Weber & McManus, 2004: 3), from the Nursing Committee of the International Society for Burn Injuries. (*Level of evidence I*).

Irrigation versus cleaning with gauze

According to the systematic review done by the JBI (2008), one controlled trial without randomisation compared wound infections and cosmetic appearance in wounds that were irrigated with normal saline and those that were cleansed with gauze and normal saline.

No difference in infection rates between the groups was noted however, optimal cosmetic appearance at the time of suture removal was higher in the non-irrigation group (JBI, 2008). If swabbing needs to be done it is important to use non-woven gauze swabs, as gauze and cotton wool have been shown to shed fibres into the wound. Swabbing with soaked non-woven gauze has been used to remove slough and loose necrotic tissue (Towler, 2001), although swabbing clean granulating or epithelializing wounds can cause trauma to the wound. Young (1995), suggests that swabbing is unlikely to damage slough and necrotic tissue and explains that it is the amount of pressure applied that is important, although measuring appropriate pressure is difficult according to Lloyd -Jones (2012: 396-399). However, the CDC (2003: 67), advocates the use of irrigation with regards to infection as an outcome. Furthermore, Lloyd- Jones (2012: 396-399), in a review, found that cleansing by irrigation is considered advantageous, in that there is no problem with shedding fibres into the wound; however, there has been numerous debates with regards to the most appropriate equipment and amount of pressure required to effectively cleanse a wound without causing trauma (Towler, 2001). According to Lloyd- Jones (2012), there are currently commercial products available, including spray cans and pods, which have been designed to deliver irrigation at the appropriate pressure without causing trauma. They also eliminate the need for supplementary equipment, such as syringes and forceps (Williams, 1999).

The recommendation thus is irrigation of wounds (*Level of evidence I*).

Showering versus non-showering

The JBI (2008), review looked at three end points under this heading and concluded the following:

Infection: Pooled results of five RCT that compared the effects of showering to non- showering patients in the post-operative period indicated that there was no statistical difference in infection rate between the groups (OR 0.80; 95% CI 0.29-2.23).

Healing: No statistically significant difference in healing rate (OR 1.21; 95% CI 0.29-5.10) or incidence of wound dehiscence was reported between the groups.

Patient satisfaction: Two RCT reported that patients in the showering group experienced a sense of health and wellbeing derived from the hygiene and motivation of showering. Therefore based on the evidence the recommendation is that of showering if the patient prefers. (*Level of evidence I*).

Soaking versus standard treatment

The findings on soaking compared to standard treatment according to JBI (2008), were:

Infection: One comparative study with concurrent controls demonstrated no significant difference in the infection rates in episiotomy wounds that were soaked in sitz baths and those that were not. There was a statistically significant decrease in infection (P=0.017) and inflammation (P=0.034) in the wounds irrigated with a syringe and needle. However, it should be noted that the criteria of infection was subjective. The authors concluded that inflammation and infection could be reduced using irrigation.

Healing: Sitz baths did not significantly affect the healing of episiotomy wounds.
Pressure: Three RCT and one comparative study with concurrent controls were included. The eligible trials involved patients with lacerations, full thickness wounds, traumatic wounds and ulcers.
The argument against soaking is based on the argument against submersion in communal hydro therapy especially in patients with larger surface area burns (CDC, 2003: 67). (*Level of evidence I*).

The third element of wound cleaning is aseptic field. An aseptic field cannot be discussed without an understanding of asepsis. A brief overview of this understanding is given as a background.

The term asepsis (aseptic) means: 'free from pathogenic micro-organisms' (Merriam Webster Dictionary, 2014a). Aseptic technique is built on the premise of asepsis. Aseptic technique therefore is the practice of carrying out a procedure in such a manner that you minimize the risk of introducing contamination into a vulnerable area or contaminating an invasive device (Dougherty & Lister, 2011: 110; Rowley, Clare, Macqueen, et al., 2010: S4; Flores, 2008:36-37; Bree- Williams & Waterman, 1996:48), and it involves hand decontamination, use of a aseptic field, gloves and sterile equipment (Flores, 2008:37; Hart, 2007: 44-45; Preston, 2005: 541-542).

The aim of the aseptic technique is to prevent the transmission of microorganisms to wounds, or other susceptible sites, to reduce the risk of infection (Preston 2005: 541; Bree-Williams& Waterman, 1996: 48). Aseptic technique is traditionally divided into two different processes; surgical aseptic technique; and aseptic non-touch technique (ANTT) (Hart, 2007:43).
ANTT is based on the assumption that asepsis is the common aim of all clinical procedures that entail an infection risk; in other words, whether the procedure is invasive or complex (for example central venous catheter insertion or surgery) or superficial or simple (for example wound care), the aim is always to prevent introducing pathogenic micro-organisms into or onto the patient (Rowley, et al., 2010:S6).

According to Hart (2007: 43), surgical aseptic technique is mainly used in operating theatres, but is also appropriate in wards and other departments for invasive procedures such as the insertion of a central venous catheter. On the other hand, ANTT is used for simpler and less invasive procedures such as administration of intravenous drugs and has been advocated in the management of wounds (Rowley, et al., 2010:S9; Flores, 2008: 37; Hart, 2007:43; Preston, 2005: 541). Although the aims and objectives of the two processes are the same, the differences take into consideration the location and procedure being undertaken and the results of the risk assessment (Dougherty & Lister, 2011: 110; Hart, 2007: 44). For the purpose of this study ANTT was applicable according to the recommendations in the literature (Rowley, et al., 2010: S9; Flores, 2008: 37; Hart, 2007:43).

ANTT is a quality assured aseptic technique providing peer reviewed standard clinical guidelines which are implemented, monitored and evaluated by a standard implementation process (Rowley, et al., 2010: S5), and is recognised as the best practice example of aseptic technique in Epic 2 (Rowley & Clare, 2009: S18: Aziz, 2009: 29). ANTT is a simple and effective way of preventing contamination of the wound bed. Studies have demonstrated that it is a safe and effective technique. (*Level of evidence II*).

The discussion on aseptic field follows.

Aseptic field

Aseptic fields are considered important because they assist to promote or ensure the integrity of asepsis during clinical procedures by providing a controlled aseptic working space (Rowley, et al., 2010: S8). The authors clearly explain the difference in aseptic fields in relation to their purpose and management.

They state that there are two grades of aseptic field that require different management depending on whether their primary purpose is to promote or ensure asepsis: critical aseptic fields are used when key-parts, usually due to their size or number, cannot easily be protected at all times with covers and caps, or handled at all times by a non-touch technique (such as in PICC or urinary catheter insertion), or when particularly open, invasive or technical procedures demand large aseptic working areas.
In such cases, the main critical aseptic field requires to be managed as a key-part (in other words only equipment that has been sterilized and is aseptic can be introduced into the critical aseptic field). As a result, management of the critical aseptic field is relatively more complicated. A sub-type of critical aseptic field is the critical micro aseptic field. Traditional non-touch/clean techniques have protected key-parts by way of syringe caps, sheathed needles, covers or packaging.

This traditional, often understated approach is given new emphasis in ANTT v2 (version two), as the inside of such caps and covers have been sterilized and thus provide optimum all-encompassing critical micro aseptic fields for key-parts. General aseptic fields are used when key-parts can easily and optimally be protected by critical micro aseptic fields (above) and a non-touch technique. As a result, the main general aseptic field does not have to be managed as a key-part and is essentially promoting rather than ensuring asepsis (Rowley, et al., 2010: S8-S9). (*Level of evidence II*).

The fourth point under technique is glove usage:

Glove usage

The use of gloves is one of the key issues relating to aseptic technique. The purpose of wearing gloves is to reduce the risks of cross-infection from staff to patients and vice versa, to reduce transient contamination of the hands by micro-organisms that can be transmitted from one patient to another, and to protect users' hands from certain chemicals (Flores, 2008: 36). As with other infection prevention and control measures, the choice with regards to glove selection (sterile versus non sterile) depends on the procedure being undertaken and the potential consequences of contamination. Rowley, et al., (2010: S8), Flores (2008:36), and Hart (2007: 44), recommend that a comprehensive risk assessment should be undertaken to determine the most appropriate glove type for the task. Key-parts and key-sites are protected by the risk assessment. Key parts are described as the aseptic parts of the procedure equipment that require direct contact with aseptic key-parts of the patient, key-sites (wound), or any liquid infusion whilst key sites are wounds, including insertion sites (Rowley, et al., 2010: S8). The healthcare professional assesses whether s/he can perform the procedure without touching key-parts and key-sites directly. The assessments take into account the technical difficulty of the procedure and the competence of the practitioner.

Unlike the traditional paradigm, assessment of risk in ANTT does not take into account the patient's age or diagnosis as the strict aim of asepsis is the same for all patients (Rowley, et al., 2010: S8).
Flores (2008: 36), listed the indications for glove use as follows: invasive procedures; contact with sterile sites; contact with non-intact skin or mucous membranes; when handling sharp and contaminated instruments; all activities that carry a risk of exposure to blood; body fluids; secretions and excretions. In addition the WHO (2009:140), states that sterile gloves are indicated for any surgical procedure, vaginal delivery, invasive radiological procedure, performing vascular access and procedures, preparing for parental nutrition and chemotherapeutic agents. Examination or non-sterile gloves are indicated in clinical situations where the potential for touching blood, body fluids, secretions and excretions and items visibly soiled by body fluids are indicated (WHO, 2009:140).
The category for use of non-sterile gloves is subdivided into direct patient exposure and indirect exposure.

Dressing changes fall under direct patient exposure and non-sterile gloves are therefore indicated. In ANTT, if it is necessary to touch key-parts directly, then sterile gloves should be used to minimize the risk of contamination (Rowley, et al., 2010:S8; Gillespie & Fenwick, 2009:67; Flores, 2008: 36; Hart, 2007: 47; Preston, 2005: 544). If contaminated, key-parts provide a direct route for transmission of pathogens between the procedure and the patient (Rowley, et al., 2010:S8). Otherwise Rowley, et al., (2010: S8), Gillespie & Fenwick, (2009:67), and Hart (2007: 47), concur with WHO (2009: 140), that non-sterile gloves are usually the logical glove of choice. (*Level of evidence I*)

Furthermore, Flores (2008: 36), recommended that gloves must be worn as single-use items, and changed between different patients and between different care/treatment activities on the same patient. According to the author gloves must be put on immediately before an episode of care and removed as soon as the activity is completed; hands should always be decontaminated after glove removal; the application of hand disinfectants to gloved hands is not recommended as gloves are single-use medical devices and alcohol products have not been tested on latex or synthetic glove material, only skin (Flores, 2008: 36). Rowley, et al., (2010: S8), add that non-sterile gloves need to be stored appropriately and not moved from dirty to clean rooms.

In reviewing the literature one systematic review was found that appraised the evidence for suboptimal compliance of healthcare practitioners to standard/universal infection control precautions (Gammon, Morgan- Samuel & Gould, 2008). Thirty-seven studies were appraised. Twenty-four related to measuring practitioner compliance and thirteen studies were done that evaluated the effect of a research intervention on compliance from 1994-2006. The review found that practitioners fail to fully appreciate, the importance of standard precautions (include hand decontamination, the use of personal protective equipment, the safe use and disposal of sharps, decontamination of equipment and the environment, patient placement and linen and waste management) or the crucial role they play in staff and patient safety (Gammon, et al., 2008: 159). Compliance to standard precautions reduces the risk of cross infection (National Health and Medical Research Council (NHMRC), 2010: 21.), contributes to the reduction of healthcare-associated infection (Wang, Fennie, He, et al., 2003; Giramonti, Johnson-Robbins, Weatherwax, et al., 2000), and protects healthcare practitioners (Curran, 2001; O'Boyle, Henly & Duckett, 2001). Most research studies suggest that compliance with standard precautions is suboptimal (Gammon & Gould, 2005; Sax, Perneger, Hugonnet, et al., 2005; Ferguson, Waitzkin, Beekmann, et al., 2004). Generally, however, this body of evidence suggests that compliance to infection control precautions is unacceptably low (McCoy, Beekmann, Ferguson, et al., 2001).

Healthcare practitioners have been shown to practise selective, rather than universal or standard precautions resulting in unnecessary risks when engaging in contact with patients (Gammon, et al., 2008; Cutter & Jordan, 2004). Remarkably high rates of exposure to body fluids, the non-adherence with hand washing and limited use of gloves have been documented (Kuzu, Ozer, Aydemir, et al., 2005; Ferguson, et al,. 2004). Specifically, with respect to certain elements of standard precaution (for example sharps), compliance is good, whilst in some studies compliance with hand washing recommendations and glove use are noted as less positive and the use of masks and eye protection poor. However, Gammon, et al., (2008: 157), noted that compliance does improve following a structured intervention; but research fails to indicate for how long the intervention affects practitioner compliance, or whether compliance after a period of time returns to the norm.

The last point under technique is equipment which will be presented below.

Equipment

ANTT is achieved by using sterile products, while ensuring that the sterile component, for example, a syringe, does not come into contact with non-sterile surfaces (Hart, 2007: 44). The author further explains that equipment should be decontaminated following every usage to ensure the equipment is clean, free from dust and spoilage and acceptable to patients. In other words all materials used in the dressing procedure are required to be sterile as opposed to being just "clean". The Royal Marsden Hospital's (Dougherty & Lister, 2011:110), guideline on aseptic technique stipulates that all the equipment required for the procedure is available, should be checked to determine if it is available and, where applicable, is sterile (in other words that packaging is undamaged, intact and dry, that sterility indicators are present on any sterilized items and have changed or not changed colour where applicable). Friedman (in Friedman & Newson, 2011:191), also recommends that wherever possible sterile dressing materials should be used for wound care in patients with burns. However, it has been suggested that in some situations a 'clean' or 'wound field' technique might be more appropriate than a rigorous aseptic technique (Rowley, et al., 2010: S9; Gillespie & Fenwick, 2009:67; Preston, 2005: 544). A clean technique follows the same principles as aseptic technique, but sterile equipment, such as gloves and dressing packs, is not as essential. According to Hart (2007:44), ANTT means that when handling sterile equipment, only the part of the equipment not in contact with the susceptible site is handled.

In a study done by Bree- Williams & Waterman (1996), the variations in aseptic techniques used by nurses were examined. According to Bree- Williams & Waterman (1996: 49), the 'transfer technique' was a technique used to prevent the forceps which come into contact with the wound being returned to the sterile field on the trolley.

This was achieved by using one pair of forceps, referred to as the 'clean' forceps, to the transfer of sterile material from the trolley to a second pair of forceps, referred to as the 'dirty' forceps. These were used to clean and dry the wound if necessary and/or to carry out any procedure, after which they were discarded. The clean forceps and a third pair of forceps was used to apply the clean dressing. This no longer is common practice in the researcher's opinion as she personally has never witnessed this in clinical practice. The alternative technique given by Bree- Williams & Waterman (1996: 50), was the 'glove technique' which was a simpler method where nurses would don gloves for the procedure and this method still presently, remains common practice. This was confirmed by Blunt (2001: 35), who argued that most nurses prefer to use gloves and that this might be linked to the fact that gloves protect the wearer from infection. In the most recent review, Lloyd -Jones (2012: 396-399), stated that swabbing the wound using a gloved hand is preferred to using forceps.
Therefore the recommendation is that sterile instruments must be used for open, raw and infected wounds: clean instruments may however be used on healed wounds as the skin is already intact. (*Level of evidence V*) Further research is needed.

After discussing the various elements of wound cleaning it follows that the temperature of the wound and the temperature of the cleaning solutions be reviewed. This gave rise to Guiding question 5.

4.4.3.2 Guiding question 5: What are the ideal wound surrounding temperatures?

Science has recognised the role temperature plays in the wound healing process and therefore if a patient has a wound, it will heal far better if the wound temperature is kept as close to normal (homeostasis) as possible. McGuiness, Vella & Harrison (2004), described the impact of temperature in the wound bed in their study that examined the influence of dressing changes on wound temperature. According to McGuiness, et al., (2004:383), when the temperature of the wound bed falls below the core body temperature, healing can be delayed as a result of slow epithelial repair, lack of collagen deposition, a reduction in late phase inflammatory cells and fibroblast and a higher percentage of wound infections, all of which lead to an increased average hospitalisation stay of 2.6 days longer than for normothermic patients. According to the same authors, in vitro studies have demonstrated that 33°C is the critical level at which neutrophil, fibroblast and epithelial cell activity decreases. Conversely, studies have shown improved healing when wounds were warmed because of increased blood flow, oxygen tension; collagen deposition and immune cell function which have been cited as possible mechanisms. It is thus important that wound temperature be maintained.

No evidence based guidelines were found that focused on the temperature of the wound. Cochrane reviews done by Fernandez & Griffiths (2012, 2008, 2002), appraised different solutions used in wound cleaning, but did not specifically have the temperature of the cleaning solutions as an outcome of the review.

However, the authors in the latest update (2012:7), mentioned that a significantly higher infection rate in the saline group was reported in one trial (Angeras, Brandberg, Falk, et al., 1992), which could be attributed to the difference in the temperature of the irrigation solution used (tap water was at 37ºC whilst normal saline was at room temperature). No further discussion is given on the subject.

Two other reviews of the literature were found (Lloyd- Jones, 2012: 396-399; Magson-Roberts, 2006: 19-24), but were not systematic reviews. No information was given on the inclusion of trials in the review. The review by Magson-Roberts (2006: 19-24), referred to the study by Griffiths, Fernandez & Ussia (2001), where both saline and tap water were applied at room temperature.
Magson-Roberts (2006: 385), added that it was pertinent to mention that ideally, solutions should be used at body temperature to prevent a drop in wound bed temperature, which prevents the body's own cleaning agents (macrophages) from working effectively as referenced by Young (1995), in the review. Furthermore the Magson-Roberts (2006: 385), review added that if solutions are not used at body temperature, it can take forty minutes for the wound to return to normal temperature, and three hours for mitotic cell division to recommence (Thomas, 1990).
The review made a recommendation based on the study by Hampton & Collins (2003), that practitioners should warm fluids to body temperature prior to cleansing in order to maintain an optimum wound healing environment.

Likewise the review by Lloyd -Jones (2012: 396-399), found that studies alluded that wound temperature influences wound healing, with healing best at a body temperature between 36°C and 38°C, and delayed healing is demonstrated when the temperature falls below core body temperature or rises above 42°C. The author suggested that it is important to ensure that any solution used is warmed to body temperature.

A study done by McGuiness, et al., (2004:383-385), examined the influence of dressing change on wound temperature. Forty four patients were recruited providing 133 dressing episodes with a total of 266 wound bed temperature measures and 619 external dressing measurements. Most of the wounds were either caused by surgical debridement (n=25) or trauma (n=19). This study found that on average wound bed temperatures were lower than the 33°C threshold which is recommended for normal cellular activities. Wound bed temperatures dropped on average by 2.7^{o}C when cleansed with room temperature normal saline. This temperature loss was influenced by the time taken to perform the dressing change, but the correlation was not significant (r 0.067), also, the degree of temperature loss did not relate to the size of the wound. The authors reported that on average, dressing products covering the wound took twenty three minutes to return to the pre- procedural temperature. The type of dressing influenced the time taken to reach this temperature, but this was not significant.

Therefore, although this study is limited by sample size, it has provided preliminary findings that suggest that the time taken to do a dressing procedure, wound size and type of dressing used, have little influence on the amount of temperature lost during dressing changes. It is likely that wound bed temperature losses are associated with the temperature of the underlying tissue. It has been suggested that coupled with what is known about the time required by hypothermic cells to return to normal cellular activity, wound activity should resume within three to four hours post dressing change. Three to four hours multiplied by a number of frequent dressing changes may result in substantial delay in wound healing McGuiness, et al., (2004).
Thus the recommendation is that fluids should be warmed to body temperature prior to cleansing in order to maintain an optimum wound healing environment. (*Level of evidence I*).

Based on the results from the mentioned studies it is important to prevent heat loss in the wound. The degree of heat loss is also influenced by ambient room temperature. It has been recommended that an "ambient room" temperature be maintained during dressing changes (Kavanagh & de Jong for the International Society for Burn Injuries, 2004: A6). Although the literature recommends an ambient room temperature be maintained, no literature was found on the exact measurement of a dressing room temperature. However numerous studies in recent years have been done on the temperature in theatre to prevent wound infection and other complications. Various recommendations are made based on the literature as to what the best intra operative temperature of the operating room should be.

The American Society of PeriAnethesia Nurses (ASPAN) recommended that an ambient temperature is 20°C -24°C (Hooper, Chard, Clifford, et al., 2010: 354); the National Institute for Health and Clinical Excellence (NICE) (2008: 36), guidelines advocate 21°C; Sessler & Kurz (2008: 23), recommend temperature exceeding 23°C and the Association of PeriOperative Registered Nurses (AORN) (2006), suggest 20°C -25°C. Studies have shown that an ambient room temperature of 20°C -23°C has shown an approximately 50% incidence of hypothermia (Kurz, Sessler & Lenhardt, 1996:1213), whereas Gamal, Kassabany, Frank, et al., (2000:695), found that, at an ambient room temperature near 26°C, the incidence was 10%. Motamed & Bourgain (2014: 3), concurred stating that hypothermia is significantly more frequent when the ambient temperature decreases to 21°C. Based on the guidelines one can infer that 20°C -25°C is the recommended temperature for the dressing room. (*Level of evidence I*).

Moving from one grey area to another, the different dressings will be discussed. From an unbiased frame of reference the researcher opted to use only generic names so as to avoid advantaging or disadvantaging specific products.

4.4.3.3 Guiding question 6: What are the differences between dressings?

The number of different wound dressings has increased considerably over recent years and this has made selecting a dressing more complicated. A variety of concepts have been devised to structure and simplify the process involved in selecting a wound dressing, including the concept of wound bed preparation (WBP) and TIME. The selection of product will depend on the objective and the expected outcome. For instance if the wound has non-viable tissue present, the objective will be to remove the non-viable tissue, the expected outcome will then be a clean wound bed and the choice of product will be a debriding agent.

Dressings are classified in a number of ways depending on their function in the wound (debridement, antibacterial, occlusive, absorbent, adherence), type of material employed to produce the dressing (for example hydrocolloid, alginate, collagen) and the physical form of the dressing (ointment, film, foam, gel) (Boateng, Matthews, Stevens, et al., 2008: 2898).

The TIME framework was discussed in Guiding question 2 in 4.4.1.2. The application of TIME will now be discussed in relation to the objective and expected outcome during the implementation phase of the nursing process.

Tissue management

If on assessment, the tissue on the wound bed is non-viable a debridement of the wound bed is required in order to create a viable wound bed. Debridement is the removal of devitalised or non-functional tissue (Schultz & Dowsett, 2012:25; Dryburgh, Smith, Donaldson, et al., 2008: 2; Fletcher, 2007: 464; Schultz, Barillo, Mozingo, et al., 2004: 24; Keast, Bowering, Evans , et al., 2004:S2), and must be clearly separated from the act of cleansing, which is defined as the removal of dirt (loose metabolic waste or foreign material) (European Wound Management Association (EWMA), 2013: S4).

Furthermore, debridement does not encompass revision of the wound, resection of functional tissue or amputation (EWMA, 2013: S4). Debridement may be achieved by a variety of methods including: surgery; bio- surgical (larvae) debridement; autolytic debridement; mechanical debridement; chemical debridement and enzymatic debridement (Brown, 2013: 17; Dryburgh, et al., 2008: 2). As from 1970 it has been proposed that early excision should be carried out on all burns, including partial thickness injuries (Janzekovic, 1970). In a study that profoundly impacted on the care of burns patients, Janzekovic (1970: 103-108), demonstrated that early excision of all wounds within the first 3–5 days of injury, followed by grafting, reduced infection rates and improved survival compared with conservative management using topical antimicrobials plus excision in the second or third week.

Since then thousands of burn patients have been evaluated, adding to a large body of evidence to support the use of early debridement.

While widespread agreement exists concerning the necessity of debridement, fewer consensuses exist concerning the optimal technique for removing necrotic tissue from the wound bed. Selecting the optimal technique for debriding a specific wound is influenced by multiple factors, including the type and volume of necrotic tissue, the presence of underlying infection or bacterial bio-burden, wound size, pain associated with the technique, presence of comorbid conditions including sepsis, vascularity of the wound and adjacent tissue, patient preference, cost (Ramundo & Gray, 2008:274), as well as availability of theatre time.

Surgical debridement is defined as a procedure performed under general anaesthesia, using various surgical instruments (EWMA, 2013: S31). EWMA further explains that the indications for surgical debridement is a solid layer of necrotic tissue, when excision and immediate grafting are considered superior to other methods of reconstruction and where there is a clear demarcation line between viable and non-viable tissue. Presumed involvement of the deep structures and complications are relative indications for surgical debridement and surgical debridement may also be relevant in cases of severe wound infection according to EWMA (2013: S31).

Furthermore, surgical debridement may be achieved by the aggressive excision of all devitalised tissue using surgical techniques while bio-surgical or biological debridement is the use of sterile larvae (maggots) of the *Lucilia sericata* species of green bottle fly that is applied to a sloughy wound (Strohal, Apelqvist, Dissemond, et al., 2013: S22). The larvae are capable of producing powerful proteolytic enzymes that destroy the dead tissue by liquefying and ingesting it; healthy tissue in the wound bed is not damaged and, although there are aesthetic considerations, larvae are increasingly being used for wound debridement (Strohal, et al. 2013: S22; Dryburgh, et al., 2008:3). Surgery and bio-surgical debridement is performed by surgeons and are outside the scope of the nursing practice.

On the other hand, sharp debridement is a minor surgical bedside procedure that involves the excision of small quantities of dead tissue by a clinician using scissors or a scalpel (EWMA, 2013: S31; Dryburgh, et al., 2008:3). The indications for sharp debridement are similar to surgical debridement, but are less aggressive and do not require anaesthesia (EWMA, 2013: S31). In some countries such as the United Kingdom, Canada and the United States of America clear regulations are in place that allows wound care nurse specialist to carry out sharp debridement (Santos, de Oliveira & da Silva, 2013:185; Price & Young, 2013:71; Rodd- Nielsen, Brown, Brooke, et al., 2011: 10). The prerequisite is that nurses are trained and qualified on the technique.

In South Africa the Scope of practice of registered nurses Chapter 2 (j) of Regulation 2598 (SANC. 1978:Act 50 of 1978) is vague, stating that the registered nurse is responsible for the "facilitation of the healing of wounds" (www.sanc.co.za/regulat/reg-scp.htm), but does not specify whether the nurses are allowed to use sharp debridement or more conservative forms of debridement like autolytic, enzymatic, mechanical and chemical. Facilitation of wound healing implies that the nurses remove barriers to healing and promote healing through the application of dressings but no clear boundary is in place. The Acts or Omissions regulation (R387 as amended) (www.sanc.co.za/regulat-act.htm), does not address it either and yet it is routinely carried out by nurses.

Regulation 2418 (Regulation relating to the keeping, supply, administering or prescribing of medicines by registered nurses) (www.sanc.co.za/regulat/Reg-med.htm), states that an authorised nurse may prescribe unscheduled medicine or any medicine listed in Schedule1, 2, 3 or 4 of the Medicine Control Act provided they have been authorised and certified to do so or the relevant institution has authorised the act of prescribing or administering the medication. An unscheduled medicine is any medication or related substance not listed on any Schedule of the Medicines Control Act (R2418). According to the Department of Health (R674 in Government Gazette No 36827, dated 13 September, 2013), hydrocolloids, hydrogels and film dressings are not listed and are therefore not scheduled.
The application of different dressings that debride will now be discussed under the different types of debridement they are responsible for.

Autolytic debridement

It is a highly selective process involving macrophages and endogenous proteolytic enzymes, which liquefy and spontaneously separate necrotic tissue and eschar from healthy tissue (Schultz, Sibbald, Falanga, et al., 2003: S9). Over time, naturally occurring enzymes will eventually break down and dissolve dead or sloughy tissue in wounds. This natural process is promoted by the maintenance of a moist environment through the use of dressings and topical agents (for example hydrogels, semi-occlusive and occlusive wound dressings) that enhance the environment for debridement by phagocytic cells and can create an environment capable of liquefying slough and promoting tissue granulation (Dryburgh, et al., 2008:3; Schultz, et al., 2003: S9).

The market is saturated with various types and brands of dressings and for the purpose of this study the generic class of dressings will be discussed.

In a Cochrane review done by Wasaik, Cleland, Cambell, et al., (2013), titled "Dressings for superficial and partial thickness burns", hydrogels, hydrocolloids and film dressings are reviewed in the management of burn wounds (Wasiak, et al., 2013: 1-85).

A hydrocolloid is defined as a dressing typically consisting of an absorbent layer of gel on a semi permeable film or foam that promotes rehydration and autolytic debridement of wounds (Wasaik, et al., 2013: 3; Queen, 2009: 2; Thomas & Loveless, 1997: 1). Hydrogel dressings, on the other hand, are high water content gels containing insoluble polymers, they provide high water content and rehydrate the wound and facilitate autolysis (Flanagan, 2013:287; Wasaik, et al., 2013: 3). Overall Wasiak, et al., (2013), found that both the quality of trial reporting and trial conduct was generally poor and meta-analysis was largely precluded due to study heterogeneity or poor data reporting.
In the context of this poor quality evidence it was found that burns treated with hydrogels and hydrocolloid dressings appear to heal quicker than those treated with the usual care of Silver sulphadiazine (SSD) (Wasiak, et al., 2013). Therefore nurses involved in the management of burn wounds could prescribe and administer hydrogels and hydrocolloid dressings for the debridement of burn wounds provided they have been authorised and certified to do so or the relevant institution has authorised the act of prescribing or administering the dressing. (*Level of evidence I*)

An alternative form of debridement is achieved through the use of medical grade honey.

According to the Wound Healing Association of South Africa (WHASA) classification system this form of debridement is classified as 'other' (Mulder, 2011: 32), but according to Acton & Dunwoody (2008:S38), medical honey maintains a moist environment and therefore aids autolytic debridement. For this reason the researcher chose to discuss the use of medical honey under the heading of autolytic debridement. In a Cochrane review done by Jull, Rodgers & Walker (2008), on honey as a topical treatment for wounds with the aim to determine whether honey increases the rate of healing in acute wounds (burns, lacerations and other traumatic wounds) and chronic wounds (venous ulcers, arterial ulcers, diabetic ulcers, pressure ulcers, infected surgical wounds).
The authors concluded that honey may improve the healing time in mild to moderate superficial and partial thickness burns compared with some conventional dressings but, there is insufficient evidence to guide clinical practice in other areas (Jull, et al., 2008). Therefore in relation to burns, honey is a more suitable dressing than SSD. (*Level of evidence I*).

Another method to remove necrotic tissue is enzymatic debridement.

Enzymatic debridement

Enzymatic debridement is another method of removing non-viable tissue from the wound bed. Topical enzymatic preparations are applied to moist (or moistened) devitalised tissue; such preparations include: streptokinase/ streptodornase, collagenase, papain or urea, and a combination of fibrinolysin and deoxyribonuclease (Dryburgh, et al., 2008: 4).

A Cochrane review done by Dryburgh, et al., (2008), explored different methods of debridement in surgical wounds and concluded that there is a lack of large, high quality published RCT evaluating debridement *per se* or comparing different methods of debridement for surgical wounds, to guide clinical decision making (Dryburgh, et al., 2008: 2).

However, another systematic review done by Ramundo & Gray (2008), explored nine studies published between January 1960 and February 2008 which compared enzymatic debridement with a petrolatum-based ointment, placebo ointment, autolytic debridement, surgical excision, silver sulfadiazine, or alternative enzymatic agents (papain-urea and trypsin/chymotrypsin) in pressure ulcers, leg ulcers, and partial- thickness burn wounds. Ramundo & Gray (2008: 279), concluded that collagenase ointment is more effective than placebo (heat inactivated ointment or petrolatum ointment) for debridement of necrotic tissue from pressure ulcers, leg ulcers, and partial-thickness burn wounds. Limited evidence suggests that treatment of partial-thickness burn wounds in children with collagenase ointment may require an undetermined time of treatment with surgical excision and that a combination treatment may reduce the need for surgical excision. The authors added that only one study reported wound healing outcomes and time to complete debridement and revealed that treatment of partial-thickness burns covering less than 25% of total body surface area healed more quickly using collagenase as compared to silver sulfadiazine (Ramundo & Gray, 2008).
It can therefore be concluded that enzymatic debriding agents are an effective alternative for removing necrotic material from pressure ulcers, leg ulcers, and burn wounds and that enzymatic agents may be used as the primary technique for debridement, especially when alternative methods are not an option. They do caution that care should be taken to avoid any products containing metal; including silver dressings when using enzymatic debriding agents because they diminish the biologic activity of collagenase and papain-urea and that different enzymatic agent should not be combined (Ramundo & Gray, 2008: 279).

According to the South Africa electronic package inserts (www.home.intekom.com/pharm/knol/iruxol.html), the only listed enzymatic debriding agent as per the Wound Healing Association of South Africa's classification system (Mulder, 2011: 32), is Schedule 1 and means that nurses are allowed to prescribe and administer the product in accordance with Regulation 2418. (*Level of evidence I*).

The next form of debridement for discussion is chemical debridement.

Chemical debridement

The use of chemical agents remains controversial due to its detrimental effects on the process of healing. A range of chemical agents, including hypochlorites such as EUSOL (Edinburgh University Solution of Lime) and Dakin's Solution (sodium hypochlorite), hydrogen peroxide and iodine, have been used to promote debridement of wounds (Dryburgh, et al., 2008: 4). The International Society for Burn Injuries warns that extreme caution should be exercised when using solutions that have been shown to be toxic to cells (Kavanagh & deJong, 2004:4). (*Level of evidence V*).

Another form of debridement to be discussed is mechanical debridement which involves physical rather than chemical or autolytic means of debridement.

Mechanical debridement

Mechanical methods of debridement are non-selective and may result in damage to healthy tissue; these methods include: wet to dry debridement; wound cleansing debridement and whirlpool debridement (Sibbald, Goodman, Woo, et al., 2011: 65; Dryburgh, et al., 2008: 4; Schulz, Sibbald, Falanga, 2003: S11).

Each method will be discussed individually.

Wet to dry debridement

The wet to dry method of debridement involves the application of a saline-soaked gauze dressing to a wound (Sibbald, et al., 2011: 65; Dryburgh, et al., 2008: 4; Dowsett & Newton, 2005: 63; Schulz, et al., 2003: S11). The moist dressing induces separation of the devitalised tissue and, once dry, the dressing is removed, together with the slough and necrotic tissue. This process is continued until all the devitalised tissue is removed (Strohal, et al., 2013: S10). This is reported to be a painful procedure and may damage healthy tissue; fibres may be left in the wound and the dressing does not provide a barrier against bacterial contamination (Dryburgh, et al., 2008: 4; Schulz, et al., 2003: S11). This method of debridement as a dressing method is often unintentionally used by nurses for whom the choice of secondary dressing is gauze and when the dressing is removed, the wound is unintentionally debrided.

Wound cleansing debridement

Wound cleansing debridement involves irrigating a wound with a continuous or intermittent flow of fluid delivered under high pressure (Dryburgh, et al., 2008: 3). The force of the fluid is between 8 and 12 pounds per square inch (psi), and is sufficient to remove devitalised tissue and wound bacteria; newer wound cleansing systems use pressurized saline delivered via a nozzle at between 12,800 and 15,000 psi (Dryburgh, et al., 2008: 4; Schulz, et al., 2003: S11), but bacteria may be driven even further into soft tissue with this technique (Schulz, et al., 2003: S11). Irrigation was favoured as per the previous CDC recommendation under wound cleansing.

Whirlpool debridement and bath soaks

Whirlpool debridement is used for large wounds on the trunk or extremities. The affected person is immersed in a whirlpool bath, where the vigorous action of the water and its hydrating effect loosens the surface bacteria and devitalised tissue, and allows for these to be washed away (Dryburgh, et al., 2008: 4; Schulz, et al., 2003: S12). This technique is suitable for necrotic wounds at the inflammatory phase but not for granulating wounds where fragile endothelial and epithelial cells may be removed (Schulz, et al., 2003: S12). It may also increase the risks of auto-contamination which could spread infection to susceptible areas such as the toe webs, nail folds, and skin fissures (Kavanagh & de Jongh, 2004: A4; Schulz, et al., 2003: S12). For patients at increased risk of infection (those with greater than 25% burn or with invasive devices) hydrotherapy should be used with caution (Weber & McManus, 2004: A19).

Another form of debridement addressed in the literature is de-roofing blisters in patients with burns through mechanical force.

De-Roofing blisters

Burn blisters are a common occurrence in the management of burn wounds as they are hallmark sign of partial thickness burns (Cleland, 2012: 374). Yet despite the blister's typical presence in burns the debate surrounding its management is ongoing.

The argument for the preservation of the burns blister is based on the natural biological protection afforded to the wound with the intact blister and the wound healing benefits of the blister fluid; the arguments in favour of debriding or de-roofing the blister focus on the components of blister fluid that are detrimental to wound healing and the infection potential associated with intact blisters (Sargent, 2006: 66; duKamp, 2001: 219-220). Even in burn centres and trauma departments across the country there seems to be no universal standard in the management of burn blisters. The arguments in the literature for or against the debridement of blisters focus on infection, healing, pain, patient comfort and functional impairment. Swain, Azadian, Wakeley, et al., (1987), conducted a controlled trial of 202 people with partial thickness (dermal) burns. In this study, randomisation was unclear. There were two treatment groups: aspirated de-roofed blisters group and an intact blister group. The intact blister group was left for ten days before burn blister fluid was aspirated for analysis. The study assessed infection rates and pain scores. The incidence of infection (bacterial colonisation) in the intact blister group was 14% compared with 76% in the de-roofed blister group ($p<0.05$).

Aspiration of fluid (in the intact blister group at 10 days) reduced pain in 34% of participants compared with 0% in the de-roofed group. De-roofing worsened pain in 43% compared with 19% in the aspiration group (Swain, et al., 1987: 181). The conclusion therefore was that blisters be left intact.

A review of the literature by Flanangan & Graham (2001: 41-45), concluded that empirical evidence over the last fifty years both supports and refutes the routine debridement of blisters. Authors such as Williams (2002: 514-521), and Pankhurst & Pochkhanawala (2002: 81-108), recommend that small blisters can be left intact, but as a general rule, blisters should be debrided and the wound dressed. The most recent published review was done by Sargent (2006: 66-81), and concluded that it may be worthwhile to consider healing rates associated with different dressing applications because they are an indirect measure of healing in intentionally de-roofed versus intact blister management in a partial thickness burns. Sargent (2006:78-79), furthermore created guidelines for the management of burns based on the findings from the review as presented in table 4.8.

Table 4.8 Guidelines for Evidence Based practice of blisters (Sargent, 2006).

Guideline	Level of evidence
1. Consider blister size	
Small blisters (<6mm) may be left intact because they are unlikely to rupture spontaneously, damage underlying tissue, or impede healing.	3
Large blisters (>6mm) should be debrided because they are more likely to rupture spontaneously.	3
Debride large blisters to prevent mechanical pressure on underlying tissue and exposure of wound bed to blister fluid with associated complications.	3
2. Consider blister type	
Thin- walled blisters should be debrided because they are likely to rupture and occur on hair lined surfaces which increases the risk of infection.	3
Thick – walled blisters on palms and soles of feet may be left intact as they are less likely to become infected and debridement is associated with a high level of patient discomfort and limited mobility.	3
3. Use infection- prevention strategies	
Blisters should be debrided to remove nonviable tissue from the wound bed and decrease the likelihood of wound infection.	
Blisters should be debrided to assist clinicians with proper visualisation of the wound bed and to allow accurate assessment of the depth of wound to determine appropriate treatment.	3
Blisters should be debrided to evacuate blister fluid that may suppress local and systemic immune function.	3 3
4. Use wound healing strategies	
Blisters should be debrided as non-viable tissue in the wound bed impedes healing and should be removed.	2
Maintain a moist wound bed for the healing of partial thickness burns.	
A moist healing environment should be provided via biosynthetic, biologic and or synthetic dressings to optimize healing.	1
Use a topical antibiotic ointment and petroleum impregnated gauze that does not cause mechanical trauma to the wound bed with removal is appropriate when the use of biosynthetic, biologic and or synthetic dressing is not feasible.	1 3
SSD should be the choice of last resort as its use allows debris accumulation in the wound bed and causes mechanical trauma to fragile healing cells with frequent dressing changes.	1

5. Consider functional and aesthetic outcomes Blisters should be debrided when their presence impedes the functional ability of the patient. Blisters should be debrided to allow for faster wound healing with associated decrease in scarring. Use temporary skin substitutes with matrix layer should be used for debrided partial thickness burn to reduce scarring.	 3 2 1
6. Optimize patient comfort Small blisters may be left intact as a natural method of pain control. Use biologic, biosynthetic and or synthetic dressings that require minimal dressing change for debrided wounds to optimize patient comfort.	 3 1
7. Strive for ease of care Use blister management strategies that involve debridement followed by application of dressings which do not require frequent change, such as biologics, biosynthetic and synthetics, to increase ease of care.	 1
8. Improve cost effectiveness Use biosynthetic dressings in debrided partial thickness burns, which may present a higher upfront price but have been shown to reduce the overall cost of care due to expedited healing, less frequent dressing changes, decreased patient discomfort with lower cost of narcotic use, and lower rates of hypertrophic scarring associated with decreased need for additional treatments and procedures.	 1

Strength of evidence criteria

1= Evidence from well designed, randomised controlled trials
2=Evidence from observational, controlled trials, with or without randomisation
3=Evidence from expert opinion and case studies documented in published clinical reviews.

(*Level of evidence I*)

Infection management

The survival rate of burn patients has improved substantially in recent years. This is partially due to advances in intensive care management in specialized burn centres, advances in fluid resuscitation, nutritional support, pulmonary care, burn wound care and infection control practices (Rafla &Tredget, 2011:6). However, infection in the burn patient is a leading cause of morbidity and mortality and remains one of the challenging concerns for the burn team (Ribeiro, Heath, Kierath, et al., 2010: 9; Weber & McManus, 2004: A16). Rafla & Tredget (2011:6), concur stating that in patients with burns over more than 40% of the total body surface area (TBSA), 75% of all deaths are currently related to sepsis from burn wound infection or other infectious complications and/or inhalation injury. The importance of preventing infection has been recognized and is widely accepted as a standard of care through the use of antimicrobial dressings.

The treatment options with antimicrobial dressings will now be described.

The wound care market is flooded with many varying dressings for the management of partial thickness burns. Based on the hierarchy of included studies it was found that the guidelines explored on the selection of dressing was not evidence-based with Silver sulphadiazine (SSD) recommended as a dressing of choice, including that of the South African Burn Society (2012). Furthermore, SSD is still on the (World Health Organisations (WHO) Essential Model list (2013), as a recommended dressing. However, recent studies are indicating that the use of SSD leads to increased pain scores, longer time to heal rates, with more dressing changes and more nursing time required when compared to other dressings (International consensus document, 2012). In a Cochrane review of twenty six trials it was found that SSD has no effect on infection and slows down healing in patients with partial thickness burns (Storm-Versloot, Vos, Ubbink, et al., 2010 :2). The use of SSD should therefore be reduced (limited) in management of burn wounds as SSD was consistently associated with poorer healing outcomes than other dressings (Wasiak, et al., 2013 :2; Storm-Versloot, et al., 2010 :2 ; Atiyah, Costagliola, Hayek, et al., 2007 : 146). (*Level of evidence I*).

Alternative dressings to SSD have been explored and one Cochrane review specifically addressed 'Dressings for superficial and partial thickness burns' by Wasaik, et al., (2013). A total of thirty randomised controlled trials were included in the review and it was concluded that superficial and partial thickness burns may be managed with hydrocolloid, silicon nylon, antimicrobial silver containing dressings, polyurethane film and biosynthetic dressings. A list of dressings that are available on the South African market has been compiled by the Wound Healing Association of South Africa (WHASA), which made up of experts in the field (Mulder, 2011:32). It should be noted that the list merely sets out to inform which dressings are available and is not a list compiled on recommendation of evidence.

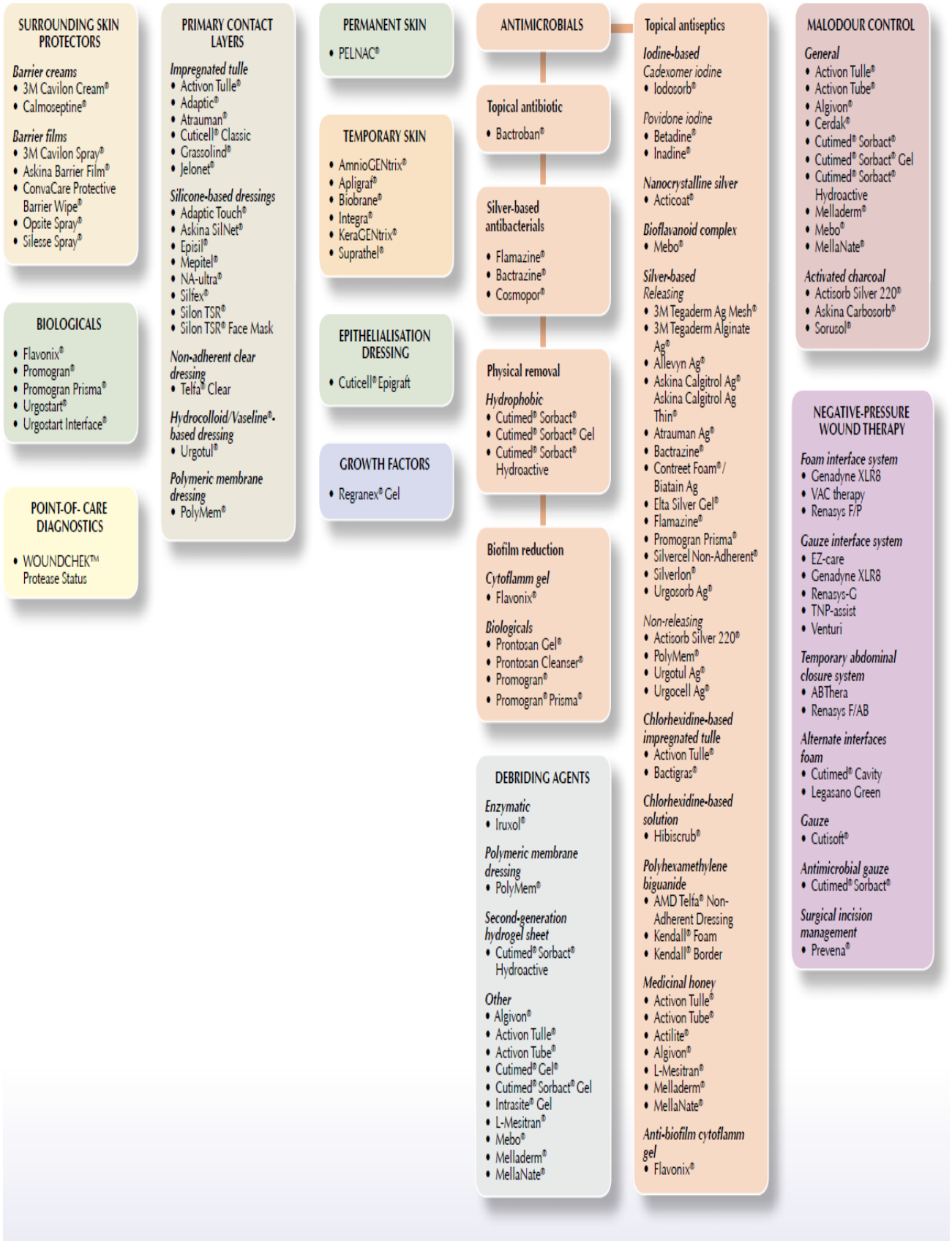

Figure 4.4 (a) WHASA Classification of dressings (Mulder, 2011).

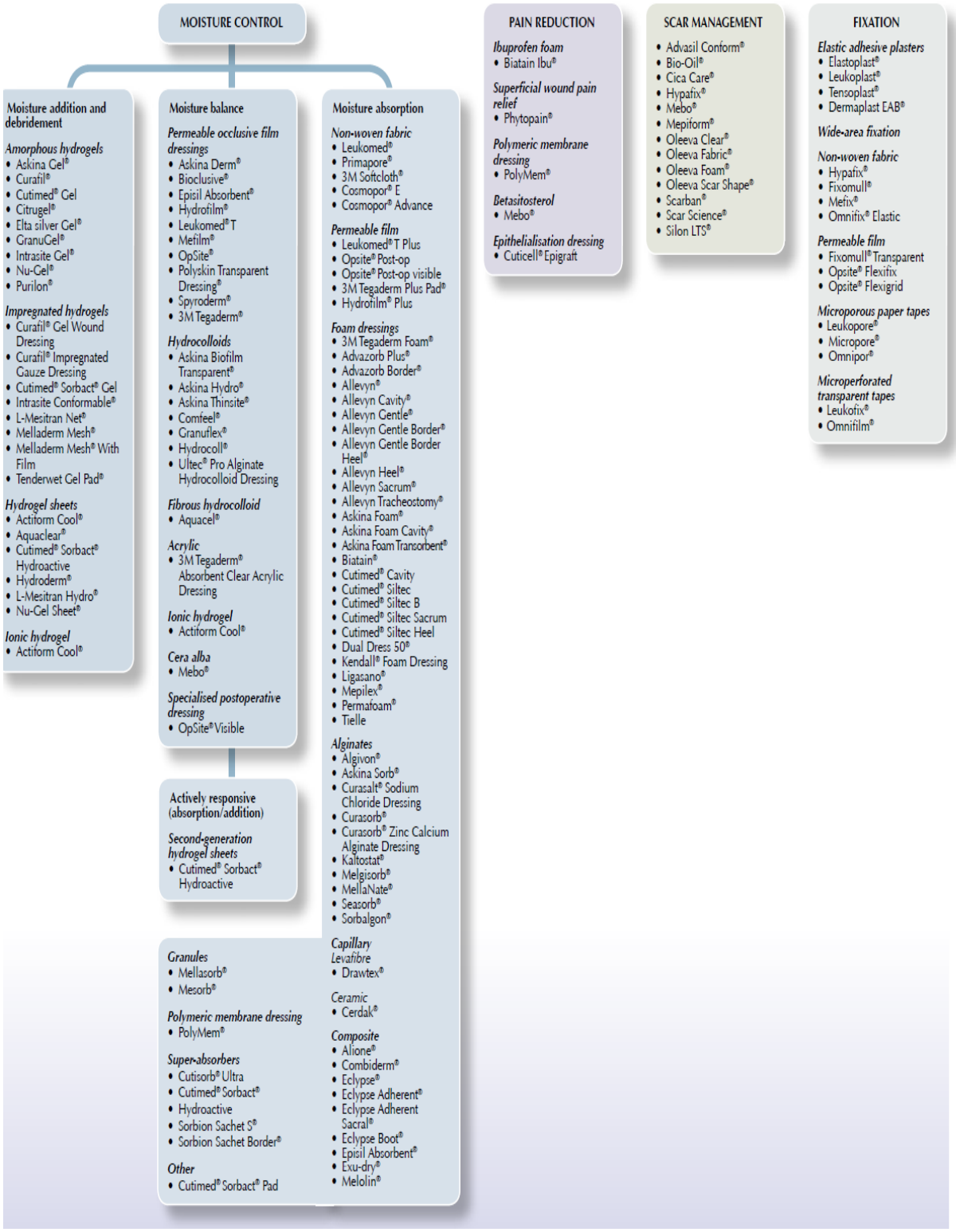

Figure 4.4 (b) WHASA Classification of dressings continued (Mulder, 2011).

Another class of dressings not mentioned in the Wasiak, et al, (2013), review is the honey dressings. One Cochrane review done by Jull, Rodgers & Walker, (2008), was found as well as two other systematic reviews (Vandamme, Heyneman, Hoeksema, et al., 2013 ; Moore, Smith & Campbell, 2001), which were published in peer reviewed journals. Jull, et al., (2008 :2), concluded that topical honey is better than conventional dressings for healing mild to moderate superficial and partial thickness burns. Moore, et al., (2001), concurred with Jull, et al., (2008), however all the reviews done on the use of honey in the management of burns are unanimous that there is a paucity of literature on the topic and that the clinicians should take the shortage of research on the topic into consideration when interpreting the results.
(*Level of evidence I*)

Moisture balance management

Achieving the correct moisture balance at the wound bed is important, as too much or too little moisture is disadvantageous for wound healing. Therefore, moist wound healing forms the basis of modern wound bed preparation. Not only does it improve healing, but it also reduces pain and discomfort as well as infection rates (Sarabahi, 2012). Controlling or balancing the moisture balance should be a priority for nurses.

Exudate management consists of two related phases of direct and indirect management according to Vowden & Vowden (2002):

1. Direct
    - The use of absorbent dressings.
    - The use of compression and/or elevation to eliminate fluid from the wound site.
    - The use of Negative Pressure Wound Therapy (NPWT).
2. Indirect
    - Control of infection or bacterial load.
    - Control of oedema by systemic therapy such as the treatment of heart failure.

The choice of dressing is based on the level of exudate. There are a variety of dressing products available for the management of exudates ranging from foams, hydrocolloids, alginates, hydrofibres, cadexomer iodine to capillary dressings.

The World Union of Wound Healing Societies (WUWHS) (2007a: 7), compiled a table that paired the aim of the dressing with the strategy or action required.

See table 4.9 below.

Table 4.9 Strategies for achieving moist wound environment (WUWHS, 2007a: 7).

Aim	Strategies
Increase wound moisture	Choose dressing type to conserve or donate moisture
	Use thinner (less absorbent) version of current dressing
	Decrease dressing change frequency
Maintain wound moisture	Continue current dressing regimen
Reduce wound moisture	Use thicker (more absorbent) version of current dressing
	Change to dressing type of greater fluid handling capability
	Add or use higher absorbency secondary dressing
	Increase frequency of primary and/or secondary dressing change

Negative pressure wound therapy (NPWT) is another form of exudate management. This is a term used to describe a pressure that is below normal atmospheric pressure (Gustafsson, Sjögren & Ingemansson: In: European Wound Management Association (EWMA), 2007: 2). NPWT is a non-invasive technique entailing exposure, either continuously or intermittently, of a wound to sub-atmospheric pressure (Best Practice Statement: Gauze-based Negative Pressure Wound Therapy, 2008: 6; Blume, Walters, Payne, et al., 2008: 631), with the aim of managing the wounds and promoting healing (Dumville & Munson, 2012: 2). Sub-atmospheric pressure is achieved by removing gas particles (air) from a sealed area (the wound site) using a suction pump (Best Practice Statement: Gauze-based Negative Pressure Wound Therapy, 2008: 6; Dowsett & Newton, 2005:66). Negative pressure wound therapy is based on the generation of sub-atmospheric topical air pressure to eliminate the presence of exudate from the wound bed, reduce oedema, and increase blood flow (Blume, et al., 2008: 631; Okan, Woo, Ayello, et al., 2007: 50). In the case of burns, NPWT is used to help the drainage of excess fluid and increase localised blood flow. It has been suggested that the action of NPWT may result in the burn being supplied with increased oxygen and nutrition which could promote healing (Dumville & Munson, 2012: 2).

None of the reviewed guidelines from the different Burns Societies mentioned NPWT as a treatment option for the management of burn wounds. The WUWHS (2008:9), consensus document recommends the use of NPWT in burns stating that it will facilitate the prevention of the progression of partial-thickness burns injuries; it may also be used for excised full-thickness burns prior to skin grafting. The Best Practice Statement (2008:8), also supports the use of NPWT on burn wounds.

Contrarily, the Wound Healing Association of South Africa's (WHASA) consensus document states that NPWT should **not** be used in burns (Naude, 2009:3). The most recent literature found contradicts the recommendation for using NPWT in burns, stating that not enough evidence is available to inform guidelines. One Cochrane review was found (Dumville & Munson, 2012), that explored 'Negative pressure wound therapy for partial-thickness burns'. The searches for this review update retrieved twenty seven references, none of which met the inclusion criteria. The original searches for this identified sixty references, forty nine of which were set aside on the basis of the abstract alone. Independent scrutiny of the titles and abstracts by two review authors identified ten potentially relevant articles. Of these the small sample size and preliminary analysis consisted of only twenty three patients. The review concluded that no data from completed RCT on NPWT for partial-thickness burn injury were available, which highlights the fact that conclusions cannot be drawn on the merits - or otherwise - of this treatment. In other words, NPWT is neither indicated nor contra- indicated for the management of burns; much more research is needed (Dumville & Munson, 2012). Orgill & Bayer, (2011: S110), and Gregor, Maegele, Sauerland, et al., (2008: 195), concurred that no robust clinical trial has been conducted to assess theoretical oedema reduction, improved tissue perfusion, or result in less scarring with negative- pressure wound therapy in burn wounds, but the present body of evidence is small and insufficient to clearly indicate an additional clinical benefit of NPWT compared with conventional wound therapy. The absence of evidence does not mean the absence of effectiveness. Therefore, the use of NPWT is neither recommended or contra indicated. (*Level of evidence I*).

In the past, wounds were left exposed in order to dry and form a scab. This method is still practised regularly in chronic wounds but less so in burns. The researcher wanted to explore what the literature said about this practice and this gave rise to the following review question.

4.4.3.4 Guiding question 7: Open vs. closed method of dressing?

Despite the advances in wound management and the acceptance of the concept of moist wound healing the debate of open or closed method of dressings is ongoing with face burns for example being managed using an "open" method whilst the rest of the body is "closed".

In reviewing the literature it is clear that moist wound healing is advantageous for wound healing (Schultz & Dowsett, 2012; Okan, et al., 2007; Bolton, 2007; WUWHS, 2007a; EWMA, 2004; Vowden & Vowden, 2002; Wiechula, 2003). The disagreement lies in the historical views as wound management has advanced. Demling & De Santi (2004), gives an overview of the evolution of open and closed technique in wound management: Prior to the late 20th century, it was believed that wounds healed better if exposed under a "scab". This process produced surface desiccation and eschar formation which is now known to deepen the wound, but was then thought to protect the wound.

This concept remained popular for wound care until the mid-20th century (and even longer for the burn wound). One exception was a report in the early 19th century where burns and wounds were managed with the wound being immersed under water, yielding good healing results. This concept was not accepted however as a standard of care. According to Demling & DeSanti, (2004), Allen and Koch in 1942 popularized a petrolatum gauze and dressing closure method, which decreased the surface drying. The primary cause of death from burns at that time was septicaemia from burn infection and remained so, and therefore there were many who returned to exposure, especially with the advent of a topical antibiotic cream by Fox 1969 (Silver Sulfadiazine) and Moncrief 1971 (Sulfamylon). The introduction of silver nitrate soaks by Moyer in 1965 required an occlusive dressing and was the first time a moist wound healing method was used on burns according to Demling & DeSanti, (2004). However, the main concept in burn care was not wet or dry, but rather the control of infection by topical antibiotics. A landmark study by Winter (1962: 293-294), demonstrated that partial thickness wounds re-epithelialized more rapidly under occlusive dressings with the reason for this being that occlusive dressings maintained a moist wound surface which accelerated the re-epithelialisation process.

In acute wounds, a balanced moist surface facilitates the action of growth factors, cytokines, and chemokines, thus promoting cellular growth and the establishment of a provisional wound matrix according to Okan, et al., (2007:40). In contrast, excess moisture in the wound bed can impair the healing process and damage the surrounding skin, leading to peri-wound maceration; furthermore if the excess moisture is left unchecked, healing can be impeded, and there may also be subsequent breakdown and further deterioration of the wound bed according to the same authors. Conversely, inadequate moisture related primarily to exposure of the wound environment to air, promotes wound desiccation, necrosis, and eschar formation and results in poorer wound healing rates; thus the formation of eschar slows the ability of regenerative cells (keratinocytes) to migrate from the wound periphery into the wound centre (Okan, et al., 2007: 40). Therefore the ideal environment for wound healing is neither wet nor dry, but rather a moist environment.

A moisture-balanced wound environment is maintained primarily by modern dressings (WUWHS, 2007a:7), with occlusive, semi-occlusive, absorptive, hydrating, and haemostatic characteristics, depending on the drainage and other wound bed properties (Sibbald, et al., 2011:69). Bolton (2007: 23-29), confirmed the utility of occlusive dressings. Bolton (2007), explored the evidence supporting an operational definition of moist wound healing (MWH) and the healing outcomes associated with that operational definition as compared to non-moist wound healing modalities. The Bolton (2007), study focused on the water vapour transmission rate (WVTR) of wound dressings as this had been used as a reliable, valid measure of moisture retention capacity of wound dressings in the past. According to Bolton (2007), correlating the operational definition of WVTR with healing implies that lower dressing WVTR is a strong ($\alpha < .001$) linear predictor of faster healing for both full-thickness ($r2 = 0.66$) and partial-thickness ($r2 = 0.57$) wounds during their most dynamic healing phases during the first week after receiving acute wounds.

WVTR levels can be categorized as (1) “low” such as hydrocolloid or film dressings with WVTR levels of 11 to 13 g/(m2 h), (2) “medium” such as foam dressings with WVTR levels averaging 33 g/(m2 h), and (3) “high” levels averaging 67 g/(m2 h), such as those observed for gauze or impregnated gauze dressings (Bolton, 2007: 24). The ideal is to get the correct balance of moistness.

According to the hierarchy of evidence for this study the researcher first reviewed guidelines and discovered that some guidelines were non-specific on moisture control or advocated the use of SSD which traditionally is placed on gauze (Australian and New Zealand Burn Association, 2010; 49). Gauze, even though a closed technique, has a high water vapour transmission rate (WVTR) (as the name indicates, moisture evaporates at high concentrations causing drier wounds), the lower dressing WVTR is a strong ($\alpha < .001$) linear predictor of faster healing for both full-thickness ($r2 = 0.66$) and partial-thickness ($r2 = 0.57$) wounds during their most dynamic healing phases the first week after receiving acute wounds (Bolton, 2007:24). On the other hand, the South African Burn Society (2012); the European working group, (Brychta & Magnette, 2011), and the International Society of Burn Injuries (Kavanagh, & de Jong, 2004), specifically argue for the use of moist wound dressings. When selecting a dressing, consideration should be given to the volume of exudate and the viscosity, as some dressings absorb a higher volume of fluid than others and some are more efficient when dealing with viscous exudate (Dowsett & Newman, 2005:68).

Again, the guidelines did not indicate what evidence informed the decision and therefore the researcher searched for evidence to support the guidelines. No systematic review was found that examined the moist wound healing in burn wound management specifically. However a systematic review was found on ‘the use of moist wound-healing dressings in the management of split-thickness skin graft donor sites’ (Wiechula, 2003: S9-S17). Similar to partial thickness burns a split-thickness skin graft (STSG) is seen as a reconstructive technique that is essentially a superficial to partial thickness wound, which heals by a process of re-epithelialization within 7–14 days (Wiechula, 2003: S9). The researcher therefore deduced that the findings from this systematic review could be applied to superficial- partial thickness burns.

The Wiechula (2003), systematic review concluded that broad comparisons of moist wound-healing dressings against traditional non-moist dressings favoured moist wound-healing approaches in terms of healing rates, pain and infection. In the debate of “open” versus “closed” technique for wound dressing the literature clearly points to closed technique. (*Level of evidence I*).

However, when it comes to the management of face burns the debate is even more divided. Even though the reviewed guidelines referral criteria clearly states that facial burns are to be admitted to a burns unit, no guideline was found on the management of the facial burn.

A Cochrane review (Hoogewerf, Van Baar, Hop, et al., 2013), was found on the management of facial burns. Five randomised controlled trials were included in the review, which evaluated the effect of a variety of topical interventions for facial burns. Three studies compared skin substitutes with different antimicrobial agents whilst two studies compared two different antimicrobial agents. Neither of the studies investigated wound preparation agents, antiseptics or other treatments, including alternative remedies. The summary of the main results was divided in two primary outcomes (in other words wound healing and wound infection) and all secondary outcomes have been combined. The results of all three studies of skin substitutes compared with antimicrobial agents favoured the skin substitutes. A cautious conclusion might be that the time to complete wound healing is shorter with the application of skin substitutes compared to topical antimicrobials. A reason for the caution is that none of the three studies used the appropriate statistical method - survival analysis - for these analyses and did not consider whether all participants were completely healed or if there were withdrawals during the study this estimate deemed that the study may be biased. It can only confidently be concluded that there is no reliable evidence as to whether topical treatments improve outcomes for people with facial burns or that this includes the improvement of wound healing, rates of infection, the need for surgery, improved appearance of scars, reduced pain, improved overall patient satisfaction, reduced adverse effects, improved quality of life or reduced the length of hospitalisation. More research is required.

That said, as facial burns are to be managed in burns units, it falls under the scope of practice of the doctor and since not enough evidence exists (Hoogewerf, et al., 2013:2); the decision is informed by individual doctors' preferences. (*Level of evidence I*).

Edge of the wound management

Burn injuries to the epidermis alone or with superficial amounts of dermis involvement will heal spontaneously and only require conservative management with wound dressings and or topical agents (Pham, Maddern, Greenwood, et al., 2006: 5).
Deep dermal burns have a protracted healing course which results in significant scarring and are unlikely to heal spontaneously because the epidermal cell nest responsible for re-epithelialisation is lost and there is deep destruction of the dermal collagen (Pham, et al., 2006: 5). The authors explain that surgical management of deep burns involves the removal of non- viable, burn injured tissue and permanently closing the burn wound in a timely fashion designed to generate the best cosmetic, functional and symptomatological result.

The scope of this study is limited to the management of partial thickness burns and conservative treatment by nurses and therefore skin substitutes and other forms of surgical management falls outside the scope of practice of the nurse and is only briefly mentioned to acquaint the reader with all available treatment options.

Biological skin substitutes (replacements) are defined as materials derived from wholly biological sources (Pham, Maddern, Greenwood, et al., 2006:5). Bioengineered skin substitutes have been designed to offer a therapeutic alternative to auto graft (patient's own undamaged skin), allograft (cadaver skin) or xenograft (graft derived from animal skin) (Pham, et al., 2006: 5). Skin substitutes perform several important functions: by adhering to the wound bed, they provide a physical covering that controls water vapour transmission, thus minimizing loss of water, electrolytes and proteins; prevents desiccation and maceration of wounded tissue and microbial invasion from the environment (Sterling, Heimbach & Gibran, 2010: 8).

Three systematic reviews were found on the use of skin substitutes (Pham, Greenwood, Cleland, et al., 2007; Barber, Watt, Pham, et al., 2006; Pham, et al., 2006). All three concluded that skin substitutes were at least as effective and as safe as standard therapies, but conclusions could not be drawn due to limited trials, small sample sizes, poor methodological detail and diversity of skin substitutes. Only two of the three reviews specifically addressed the usage of skin substitutes in burn wounds (Pham, et al., 2007; Pham, et al., 2006). (*Level of evidence I*).

4.4.3.5 Guiding question 8: Ointment vs. dressing?

The physical form of a dressing varies (ointment, film, foam, gel) (Boateng, Matthews, Stevens, et al., 2008: 2898).The comparison between and ointment and dressing should be traditional dressings or (modern) advanced dressings in the management of burn wounds. A review done by Boateng, et al., (2008),classified the different types of dressings on the market. Traditional wound healing agents include topical liquid and semi-solid formulations as well as dry traditional dressings. These topical pharmaceutical formulations are prepared as liquid (solutions, suspensions and emulsions) and semi-solid (ointments and creams) preparations and their use is widespread.

The major problem with liquid dosage forms, however, is short residence times on the wound site, especially where there is a measurable degree of suppuration (exuding) of wound fluid. Semi-solid preparations such as Silver sulphadiazine cream and silver nitrate ointment used to treat bacterial infection remain on the surface of the wound for a longer period of time compared with liquid solutions (Boateng, et al., 2008: 2989). Boateng, et al., (2008: 2990), further explain that traditional dry dressings include cotton wool, natural or synthetic bandages and gauzes and unlike the topical pharmaceutical formulations, these dressings are dry and do not provide a moist wound environment. They may be used as primary or secondary dressings, or form part of a composite of several dressings with each performing a specific function.

Modern dressings have been developed as an improvement upon the traditional dressings according to Boateng, et al., (2008: 2990). Their essential characteristic is to retain and create a moist environment around the wound to facilitate wound healing. The modern dressings are mainly classified according to the materials from which they are produced including hydrocolloids, alginates and hydrogels, and generally occur in the form of gels, thin films and foam sheets Boateng, et al., (2008).

Effective wound management depends on understanding a number of different factors related to wound management: the type of wound being treated, the healing process, patient conditions in terms of health (for example diabetes), environment and social settings, and the physical chemical properties of the available dressings (Boateng, et al., 2008: 2893). Boateng, et al., (2008: 2909), state that the specific dressing will depend on both the type of wound dressing and the nature of the surface to which the dressing will be applied and any secondary dressings that may be involved. No single dressing is suitable for the management of all wounds.

Despite the breadth of literature on wound-care treatments, published systematic reviews of studies comparing clinical outcomes of modern versus traditional dressings on chronic wounds, suggest the former did not clearly demonstrate effectiveness over the latter, mainly because the methodology used to test them was inadequate (San Miguel, TorraiiBou, Verdu Soriano, 2007:50). Compared to acute wounds, the authors found that there is enough evidence proving the superiority of modern dressings in acute wounds. However, no systematic review was found. Several RCT were found comparing various dressings to SSD. The conclusions were that all other dressing results were better than SSD (International consensus document, 2012). The results in favour of the "other" dressings are not necessarily due to the effectiveness of the dressing, but rather because of the ineffectiveness of SSD which had increased pain scores, longer time to heal rates and also required more dressing changes and more nursing time compared to other dressings (International consensus document, 2012).

In a Cochrane review of twenty six trials, SSD was found to have no effect on infection and slowed down healing in patients with partial thickness burns (Storm-Versloot, Vos, Ubbink, et al., 2010: 2). Therefore, the decision on whether to use an ointment or a dressing should be informed by the objective and the expected outcome by taking into consideration the type of wound, healing process, patient conditions, environment and properties of different dressings with reference to the TIME framework. (*Level of evidence I*).

The final phase of the nursing process is the evaluation phase and the guiding questions that informed this part of the study is deliberated on.

4.4.4 Outcomes and Evaluation

4.4.4.1 Guiding question 9: How is wound healing measured?

It is important to highlight that although the periodic assessment of wound healing is mentioned in the literature to evaluate the progress of the wound and to determine the effectiveness of the nursing interventions in order to either continue on the nursing plan or to change and have a modified plan, no guideline was found on measuring wound healing in burn wounds. The Baber Measuring Tool (BMT) was created as a measurement tool to track the progress of different types of wounds, including surgical, burn and chronic wounds (namely pressure ulcers) (Baber, 2008: 42). The tool was used in over four hundred wounds to track changes in wound volume over time, with wound progression presented as "percentage healed" over time (Baber, 2008: 42). However, there was no data to support this claim as this instrument has not been evaluated for validity or reliability. It must be noted that while saying this, several studies support the idea that percentage wound area reduction is an important indication for differentiating between healing and non-healing wounds, suggesting that the BMT may have a role in the assessment of wound healing (Pillen, Miller, Thomas, et al., 2009: 216).

A review done by Pillen, et al., (2009), addressed the validity, reliability and sensitivity of available instruments for the assessing of wound healing. The review only included instruments that were able to measure changes in wound healing and not those used to predict healing, classify wounds, or the measurement of wound characteristics *per se*. The review examined all wound types with a total of twenty articles which included and evaluated the validity of ten instruments used to monitor wound healing. The instruments used to assess pressure ulcers, notably the Pressure Ulcer Scale for Healing (PUSH) and Pressure Sore Status Tool (PSST), had been validated to the greatest extent, whilst those describing healing in leg ulcers and general or surgical wounds tended to lack comprehensive and quality evaluation (Pillen., et al., 2009: 208-217). Even though the PUSH instrument has been designed for pressure ulcers, its use has been tested in leg and venous ulcers and, while not perfect, it appeared to have the most reliability and validity. Until the BMT is tested for validity and reliability the use of the PUSH instrument in measuring burn size should be considered. Table 4.10 below shows validity and reliability test done on different wound measurement instruments.

Table 4. 10 The validity and reliability test done on wound measuring instruments by (Pillen, et al., (2009:216).

Wound type	Instrument	Content validity	Concurrent validity	Predictive validity	Intra-rater reliability	Inter-rater reliability	Sensitivity to change
Pressure ulcers	PUSH	Unsure	+	+	-	Unsure	Unsure
	PSST	+	+	-	+	+	-
	SS	+	+	+	+	+	-
	SWHT	-	-	-	-	-	-
	DESIGN	-	+	-	-	+	-
	WHS	-	-	-	-	-	-
Leg and	PUSH	-	-	-	-	Unsure	-
Venous ulcers	LUMT	Unsure	-	-	+	+	+
General and	BMT	-	-	-	-	-	-
surgical wounds	ASEPSIS	-	-	-	-	+	-
	Granulometer	-	-	-	-	+	-

(+) adequetely adressed; (-) not adequeately adressed; (unsure) anble to confirm or deny based on the available information.
(*Level of evidence I*).

Just as it is important to evaluate the progress of wound healing through the use of wound measuring instruments so too is it important to evaluate if patients' pain levels are managed effectively.

4.4.4.2 Guiding question 10: How should pain in burns be managed?

Pain is a major factor for patients with burn injuries. Pain is described as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Registered Nurses' Association of Ontario (RNAO) 2013:17; International Association for the Study of Pain, 2012; Bowers & Barret, 2009:49). Burn pain is not a single entity but involves several components, which causes the most severe and prolonged types of pain and from the first moments of injury; throughout the entire period of treatment, pain affects the patient not only as a symptom but also as a difficult medical problem according to Esfahlan, Lotfi, Zamanzadeh, et al., (2010: 1129).

Furthermore, uncontrolled acute burn pain has been shown to increase the incidence of mental health disorders such as depression and post-traumatic stress disorder (Esfahlan, et al., 2010: 1129; Wiechman, & Sharar, 2009:522; Wasiak & Cleland, 2008:2: Patterson, Hoflund & Espey, 2004: 1), and to correlate with the incidence of suicide following discharge from hospital (Mahar, Wasiak, O'Loughlin, et al., 2012: 148). Ultimately, the screening, prevention and alleviation of pain are both a medical and nursing responsibility (Park, Oh & Kim, 2013: 101; Wasiak & Cleland, 2008:2). It is therefore essential to deal aggressively with the problem of burn pain.

Pain arises both from the burns and their treatment, the latter includes dressing changes, surgical operations and physical and occupational therapy. In terms of treatment, pain during hospitalisation can be classified as background (that which is present while the patient is at rest; pain of lower intensity and longer duration), procedural (more intense, short-lived pain generated by wound care or therapies), breakthrough (spiking of pain levels that occur when current analgesic efforts are exceeded) and postoperative (Esfahlan, et al., 2010: 1129-1130). Pain can be classified by these types according to RNAO (2013: 17):

a. Nociceptive pain. This is considered a warning signal that results from actual or threatened damage to non-neural tissue resulting in the activation of nociceptors in a normal functioning nervous system; or

b. Neuropathic pain, which is a clinical description of pain thought to be caused by damage from a lesion or disease of the somatosensory nervous system that is confirmed by diagnostic investigations.

According to Esfahlan, et al., (2010: 1129-1130), and Norman & Judkins (2004: 57), burn pain is influenced by the following factors: depth of burn, stage of healing, nature of care procedures and patient characteristics; and psychological factors such as depression or anxiety which can become a part of the experience of pain, particularly if pain medication is not initiated prior to any unpleasant procedures.

The Australian and New Zealand Burns Association (2010: 67), addressed the screening for burn pain stating that: "the worst pain score should be less than 5 on a scale of 0–10. Scores of 5 or higher interfere with sleep, activity and mood". The South African Burn Society (2012), and the European working party (Alsbjorn , Gilbert, Hartmann, et al., 2007: 158), speak about administration of "pain medication", but screening is not mentioned.

Guidelines on pain management have been written about extensively in the literature including: Registered Nurses' Association of Ontario (RNAO) (2013, 2007), WHO (2009b), WUWHS (2007b), British Pain Society (2007), National Guideline Clearing house (2006), EWMA (2002).

The RNAO (2013), recommendations are based on evidence from a systematic review and therefore supersede any other guidelines for the purpose of this study; furthermore the guidelines are endorsed by the International Association for the Study of Pain (RNAO, 2013). An appropriate and comprehensive pain-management regimen is needed to consider these variables in patients with burns and involves screening for pain and non- pharmacological and pharmacological pain management.

On the next page are the comprehensive recommendations:

Table 4.11 Recommendations on pain (RNAO, 2013).

Assessment	Recommendation 1.1 Screen for the presence, or risk of, any type of pain: ■ On admission or visit with a health-care professional; ■ After a change in medical status; and ■ Prior to, during and after a procedure. Recommendation 1.2 Perform a comprehensive pain assessment on persons screened having the presence, or risk of, any type of pain using a systematic approach and appropriate, validated tools. Recommendation 1.3 Perform a comprehensive pain assessment on persons unable to self-report using a validated tool. Recommendation 1.4 Explore the person's beliefs, knowledge and level of understanding about pain and pain management.

	Recommendation 1.5 Document the person's pain characteristics
Planning	Recommendation 2.1 Collaborate with the person to identify their goals for pain management and suitable strategies to ensure a comprehensive approach to the plan of care. Recommendation 2.2 Establish a comprehensive plan of care that incorporates the goals of the person and the inter professional team and addresses: ■ Assessment findings; ■ The person's beliefs and knowledge and level of understanding; and ■ The person's attributes and pain characteristics.
Implementation	Recommendation 3.1 Implement the pain management plan using principles that maximize efficacy and minimize the adverse effects of pharmacological interventions including: ■ Multimodal analgesic approach; ■ Changing of opioids (dose or routes) when necessary; ■ Prevention, assessment and management of adverse effects during the administration of opioid analgesics; and ■ Prevention, assessment and management of opioid risk.

	Recommendation 3.2 Evaluate any non-pharmacological (physical and psychological) interventions for effectiveness and the potential for interactions with pharmacological interventions. Recommendation 3.3 Teach the person, their family and caregivers about the pain management strategies in their plan of care and address known concerns and misbeliefs
Evaluation	Recommendation 4.1 Reassess the person's response to the pain management interventions consistently using the same re-evaluation tool. The frequency of reassessments will be determined by: ■ Presence of pain; ■ Pain intensity; ■ Stability of the person's medical condition; ■ Type of pain e.g. .acute versus persistent; and ■ Practice setting. Recommendation 4.2 Communicate and document the person's responses to the pain management plan.

Each aspect of screening, pharmacological and non-pharmacological management of pain will be discussed individually.

Pain screening

Nurses are in a unique and advantaged position as they spend the most time with patients and would be the ideal person to assess the patient for pain. Assessment tools are essential for the diagnosis of underlying burn pain syndromes and the effectiveness of their treatment (Tait, James, Williams, et al. 2012). Reliable and accurate assessment of pain is necessary and important to ensure patients experience safe, effective and individualized pain management.

The assessment of acute pain should include a history and physical examination supplemented with one or more self-report measures of pain that are sensitive, accurate, reliable, reproducible, valid and useful for both clinical and experimental situations (Mahar, Wasiak, O'Loughlin, et al., 2012: 148). According to Mahar, et al., (2012: 148), there are many different forms of pain assessment tools currently available to the burns treating team; these range from the recording of patient-subjective experiences, uni-dimensional tools such as verbal descriptive scales, numeric rating scales and visual analogue scales (Summer, Puntillo, Miaskowski, et al., 2007: 534), to more complex and multidimensional tools such as the McGill Pain Questionnaire, the Brief Pain Inventory (BPI)and the abbreviated Burn Specific Pain Anxiety Scale (BSPAS) (Mahar, et al., 2012: 148). Pain is a multidimensional, subjective phenomenon, so a patients self-report is the most valid way of assessing pain if the person is able to communicate this information (RNAO, 2013:21).

One systematic review (Mahar, et al., 2012), was found that evaluated burn assessment tools. This systematic review revealed that RCT in the area of pain assessment, in the adult burns population, examined a variety of different interventions and over different time frames coupled with relatively small sample sizes. More so, most of the studies included either a numerical rating scale (NRS) or a visual analogue scale (VAS) in their assessment of pain outcomes. These scales have been shown to be reliable and valid in the assessment of pain intensity, with no one scale consistently demonstrating a greater responsiveness in detecting improvements in pain treatment. Other assessment tools were used less frequently, possibly due to a lack of documented reliability or validity in certain cases, or due to the necessary increase in labour, cost and resources required to undertake these assessments. Tools which have been shown to be both reliable and valid, in some cases more so than visual analogue scales in burns patients, such as the Visual Analogue Thermometer (VAT) were not used in any of the included studies. The duration of follow-up of uni-dimensional pain assessment tools such as the VAS or NRS amongst the included studies varied significantly. Some studies used specific time frames at which they implemented assessment tools (in other words seventy two hours post-burn), whereas other studies recorded their assessments following, for example, a number of defined procedures (for example after ten consecutive procedures) (Mahar, et al., 2012).

According to the authors this variability was dependent on the type of pain observed, be it acute, chronic or procedural; however, this heterogeneity made the comparison of pain assessment difficult, even with simple uni-dimensional tools. Multidimensional assessment tools were used infrequently along with more complex pain tools which were only used in a handful of studies. This is concerning because burn pain quickly establishes itself in the persistent or chronic pain paradigm and therefore the management of burns patients' needs to take this into consideration. Pain assessment tools used in burns patients should provide information on the history, intensity, location and quality of the pain, and aim to cover multiple outcome domains without compromising on their validity, reliability or ease of administration (Mahar, et al., 2012).Which tool a nurse chooses will depend on the person's characteristics including age, ability to verbalize, clinical condition, cognitive or developmental level, literacy, ability to communicate and culture and ethnicity (RNAO, 2013: 22). Particularly with respect to multidimensional tools, clinicians and researchers should aim to report the outcomes of pain assessment tools in a manner that is easily transferable within and amongst studies, and aims to identify features of chronic pain early in the patient's clinical presentation (Mahar, et al., 2012: 150-152).

The RNAO, (2013: 21), propose that nurses should use a consistent, systematic approach to exploring and assessing pain. Table 4.12 describe the acronym that uses the mnemonic OPQRSTUV to assist nurses and health-care providers to systematically explore and assess people who screened positive for the presence or risk of, any type of pain and who are able to self-report.

Table 4.12 Adapted Pain Assessment using Acronym O, P, Q, R, S, T, U and V (RNAO, 2013).

Onset	When did it begin? How long does it last? How often does it occur?
Provoking/ **P**alliating	What brings it on? What makes it better? What makes it worse?
Quality	What does it feel like? Can you describe it?
Region/ **R**adiation	Where is it? Does it spread anywhere?
Severity	What is the intensity of the pain? (0n a scale of 0 to 10 with 0 being none and 10 being the worst possible) Right now? At best? At worst? On average?
Timing/ **T**reatment	Is the pain constant? Does it come and go? Is it worse at any particular time? What medications and treatments are you currently using? How effective are these? Do you have any side effects from the medications and treatments?
Understanding/ Impact on you	What do you believe is causing the pain? Are there any other symptoms with this pain? How is this pain impacting you and your family?
Values	What is your goal for this pain? What is your comfort goal or acceptable level for this pain? (On a scale of 0 to 10 with 0 being none and 10 being worst possible)? Are there any other views or feelings about this pain that is important to you or your family? Is there anything else you would like to say about your pain that has not been discussed or asked?

Conversely, the RNAO (2013:25), recommend when someone cannot report their pain:

1) Attempt to have the person self-report.

It is always important to determine if self-report is possible, allowing people sufficient time to respond. A simple yes or no answer, or behavioural cues such as nodding or pointing to the assessment tool to indicate the presence or absence of pain is a valid way for a person to describe pain.

2) If a person is unable to self-report, rely on behavioural indicators or behavioural pain scales validated for the specific population they belong to and the context. Behavioural pain scales are recommended when self-reporting pain is not possible according to the RNAO (2013:25). The nurse must select a pain scale that has been validated for use in the targeted population and context.

It has been suggested that health-care providers consider the use of both pharmacological and non-pharmacologic strategies to optimize the management of pain, help reduce the intensity of pain and minimize the amount of pharmacological intervention required (RNAO, 2013:31; Bowers & Barret: 2009: 52-54; Norman & Judkins, 2004: 58-61).

Pharmacological management

Pharmacologic intervention includes non-opioid analgesics such as non-steroidal anti-inflammatory drugs [NSAIDs]; opioids (for example morphine) and adjuvant medications (for example antidepressants, anticonvulsants, anaesthetic agents) that act through different mechanisms to modulate a person's pain; nurses work with the inter professional team to adjust the type, dose, route and scheduling of medications based on the person's response (RNAO, 2013:33). This type of approach maximizes analgesic efficacy and can reduce overall opioid use whilst minimizing adverse effects (RNAO, 2013:33).

The cornerstone of effective burn pain management is an opioid (such as morphine) administration (Li, Shi, Sun, 2009: 2; Wasiak & Cleland, 2008:2; Patterson, Hofland, Es pey ,et al., 2004: 1). Opioids are potent, the risks and benefits are familiar to the majority of care providers, and they provide some degree of dose-dependent sedation.

Morphine is the most common conventional drug used for burn pain, but topical morphine sulphate does not appear to be as effective when used for the pain associated with superficial burns as when used for the pain associated with chronic inflammatory wounds (Li, et al., 2009; Wasiak & Cleland, 2008; Patterson, et al., 2004).

Moreover, the level of dosage required to treat the pain is often undesirable due to the risk of hemodynamic alterations and respiratory depression (Li, et al., 2009: 2), leading to the use of ventilatory support and consequently the risk of nosocomial pneumonia increases and problems with gut motility and subsequent constipation, secondary to the opiate use emerge (Wasiak & Cleland, 2008:2). Conventional drugs also appear to contribute to the development of post-burn immune dysfunction, which increases the risk of complications during pain management (Li, et al., 2009: 2).

The WHO (2009b), has developed a three-step "ladder" for cancer pain relief in adults. It was originally applied purely for the management of cancer pain, but is now widely used by medical professionals for the management of all types of pain. This ladder has been incorporated in the World Union of Wound Healing Societies (WUWHS) (2007b), consensus document on principles of best practice: Minimising pain at wound dressing-related procedures. The ladder is depicted in figure 4.5.

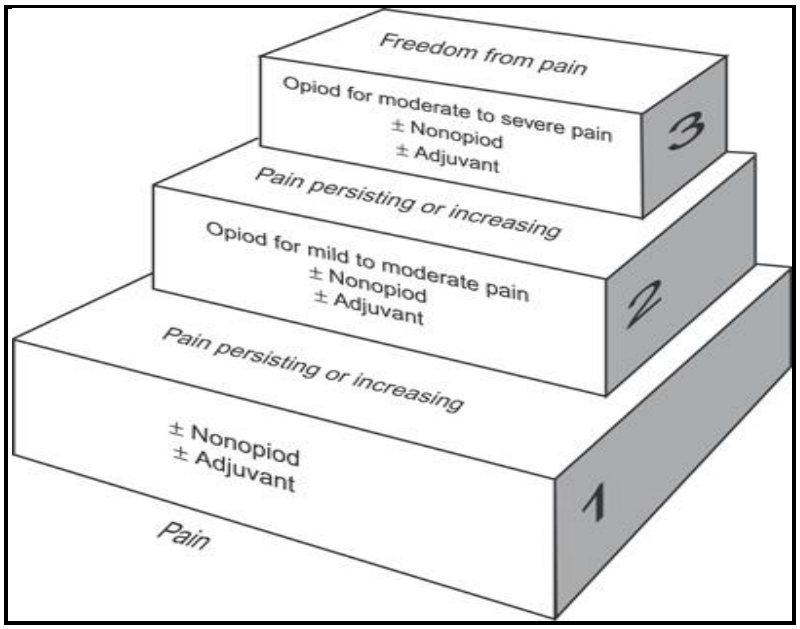

Figure 4. 5 WHO three step ladder to pain management WHO (2009b).

The WHO (2009b), ladder recommends a stepped approach to the selection of analgesia, with the additional consideration of adjuvant medication to provide a comprehensive pharmacological based treatment where more complex pain exists. The progression is from non-opioids (step 1) to weak opioids such as codeine (step 2) to finally strong opioids such as morphine (step 3).

Steps 2 and 3 indicate that combinations of non-opioids and opioids should be considered (WHO, 2009b; Bowers & Barret, 2009: 53; WUWHS, 2007b: 6).

Because of the side effects of opioids alternatives have been explored in the literature. One such study was a Cochrane review done by Wasaik & Cleland (2008). As an alternative, agents such as lidocaine (also named lignocaine) – a local anaesthetic agent of the amide type that has been used for local anaesthesia and systemically as an anti-arrhythmic drug – has been proposed as a means to alleviate the debilitating effects of various types of pain (Wasaik & Cleland, 2008). According to the authors systemic lidocaine has been reported to be effective in treating the neuropathic pain of a burn injury and has been shown to be effective in the reduction of neuropathic pain and has none of the side effects associated with high dose opioids. However, Wasaik & Cleland (2008), concluded that since current clinical evidence is subject to the inherent weaknesses of case series or reports, intravenous lidocaine must be considered a pharmacological agent under investigation in burns care whose effectiveness is yet to be determined in well-designed and conducted clinical trials.

Another alternative to traditional opioids is Fentanyl. A Cochrane protocol for the use of Fentanyl for pain relief in burn patients has been prepared by Li, et al., (2009). Fentanyl is a synthetic opioid and with extreme lipid solubility; it can cross the biological membranes quickly and be taken up rapidly; thus, it shows short-acting analgesic activity after intravenous or subcutaneous administration.
Transdermal fentanyl shows a slow increase to a stable serum concentration, the apparent long elimination makes this a reasonable choice for long-term pain relief. At present, fentanyl has been used as an analgesic in the management of postoperative as well as cancer pain with a clinical potency ratio of fifty to hundred times that of morphine, fentanyl has equivalent function to oral morphine in the provision of analgesia for burn wound dressing changes. In addition, oral trans-mucosal fentanyl, with a rapid onset of action, is suitable for acute pain relief, which may be useful in patients in whom parenteral injections are difficult and painful. Some studies have shown that fentanyl is effective in controlling pain associated with burns and therefore this review will assess the efficacy of fentanyl for pain relief in burn patients and explore the optimal route of administration. At the time of writing this study the Li, et al., (2009), review had not been published.

The RNAO (2013: 33-34), added that, to maximize efficacy and minimize the adverse effects of a pharmacological pain management, nurses should use the following principles to guide practice:

1. Use the most efficacious and least invasive way to administer analgesics.

2. Consider a multimodal analgesic approach to pain management:

Use non-opioids to manage mild to moderate pain (acetaminophen or NSAIDs);

Use opioids in combination with non-opioids to manage moderate to severe pain;

Use advanced modalities such as patient-controlled analgesia.

In complex pain situations, routine use of non-opioids is not mutually exclusive and may be used in combination with other modalities.

3. Advocate for the most effective dosing schedule, considering the medication(s) duration of onset, effect(s) and half-life. The optimal analgesia dose is the one that effectively relieves pain with minimum adverse effects.

4. Recognize potential contraindications, such as co-morbidities or drug-drug interactions, related to the person's clinical condition.

5. Titrate any pain medications to achieve the maximum effectiveness whilst minimizing adverse effects.

6. Anticipate and manage the adverse effects from pharmacologic interventions. Nursing actions should include:

7. Consider consulting the inter-professional team or pain-management experts for complex pain situations, such as:

a. Pain that does not respond to standard pain management interventions;

b. Multiple sources of pain;

c. Mixed neuropathic and nociceptive pain;

d. History of substance use disorders; and

e. Opioid-tolerant persons undergoing procedures or having exacerbations of pain.

The non-pharmacological management discussion follows.

<u>Non pharmacological management</u>

Non pharmacological approaches are targeted at the reduction of anxiety and stress and the improvement of personal coping skills. Some of the non-pharmacological pain relieving procedures includes distraction, relaxation techniques, music therapy, patient involvement, giving information and making use of patients "time out" to signal interruption to the procedure and time for rest (Bowers & Barret, 2009:49).

WUWHS (2007b:6), added to the list of forms of non-pharmacological approaches: touch, visual stimulation, hypnosis, stress reduction strategies, guided imageries, behaviour and cognitive therapy, along with distraction, listening and connecting and simply talking to the patient and engaging in the patient's life. Distraction techniques does not have to be elaborate, it may be as simple as movies according to Patterson, et al., (2004: 5).

Non-pharmacological interventions, whether physical, such as physiotherapy or massage, or psychological, such as cognitive behaviour therapy, are often used with pharmacological interventions to manage pain (RNAO, 2013:36). However, Faucher & Furukawa (2006: 664), cautions that there is no evidence to suggest that it should be used as a substitute to pharmacological management of pain.

The RNAO (2013:36-37), categorizes the non-pharmacological approaches into physical and psychological:

Physical

Physical interventions such as physiotherapy, exercise massage and application of heat or cold should be considered along with pharmacological interventions to reduce pain, improve sleep, mood and general well-being.

Psychological

Psychological (psychosocial) interventions such as cognitive behaviour therapy, music, distraction, relaxation techniques and education should be considered in pain management as these interventions affect the way a person thinks feels and responds to pain. Psychological interventions related to education have been shown to assist with coping and enhancing the person's ability to self-manage and thereby lessen pain (post-operative pain).

The WUWHS (2007b:4), added that the selection of dressing also contributes or reduces pain, by encouraging that the selection of addressing should be to minimise pain and trauma during application and removal. It has been reported that patients experience more pain with gauze dressings than with any type of advanced moisture balanced dressing.

Furthermore, repeated application and removal of dressings with traditional adhesives create trauma to the skin surface. Bowers & Barret (2009:54-55), concurred and added that wound care practices that have been found to trigger painful sensations include exposure of the wound to air on dressing removal, dressing removal following adherence to the wound, inappropriate dressing choices, tightly packed cavity wounds, wound swabbing and uncomfortable primary dressings causing stinging or drawing sensations and retention or compression bandaging.

Therefore, dressings that adhere to the wound, causing pain on removal and trauma to the wound bed, should not be used as they can cause damage to delicate healing tissue in the wound and surrounding skin (Bowers & Barret, 2009: 54; WUWHS, 2007b: 6). (*Level of evidence I*).

The final stage of the nursing process is documentation and will now be discussed.

4.4.4.3 Guiding question 11: How should the management of burn wounds be recorded?

It is important that wound assessment is documented on a standardised form to ensure that all relevant areas are covered and to provide a guide as to what should be covered. Documentation ensures continuity of care and allows for a common language amongst health professionals (Keenan, Yakel, Tschannen, et al., 2008).

There have been several recent reviews of nursing documentation. A systematic review conducted by Saranto & Kinnunen (2009), covered forty one studies on evaluating nursing documentation and focused on research designs and methods, which were not limited to record audit. The review provided insights into several audit instruments and issues relating to documentation quality, but quality measures were not fully addressed. Another review was by Muller-Staub (2006), evaluated the use of nursing diagnosis, interventions and outcomes in nursing documentation. Neither of these concentrated on overall measurement standards and outcomes of nursing documentation itself, although segmental relevant information was found. Wang, Hailey & Yu (2011), conducted a systematic review where seventy-seven publications were included. Flaws of nursing documentation were identified and the effects this had on concise, complete and informative documentation. The authors concluded that flaws in nursing documentation include lack of documentation on psychological and social aspects of care; insufficient documentation regarding the steps of the nursing process and lack of specific data in relation to a particular clinical care issue.

Approaches to improving nursing documentation include the use of electronic health records, standardized documentation systems, application of specific nursing theories, education and organizational changes. (*Level of evidence 1*).

4.5 GAPS IN THE LITERATURE

The data available on certain aspects of the review was limited and were informed by expert opinions. On certain topics guidelines or recommendations were impossible to formulate due to the small sample sizes as well as methodological weaknesses for example the use of skin substitutes in burn wound management. The gaps in the literature included 1) a lack of research on burns, 2) that there were too few studies which examined nurses specific practice 3) wound management is not recognised as a speciality in South Africa and as such uncertainty exists as to what is permissible, for example the use of sharp debridement.

Based on the studies reviewed, there seems to be a trend where a great deal of emphasis placed on chronic wounds whilst acute wounds and specifically in burn wound management seems to be relegated.

4.6 CONCLUSIONS

The purpose of conducting this integrative review was to identify, analyse and synthesise results from independent studies in order to determine the current knowledge for burn wound management. While the results are varied from no statistical significance to improved patient outcomes, there was an obvious lack of guidelines specifically for burns. Currently no standards of practice for the nurse in the multi-disciplinary burn team exist and this means that the role of the nurse is undefined. By maintaining autonomy and putting standards in place the role and responsibilities of the nurse will be clearly defined. This indicates the need for this study as well as future research specifically focused on burn wound management. Chapter Four sets out what the literature says about the management of burn wounds by nurses internationally. Chapter Five will describe the clinical practice of nurses in a single burns unit in Gauteng.

CHAPTER FIVE LAYOUT

CHAPTER 5	5.0 Introduction		
	5.1 Research design and method		
	5.2 Dressing preparation		
	5.3 Assessment and Diagnosis		
	5.4 Dressing execution		
	5.5 Outcome and Evaluation		
	5.6 Discussion	5.6.1 Dressing preparation	5.6.1.1 Introduction of him or herself and explanation of procedure 5.6.1.2 Preparation of proposed material 5.6.1.3 Temperature of cleaning solution 5.6.1.4 Hand washing 5.6.1.5 Integrity of patient
		5.6.2 Assessment and Diagnosis	5.6.2.1 Assessment done on the wound 5.6.2.2 Classification and location 5.6.2.3 Description and use of TIME 5.6.2.4 Size of the wound described 5.6.2.5 Pain control and consideration of subjective pain complaints
		5.6.3 Dressing execution	5.6.3.1 Preparation of environment 5.6.3.2 Opening of packages and expiry dates 5.6.3.3 Dirty material kept separately and aseptic technique maintained 5.6.3.4 Prescribed solution for wound cleaning 5.6.3.5 Logical sequence throughout procedure
		5.6.4 Outcome and Evaluation	5.6.4.1 Nursing process and TIME framework reflected in cardex 5.6.4.2 Referral to multi-disciplinary team
	5.7 Summary		
	5.8 Conclusion		

CHAPTER FIVE

STRUCTURED OBSERVATION

5.0 INTRODUCTION

Chapter Three described the nursing process as a background to the description of the application in clinical practice of nurses in burn wound management. The results and discussion of the second objective are presented in Chapter Five. The second objective described the current practice by nurses of the management of burn wounds according to the themes of the nursing process through the observation of burn wound dressing procedures with assistance of a quantitative checklist.

This chapter relates to Phase Two described in the research design and research method. The results and the discussion are presented as follows: description of the observed behaviour by means of descriptive statistics and illustrative representation of the findings set out in various tables and graphs. The objective to describe current practice was met and will be presented as such. The results and discussion are centred on the nursing process. These are divided into headings of Assessment, Diagnosis, Intervention/Implementation, Outcomes and Evaluation (Refer to Chapter Three for a detailed description of each phase of the nursing process).

5.1 RESEARCH DESIGN AND METHOD

The research design and research method are briefly described in order to provide a point of departure for Chapter Five. A mixture method, QUAN (quantitative) → QUAN+QUAL (quantitative and qualitative), non- experimental, explanatory sequential, descriptive design was used (Polit & Beck, 2012: 608-612; Creswell & Plano Clark, 2011: 104). This mixed method design was chosen as it allowed for a greater depth in the perspective surrounding the findings. The sequential design indicated the timing of data collection (Polit & Beck, 2012: 608; Creswell, 2009a: 206), the quantitative data was firstly collected through an integrative review (Phase One, Chapter Four), followed by the parallel collection of quantitative data through structured observation (Phase Two (a), Chapter Five) and qualitative data through semi structured interviews (Phase 2 (b), Chapter Six).

Sequential explanatory strategies are characterised by the collection and analysis of quantitative data followed by qualitative data; weight is given to the quantitative data and informs or expands on the qualitative data (Creswell, 2009a: 211; Teddilie &Tashakkori, 2006: 21).Since no intervention was introduced, the study was non-experimental (Polit & Beck, 2012:735; LoBiondo- Wood & Haber, 2010: 582).

According to Polit & Beck (2012: 725), descriptive research's main objective is the accurate portrayal of people's characteristics or circumstances and or the frequency in which they occur. As such, this study sets out to describe best evidence and current practice in relation to the management of burn wounds carried out by nurses.

The population included all nurses providing care to patients with superficial to partial thickness burn wounds who had been admitted to a single burns unit within the public sector tertiary academic hospital and was selected by purposive sampling. A total of n= 303 dressings were observed.

The collected data was analysed with the assistance of a statistician. For analysis, the Positivity Index (PI) percentage was used, which consists of categorising each item stipulated in the instrument, the kind of practice observed (affirmative, negative or not applicable). The percentage of positivity for each instrument item was obtained for every phase of the procedure. A PI percentage was used as the parameter for wound dressing procedure quality assessment, with a PI percentage score with values greater than 70% considered satisfactory (Nkamara, Atulomah & Otu, 2013: 22; Nonino, Anselmi & Dalmas, 2008: 60). In addition a Confidence Interval measurement is provided for each observation where possible. Confidence Interval (CI) has been defined as the range of values within which a population parameter is estimated to lay, at a specified probability for example 95% CI (Polit & Beck, 2012: 723; LoBiondo-Wood & Haber, 2010:575; Creswell, 2009a:228). In other words a CI provides a range pertaining to the observed effect size.

In order to measure a CI, a standard error of the difference of proportions was calculated (Polit & Beck, 2012: 421). It is conventional to create a CI at the 95% level; this means that 95% of the time a properly constructed CI should reflect the true value of the variable of interest. Where possible the researcher presented the outcome results for each observation with a 95% CI. A STATA 13.1 statistical program was used to calculate the proportion, standard error and 95% CI for this study.

Conclusions drawn in Chapter Five were integrated and synthesised with the conclusions drawn from the evidence obtained and described in the integrative review in Chapter Four and the semi structured interviews in Chapter Six. These conclusions were used to develop guidelines for nurses on the management of burn wounds

For consistency purposes, refer to figure 5.1 for an outline of the research design and research method.

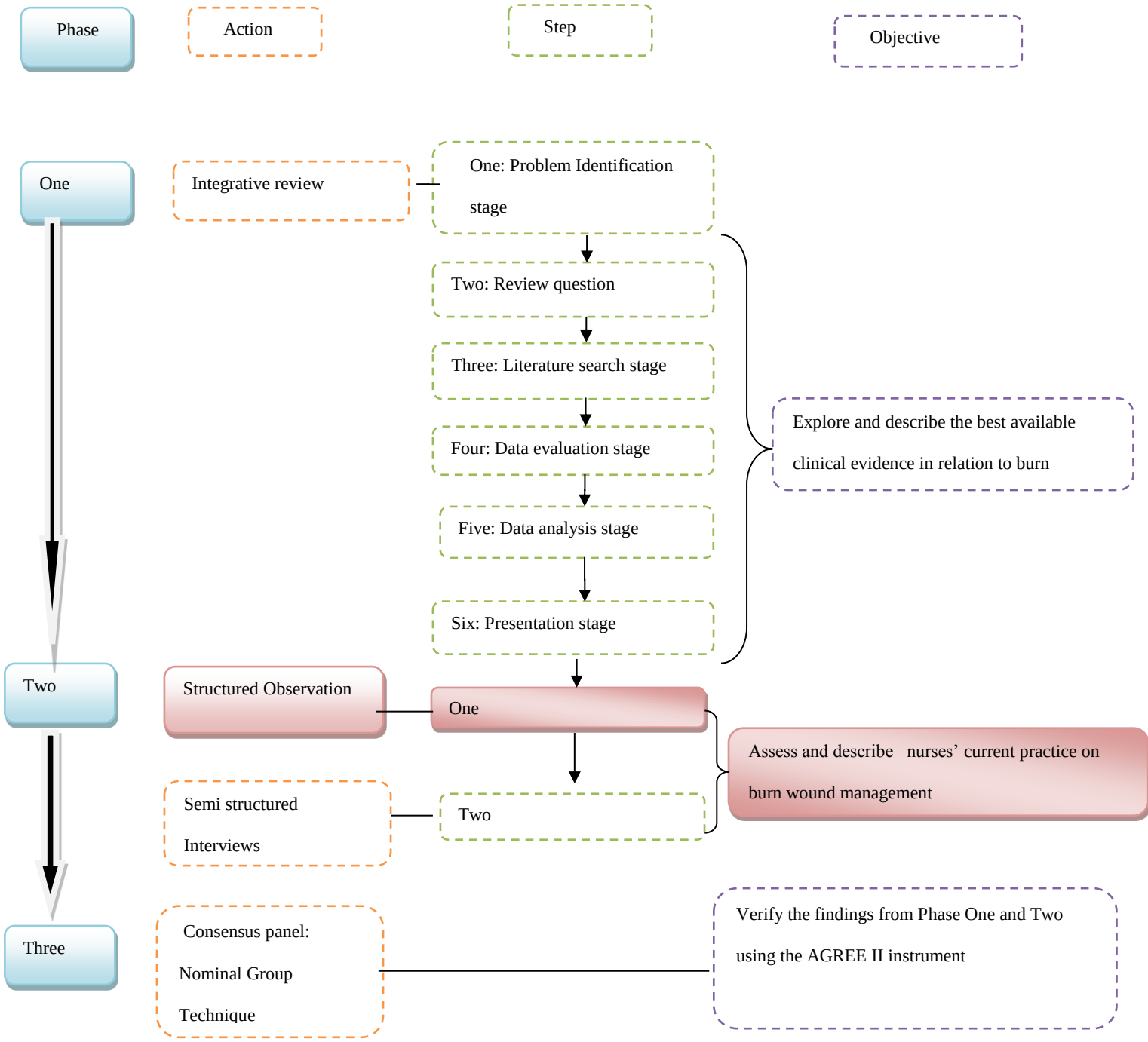

Figure 5.1 Overview of the research design and research method

In this chapter Phase Two (a) of the study, the findings of the structured observations will be described. In positivist research, structured observation is a discrete activity whose purpose is to record physical and verbal behaviour; observations' schedules are predetermined using taxonomies developed from known theory (Mulhall, 2003: 306). Structured observation has been adopted by many nurse researchers (Levett-Jones, Gersbach, Arthur, et al., 2011: 64-69; Nonino, et al., 2008: 57-63; Booth, Davidson, Winstanley, et al., 2001: 98-105), to explore the physical and verbal behaviour of participants in their natural settings. The purpose of the observation method in assessing current practice was to obtain first-hand information in a naturally occurring situation in order to identify the strengths, weaknesses and gaps in current practice.

Descriptive statistics is the process of summarizing raw data from research and creating useful statistics, to enable a better understanding of data (Polit & Beck, 2012: 725; LoBiondo- Wood & Haber, 2010: 577). In a review done in 2000 by Zellner, Boerst & Tabb (2007), that explored the statistics used in nursing research, it was found that descriptive statistics were the tools used most frequently in the nursing articles. These tools provide useful and relevant information gained from nursing and other studies (Shahravan, Ghassemi & Baneshi, 2012: 53). In this study the variables were observed behaviours and these were rated as follows: affirmative= 1; negative= 0; N/A= 2, even though statistically it would be possible to calculate a mean, median or mode, it would not be of additional value as the objective was to describe the findings which were adequately answered with a PI percentage.

Furthermore, as the population was homogenous and certain behaviours if not intervened on (conditioned to an alternative) will not change. For example in Observation 1(Does the nurse introduce himself or herself to the patient?) this will remain consistently the same for the same person regardless of how many times the person was observed. In the quality assessment done by Nonimo, et al., (2008), the PI percentage was sufficient to describe wound dressing procedures carried out in a University Hospital in Brazil. According to Fathalla (2004: 87), descriptive statistics help to make sense of a large volume of data and allow the data to be organized and displayed in tables as is the case in this study, n=303. By summarizing the frequencies and percentages for each observation, the data was organized according to the nursing process and an analysis was completed.

Even though the dressing procedure is a single process, each section will be discussed individually for the sake of simplicity.

5.2 DRESSING PREPARATION

According to Nonimo, et al., (2008: 60), the different items that compose the preparation phase are: "introduction to the patient", "heating the solution" and "washing hands before starting the dressing" this demonstrates a commitment by the nurse. A literature search for dressing preparation revealed a paucity of information on how to prepare for the actual procedure. However, when the various topics included in the observation checklist were searched, the literature revealed only two of the items listed under dressing preparation, these are, temperature of the cleaning solution and hand washing.
Presented below in figure 5.2 are the findings from the dressing preparation procedures.

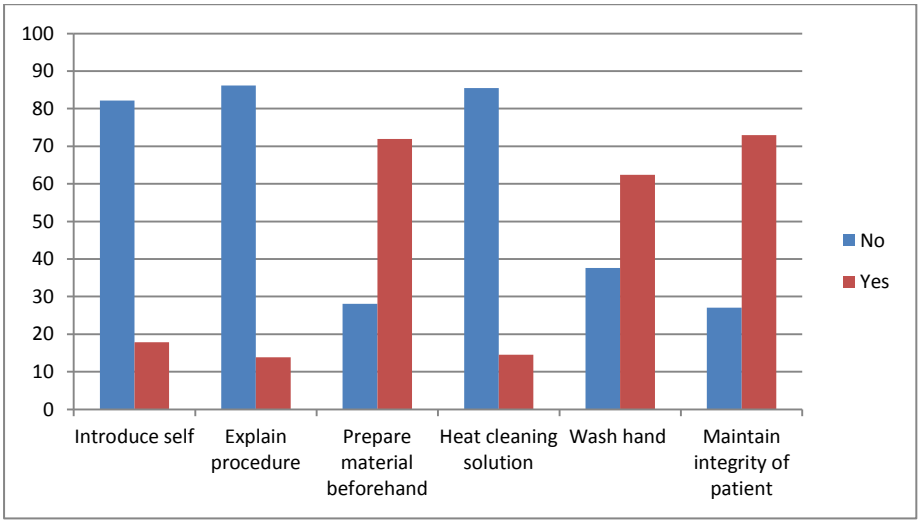

Figure 5.2 Frequency of observed behaviours of dressing preparation procedures.

An examination of the data revealed that, in the observed procedures, 54 (17.82 %) (95% CI 0.13- 0.22) of the respondents introduced themselves to the patient, while 249 (82.17%) did not introduce themselves. It is a possibility that the nurses had introduced themselves to the patients during either admission to the ward or during a procedure where the researcher was not present. In 42 (13.86 %) (95% CI 0.07- 0.14) of the observations, an explanation of the procedure was given.
Some of the patients were not new admissions to the ward and had dressings changes done prior to the structured observation; they might have received an explanation of the proposed procedure on a previous occasion. In 218 (71.94 %) (95% CI 0.93- 0.97) of the observed procedures the material for the dressing was prepared beforehand. The cleaning solution was heated in only 44 (14.52 %) (95% CI 0.01- 0.05) of the observations. It should be noted that the heated cleaning solution was administered when the patient was submerged or rinsed with warm water. Only189 (62.37%) (95% CI 0.56- 0.67) of the participants washed their hands before starting the dressing procedure.

The findings from this study revealed that the majority of participants, 221 (62.37 %) (95% CI 0.71-0.80), had maintained the patients integrity during the dressing procedure. Integrity encompasses the patients' right to privacy.

Table 5.1 Positivity Index (PI) percentages for the dressing preparation.

Dressing Preparation	**PI (%)**
Does the nurse introduce him or herself to the patient?	17.82
Does the nurse explain the proposed procedure?	13.86
Does the nurse prepare the material for the dressing beforehand?	71.94
Does the nurse heat the cleaning solution?	14.52
Does the nurse wash hand before starting the dressing procedure?	62.37
Does the nurse maintain the integrity of the patient during the dressing procedure?	72.93

The PI percentage parameter for wound dressing procedure quality assessment values of greater than 70% are considered satisfactory (Nkamara , et al., 2013: 22; Nonino, et al., 2008: 60). The only two satisfactory scores which were obtained were for "prepare material beforehand" and "maintain integrity of the patient". The rest of the dressing preparation observations scored less than 70 %.

The second section for presentation is the Assessment and Diagnosis phase of the nursing process.

5.3 ASSESSMENT AND DIAGNOSIS

A structured wound assessment is a crucial part of wound management, in fact Schultz, Barillo, Mozingo, et al., (2004), go so far as to say that wound assessment is a prerequisite of good wound management. A thorough assessment facilitates the setting of an appropriate diagnosis. The nursing diagnosis drives interventions and patient outcomes, enabling the nurse to develop objectives and thus the planning and evaluation of care (Berman, Snyder, Kozier, et al., 2015: 235). Figure 5.2 depicts the frequency of observed behaviour during wound assessment.

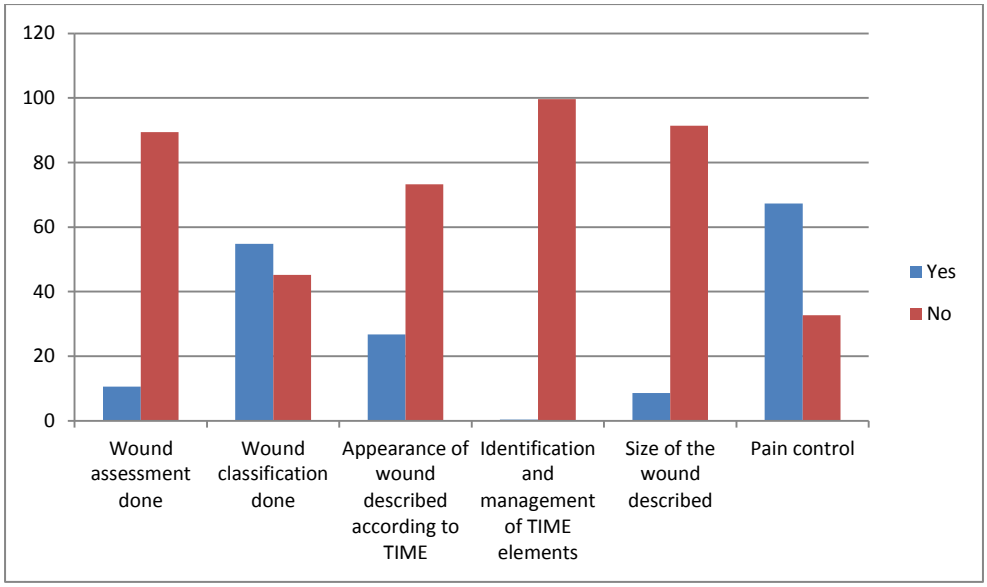

Figure 5.3 Frequency of observations during wound assessment.

The behaviour during observation indicated that participants did not routinely assess and diagnose each patient for whom dressings were done. As many as 271 (89.43%) (95% CI 0.07- 0.14) of the participants did not do assessments on the wounds in this study. Only 166 (54.78%) (95% CI 0.52- 0.63) of the participants used descriptive words to classify the wounds according to depth of the wound and the type of burn while 166 (54.78%) (95% CI 0.22- 0.32) had mentioned the location of the wound in relation to the dressing change.

The appearance of the wound bed was described according to the elements of the TIME model in only one (0.33%) (95% CI 0.00- 0.02) of the observations. Likewise, 26 (8.58%) (95% CI 0.03- 0.08) identified and managed the wound according to TIME. Two hundred and four (67.32%) (95% CI 0.61- 0.72) participants described the size of the wound. A number of participants n= 200 (66%) (95% CI 0.72- 0.81) managed the patient's pain during the dressing change procedure. Table 5.2 presents the PI percentage of assessment and diagnosis of dressing procedure.

Table 5.2 Positivity Index data of the assessment and diagnosis stage of the dressing procedure.

Assessment and Diagnosis	PI (%)
Was an assessment done on the wound? Cardex or verbal description?	10.56
Was the wound classified? Type of burn and depth described?	54.78
Was the location of the wound mentioned, described or considered?	26.73
Was the appearance of the wound bed described? TIME.	0.33
Identification and management of the elements of TIME.	8.5
Was size of the wound described? TBSA	67.32
Was pain control managed? Analgesia administered or non- drug methods for pain control.	66.00

None of the elements scored greater than 70% PI of the recommended level. The two items that scored the lowest were related to the TIME model with PI less than 10%.

The next section is the dressing execution phase of the nursing process.

5.4 DRESSING EXECUTION (INTERVENTION)

Dressing execution refers to any treatment or action performed by a nurse based on clinical judgement and knowledge, which helps the patient achieve the goals and expected outcomes set (Bulecheck, Butcher, Dochterman, et al., 2013: 2; DeLaune & Ladner, 2011: 132; Potter & Perry, 2005: 324). It refers to the act of carrying out the dressing, the choice of solution and dressing material as well as the patients' subjective complaints about the procedure. Figure 5.4 illustrates the frequency of dressing interventions.

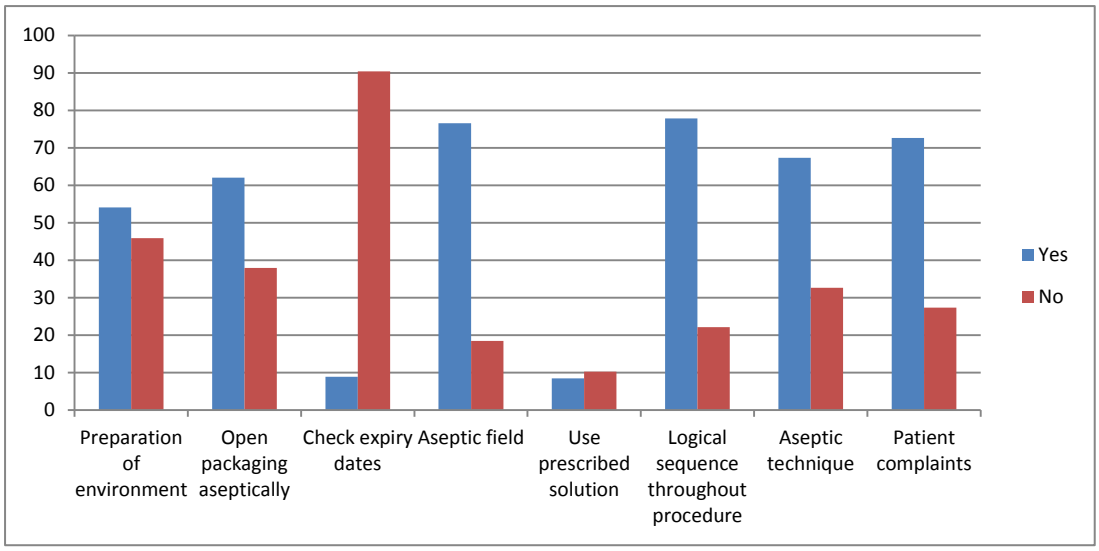

Figure 5.4 The frequency of dressing interventions.

The majority 164 (54.12%) (95% CI 0.48- 0.59) of participants did "prepare the environment", while 188 (62.04%) (95% CI 0.56- 0.67) opened the packaging aseptically. The findings from this study revealed that 27 (8.9 %) (95% CI undetectable) of the participants checked the expiry dates of the products used. A large number, 232 (76.56%) (95% CI 0.71- 0.81) of participants kept the "dirty" material separated from the "clean" field.

In 246 (81.18 %) instances, the cleaning solution was not prescribed. This could be due to either a protocol being in place in this regard or a standing order. In 26 (8.5%) (95% CI 0.03- 0.09) of the observations the prescribed solution was used for dressing the wound. Out of the 303 observations, 236 (77.88%) (95% CI 0.72- 0.81) followed a logical sequence throughout the procedure. Furthermore nurses maintained asepsis throughout the procedure in 206 (67.98%) (95% CI 0.62- 0.73) observations. The results indicated that in 220 (72.60%) (95% CI 0.67- 0.77) instances the patients complaints of pain were considered. Table 5.3 depicts the PI percentage of the dressing execution stage of the procedure.

Table 5.3 Positivity Index data of the dressing execution stage of the procedure.

Dressing Execution	PI (%)
Did the nurse prepare the environment?	54.12
Did the nurse open the packaging aseptically?	62.04
Did the nurse check the expiry dates of the products used?	8.91
Was the "dirty" material kept separately from the clean field?	76.56
Did the nurse use the prescribed solution?	8.5
Did the nurse keep a logical sequence throughout the procedure?	77.88
Did the nurse keep asepsis technique throughout the procedure?	67.32
Did the nurse consider the pain complaints of the patient?	72.60

Three elements scored a PI greater than 70% (aseptic field, logical sequence kept throughout the procedure and response to patients' pain complaints). In some items however, the PI percentage was less than 70%, namely: "the environment was properly prepared" (54.12%), "open packaging aseptically" (62.04%), "the expiry date of the material was checked" (8.91%) and "use of prescribed solution" (8.5%).

The next section for discussion is the outcome and evaluation phase of the nursing process.

5.5 OUTCOME AND EVALUATION

The outcomes describe the responses of the patient in reaction to care provided (Bulecheck, et al., 2013: 13). Relatedly, nursing evaluation is the determination of whether expected outcomes were met; in other words measuring the effectiveness of nursing care (Medical Dictionary for the Health Professionals and Nursing, 2012). Figure 5.5 is the frequency of outcome and evaluation.

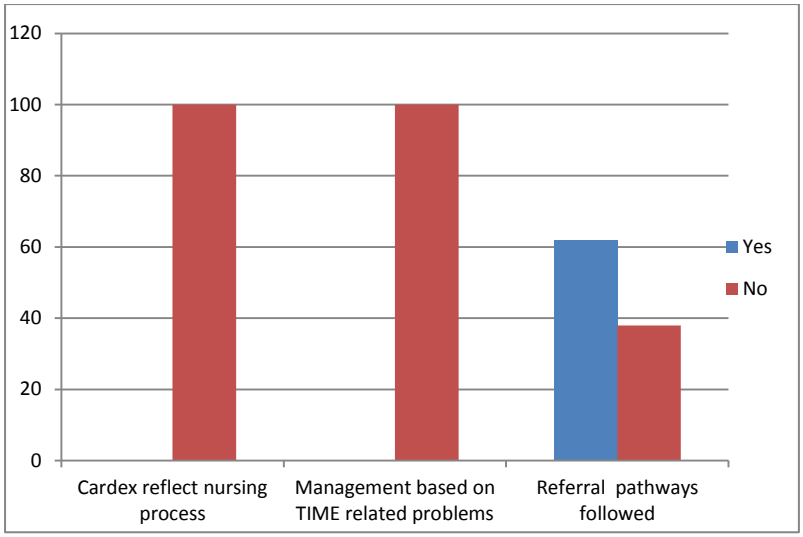

Figure 5.5 Frequency of outcome and evaluation

This section of the observation comprised only three elements. Out of the 303, none (0%) (95% CI undetectable) of the participants reflected the nursing process in their documentation. Equally none (0%) (95% CI 0.00- 0.02) of the wound management was based on the identification, recording and treatment of TIME related problems. The results showed that in 188 (62.04%) (95% CI 0.57- 0.68) instances referral pathways were followed.

Below the PI percentage for outcome and evaluation is tabled.

Table 5.4 Positivity Index data of the outcome and evaluation stage of the procedure.

Outcome and Evaluation	PI %
Does the cardex reflect the nursing process with regards to wound management?	0
Was the management based on the identification, recording and treatment of TIME- related problems?	0
Were referral pathways followed? Physio, Surgeon, Counsellor, etc. referral if needed?	62.04

The PI percentage for outcome and evaluation showed that all of the elements had a PI percentage of greater than 70%. None of the observed reporting reflected the nursing process and likewise TIME was not used to identify record or treat wounds (0%). Even though in more than half of the observations carried out, referral pathways were followed, this was still less than the recommended 70%.

5.6 DISCUSSION

Each of the sections presented above (5.2 to 5.5) will be discussed separately. On certain elements where there is overlap or, if elements are related, a combined discussion is presented.

5.6.1 Dressing Preparation

5.6.1.1 Introduction of him or herself to the patient and explanation of proposed procedure.

The findings from this study were consistent with Nonimo, et al., (2008), that communication was deficient. Communication is a dynamic, complex, and context-related ongoing process in which the experiences are shared (Fleischer, Berg, Zimmermann, et al., 2009: 342). Communication constitutes an important part of the quality of nursing care and predominantly influences patient satisfaction; it is a core element of nursing care and a fundamentally required skill (Fleischer, et al., 2009: 342; McCabe, 2004: 41). Without communication, patients cannot relate to healthcare professionals, make their needs and concerns known or make sense of what is happening to them (Casey & Wallis, 2011:35). Likewise without communication, patients are excluded in and from their health plan and decision making and evidence based practice. Figure 5.6 demonstrates the importance of communication in cognisance of patient preferences in evidence based practice.

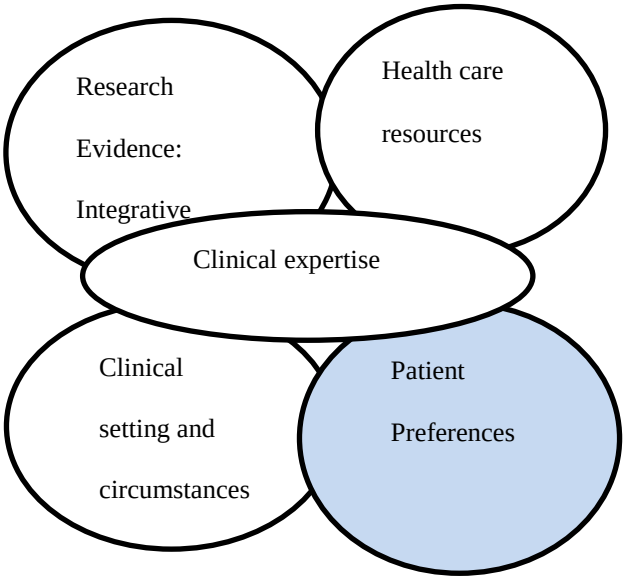

Figure 5.6 A model for evidence based clinical decisions (Taken from DiCenso, et al., 2005: 5).

The Royal College of Nursing (RCN), in collaboration with patient and service user organisations, the Department of Health, the Nursing and Midwifery Council, nurses and other healthcare professionals, developed "Principles of Nursing Practice" which states that nurses and nursing staff are at the heart of the communication process as they assess, record and report on treatment and care, handle information sensitively and confidentially, deal with complaints effectively and are conscientious in reporting the things they are concerned about (Casey & Wallis, 2011: 35).

Similarly the College of Nurses of Ontario (2006), has practice standards in place that inform and guide nurses in Ontario, Canada. These practice standards specifically addresses the principles for communication. Some of the criteria are: introduction of the nurse to a patient, addressing the patient by the name and/or title that the patient prefers, giving the patient time, opportunity and ability to explain himself/herself, and listening to the patient with the intent of understanding without diminishing the patient's feelings or immediately giving advice and providing information to promote patient choice and enable the patients to make informed decisions (College of Nurses of Ontario, 2006).

Adhering to the criteria from the practice standards demonstrated that communication in this study was less than effective. This situation is not unique to South Africa with studies having been conducted in Sweden (Rondahl, Innala & Carlsson, 2006), the United Kingdom (Simons & Roberson, 2002), and Australia (Russel, 1999), all of which record similar findings. However, the positive results of effective communication are well documented and are essential in achieving, amongst other things, increased recovery rates, a sense of safety and protection, improved levels of patient satisfaction and greater adherence to treatment options; aside from these, successful communication through a patient-centred approach also serves to reassure relatives that their loved ones are receiving the necessary treatment (Wright, 2012: 1).

Thus the PI percentage of 17.82% for introduction and explanation of proposed procedure with PI percentage of 13.86% indicates an unsatisfactory score.

5.6.1.2 Preparation of proposed material

Good preparation before and for the dressing procedure shortens the actual dressing change process (Diem & Sailer, 2013:3). According to Mulder, Small, Botma, et al., (2002: 64), preparation includes manipulation of the environment, the collection of necessities needed for the nurse, the procedure and the patient.

Overall the PI percentage scored for preparation of material was 71.94 % which is an indication of a quality assessment.
The next point for discussion is warming the cleaning solution.

5.6.1.3 Temperature of cleaning solution

The application of cold cleansing solutions may reduce the surface temperature of the wound; experimental studies of 137 dressing episodes in human wounds found that wounds cleansed with ambient-temperature solution (mean 29ºC) led to a 2º C drop in wound temperature, resulting in a mean temperature of 32.6ºC in all wounds studied - below the target of 33ºC (McGuinness, Vella & Harrison, 2004: 384).

In a review done by Fernandez & Griffiths (2012:7), a significantly higher infection rate was reported in one trial (Angeras, Brandberg, Falk, et al., 1992), which could be attributed to the difference in the temperature of the irrigant, tap water; (tap water was at 37ºC whilst normal saline was at room temperature). In practice, nurses should warm a solution to between 37ºC and 42ºC so as to minimize a fall in temperature, as maintaining optimum wound temperature helps increase blood flow to the wound bed, enhances the rate of gain of wound tensile strength and increases oxygen tension, all of which aids wound repair, helps prevent uncontrolled bacteria proliferation and thereby reduces the risk of infection (Gannon, 2007: 44-46). None of the fluids were intentionally heated for cleansing in this study. Nonimo, et al., (2008:60), also found that the solution used was not warmed with PI percentage less than 10% in all observed cases, 03, 02, 07 and 0 respectively. The PI percentage for warming the cleaning solution in this study was also insufficient, with a PI = 14.52%.

The discussion on hand washing follows.

5.6.1.4 Hand washing

The relationship between poor hand hygiene and infection risks have been well documented (Gould, Moralejo, Drey, et al., 2010; WHO, 2009a:9; Hart, 2007:44; Pittet, 2001: 236). Most healthcare-associated infections (HCAI) are thought to be transmitted by the hands of healthcare workers (WHO, 2009a:10; Hart, 2007: 44; Hebl, 2006:313), compliance with hand washing recommendations are estimated to be between 29% (Preston, 2005: 542), and less than 50% (Pittet, 2001:234). HCAI are infections acquired in health care settings (WHO, www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf).

Hand washing is considered to be the most effective measure to reduce the risk of HCAI (WHO, 2009a:24), yet hand washing remains a challenge globally. As a result the WHO put guidelines in place (WHO, 2009a), with the ultimate objective being that of changing the behaviour of individual health care workers to optimize compliance with hand hygiene at the recommended moments and to improve patient safety.

The identified moments for hand hygiene according to the WHO (2009a: 101-102), are: before touching a patient; before a clean or aseptic procedure (wound care for the purpose of this study); after body fluid exposure risk; after touching a patient and after touching patient surroundings.

Furthermore appropriate hand-cleansing methods and solutions are recommended by the WHO Guidelines on Hand Hygiene Care (2009a: 49-60), to help achieve system change and adopt alcohol based hand rubs as the gold standard for hand hygiene in healthcare as this is the only known means for rapidly and effectively inactivating a wide array of potentially harmful micro-organisms on hands. However, surgical hand preparation is not replaced by alcohol hand rub and neither does the use of gloves replace the need for hand washing. The method used will depend on the level of contact with the patient and the level of contamination that may occur; irrespective of the hand hygiene method used, the preparation and requirements are the same (Hart, 2007:44).

Hand washing is the most important component to patient safety for the prevention of infection. Yet, non-compliance with hand washing remains a major problem (Pittet, Allegranzi, Sax, et. al., 2006:641; Boyce & Pittet, 2002: S6-S7). Most healthcare workers practice hand hygiene but this is still less than half as often as they should according to (Sax, Allegranzi, Uckay, et al, 2007: 10). In the Nonimo, et al., (2008:60), study, hand hygiene was found to have scored less than 50% for each of the four observed settings. In this study a better PI percentage score was obtained of 62.37%. Though the PI percentage in this study for hand washing was better than in the Nonimo, et al., (2008:60), trial, it is still below the 70% parameter for quality assessment.

The next discussion point under dressing preparation is the integrity of the patient.

5.6.1.5 Integrity of the patient

Integrity is a complex and important concept in nursing care (Widang & Fridlund, 2003:47). Integrity is defined as a state of wholeness giving individuals a sense of being in control of their life (Teeri, Välimäki, Katajisto, 2008: 523; Widang & Fridlund, 2003:47).

In health care, the concept of integrity is often understood as occupying a personal and/or territorial space; and as the right to a private sphere in relation to physical (certain parts of the human body) and/or psychological (certain values, opinions and thoughts) aspects of the person (Teeri, et al., 2008: 523; Randers & Mattiasson, 2004: 64). According to Widang & Fridlund (2003:47), exposing a patient's body in the presence of others, violating their privacy, not respecting confidentiality and ridiculing them are all ways of infringing patients' integrity. The PI percentage achieved in this study was 72.93% which is a good quality assessment. In contrast the Nonimo, et al., (2008:60), study the scores achieved was less than 70%.

The next phase is assessment and diagnosis of the nursing process.

5.6.2 Assessment and Diagnosis

5.6.2.1 Assessment done on the wound

In this study macro and micro assessments were separated with macro assessment referring to the burn size and depth and micro assessment referring to the wound assessment. According to Stewart, Bennett, Blokzyl, et al., (2009: 49), Fletcher (2007:462), Doughty (2004: 369) and Schultz, Barillo, Mozingo, et al., (2004: 19), an accurate and structured wound assessment is a critical component of effective wound management in nursing because it drives the treatment plan. A comprehensive assessment forms the cornerstone of the meaningful planning of wound care and the ability to determine whether the wound treatment was effective (Mulder, 2009b:20). Evidence from the literature showed that if the assessment is poor, the documentation of that assessment will also be poor (Dowsett, 2009:18), leading to poor patient outcomes. Provision was made for either a verbal or recorded assessment in this study.

The results from this study suggest that the number of assessments observed was less than 70% the recommended number for quality. The PI percentage was a mere 10.56 % indicating a clear gap in current practice if improved patient outcomes are to be expected.

Classification of the wound is the next element for discussion.

5.6.2.2 Classification and location of the wound described or considered

Wounds are classified as acute, chronic or postoperative wounds (Mulder, 2009b:18; Granick, Boykin, Gamelli, et al., 2006:S1; Mulder, Small, Botma, et al., 2002: 45).

Wounds are also classified in terms of the depth of the damaged tissue layers according to Mulder (2009b: 18). This classification gives an indication of time to complete wound healing which will allow the clinician to identify signs of delayed healing or ineffective treatment timeously to alter or change the treatment plans. Similarly, the location of the wound will alter the intervention with, for example, faces requiring specialised care.

The results from this study indicated that more than 50% of the burns were classified, but the location of the wounds was only considered or described in less than 30 % of the observations with the PI percentage of 54.78% for classification and 26.73% for location.
The TIME model's practical implementation is the next element for discussion.

5.6.2.3 Description of the wound bed utilizing the TIME model and the identification and management of elements of TIME.

The TIME framework summarizes four main components: **T**issue management; Control of **I**nfection and **I**nflammation; **M**oisture imbalance; Advancement of the **E**pithelial edge of the wound (Schultz & Dowsett, 2012: 25-27; Dowsett & Newton, 2005: 59-70; Falanga, 2004: 2-5; Schultz, et al., 2004: 24-30; Schultz, Sibbald, Falanga, et al., 2003: 10), and is a useful practical tool used to identify the barriers for healing and implementing a structured plan of care to remove the barriers that delay wound healing with the ultimate goal being to promote wound healing. In a PhD thesis (Dowsett, 2009), an experimental pre-test–post-test design using repeat measures was used to test the hypothesis that a structured educational intervention based on the TIME framework would positively impact on community nurses' wound care knowledge and practice.

Results indicated that community nurses' wound care knowledge and practice improved significantly after training ($p<0.001$) and that the TIME framework is a useful tool for delivering wound care education and can contribute significantly to improvements in respect of wound care practice (Dowsett, 2009). Similarly to the Dowsett (2009), trial this study found that without a structured framework such as TIME, wound care knowledge and practice was not optimal. The PI percentage was 0.33% for the use of TIME to describe the appearance of the wound bed and 8.5% for the identification and management of elements of TIME.

This indicates a weakness in the management of burn wounds with an area for development in future. In contrast to the Dowsett (2009), trial, the study design was descriptive, non-experimental; future experimental research is required based on the recommendations from this study. The size of the wound discussion follows.

5.6.2.4 Size of the wound described

Not only is the size of the wound used to establish the need for fluid resuscitation, the calculation of fluid requirements, nutritional support, evaluation of prognosis (in other words the morbidity and mortality) but it is also very important for monitoring the progress of healing (Miminas, 2007:58-60; Wachtel, Berry, Wachtel, et al., 2000; 156). The PI percentage for description of and size of the wound in the observations was 67.32%.

Even though assessments were not routinely carried out, nurses acknowledged the size of the wound and indicated that the estimation was done by the doctors in the ward, but they were cognisant of the size as it influenced their planning for the procedure.
Pain and pain control is discussed below.

5.6.2.5 Pain control and considering the subjective pain complaints of the patient

Burns can be extremely painful. Pain management, which includes pharmacologic and non-pharmacologic approaches, is a central component of the complex issues involved in treating patients with burns; despite advances in burn care, inadequate burn pain management still exists (Patterson, Hofland, Espey, et al., 2004: A10). The effect of burn pain lingers long after the wounds have healed and nurses therefore have a responsibility to effectively manage burn pain. Wiechman, Patterson & Sharar (2009: 522), stated that burn pain is amongst the most common causes of distress during the first year after discharge. According to Esfahlan, Lotfi, Zamanzadeh, et al., (2010: 1129-1130), and Norman & Judkins (2004: 57), burn pain is influenced by the following factors: depth of burn, stage of healing, nature of care procedures and patient characteristics; and psychological factors such as depression or anxiety which can become a part of the experience of pain, particularly if pain medication is not initiated prior to the unpleasant procedures.

Even though pain control was not greater than70% PI percentage, a score of 66% was one of the better managed aspects of the wound management process. Pain is subjective and is experienced differently by people. It is therefore imperative that nurses communicate with patients to get an understanding of their experience of pain.

The PI percentage for the consideration of patients' pain complaints was 72.60%. This is an indication of a quality assessment. Thus pain control was one of the areas that nurses performed the best in the process of wound management.

The next phase for discussion in the nursing process is the intervention (dressing execution) phase. This refers to all activities implemented and starts with the preparation of the environment.

5.6.3 Dressing execution

5.6.3.1 Preparation of environment

Manipulation of the environment includes: air current; equipment and surfaces as well temperature of procedure room. Each of these will be discussed.

a. **Air current**

Windows and doors must be closed during dressing procedure as open doors and windows cause a vacuum that suctions dust particles into the room; electric fans must be switched off so that dust particles are not circulated in the room (Mulder, et al., 2002: 64).

b. **Equipment and surfaces**

Instruments, equipment, furniture and supplies such as dressing packs must be cleaned and decontaminated before and after use (Hart, 2007: 44; Mulder, et al., 2002: 67). According to the same authors, sterile instruments must be used for open, raw and infected wounds; furthermore, surgically clean instruments may be used on healed wounds as the skin is already intact.

c. **Temperature of environment (procedure room)**

No study was found that examined the concept of temperature in the procedure room, however studies have been found that addressed the impact of room temperature in the operating room on infection (Putzu, Casati, Berti, et al., 2007: 166; Odom-Forren, 2006: 62). The same authors recommended that a sufficiently high temperature in the operating room be maintained to reduce heat loss which in turn will reduce the risk of infection. When the temperature of the wound bed falls below the core body temperature wound healing can be delayed as a result of slow epithelial repair, lack of collagen deposition, a reduction in late phase inflammatory cells and fibroblasts and a higher percentage of wound infections (McGuiness, Vella & Harrison, 2004: 383).

In vitro studies have demonstrated that 33°C is the critical level at which neutrophil, fibroblast and epithelial cell activity decrease; on the other hand studies have shown improved healing when wounds are warmed because of increased blood-flow, oxygen tension, collagen deposition and immune cell function (McGuiness, et al., 2004:383). Furthermore, studies have suggested that wounds heal more effectively at normal core body temperature (36°C -38°C) and that wound healing is delayed when temperatures fall either below core body temperature or rise above 42°C (McGuiness, et al., 2004:383).

The PI percentage was 54.12%. Certain aspects were addressed in relation to preparation of the environment. Windows and doors were closed prior to dressing procedure. Electric fans, where available, were switched off. Instruments, equipment, furniture and supplies were cleaned and decontaminated before and after use. Non sterile scissors were decontaminated before use.
Sterile dressing packs were used for wound dressing. The only aspect not addressed in preparation of the environment was the temperature of the room. No active warming of the room was done, however doors and windows were closed to minimise airflow and indirectly adjust room temperature.

The next point for discussion is the aseptic opening of packs and expiry dates.

5.6.3.2 Packaging opened aseptically and expiry dates checked

Castille (1999: 48-52), stated that when preparing to undertake an aseptic technique it is important to check that: the medical device being used is CE marked (Conformite Europeene) (a mandatory conformity marking in Europe), the medical device is not expired, the packing of the device is intact before use, the device has been stored in a dry, clean, safe store, if the device is sterile, evidence of sterilisation is provided, single-use items are only used once not cleaned or reused and unused swabs and dressings are not to be saved and used at a later stage or date.

In this study a PI percentage of 62.04% was achieved for opening packaging aseptically. Compared to the opening of packs aseptically, checking of expiry dates the PI percentage achieved a much lower score of a mere 8.91%. The PI percentage in the Nonimo, et al., (2008:60), trial had a mean of 82.50% for the opening of packs aseptically and expiry dates checked had a mean score of 5.75%.

Following on the discussion on aseptically opening of packs, the use of an aseptic field will be discussed below.

5.6.3.3 "Dirty" material kept separately from the clean field and aseptic technique maintained

The researcher will first explain the difference between aseptic technique and aseptic non touch technique as a recap for the reader.

Aseptic technique is traditionally divided into two different processes: surgical aseptic technique and aseptic non-touch technique (Hart, 2007: 43). Although the aims and objectives of these two processes are the same, the differences take into consideration the location and procedure being undertaken.

Surgical aseptic technique is mainly used in the operating theatre, but is also appropriate in wards and other departments for invasive procedures such as the insertion of a central venous catheter while aseptic non-touch technique is used for simpler and less invasive procedures such as administration of intravenous drugs and wound care (Hart, 2007: 43). Aseptic fields are considered important because they help to promote or ensure the integrity of asepsis during clinical procedures by providing a controlled aseptic working space (Rowley, Clare, Macqueen, et al., 2010: S8).

There are two grades of aseptic field that require different management depending on whether their primary purpose is to promote or ensure asepsis: critical aseptic fields are used when key-parts, usually due to their size or number, cannot easily be protected at all times with covers and caps, or handled at all times by a non-touch technique, such as in PICC (Peripherally Inserted Central Catheter) or a urinary catheter insertion, or when particularly open, invasive or technical procedures demand large aseptic working areas according to (Rowley, et al.,2010: S8).

The observations in this study revealed that the "dirty" material was kept separate from the clean or aseptic field with a PI percentage score of 76.56%. This indicates a quality assessment as the score was above the 70% parameter. However, on the observation of aseptic technique maintained throughout the procedure a PI percentage of 67.32% was allocated. In the Nonimo, et al., (2008:60), study the PI percentage was also below the 70% parameter. In this study the low PI percentage was due to the fact that a clean procedure was used as opposed to surgically clean or sterile technique with non-sterile gloves being used as the gloves of choice, use of non- sterile dressing as in the case of previously opened ointments and creams and the use of non-sterile water to clean wounds. On the topic of the use of non-sterile water for wound cleansing and the use of the prescribed solution for dressing the wound follows.

5.6.3.4 Prescribed solution for wound dressing

Numerous studies have focused on various cleaning solutions. Traditionally preparations with antiseptic properties have been used to clean wounds, but published research using animal models has suggested that antiseptic solutions may hinder the healing process (Fernandez & Griffiths, 2012: 2). The most commonly used solutions lately are normal saline and tap water (Lloyd- Jones, 2012:397; Fernandez & Griffiths, 2012: 2; Gannon, 2007: 44-45; Blunt, 2001: 34), however, the choice of a cleaning solution is still largely based on preference and experience of the clinician. Normal saline (0.9%) is the favoured wound cleansing solution because it is an isotonic solution and does not interfere with the normal healing process, damage tissue, cause sensitisation or allergies or alter the normal bacterial flora of the skin (which would allow the growth of more virulent organisms) (Fernandez & Griffiths, 2012: 2; Lloyd- Jones, 2012: 397; Gannon, 2007: 44-45; Blunt, 2001: 34).

Potable tap water is also recommended as a cleaning solution (Fernandez & Griffiths, 2012: 2; Joanna Briggs Institute (JBI), 2008: 28; JBI, 2006: 1; Blunt, 2001: 1), as no difference was noted in infection rates when compared to 0.9 % for the use of saline and has the advantages of being efficient, cost-effective and accessible (Fernandez & Griffiths, 2012: 2; Lloyd- Jones, 2012: 397). However, clinicians have been cautioned against using tap water to cleanse wounds that have exposed bone or tendon, in which case normal saline is recommended (Fernandez & Griffiths, 2012: 2).

The type of cleaning solution to be used for wound cleaning is vague in clinical practice. In 246 (81.18%) of the observations, the type of solution to be used was not prescribed. One possibility was that the choice of cleaning solution was informed by standing orders (prescription) or the choice was based on clinician preference. The PI percentage was a mere 8.5%. The use of logical sequence follows.

5.6.3.5 Logical sequence throughout the procedure

All actions to be undertaken need to be predetermined and planned to limit the risk of contamination. Planning ensures that a logical sequence is followed throughout the procedure. In the clinical setting, wound dressing techniques are still largely taught using a procedural approach through a series of sequential steps in the absence of an adequate rationale for such steps (Gillespie & Fenwick, 2009: 63). It is well documented that the practices incorporated in performing wound dressings are, in many instances ritualistic rather than evidence based (Lloyd Jones, 2012: 396; Gillespie & Fenwick, 2009: 63; Flanagan, 2005:76; Moore & Price, 2004: 944; Blunt, 2001: 33). This tendency to cling to ritualistic practice may stem from a fear of change due to lack of knowledge rather than an unwillingness to change (Moore & Price, 2004: 944). According to Gillespie & Fenwick (2009: 63), any departure in the prescribed order of these steps is conjectured to jeopardise the cleanliness of the procedure, and consequently increase the patient's risk of acquiring a wound infection.

Bree- Williams & Waterman (1996: 51), in their observational study, found that 33% of nurses contaminated their hands and equipment during wound dressing as a result of a number of factors, ranging from making the procedure more complicated than required, poor skill in hand-washing, glove technique and use of non-touch principles in handling sterile equipment and instruments.
Nurses, should therefore have a structure in mind as to sequence to be followed throughout a process thereby eliminating the over complication of the procedure. This structure is provided in the form of the nursing process.

In this study a PI percentage of 77.88% was allocated for logical sequence indicating a quality assessment. In contrast the PI percentage in the Nonimo, et al., (2008:60), study had a mean score of 50.5%.
The final phase of the nursing process with its various elements will now be discussed.

5.6.4 Outcome and Evaluation

5.6.4.1 Nursing process and the TIME framework reflected in cardex (documentation)

Documentation is a requirement of nursing practice. The main benefit of documentation is to enhance the improvement of the structured communication between healthcare professionals to ensure the continuity of individually planned patient care (Dowsett, 2009: 14; Björvell, Thorell-Ekstrand & Wredling, 2006:7). Furthermore documentation allows for reviewing and evaluating the efficacy of care. Following the nursing process whilst documenting the nursing actions will guide the nurse in the sequences and make nursing documentation structured.

Despite the nursing process first been described in 1958 (Marriner-Tomey & Alligood, 2006: 432), and the concepts being widely accepted, the PI percentage in this study was 0%. This indicated that the nursing process was not reflected in documentation at all.

The TIME framework was developed as a systematic approach to wound management (Dowsett, 2009:14). Neither the TIME framework was reflected in the documentation with a PI percentage of 0%. Overall, despite its popularity in the literature, the TIME framework was not applied in the description of the wound bed (PI= 0.33%), nor in the identification and management of the elements of TIME, in assessment and diagnosis of burn wounds (PI= 8.5%) and in its use in documentation (PI= 0%).

The final element for discussion is referral pathways follows.

5.6.4.2 Referral to multi-disciplinary team

Burns patients are trauma patients cared for by a multidisciplinary team made up of nurses, doctors, physiotherapists, dieticians, counsellors, etcetera. The WHASA (Wound Healing Association of Southern Africa) WHEEL is a concept that has been developed to demonstrate the impact of inter-speciality co-operation for the ultimate benefit of the patient; the WHASA WHEEL that demonstrates the role of various health workers in the management of a patient with a wound (Widgerow, 2008:8). Figure 5.7 illustrates the role of inter-speciality.

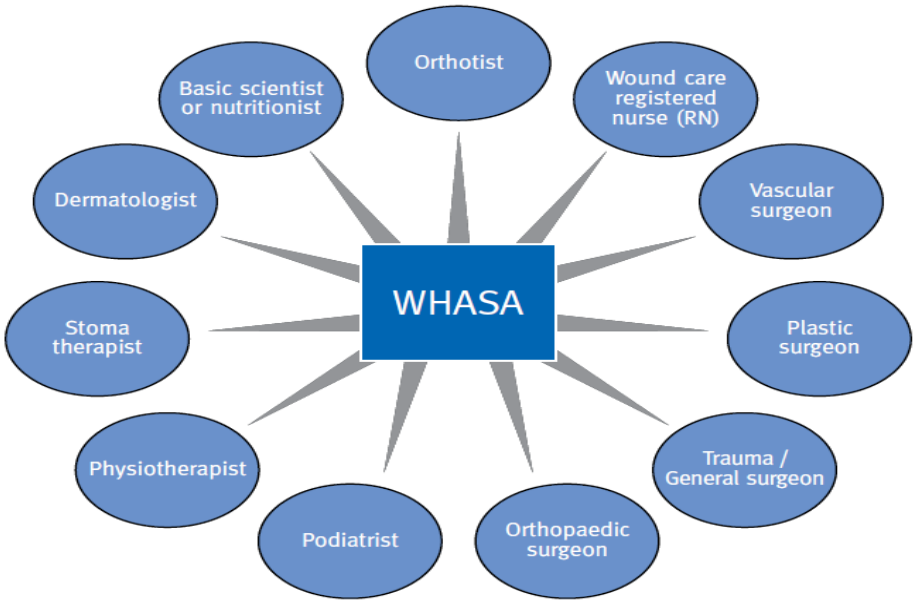

Figure 5.7 WHASA WHEEL (Widgerow, 2008:8).

The improved outcomes utilising the WHASA WHEEL, have been demonstrated in numerous studies (Widgerow, 2008:8; Vu, Harris, Duncan, et al., 2007; Sumpio, Aruny & Blume, 2004; Gottrup, 2004a). Each member of the team has a contribution to make to the improved outcomes of patients. In this study the PI percentage was 62.04%.

5.7 SUMMARY

In conclusion, the communication from the nurse to the patient was not effective with PI percentage scores of 17.82% for introduction of self and 13.86% for explanation of procedure carried out. The heating of cleaning solution and hand washing was also identified as an area for improvement. During dressing preparation the nurses effectively prepared material for the dressing before the procedure and maintained the patients' integrity.

On assessment and diagnosis, nurses scored below the 70% mark for quality assessment with the lowest scores observed for the use of the TIME framework. This is an indication that the framework has not been adopted as a frame of reference for the management of burn wounds in the setting observed.

The dressing execution obtained satisfactory scores on certain elements, namely: aseptic field maintained; logical sequence kept throughout procedure; and considering the pain complaints of the patients. However, an identified gap in competence was the preparation of the environment, opening of packages, checking expiry dates and the use of technique for cleaning. These results indicate that the dressing execution can raise the risks of infection, compromising the healing and recovery process of the patient's skin integrity, thus demanding a longer hospital stay (Nonimo, et al., 2008: 62).

The use of the nursing process and the TIME framework were not used during documentation which indicates a need for a more structured approach to reporting. The referral pathways, whilst done, had a PI percentage of 62.04%, which is below the benchmarked score of 70% for quality.

These results indicate a need for guidelines on the management of bun wounds by nurses.

5.8 CONCLUSION

The conclusions drawn in Chapter Five were used as evidence for the development of the interview schedule for nurses during semi- structured interviews in Phase Two (b) of the study which is discussed in Chapter Six.

CHAPTER SIX LAYOUT

CHAPTER 6	6.0 Introduction	
	6.1 Dressing preparation	6.1.1 Preparation of patient 6.1.2 Preparation of self 6.1.3 Preparation of environment 6.1.4 Preparation of supplies 6.1.5 Introduction of self to patient 6.1.6 Explanation of procedure 6.1.7 Temperature of cleaning solution 6.1.8 Hand washing 6.1.9 Integrity
	6.2 Assessment	6.2.1 Roles and responsibilities 6.2.2 Description of the wound 6.2.3 TIME framework
	6.3 Dressing execution	6.3.1 Process of dressing change 6.3.2 Information overload
	6.4 Outcome and Evaluation	6.4.1 Documentation 6.4.2 Referral 6.4.3 Work overload 6.4.4 Needs of nurses
	6.5 Conclusion	

CHAPTER SIX
SEMI STRUCTURED INTERVIEWS

6.0 INTRODUCTION

The results and discussion of the third objective are presented in Chapter Six. Chapter Six relates to Phase Two (b) of the research design and research method. The third objective was to describe the current practice for the management of burn wounds according to the themes of the nursing process through semi structured interviews conducted with nurses working in a single burns unit at a public sector tertiary academic hospital, with the intention of providing research evidence for the development of guidelines for the management of burn wounds by nurses. This objective was achieved through a qualitative, descriptive research design.

The research design and research methods of the study are briefly described. A mixed methods, QUAN (quantitative) → QUAN+ QUAL (quantitative and qualitative), non-experimental, explanatory sequential, descriptive design (Polit & Beck, 2012: 608-612; Creswell & Plano Clark, 2011: 104), was used. This mixed method design was chosen as it allowed for a greater insight into the perspective to the findings of the study. The design was sequential indicating the timing of data collection (Polit & Beck, 2012: 608; Creswell, 2009a: 206), with the quantitative data collected first through an integrative review (Phase One, Chapter Four), followed by the parallel collection of quantitative data through structured observation (Phase Two (a), Chapter Five) and qualitative data through semi structured interviews (Phase 2 (b), Chapter Six). Sequential explanatory strategies are characterised by the collection and analysis of quantitative data followed by qualitative data; weight is given to the quantitative data and informs or expands the qualitative data (Creswell, 2009a: 211; Teddilie & Tashakkori, 2006: 21). Since no intervention was introduced, the study was non-experimental (Polit & Beck, 2012:735; LoBiondo- Wood & Haber, 2010: 582).

For consistency purposes refer to figure 6.1 for an overview of the research design and research method.

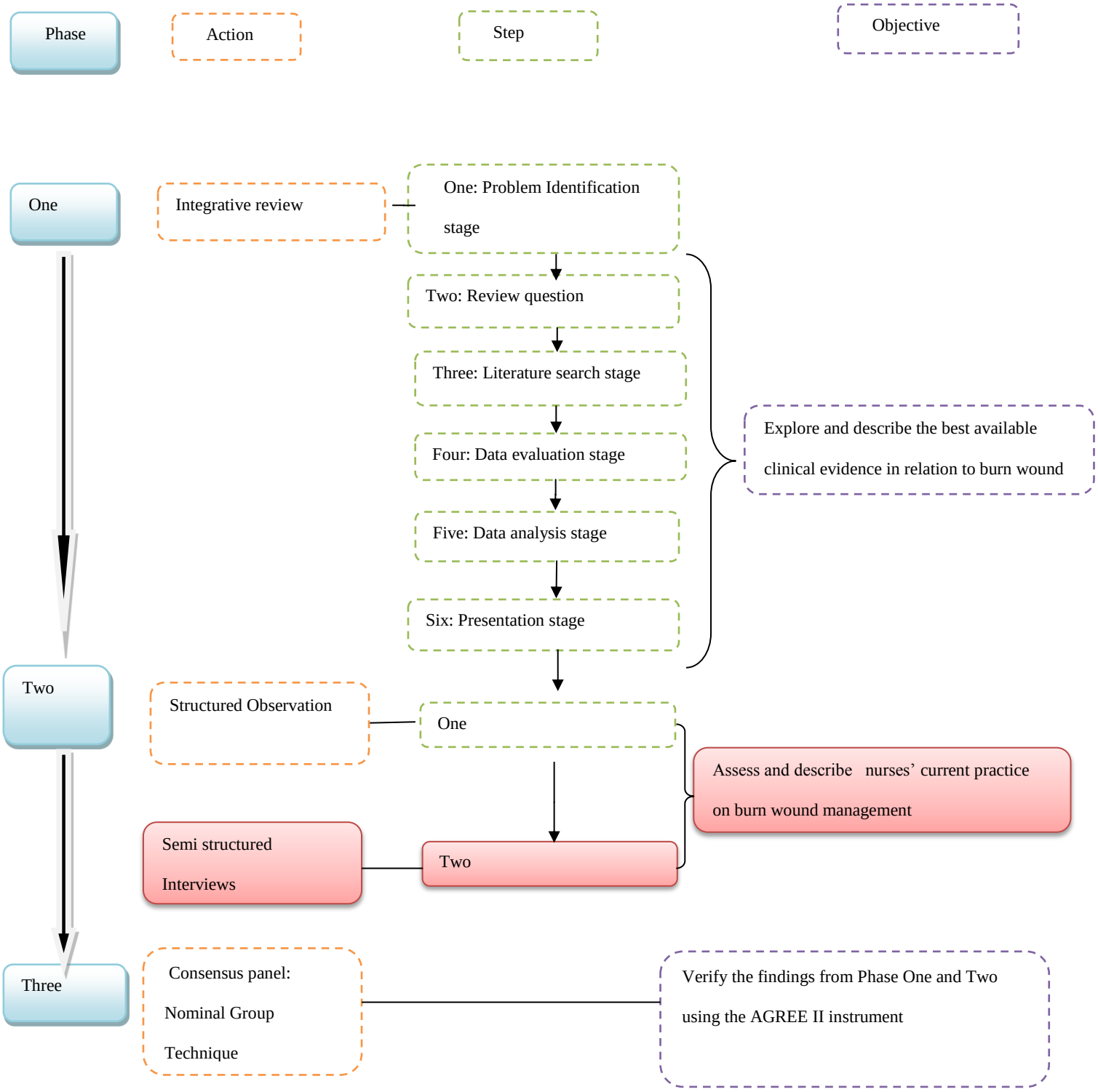

Figure 6.1 Overview of the research design and research method.

The research design and research method are summarised (Refer to Chapter Two for a detailed description of the research design and research method). Semi-structured interviews were selected as the means of data collection because of two primary considerations.

Firstly, semi- structured interviews were selected to augment the data gathered during observation in order to enhance the researcher's understanding of nurses' current practice on the management of burn wounds as it enabled probing for more information and clarification of answers.

Secondly, the varied professional, educational and experience of the sample group precluded the use of a single method of data collection, in other words just doing structured observation and the interviews sought a narrative description and explanation.

The population was the same population used for the structured observation (Chapter Five). Purposive sampling was done to include all the nurses working in the unit. As the purpose was to explore current practice by nurses and the total population was forty one (n=41), the researcher decided to include all nurses to get a better understanding of current practice. Various authors (Holloway & Wheeler, 2010:138; Parahoo, 2006: 333), describe purposive sampling as sampling where chosen individuals have special knowledge of the topic.

Inclusion criteria were all nurses that were working permanently in the burns unit at the time of data collection. The exclusion criteria were students and nurses not permanently employed in the unit as well as nurses that were not on the South African Nursing Council register or roll. These nurses were excluded, as the level of knowledge and experience was uncertain. Interviews were conducted whilst the structured observation was in progress in the burns unit. All the interviews were conducted in the natural setting in the burns unit and participants were reminded of the interviews during the data collection period. Data saturation was achieved after interviewing six participants. However saturation is a problematic term (Mason, 2010; Morse, 1995) as its meaning is interpreted by the researcher as vague. The saturation the researcher was aiming for was "knowledge saturation" (Bertaux, 1981:37) and therefore two additional interviews were conducted. At this point the researcher recognized patterns in the participants' experiences and no new themes emerged.

Tape recorded data were transcribed and analysed as described by Tesch (Tesch, 1990 in Creswell, 1994:155). Extracts from the original transcripts were inserted so as to provide evidence to support the expressed categories. Elo & Kyngäs (2008:111), point out that creating categories does not simply mean bringing together observations that are similar or related, but rather that data is classified as belonging to a particular group a33nd providing a way of describing the phenomenon.

As the purpose of the semi structured interviews was to describe current practice for the management of burn wounds the participants were asked the following questions:

Questions:

- *I would like to know from you what sort of preparation you do in preparing for a dressing?*
- *Please describe what you look for when assessing a wound?*
- *Kindly describe how you would go about doing a dressing on a patient in the following scenarios:*
    - *on admission of new patient,*
    - *routine dressing-change in the ward*
    - *post discharge in out –patients*
- *Please tell me what you typically do after a dressing change?*

Subsequent probing questions were planned guided by the discussion. The semi-structured interview not only gives interviewers some choice in the wording of each question but also in the use of probes (Barriball & While, 1994: 331).

Probing questions included:

- *Can you please tell me how one decides which dressing is appropriate for which wound?*
- *I would like to know more about how you would describe the different depths of the burns?*
- *Please explain how do you know if the wound is not getting better?*

Making convincing arguments with qualitative data is central to developing a written account in qualitative research that is coherent and persuasive (Holloway, 2005:272; Rossouw, 2003:37). Evidence from data is therefore used to support arguments by the use of words of the participants and/or from field notes (Corbin & Strauss, 2008:123). Furthermore, Mason (2002:182), suggests that making convincing arguments is based on a relational process between an idea and data.

Four ways of approaching arguments are according to (Mason, 2002:176), as follows:

(i) arguing evidentially, whereby what is relevant is presented logically and appropriately to support arguments in relation to the data;

(ii) arguing interpretatively or narratively, whereby the argument is linked to the data meaningfully or reasonably, and therefore the evidence is used to support the interpretation and to illustrate that it is valid and appropriate in nuance;

(iii) arguing evocatively or illustratively, whereby the argument evokes understanding or empathy towards the data on the phenomenon, and thus facilitates experiential understanding. In this regard, evidence is used to illustrate or convey the meaning that supports the evocative argument;

(iv) arguing reflexively or multivocally, whereby the argument illustrates a range of meaningful experiences, understandings or perspectives encountered in the data, including critique and indications of gaps or omissions in knowledge about the phenomenon under study.

In this study the researcher used these four methods of arguing the phenomenon under study, the data and evidence accessed.

The themes were centred on the nursing process: Assessment, Diagnosis, Intervention/ Implementation, Outcomes and Evaluation (refer to Chapter Three for a detailed description of each phase of the nursing process).

The categories and sub categories emerged from the data. The conclusion statements of the emergent categories and subcategories positioned the description of the theme in relation to data and/or evidence. Refer to table 6.1.

Table 6.1 The themes and categories

Theme	**Categories**	**Sub categories**
Dressing preparation	Preparing the patient	Pain medication
	Preparation of self	Gown, plastic aprons, gloves
	Preparation of environment	Cleaning surfaces and equipment
	Preparation of supplies	Collecting dressing materials
	Introduction of self to patient	Meet and greet
	Explanation of procedure	Uncertainty of what information to share Perception that patients might not understand or be in too much pain or emotional distress to want to discuss procedures
	Temperature of cleaning solution	Varied practice
	Hand washing	Specified times
	Integrity	Respect for patient
Assessment and Diagnosis	Roles and responsibilities	Of the nurse and the doctor
	Description of the wound	Size and depth Appearance Healing Infection Dressings selection
	TIME framework	Awareness and implementation of TIME framework
Dressing execution	Process of dressing change	Justification for actions
Outcome and Evaluation	Documentation	Freestyle writing
	Referral	Open communication
	Work overload	Concerns about patient numbers and care received
	Needs of nurses	Better patient outcomes

The number of the participant referenced the extracts from the transcripts followed by the relevant page of the transcript, for example: 1:6 (participant number one (1) and six (6) the page number of the transcript). Field notes are also inserted where relevant, in brackets.

The researcher found that the semi structured interviews were the most appropriate method of data collection in Phase Two (b) as it allowed direct interchange of information. The objective to describe current practice was met and will be presented in Chapter Six. Each theme, its related categories and supporting literature will now be discussed in detail.

6.1 DRESSING PREPARATION

The first theme for the interviews was dressing preparation. From this theme categories were identified and are summarised in table 6. 2. The categories refer to the different aspects identified by the nurses as part of preparation.

Table 6.2 Identified categories and sub categories for dressing preparation

Theme	Categories	Sub categories
Dressing preparation	Preparing the patient	Pain medication
	Preparation of self	Gown, plastic aprons, gloves
	Preparation of environment	Cleaning surfaces and equipment
	Preparation of supplies	Collecting dressing materials

Each category will be discussed with quotes from nurses and with literature control where available to support or refute the findings of the study. Finally the researcher's interpretation of the phenomena is explained in relation to this study.

6.1.1 Preparation of the patient

The first question was on the dressing preparation and was asked as an introductory question on choices made during the planning phase for dressing procedure. The main purpose of this question was to allow the participants to shift their thinking from general to specifics (de Vos, Strydom, Fouche, et. al., 2005: 308). Participants considered pain management as an important factor in preparing the patient for a dressing change. In fact it appeared that the main focus in terms of preparing the patients was pain control. Participants demonstrated and expressed a great deal of empathy for patients with burns as, unanimously, participants placed a lot of emphasis on ensuring the patient is free from pain.

This can clearly be seen from the following statement made by a participant:

*"**Definitely the first step is to make sure the patient is comfortable. I give the morphine or Tramal that was prescribed. But definitely we do give pain medication."*** **(6.1)**

Although burn injury pain was clearly described as a major clinical problem, researchers continue to report that burn pain remains undertreated (Summer, Puntillo, Miaskowski, et al., 2007: 533).
This is of concern because unrelieved pain is thought to contribute to long-term sensory problems, including chronic pain, paresthesias, and dyesthesias, as well as debilitating psychological conditions (Esfahlan, Lotfi, Zamanzadeh, 2010: 1129; Summer, et al., 2007: 533).

Participants recognised the importance of pain management as part of their wound management procedure. Participants took ownership for the procedural pain induced during dressing procedure and took the necessary measures to minimise patients' discomfort. In the researcher's experience nurses generally appear to distance themselves from the patients' pain during the procedure by continuing almost mechanically with the dressing change and responding with the occasional *"Sorry, I know it's sore"* or "*It is not me hurting you, but the wound itself is sore".* By ensuring that pain medication is administered prior to the procedure nurses appear to exempt themselves from the induced procedural pain. Assessment of pain and pain scales were not mentioned, however on probing participants were familiar with the Visual Analogue Scale although it was not routinely utilized. On enquiry participants admitted that a pain measurement scale should be used, but due to lack of training, limited time and additional paper work the pain scales were not routinely used in practice. An appropriate and comprehensive pain-management regimen is needed to ensure that patients with burns are not under treated and that as part of evidence based practice patient preferences are taken into consideration.

6.1.2 Preparation of self

A person is a bio-psycho-social being, including the nurse working in the burns unit. Working in a burns intensive care unit is stressful and the only preparation of the self that was done was on the physical preparation by wearing protective clothing. No debriefing was done for the nurses caring for these often debilitating, traumatised patients. It would appear that nurses "dress" their own emotional needs, stress and the trauma of nursing patients with burns with protective clothing as evident by the following response:

***"We change when we come into the ward in the morning…"* (3.1)**

The importance of infection prevention in a patient with burns cannot be overemphasised. This is not only through patient to patient transmission via the colonised hands of healthcare workers but also via their clothes or equipment, and this is considered to be the main factor responsible for the spreading of organisms in the hospital setting.

The two areas most likely to become contaminated when caring for the patient with burns are the hands and apron area of the person, as the surfaces (for example beds, side rails, tables, equipment) are often heavily contaminated with organisms from the patient (Rafla & Tredget, 2011: 7; Weber & McManus, 2004: A20). The decision to use clean gowns or plastic aprons should be evaluated for adequacy of protection, ease of use, comfort, and cost according to Weber & McManus (2004: A20). The authors recommend universal precautions are a standard practice when caring for all patients with burn injuries as the open burn wound increases the environmental contamination. Furthermore, Rafla & Tredget (2011: 12), recommend the use of sterile gloves and masks while dealing with an open wound. On the other hand several authors argued that non-sterile gloves are usually the logical glove of choice for dressing changes (Rowley, Clare, Macqueen, et al., 2010: S8; WHO, 2009a: 140; Gillespie & Fenwick, 2009:67; Hart, 2007: 47), because they advocate for the use of aseptic non touch technique (ANTT) in which non sterile gloves are used in wound care and sterile gloves are reserved for key areas and invasive practices such as surgical procedures.

The researcher pondered if the "change" the participants referred to was addressing the clothing or was it a metaphor for a form of adaptation to cope with the stress related to nursing patients with burn injuries. Rafla & Tredget (2011: 12), claim that the use of personal protective garments for all healthcare professionals involved with caring for the wounds of patients in the burn unit is primarily for personal protection. Blunt (2007: 35), argued that most nurses prefer to use gloves and that this might be linked to the fact that this protects the wearer from infection. The psychological preparation or lack thereof was not within the scope of this study and is recommended as a topic for future research. Participants in this study demonstrated an understanding of the mechanisms of transfer of micro-organisms between patients and from patients to themselves as demonstrated by their verbalisation of the need for wearing protective clothing. They also indicated an alignment with the use of ANTT as opposed to sterile technique for dressing changes. However, it is acknowledged that infection is a leading cause of mortality in patients with burns, but the psychological condition of the nurses caring for the patient with burns needs to be recognised so as to avoid burn out and work induced stress.

6.1.3. Preparation of the environment

Participants appeared to have difficulty with this aspect of preparation with answers being very drawn out as if a lot of thought was required. The researcher got the impression that nurses were trying to give the 'correct' answer.

***"I start with damp dusting… I wipe all the surfaces… and trolley so that I know that before I start with the dressings the place is clean…"* (3.2)** (Participant looked up repeatedly whilst answering as if she was searching for answers. The researcher found even the pauses strange because if this was normal practice the participant would not have had to think about it).

Preparation of the environment includes: air current; equipment and surfaces as well temperature of procedure room (Mulder, Small, Botma, et al., 2002: 64- 67). According to the Centre for Disease Control (CDC) (2007), there is no consensus on the most effective infection control practices to prevent transmission of infections to and from patients with serious burns (for example single bed rooms, laminar flow or maintaining burns patients in a separate unit without exposure to patients or equipment from other units) (CDC, 2007: 33).

The participants in this study did not discuss air current or temperature of the room as part of dressing preparation of the environment. Dusting was mostly mentioned as the required preparation of the environment along with the collection of supplies. However, a lot of probing had to be done as preparation of the environment seemed to be forgotten as being an integral part of planning and preparation.

6.1.4 Preparation of supplies

After administering analgesics participants stated the collection of **enough** supplies was important. All of the participants spoke about collecting of supplies to save time. The word "time" was repeated on several occasions in response to dressing preparation and supplies as demonstrated in the two quotations below.

***"… I just want to finish quick quick so that I can cover the patient. "* (8.2)**

***"You saw mos (*slang word used in South Africa*), I take everything. Dressings, aprons, gloves, lotion (green towels) to save time*" (4.2)**

Good preparation for the dressing procedure shortens the actual dressing change process. According to Mulder, et al., (2002: 64), preparation includes the collection of necessities needed for the nurse, the procedure and the patient.

Participants were very clear on the collection of supplies as part of the preparation for wound dressing procedure to avoid time wastage as they felt that this was not only of concern to them but that it would also be of concern for the patient. Understandably nurses do not want to waste time by running up and down. Furthermore, the risk of infection is increased if the patient is exposed and nurses are going in and out of the dressing room, possibly transporting organisms to the stock room, other patients and other health care workers. Categories that emerged through probing are depicted in table 6.3.

Table 6.3 Probed categories and sub categories

Theme	Categories	Sub categories
Dressing preparation	Introduction of self to patient	Meet and greet
	Explanation of procedure	Uncertainty of what information to share Perception that patients might not understand or be in too much pain or emotional distress to want to discuss procedures
	Temperature of cleaning solution	Varied practice
	Hand washing	Specified times
	Integrity	Respect for patient

6.1.5 <u>Introduction of self to patient</u>

Participants took it as a given that everybody greeted the patients routinely. Participants seemed surprised by this question and were nonchalant about greeting as demonstrated by the following statement.

"*It is in our culture to greet of course, but we greet the first time we see the patient."* (2.1)
(Appeared irritated by the question)

Africans generally greet everyone including strangers and people from other cultures (Macleod, 2002: 11). Greeting is a form of acknowledgment of the person and shows respect (Casperson, 1999: 11). Because the world is made up of diverse people, with diverse cultures, transcultural nursing is very important.

Transcultural nursing has been defined as: a substantive area of study and practice focused on comparative cultural care (caring) values, beliefs, and practices of individuals or groups of similar or different cultures with the goal of providing culture-specific and universal nursing care practices in promoting health or well-being or to help people to face unfavourable human conditions, illness, or death in culturally meaningful ways (Leininger, in Sitzman, 2011:95). Nussbaum (2003:2), describes the interconnectedness as the African value of "ubuntu". Ubuntu is consciousness of the natural desire to affirm fellow human beings and to work and act towards each other with the communal good in mind; ubuntu calls upon the believe that: "your pain is my pain" (Nussbaum, 2003:2).

Participants greeted the patients daily during their first encounter with the patient. In this study dressing observation was carried out as an isolated event after breakfast and was not the first encounter nurses had with the patients. Participants' responses were thus also taken into context. Whilst participants did not routinely greet patients before the onset of the dressing, greeting formed part of the morning routine. In the researcher's experience greeting patients was a part of the culture in the ward.

6.1.6 Explanation of the procedure

In this study the researcher did not interview patients and could not verify the level or amount of information given to patients. Participants acknowledged that explanation of the dressing procedures were not always done. The reasons stated include patients' pain, nurses' perception of patients not understanding or wanting to hear about the procedure, time restraints and an inability of the nurses to explain a procedure that is methodological for nurses as part of their daily routine.

"These patients are in pain. They don't want to talk. So I just do the dressing quickly so I can finish so they can rest" **(6.1)**

On the other hand, some participants did explain the procedure to patients, but not at every dressing change.

"*…it's important that patients are involved and understand what is happening in the ward. That is why I will explain to them what is what.*" (7.1) (Hand gestures used to emphasise the point)

Many organisations including the European Union (EU) (2004), Department of Health (DH) (2004), the National Health Service (NHS) Modernisation Agency (2003), and World Health Organization (WHO) (2000), have all emphasised the importance of patient focused communication between health professionals and patients; this is seen as vital to achieving patient satisfaction, inclusive decision making in caregiving and an efficient health service (Bach & Grant, 2009:9). Furthermore, communication constitutes an important part of the quality of nursing care and predominantly influences patient and resident satisfaction; it is a core element of nursing care, and a fundamentally required nursing skill (Fleischer, Berg, Zimmermann, et al., 2009:342). On the other hand poor communication has been proven to cause anxiety and less optimal recovery of the patient (Russel, 1999: 783), nurses asking inappropriate question which in turn leads to incorrect judgements (Rondahl, Innala & Carlsson, 2006:380), and creates obstacles in effective care for example pain management (Simons, & Roberson, 2002:78).

In this study participants acknowledged that 'explanation of procedure' was limited as participants deemed it not necessary to explain the procedure either due to time restraints, pain or nurses reluctance to educate patients about their wounds. This is in contrast to evidence based care that highlights the importance of patient preference and involvement (DiCenso, Guyatt, & Ciliska, 2005:5). In the researcher's experience nurses tend to carry out dressings changes in a ritualistic way and the researcher has never observed any explanation on dressing procedure being given to a patient. However, the researcher has, on occasion, observed nurses briefly explain the type of dressing that will be applied.

6.1.7 Temperature of cleaning solution

Participants appeared flabbergasted when asked about the temperature of the cleaning solution as heating the solution seemed to not be a consideration. Participants verbalised using solutions mainly at room temperature.

"***We don't warm the solution if we are using saline. But of course we always warm the bath water….*****" (6.2)**

When the temperature of the wound falls below core body temperature healing can be delayed as a result of slow epithelial repair, lack of collagen deposition, a reduction in late phase inflammatory cells and fibroblast and a higher percentage of wound infections, all of which lead to an increased average length of hospital stay of 2.6 days longer than for normo thermic patients (McGuiness, Vella, & Harrison, 2004: 383).

The consensus in the literature is that cleaning solutions should be warmed before application (Fernandez & Griffiths, 2012:7; Lloyd Jones, 2012: 396-399; Magson-Roberts, 2006: 385).

The participants in this study mentioned that the cleaning solution was routinely warmed by default when tap water was used, but when using any other cleaning solutions no warming was done. However, when patients were dressed in theatre the researcher had observed that on occasion the solutions were warmed. A possible reason for this is the availability of warm solutions from the fluid warmers that are in theatre. Logic would therefore dictate that nurses are aware that solutions should be warmed. The reason for the disparity between in theatre and out of theatre dressing changes is a question for future research.

6.1.8 Hand washing

This category evoked a lot of emotion amongst participants with them responding in a somewhat irritated tone. The researcher had to remind the participants that the question was not an accusation, but a question or probe to explore current practice. Participants appeared defensive and the researcher had to reassure them that data will be reported on anonymously and that there would be no implications for them in terms of punishment or penalties. Participants were uneasy discussing the category of hand washing.

"*Yes of course I wash my hand before and after touching the patient*." (3.2)

Hand washing is the most effective measure to reduce the risk of health care associated infections (WHO, 2009a:24). Yet, globally compliance with hand washing recommendations are estimated to be between 29% (Preston, 2005: 542), and less than 50% (Pittet, 2001:234).

In this study none of the participants volunteered information on whether they washed their hands as part of preparation for the dressing procedure. But when probed, they all reported that they washed their hands before and after each dressing change. However, this has been disproved during the structured observation done in Chapter Five.

6.1.9 Integrity

This category was related to the category on greeting patients and addressed the culture in the unit which is related to acknowledging the patient as a person. Participants used "*respect*" and "*not expose*" and "*protect patients privacy*" when responding to the category of integrity.

"*In the burns unit we try our level best to maintain patients' dignity. We never just expose the patient…*" (5.2) (Gesturing with her hands)

Integrity is defined as a state of wholeness giving individuals a sense of being in control of their life (Teeri, Välimäki, Katajisto, 2008: 523; Widang & Fridlund, 2003:47). In health care, the concept of integrity is often understood as occupying a personal and/or territorial space; and is seen as the right to a private sphere in relation to physical (certain parts of the human body) and/or psychological (certain values, opinions and thoughts) aspects of the person (Teeri, et al., 2008: 523; Randers & Mattiasson, 2004: 64).

Participants recognised the importance of maintaining patients' integrity and demonstrated concern about exposing patients unnecessary. It was evident that this value was held in high regard in the burns unit as it was a common theme in all the interviews. Participants verbalised covering patients and demonstrated empathy for their "nakedness" as human beings. In contrast patients in the researcher's experience do not want to be exposed, but seem to be blinded by the uniform and would expose themselves by removing clothing items when a procedure is to be done without considering that it might not be necessary to, for instance removal of hospital gown exposing her breast for a dressing on the abdomen. The second theme for discussion is assessment which is discussed below.

6.2 ASSESSMENT

The second question was on assessment and diagnosis. It was a structural question to determine the terminology used by the nurses to describe key concepts during assessment and diagnosis of wounds.

The identified categories and sub categories are summarised in table 6.4. The categories refer to the different aspects identified by the nurses as part of assessment.

Table 6.4 Identified categories and sub categories for assessment

Theme	Categories	Sub categories
Assessment and Diagnosis	Roles and responsibilities	Of the nurse and the doctor
	Description of the wound	Size and depth Appearance Healing Infection Dressings selection

6.2.1 Roles and responsibilities

Participants described their role in the management of burns as that of a person that follows doctors' orders without input. However, the same nurses (participants) manage wounds independently in outpatients and during periods when doctors are not immediately available. The researcher got the impression that participants though important members of the multidisciplinary team seemed uncertain of the independent roles and limits. On the other hand shying away from participation in assessment could be a convenient method of avoiding taking responsibility for their role in management of the burn wound as demonstrated by the following statements:

"*The nurses don't assess wounds. The doctor does."* (1.3)

"*The doctor will say this is a third degree burn. And then he writes what dressing we must do like Acticoat or Flamazine, but nurses do not involve themselves in doctors business. They will sometimes ask us what they can write if it is students. But the other doctors know all the dressings*." (7.2)

The South African Nursing Council (SANC), the nursing regulatory body, states that on completion of training nurses as independent professionals should be competent in the management of wounds (SANC, 1984: R2598, Chapter 2, subsection (j) Act 50 of 1978). However, nurses practise under prescription from a medical doctor as described in Section B of the Medical, Dental and Supplementary Health Service Professions Act (Health Professions Act 56 of 1974). These two Acts cause confusion as to the role of the nurse in the wound management team in South Africa as nurses have dependent and independent roles and functions.

Traditionally wound care is taught to nurses at undergraduate level. In a study to gather information on the training received by medical professionals on wound management and treatment during their formal tertiary studies towards the MBChB/MBBCh degree in South Africa, it was concluded that eighty-eight per cent of participants stated that "no", "very little" or "minimal" time is being spent on wound management education during their training. Seventy-seven per cent of medical practitioners felt uncertain about what wound care treatment should be prescribed, and 97% of medical practitioners said that wound care education was very important and that more training should be provided in this field (Fourie, 2013: 21). The improved outcomes in the multidisciplinary team in wound care have been demonstrated in numerous studies (Widgerow, 2008:8; Vu, Harris, Duncan, et al., 2007; Sumpio, Aruny & Blume, 2004; Gottrup, 2004a).

In this study participants appeared to rely on doctors for wound assessment. Professional autonomy means the authority to make decisions and the freedom to act in accordance with one's professional knowledge base (Skar, 2010; Varjus, Suominen, Leino- Kilpi, 2003). The key aspect of autonomy is the "knowledge base". According to Skar (2010) in order to gain autonomy nurses must be competent and have the courage to take charge. Without being empowered with knowledge nurses are not in a position to exercise their autonomy. It appears that doctors themselves are not adequately trained on wound management. Thus it is imperative that nurses as independent practitioners, understand their role and contribution to the management of patients with burns.

6.2.2 Description of the wound

Various terms were used to describe the depth of the burn with some participants describing the size in degrees (more traditional terminology) for example first degree, whilst others used the newer terminology that refers to superficial burns for instance. On exploration on reasons for the use of the different terminology participants were unable to furnish reasons for this. The researcher was concerned that these variations could lead to misunderstandings.

a) *Size and depth*

"*Full thickness…*" (2.1), "*Third degree*" (8.1)

In recent literature there seems to be a shift in the terminology grounded on the anatomic thickness of the skin involved based on increasing depth going from epidermal to superficial partial thickness, deep partial thickness to full thickness burns (Devgan, Bhat, Aylward, et al., 2006: 7-15; Watts, Tyler, Perry, et al., 2001:154), as opposed to first degree, second degree and third degree burns.
And even more recently Monstrey, Hoeksema, Verbelen, et al., (2008: 762), observed that burn depth is better defined by the time to healing which is linked to the risk of developing hypertrophic scarring; superficial wounds healing by conservative treatment versus deep burn wound requiring surgical therapy.

The terminology used to describe burn depth was mostly the outdated terms. However, participants were familiar with the newer terminology, but elected to use the older terminology to describe the depth of the burn possibly due to habit or familiarity. During exploration of the size of the burn the general response was that this decision was part of the medical diagnosis and nurses were not involved. Participants verbalised that the Rule of Nines method was used to assess the burn size by doctors. Participants had a good understanding of the Rule of Nines, but did not assess the size themselves.

b) *Appearance of the wound*

Participants appeared to be uncomfortable with the discussion on the appearance of the wound. They stated that there was no set format that guided them.

Participants were slow to answer the question and it was clear that participants considered their answers before responding. The terminology varied being very simplistic for example:

"*Beefy*" (1.2) "*…pus…*" (7.3) "*clean*" (8.2)

In contrast, more scientific terms were also used to describe the appearance of the wound as demonstrated below:

"*Infected*" (5.3) "*Hypergranulation*" (5.3)

The terminology used to describe the appearance of the wound is standardised in the literature. Each of the elements in the TIME model will be mentioned along with the various words in each element. The wound appearance is described as granulation, epithelialization or hyper- granulation tissue, slough, or necrotic, according to the colour the wound bed presents according to Dowsett & Newton (2005: 60), and Keast, Bowering, Evans, et al., (2004:S10), as part of the description of the **T**issue in the TIME model. All wounds contain bacteria at levels ranging from contamination, colonization, critical colonisation to infection (Green, 2012: 48-49; Sibbald, Woo & Ayello, 2008: 31; Healy & Freedman, 2006: 838-841; Dowsett & Newton, 2005: 63; Schultz, Sibbald, Falanga, et al., 2003:S14; Bowler, 2003a: 44–53), under **I**nfection/ **I**nflammation of TIME. The description of **M**oisture balance is described as dry, moist, wet, saturated and leaking according to World Union of Wound Healing Societies (WUWHS, 2007a:6). The edge of the wound should advance through the process of epithelialisation. When the edges of a deep wound show signs of new granulation tissue formation or when the edges of a superficial wound is recolonized by visible epithelial islands, this indicates wound healing (Mulder, 2011:34).

The participants in this study used certain correct terminology, but they also used very basic words like for example "beefy" to describe granulating wound beds. It also emerged that the continuum of infection was not clearly distinguishable with the presence of odour and purulent exudate being automatically described as infected or septic. The researcher found that the same words were repeated by the participants which confirms the ritualistic nature of in-service training with the information not necessarily being accurate or evidence based.

c) *Healing*

Participants' body language indicated that the researcher was wasting time by asking obvious questions.

"*Obviously if the size of the wound is getting smaller you know that the wound is healing*." (2.3) (Rolling her eyes)

"***It will go smaller and smaller. The smell is not bad and the patients tell you it's starting to itch*." (6.3)** (Sitting backwards in chair)

Wound healing occurs when the wound edges of a deep wound show signs of new granulation tissue and a superficial wound's edges epithelialize and epithelium islands are visible (Mulder, 2009a:78). Falanga (2004: 4), concurred, and added that effective healing requires the re-establishment of an intact epithelium and restoration of skin function. According to the European Wound Management Association (EWMA) (2004: 4), effective healing requires the re-establishment of an intact epithelium and restoration of skin function.

All of the participants in the study were very clear regarding the distinction between healing and non-healing wounds. They verbalised a reduction in wound size yet none of them indicated how size was measured or recorded. No reference was made in the documentation on the measurements taken.

d) *Infection*

Participants were very vocal on the topic of infection. They enthusiastically identified the signs of infection as well as ways to prevent infection. The bacterial continuum was not mentioned and from the discussion the researcher deduced that participants perceived wounds to either be "septic" or not infected. There did not seem to be a gradual progression, but rather wounds existed in either of the two extremes as evidenced by the following statement:

"*The smell. Normally septic wounds will have a pseudomonas smell and the pus will be thick*." (1.3)

Furthermore when the clinical signs of infection were discussed as well as the clinical signs of inflammation participants agreed on the similarities, but was not able to indicate a distinction. Participants' responses were vague:

"*Umm….*" (5.3); "*Er…I think it's is, eish (*South African slang*). It's the same thing*" (Giggling) (6.3)

Cutting, White, Mahoney, et al., (2005:8), indicate that 'cellulitis', 'malodour', 'pain', 'delayed healing' or 'deterioration in the wound'/'wound breakdown' (although individual descriptions differ) are criteria that are common to all wound types. An 'increase in exudate volume' was identified as an infection criterion for all wound types except for acute wounds healing by primary intention and burns (full-thickness) (Cutting, et al., 2005).

The participants in this study identified the signs and symptoms of infection as "stinking", copious amounts of "exudate/pus", and "non-healing". This is in line with the literature. However, no other topical signs were mentioned. On further probing systemic signs were described such as pyrexia, increase in white cell count and general malaise. Biofilms were discussed. Furthermore, participants placed a lot of emphasis on the subjective data to inform if wounds were infected. Patients' verbalisation of an increase in pain was not mentioned as a sign of infection.

e) *<u>Dressing selection</u>*

This category created an awkward atmosphere during the interviews. Possibly because the participants were aware of the fact that the researcher is employed by a commercial company that sells wound dressings and disclosing certain information might cause problems for them or the unit. The researcher got the impression that participants were not completely honest on this topic as the answers appeared to be made more agreeable:

"*…it's easier for us to just use what is on tender*." (2.3) (Shuffling uncomfortably in chair).

"*We don't have to buy out. If it is a clean wound we can just use Jelonet. Also when it is healing, Jelonet. The Jelonet makes the wound not to stick. If the wound is septic we use Flamazine or sometimes Acticoat. With the Acticoat the doctor must order it because it is very expensive. If the wound is sloughy we mix Intrasite with Flamazine or Melladerm. I like the Melladerm. We have used Mebo but not as much*." (4.3)

Dressings are classified in a number of ways depending on their function in the wound (debridement, antibacterial, occlusive, absorbent, adherence), type of material employed to produce the dressing (for example hydrocolloid, alginate, collagen) and the physical form of the dressing (ointment, film, foam, gel) (Boateng, Matthews, Stevens, et al., 2008: 2898). A list of dressings that are available on the South African market has been compiled by the Wound Healing Association of South Africa (WHASA) (Mulder, 2011:32).

The participants in this study were well versed on the indications as well as the variety of dressings available on the South African market. They were frequently involved in evaluations of new products and demonstrated this by being able to group products according to their indications, for example silver dressings were grouped together. The deciding factor on dressing selection was based on doctors' preference and availability which was related to cost. Participants were aware of their ability to influence the choice of dressing as they had more exposure than circulating doctors, but quickly pointed out that it was doctor specific based according to his or her preference. Participants' uncomfortableness was evident on their motivation to use certain products over others for reasons other than what the wounds required. They verbalised that the training they received from commercial companies for instance made them favour one product over another.

In the researcher's experience the training provided by commercial companies are bias and it is the opinion of the researcher that commercial companies have a contribution to make as they often have better resources, but nurses should have the knowledge and competence to be able to make informed decisions that is in the best interest of the patient and not be dictated to by commercial companies.

A category that emerged from probes is depicted in table 6.5.

Table 6.5 Probed categories and sub categories

Theme	**Category**	**Sub category**
Assessment and Diagnosis	TIME framework	Awareness and implementation of TIME framework

6.2.3 TIME framework

The probing on this category revealed that the concept of time was not widely known by participants. As they were not familiar with the concept as they did not implement it in their practice.

"TIME model? Is it that thing (silence)…. No I don't know it." **(1.3)** (Participant appeared embarrassed)

The TIME acronym provides a structured approach to wound management (Schultz & Dowsett, 2012: 25-26; EWMA, 2004; Keast, et al., 2004:S2; Schultz, et al., 2003: 10). It summarises the four main components of wound bed preparation namely: **T**issue management; Control of **I**nfection and **I**nflammation; **M**oisture imbalance; Advancement of the **E**pithelial edge of the wound (Schultz & Dowsett, 2012: 25-27; Falanga, 2009:2; Dowsett & Newton, 2005: 59-70; Falanga, 2004: 2-5; Schultz, Barillo, Mozingo, et al., 2004: 24-30; Schultz, et al., 2003: 10), and is a useful practical tool used to identify the barriers to healing and to implement a structured plan of care to remove the barriers that delay wound healing with the ultimate goal to promote wound healing.

Though the TIME model (framework) is widely published and used in wound care, the participants in this study were not familiar with the model. There seemed to be confusion on the themes of the model, what the model was and where and when it can be used. Participants seemed uncomfortable as demonstrated by pauses, shuffling in chairs, appearing embarrassed and a reluctance to answer the question.

The next phase for discussion is the intervention.

6.3 DRESSING EXECUTION (INTERVENTION)

The third question was on the actual execution of the dressing procedure, with the purpose of validating the observations made (de Vos, Strydom, Fouche, et al., 2005: 298). The next step of the identified categories and sub categories are summarised in table 6.6.

Table 6.6 Identified categories and sub categories for dressing execution

Theme	Categories	Sub categories
Dressing execution	Process of dressing change	Justification for actions

6.3.1 Process of dressing change

Participants responded positively to this category. They appeared more at ease and spoke freely.

"*The patient is seen by the doctor on admission. The doctor will then decide the size and depth of the burn. The doctor will then decide the type of dressing. Sometimes it is the Melladerm dressing, sometimes Flamazine. Sometimes it's Acticoat. The nurses then just put on what the doctor ordered*." (2.4)

The TIME framework is a structured approach to wound management (Schultz & Dowsett, 2012: 25-26; EWMA, 2004; Keast, et al., 2004:S2; Schultz, et al., 2003: 10). Similarly, the nursing process is a framework for providing professional, quality nursing care; and directs nursing activities (DeLaune & Ladner, 2011: 79). The nursing process involves a series overlapping steps that build on each other according DeLaune & Ladner (2011: 79). A structured approach ensures that all the phases and elements of wound management are addressed in a structured logical sequence.

The participants of this study were very knowledgeable in the dressing procedure, but the researcher got the impression that the process was ritualistic as some choices or steps in the process were not explainable for example the timeframe between dressings when choosing between the different silver dressings and why silver sulphadiazine was used when more advanced silver dressings are available in the ward. The probed categories are depicted in table 6.7

Table 6.7 Probed categories and sub categories

Theme	Category	Sub category
Dressing execution	Information overload	Companies product claims

6.3.2 Information overload

In this category participants unanimously verbalised that the amount of information received can sometimes be confusing as the messages were often contradictory in information from different companies and information could be repetitive in some instances. An example they used was on product training and found that this could sometimes be very time consuming when the ward is full and they have routine to carry out.

"*All the companies claim their product is the best and want us to use their product instead of the other company's*" (5.4)

"*I am not always sure who to believe. ..everybody says 'my product is a good one'* " (4.4)

Health care is constantly challenged with resources and needs of patients. Watret (2005), stated that one way this may be resolved is through working in partnership with commercial companies. According to Watret (2005), commercial companies provide information on the use of their products and on related topics. Flanagan (2003), argues that, with regard to tissue viability, the close relationship between product manufacturers and clinicians has been used to everyone's advantage to develop a wide range of high-quality educational resources. However, Watret (2005), cautions that there is a risk that information may be biased in favour of the products sold by the commercial company and that involvement of higher education institutions can complete the partnership by ensuring quality assurance in educational provision, whereby everyone concerned can place a value and relevance to the education accessed.

In this study participants indicated that their decision on product choice is based on the training received by commercial companies as well as their interaction with commercial company representatives. Participants received training from companies that is not quality assured and high risk of product bias towards the company presenting the training. Nurses do not always have the time or ability to access and evaluate literature and they have seemed to have developed a dependence on commercial companies for training and guidance in wound management. Participants expressed confusion created by the various companies as all companies make claims of their products to increase revenue on their respective products. The final phase for discussion is outcome and evaluation.

6.4 OUTCOME AND EVALUATION

The last question was on outcome and evaluation of the dressing procedure. The purpose of this question, in line with the nursing process and legal requirements of nursing, was to explore how nurses evaluated their own actions. Table 6.8 depicts the emerging categories and sub- categories.

Table 6.8 Identified categories and sub categories for outcome and evaluation

Theme	Categories	Sub categories
Outcome and Evaluation	Documentation	Freestyle writing
	Referral	Open communication
	Work overload	Concerns about patient numbers and care received
	Needs of nurses	Better patient outcomes

6.4.1 Documentation

Participants focused mainly on whether the documentation was completed or not and not on the contents of what they wrote. The researcher had to repeat the question several times in an attempt to explore the content of what was written.

"*Of course I write my report of everything I did on the patient. I write if the patient was complaining about something."* (4.4)

Quality nursing documentation promotes effective communication between caregivers, which facilitates continuity and individuality of care and the content of nursing documentation, which contains evidence about care, is closely associated with nurses' professional expertise (Wang, Hailey & Yu, 2011:1). It is important that wound assessment is documented on a standardised form to ensure that all relevant areas are covered and to provide a guide as to what should be covered.

Participants in this study verbalised recording nursing activities in "freestyle". On review of the documentation no standardised format was noted with descriptions of the procedures being uncommunicative for example, "dressing done, no complaints." Furthermore participants verbalised that sometimes the "paperwork" gets in the way of them nursing the patient:

"*We sometimes nurse papers…*" (4.4)

6.4.2 Referral

This category was difficult for the researcher to ascertain as the responses from participants indicated that referrals were done. Yet, participants did not recognise it as referral but rather as a reporting mechanism.

"*…If there was a problem I will then tell the doctor."* (3.4)

"*With handover we report any problems that there was*." (5.4)

The collaborative multi-disciplinary team approach is very common in wound care. The team approach and collaboration between all health care professionals facilitate high quality holistic care (Gottrup, 2004b:130; Gottrup, Holstein, Jørgensen, et al., 2001: 765). Not only does referral allow for continuity of care, it also escalates problems or concerns to ensure that the patient receives the best possible care (Antonelli, McAllister & Popp, 2009; McAllister, Presler, Turchi, et al. 2009).

Participants verbalised reporting problems to the nurse in charge. Furthermore, the participants verbalised "reporting" if a need was identified for something specific.
For example if a patient required physiotherapy, the physiotherapist was called in. However, the independent function of the nurse was only acknowledged in the outpatient context.

6.4.3 Work overload

The participants spoke about the shortage of nurses and the high admission rate and subsequent high workload. The researcher got a strong sense that there was a lot of work in the unit and too few nurses:

"*When the ward is full we run like headless chickens*." (1.4)

"*Nobody wants to work this side. We work too hard. Its dressings that take long, sick patients with some on vents. Yoh and we are just a few of us*." (8.4)

The shortage of health workforce is an international problem with many references quoting nursing shortages in South Africa (Solidarity Research Institute, 2009, www.solidarity.co.za;
Van Niekerk, 2008: 29; Wildschut & Mqolozana, 2008:6). According to Van Niekerk (2008: 29), there was a shortfall of more than 600 000 nurses in Sub-Saharan African countries in 2008 and one can deduce that the numbers have increased since then. Makalima (2011), concurred that staffing a burns unit is a challenge due to nurse shortages as well as a reluctance of nurses to work in this specialised unit.

Working in a burns unit has been described as a stressful occupation where every nurse who cares for a burn victim knows that stress is a part of working in this field; these nurses experience dealing with self-inflicted burns, uncooperative patients, inter-staff conflicts and dying patients on a daily basis **(**Rafii**,** Oskouie & Nikravesh, 2004). The impact of the nurse shortage is felt at a ward level where remaining nurses are burdened with high workloads.

Participants expressed that the workload is high with high demands placed on them. The researcher also sensed that this topic needed to be explored further as participants had a lot to say on the topic. The researcher had to however stay focused on the objectives of this study and did not delve fully into the secondary sub categories as new end points. The researcher acknowledges the views expressed as important, but believes it would have diverted attention away from the set objectives.

6.4.4 Needs of nurses

As an extension on the category of workload, participants identified needs that would better equip them to work in a burns unit. The researcher endeavoured to capture and present the most captivating need/s, which posed a one of the more serious challenges as the identified needs were diverse and from the researcher's perspective all equally important. Thus the most compelling quotes are presented below.

"*We need nurses to want to come and work in the burns unit…So we are always short of staff*." (2.4)

"*I would like more training…. Sometimes I don't understand because all the reps try to push their product and that confuses me*."(3.4)

"*I think if we can have a poster with pictures that shows different wounds it can help*." (5.4)

"*…we should have special incentives to work here*." (7.4)

Education was the most identified need by nurses in the literature (Hutchinson, Foley, Watts, et al., 2007:37; Hennessy, Hicks, Hilan, et al., 2006:1 ; Joy, Carter, & Smith, 2000: 1044). Additional needs were included leadership and management, evidence-based practice, and advanced practice issues (Nalle, Wyatt & Meyers 2010: 107).

Participants in this study also expressed a need for education and training as a priority. This identified need has been exploited in the past by commercial companies for financial gain with unregulated training that is not necessarily evidence based.

No further categories emerged when probed.

6.5 CONCLUSION

Each of the identified categories and subcategories had conclusions drawn throughout this chapter. Conclusions drawn in Chapter Six were integrated and synthesised with the conclusions drawn in Chapter Four and Chapter Five, thus providing evidence for the development of guidelines. In Chapter Seven the proposed guidelines are appraised by experts in the management of burn wounds using the AGREE II tool.

CHAPTER SEVEN LAYOUT

CHAPTER 7	7.0 Introduction		
	7.1 Verification process		
	7.2 Methodology for verification	7.2.1 Planning the nominal group 7.2.2 Selecting participants 7.2.3 Conducting the group	
	7.3 Verification instrument	7.3.1 AGREE II instrument	
	7.4 Verification of best practice guidelines	7.4.1 Scope and purpose 7.4.2 Stakeholder involvement 7.4.3 Rigour of development 7.4.4 Clarity of presentation 7.4.5Applicability 7.4.6 Editorial independence 7.4.7 Overall assessment	
	7.5 Integration and synthesis of conclusions and development of best practice guidelines		
	7.6 Summary		
	7.7 Conclusion		

CHAPTER SEVEN

VERIFICATION OF GUIDELINES

7.0 INTRODUCTION

The results and discussion of the fourth objective are presented in Chapter Seven. The fourth objective was to verify the findings from Phases One and Two through a consensus panel using the Appraisal of Guidelines for Research & Evaluation (AGREE) II (Brouwers, Kho, Browman , 2009), instrument by experts in the field. Chapter Seven relates to Phase Three of the research design and research method. The guidelines for the management of burn wounds by nurses were verified by seven purposively selected specialists in the management of burns and wound management. The purpose of verifying the guidelines was to assess the quality of the guidelines, refine and further develop the guidelines and ensure the content validity of the guidelines.

An overview on the methodology, guidelines: its purposes, benefits and potential harms as well as the findings from the Nominal Group Technique are provided in this chapter.

For consistency purposes refer to figure 7.1 for an overview of the research design and research method.

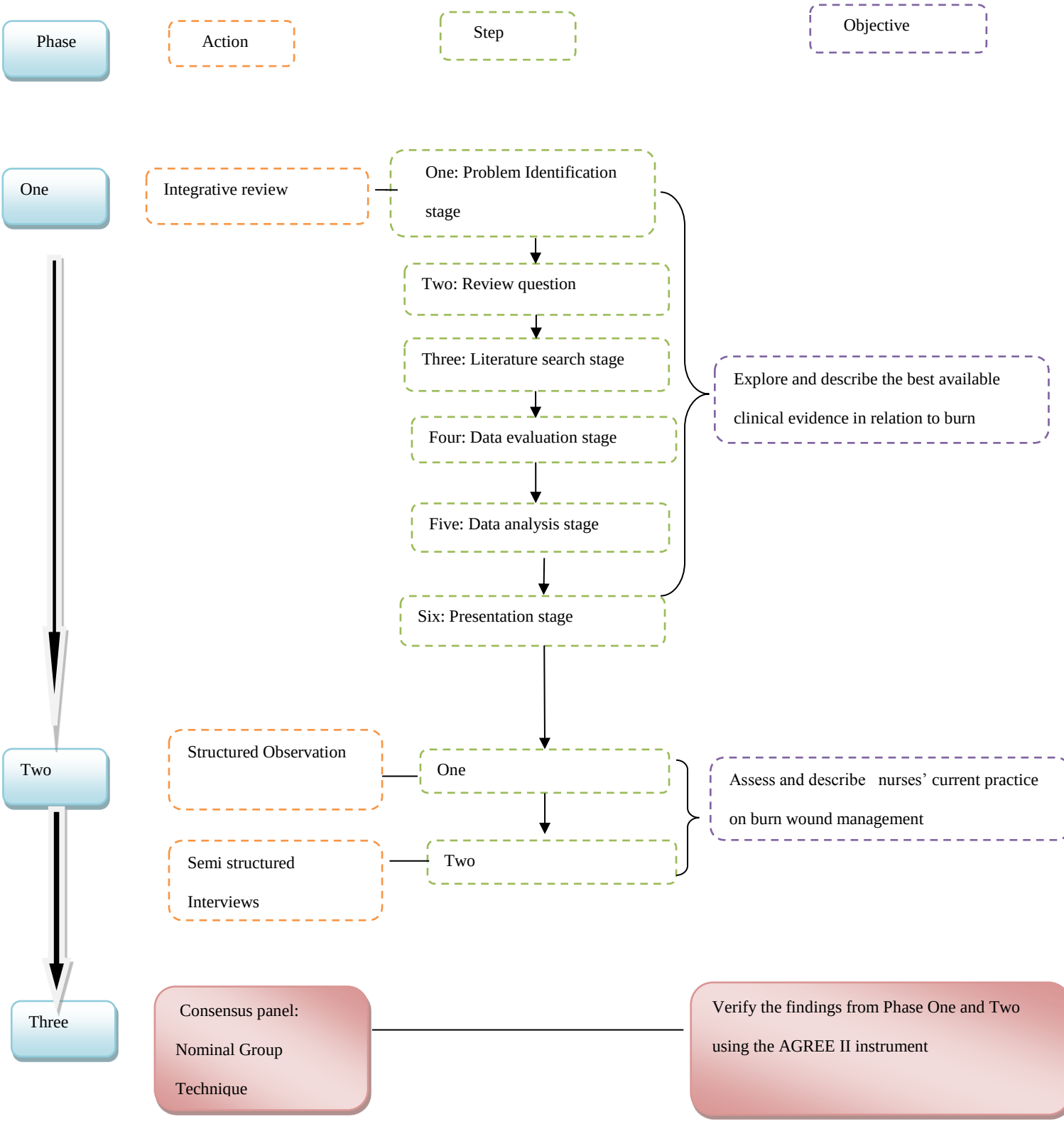

Figure 7.1 Overview of research design and research method

7.1 VERIFICATION PROCESS

Verification is the process of checking, confirming, making sure, and being certain of an assertion (Oxford English Dictionary, 2013). In qualitative research, verification refers to the mechanisms used during the process of research to incrementally contribute to ensuring reliability and validity and, thus, the rigor of a study (Morse, Barrett, Mayan, et al., 2002). In this study verification was done by seeking consensus on the findings from Phases One and Two.

Consensus knowledge building is defined as an outcomes design that requires critique and synthesis of an extensive international search of the literature on the topic of concern (Burns & Grove, 2007: 5350). Consensus knowledge building brings experts face to face to gain either further understanding or consensus in a particular field; the experts are often multidisciplinary and may be composed of professionals, healthcare users or both and panels are used to develop guidelines (Moule & Goodman, 2009: 234; Burns & Grove, 2007: 298-299). According to Moule & Goodman (2009: 235), the consensus technique can be useful in cases where there is a lack of knowledge or understanding on a particular health issue. It enables healthcare professionals to access the views of experts with regard to aspects of practice, education and research priorities and may be invaluable when developing clinical guidelines and in identifying agreements on health and research priorities (Moule & Goodman, 2009: 235).

Consensus knowledge building was applied in this study to critique the findings from the integrative review (Chapter Four) in order to deliver evidence-informed guidelines for the management of burn wounds as no such guidelines or standards are presently available in South Africa.

The three consensus methods identified in the literature are: Focus Group Discussions, Delphi and Nominal Group Techniques (NGT). A brief explanation of each of the three methods follows. For a detailed description refer to Chapter Two.

Focus group

An interview with a group of individuals assembled to answer questions on a given topic; the key feature of focus groups is the active interaction among participants to explore their views and opinions (Jayasekara, 2012: 411; Polit & Beck, 2012: 728; Burns & Grove, 2007: 540). A critique on the focus group is that it is usually more difficult to arrange, and bringing participants together requires energy, time, and money (Jayasekara, 2012: 414).

Delphi technique/survey

A technique for obtaining judgements from an expert panel about an issue of concern (Polit & Beck, 2012: 725; 537; LoBiondo-Wood & Haber, 2010:577; Burns & Grove, 2007: 537; Hasson, Keeney & McKenna, 2000: 1009).

The Delphi technique is an iterative multistage process, designed to transform individual opinions into group consensus without requiring face-to-face discussion (Polit & Beck, 2012:267; Hasson, et al., 2000: 1010). A critique on the Delphi technique is that it is time consuming and panel members' cooperation may wane in later rounds (therefore attrition bias is a potential problem).

Nominal Group Technique (NGT)

A structured procedure for gathering information from groups of people who have insight into a particular area of interest (Varga-Atkins, Bunyan, McIsaac, et al., 2011: 4; Carney, McIntosh & Worth, 1996: 1026; Gallagher, Hares, Spencer, et al., 1993: 76). The term "nominal" group signals that the group is merely a group "in name", when in reality, it requires *individual* input from its respective members (Varga-Atkins, et al., 2011: 4).

The purpose of the NGT is to generate information in response to an issue that can then be prioritised to achieve consensus and action planning through group discussion (Potter, Gordon & Hamer, 2004: 126). The NGT combines aspects of the Delphi technique and focus group. A critique on the NGT is that views of individuals may influence others in the discussion phase, minority disagreements can be masked, the timing of nominal group sessions can contribute to and influence the outcome of the research and that reporting on only the top five items may be considered to be an issue (Varga-Atkins, et al., 2011: 8).

Table 7.1 depicts the comparisons between the decision making groups.

Table 7. 1 Comparison of consensus decision making groups (Potter, et al., 2004: 127).

Attribute	**Decision making process**		
	Delphi	**Focus Group**	**NGT**
Face-to-face group meeting process	No	Yes	Yes
Generates a large number of ideas	Yes	Maybe	Yes
Avoids focusing on a single train of thought	Yes	Yes	Yes
Encourages equal input from all participants	Yes	No	Yes
Highly structured process	Yes	Maybe	Yes
Meeting time usually 1-2 hours duration	No	Yes	Yes
Avoids 'quick' decision making	Yes	No	Yes
High degree of task completion	Yes	Maybe	Yes
Provision of immediate feedback	No	Maybe	Yes
Measures the relative importance of ideas generated	Yes	No	Yes

A consensus technique may also be carried out by a consensus panel. Consensus panels are groups of individuals gathered with the object being that of arriving at some agreement regarding an issue/s (Green & Thorogood, 2014), such as guidelines for the management of burn wounds by nurses in this study.

There are a number of different types of consensus panels (Green & Thorogood, 2014:127).

Delphi groups: In this type of group the participants do not meet, but are mailed a questionnaire to garner views on a given topic. Summaries of the views of the group are then mailed back, with participants invited to change their responses in light of the views given by other participants in the group. This can be repeated several times until members of the group reach consensus.

Consensus conferences: This is a generic term for workshops or discussion groups where participants reach a consensus through debate and interaction regarding specific activities such as guideline development.

Consensus panel convened for an NGT: This type of group was developed to enable specific groups of individuals who have an interest or expertise in an area to generate and rank ideas. Each participant privately and independently writes their comments in answer to the group's question. These are then listed and discussed. Finally points are awarded to the top ideas which are then ranked. The consensus method used in this study is the NGT.

A description of the methodology (the how) follows the justification for the selection of consensus method (the why) in the verification process.

7.2 METHODOLOGY FOR VERIFICATION

Data collection entailed planning the nominal group, selecting participants, and conducting the group. Each process will be described below.

7.2.1 Planning the nominal group

The participants in the nominal group qualified for selection based on their expertise on the matter under discussion or because they are representative of their profession and have the power to implement the findings (Potter, et al., 2004: 127).

Experts were handpicked to participate in the verification process based on their expertise and experience in the management of burns and wounds respectively. The nominal group verified the findings from this study and addressed the questions from the integrative review done in Chapter Four.

7.2.2 Selecting participants

A list of the multidisciplinary team involved in the management of burns was compiled from admission to hospital until discharge. The clinical management team from which the nominal group was likely to be selected included trauma doctors, surgeons and nurses, plastic and general surgeons, intensivist specialists, infection control nurses, intensive care nurses, wound care nurses, dieticians, a physiotherapist and an occupational therapist.

The suggested size of a nominal group is five to nine participants according to Potter, et al., (2004:126). Nine experts were invited to participate in the group, however, one expert declined due to time constraints and another was on leave at the time of the verification.Seven participants were recruited, three medical doctors and four nurses. The logic for this was to include one person from the different specialties in burn management.

Though nutrition and mobility are important in burn wound management, the researcher excluded representatives from these specialties as there was no direct accountability between nurses, physiotherapist, occupational therapist and dieticians as the South African Nursing Council (SANC), states that nurses are independent professionals (SANC, R2598, Act 50 of 1978), that practise either independently or under prescription from a medical doctor as described in Section B of the Medical, Dental and Supplementary Health Service Professions Act (Health Professionals Act 56 of 1974).

The panel included specialist doctors and nurses, heads of departments, academics and opinion leaders in the management of burns, infection control and wound management.

Table 7.2 is a list of the experts who were included. The panel wished to be acknowledged for their contribution in the development of the guidelines and have given permission for their names and specialties to be documented in the thesis.

Table 7.2 Panel of experts (alphabetical order)

Name	**Speciality**	**Burn or wound management experience/ expertise**
Professor Jaques Goosen	Trauma surgeon	✓
Sister Phindi Lehabe	Registered Nurse	✓
Sister Eva Lekwaba	Private nurse practitioner (wound care)	✓
Doctor Adelin Muganza	General surgeon	✓
Professor Elias Ndobe	Plastic surgeon	✓
Sister Katinka Rheeder	Nursing manager	✓
Sister Karen Swart	Infection control and quality assurance	✓

7.2.3 Conducting the group

A nominal group pack was compiled and distributed to each member of the expert panel prior to the nominal group.

The pack included a covering letter inviting them to participate in the study; the purpose of the study was stated, the methodology which was to be used, as well as a description of the process of NGT and their contribution and involvement in the group should they agree to participate. The pack also included an information sheet, consent letter, a user's manual for the AGREE II instrument, the AGREE II instrument, a summary of the methodology of the integrative review as per (Whittemore & Knafl, 2005), which included the search methods, selection criteria, methods to assess the quality and strength of the evidence (DiCenso ,Guyatt, & Ciliska, 2005: 34), the integrative review findings, along with a table of recommendations for guidelines that were to be evaluated by them.

The process of guideline development required the researcher to include reference support to ensure that guidelines are evidence based. This provided the experts with the current information available to use in the discussions and allowed the panel to draw on current knowledge in verifying the guidelines.

Only one meeting was held in a pre-booked venue. Experts were not paid (Moule & Goodman, 2009: 234). The researcher moderated the discussions and took notes. Moderation augmented facilitation of the discussion; this ensured the flow and guided the process. The nominal group discussion lasted approximately one hour and forty five minutes; the average recommended duration of nominal group discussions is up to two hours (Potter, et al., 2004: 126; Gallagher, et al., 1993: 80).

The nominal group technique process comprises a different number of stages. Table 7.3 depicts the recommended stages of NGT and the actual stages as implemented in this study.

Table 7.3 Stages of NGT**.**

Stages of the NGT (Varga-Atkins, et al., 2011:11)	**Stages of NGT for this study**
Welcoming statement	Welcoming statement Introduction: purpose of the session ,session structure, review of researchers packs and address queries or concerns
Stage 1 Silent generation of ideas	Stage 1 – Individual responses from AGREE II
Stage 2 Round robin recording of ideas	Stage 2 – Clarification and consolidation: responses are read out, clarified and discussed, consensus reached, recommendations for changes discussed.
Stage 3 Serial discussion and clarification	Stage 3 – Ranking results are calculated and shared with the group as per AGREE II
Stage 4 Preliminary vote on item importance	Stage 4- Each recommended guideline discussed to qualify, refine and further develop the guideline and to ensure it is applicable to the South African context.
Stage 5 Discussion of preliminary vote (optional)	Stage 5- Final vote
Stage 6 Final vote	Stage 6- Revised guidelines send for review by experts
Top five shared with the commissioners of the research	
„Technology" of recording ideas: pen and flipchart, facilitator writes on board as participants dictate. Ranking by paper.	

Next the verification instrument is discussed.

7.3 VERIFICATION INSTRUMENT

The nominal group used the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument to verify the guidelines for the management of burn wounds by nurses.

7.3. 1 AGREE II INSTRUMENT

The Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument was used to allocate values to the level of agreement on various aspects of burn wound management.

A brief account of the instrument is given below as per the AGREE trust (Brouwers, et al., 2009).

The AGREE instrument was developed to address the issue of variability in guideline quality. To that end, the AGREE instrument is a tool that assesses the methodological rigour and transparency in which a guideline is developed. It is important to assess the methods used to develop practice guidelines in order to be confident of the resulting recommendations.The original AGREE instrument has been refined, which has resulted in the new AGREE II. The AGREE II is now the new international tool for the assessment of practice guidelines. The AGREE II is both valid and reliable and comprises twenty three items organized into the original six quality domains, namely: i) scope and purpose; ii) stakeholder involvement; iii) rigour of development; iv) clarity of presentation; v) applicability; and vi) editorial independence. Each of the twenty three items targets various aspects of practice guideline quality. Each of the six domains is explained below.

Domain 1. Scope and Purpose is concerned with the overall aim of the guideline, the specific health questions, and the target population (items 1-3).

Domain 2. Stakeholder Involvement focuses on the extent to which the guideline was developed by the appropriate stakeholders and represents the views of its intended users (items 4-6).

Domain 3. Rigour of Development relates to the process used to gather and synthesize the evidence, the methods to formulate the recommendations, and to update them (items 7-14).

Domain 4. Clarity of Presentation deals with the language, structure, and format of the guideline (items 15-17).

Domain 5. Applicability pertains to the likely barriers and facilitators to implementation, strategies to improve uptake, and resource implications of applying the guideline (items 18-21).

Domain 6. Editorial Independence is concerned with the formulation of recommendations not being unduly biased with competing interests (items 22-23).

Overall assessment includes the rating of the overall quality of the guideline and whether the guideline would be recommended for use in practice.

The practical application of the AGREE II instrument discussion follows.

7.4 VERIFICATION OF THE BEST PRACTICE GUIDELINES

The feedback, recommendations, criticisms and suggestions of the expert panel are discussed for each domain. The six domains assessed by the AGREE II instrument include: scope and purpose, stakeholder involvement, rigour of development, clarity of presentation, applicability and editorial independence. Finally, the panel of experts were requested to make overall judgments of the practice guideline and state if they would recommend the guidelines: 'yes', 'yes with modifications' or 'no'. Each domain will be discussed individually.

7.4.1 Scope and Purpose

The first domain was the **scope and purpose** of the guidelines. This domain addressed the objective of the guideline, the health questions and the population to whom the guideline is meant to apply. Refer to table 7.4 for experts' assessment of the scope and purpose of the guidelines.

Table 7.4 Experts' assessment of the scope and purpose of the guidelines.

Expert	Item 1	Item 2	Item 3	TOTAL
Expert 1	6	6	7	19
Expert 2	6	6	7	19
Expert 3	5	4	6	15
Expert 4	6	6	7	19
Expert 5	6	6	7	19
Expert 6	6	6	6	18
Expert 7	6	6	7	19
TOTAL	**41**	**40**	**47**	**128**

$$\text{The standardised domain score} = \frac{\text{Obtained score – minimum possible score}}{\text{Maximum possible score – minimum possible score}}$$

$$= \frac{128\text{-}217}{147\text{-}21}$$

$$= 84.9\%$$

A score of 84.9% was obtained for the scope and purpose of the guideline.

No changes were made as the experts were satisfied that the scope and purpose of the guidelines was applicable for the intended population.

7.4.2 Stakeholder Involvement

The second domain was **stakeholder involvement** in the development of the guidelines and addressed the involvement of individuals from all relevant professional groups, the views and preferences of the intended users and target users of guideline clearly defined. Refer to table 7.5 for experts' assessment of stakeholder involvement.

Table 7.5 Experts' assessment of stakeholder involvement

Expert	Item 4	Item 5	Item 6	TOTAL
Expert 1	7	6	7	20
Expert 2	6	5	6	17
Expert 3	7	6	5	18
Expert 4	7	6	6	19
Expert 5	5	7	7	19
Expert 6	5	6	6	17
Expert 7	7	7	7	21
TOTAL	**44**	**43**	**44**	**131**

$$\text{The standardised domain score} = \frac{\text{Obtained score – minimum possible score}}{\text{Maximum possible score – minimum possible score}}$$

$$= \frac{131-21}{147-21}$$

$$= 87.3\%$$

A score of 87.3% was obtained for the stakeholder involvement.

Experts made the following comments:

- **Item 4:** Inclusion of individuals from all relevant professional groups.

"The burns care team should involve not only doctors and nurses, as physiotherapist and occupational therapist play a very important role in the multidisciplinary team."

The researcher noted that these professionals are important, but they were not included for two reasons. Firstly, there is no direct accountability between nurses and these professions and these guidelines were written with the focus on nursing. Secondly, the size of the invited participants was at maximum capacity for NGT.

7.4.3 Rigour of Development

The third domain was the **rigour of development** of the guidelines and addressed the methods used to search for evidence, criteria for selecting the evidence, strengths and limitations of the evidence clearly described, methods used to formulate the recommendations, health benefits, side effects and risk considered when formulating recommendations, link between recommendations and supporting evidence and external review of guidelines by experts prior to publishing. Refer to table 7.6 for experts' assessment of rigour of development.

Table 7.6 Experts' assessment of rigour of development

Expert	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	TOTAL
Expert 1	7	7	7	7	7	7	7	7	56
Expert 2	7	6	6	6	5	5	7	6	48
Expert 3	7	6	7	5	4	5	4	5	43
Expert 4	6	7	7	7	7	7	7	6	54
Expert 5	7	7	7	7	7	6	4	7	52
Expert 6	7	7	6	7	6	7	7	7	54
Expert 7	7	7	7	7	7	7	7	7	56
TOTAL	**48**	**47**	**47**	**46**	**43**	**44**	**43**	**45**	**363**

$$\text{The standardised domain score} = \frac{\text{Obtained score – minimum possible score}}{\text{Maximum possible score – minimum possible score}}$$

$$= \frac{363-56}{392-56}$$

$$= 91.3\%$$

A score of 91.3% was obtained for the rigour of development of the guidelines.

The experts made the following comments:

- The procedure for updating the guidelines requires clarification; and
- **Item 13**, which "was the guideline reviewed by experts". Two of the panel members commented that the guidelines are not always reviewed by experts. This was not clear as the experts on this panel were the reviewers of the proposed guidelines in this study, but the comment was about guidelines in general.

The following changes were made to the guidelines:

- The procedure for updating the guideline will be provided in a 'toolkit' for implementation. This 'toolkit' for implementation is described in recommendations for practice and recommendations for further research.

7.4.4 Clarity of Presentation

The fourth domain was **clarity of presentation** of the guidelines and addressed whether guidelines were considered specific and unambiguous, if different options for management of the condition is clearly presented and if key recommendations are easily identifiable. Refer to table 7.7 for experts' assessment of the clarity of presentation.

Table 7.7 Experts' assessment of clarity of presentation

Expert	Item 15	Item 16	Item 17	TOTAL
Expert 1	7	7	7	21
Expert 2	6	6	6	18
Expert 3	6	6	6	18
Expert 4	7	7	7	21
Expert 5	7	7	7	21
Expert 6	7	6	6	19
Expert 7	7	7	7	21
TOTAL	**47**	**46**	**46**	**139**

The standardised domain score = Obtained score – minimum possible score

Maximum possible score – minimum possible score

= 139-21

147-21

= 92.9%

A score of 92.9% was obtained for the clarity of presentation of the guidelines.

No changes were made as the experts were satisfied with the clarity of presentation of the guidelines.

7.4.5 Applicability

The fifth domain was **applicability** of the guidelines and addressed facilitators and barriers to guideline application, advice and recommended tools and how these recommendations will be implemented, resource implications of applying the recommendation and monitoring and auditing criteria in other words organisational, behavioural and cost implications. Refer to table 7.8 for experts' assessment of applicability.

Table 7.8 Experts' assessment of applicability

Expert	Item 18	Item 19	Item 20	Item 21	TOTAL
Expert 1	7	7	7	7	28
Expert 2	6	6	6	6	24
Expert 3	6	5	5	5	21
Expert 4	6	6	6	6	24
Expert 5	5	6	5	7	23
Expert 6	6	6	6	6	24
Expert 7	7	7	7	7	28
TOTAL	**43**	**43**	**42**	**44**	**172**

The standardised domain score = Obtained score – minimum possible score

Maximum possible score – minimum possible score

= 172-28

196-28

= 85.7%

A score of 85.7% was obtained for the applicability of the guidelines.

The experts made the following comments:

- The organisational barriers that could affect implementation of the guidelines as well as the economical variance between private and government hospitals could make implementation difficult and required further description.
- Tools on how it would be implemented require elaboration.

The following changes were made to the guidelines:

- It is included in the recommendations for further research as organisational barriers, costs of implementation and review criteria for monitoring were deemed to require elaboration.

7.4.6 Editorial Independence

The sixth domain was **editorial independence** of the guidelines and addressed independence of the recommendations and acknowledgement of possible conflicts of interest occurring during guideline development. Refer to table 7.9 for experts' assessment of editorial independence.

Table 7.9 Experts' assessment of editorial independence

Expert	Item 22	Item 23	TOTAL
Expert 1	7	7	14
Expert 2	N/A	N/A	?
Expert 3	5	N/A	5
Expert 4	7	7	14
Expert 5	7	7	14
Expert 6	6	6	12
Expert 7	7	7	14
TOTAL	39	34	73

$$\text{The standardised domain score} = \frac{\text{Obtained score – minimum possible score}}{\text{Maximum possible score – minimum possible score}}$$

$$= \frac{73-14}{98-14}$$

$$= 70.2\%$$

A score of 70.2% was obtained for the applicability of the guidelines.

The experts made the following comments:

- **Item 22,** verification was required as to whether the guidelines were editorially independent from the funding body. It was not stated within the guidelines that the development of the guidelines were not funded; as a result, the guidelines were attested to be editorially independent of a funding body.
- **Item 23,** required verification as to whether conflicts of interest of guideline development existed for the members; as an individual developed the guidelines, no conflict of interest occurred.

7.4.7 Overall Assessment

The expert reviewers were requested to firstly rate the overall quality of the guidelines. One (score =1) is the "lowest possible quality" and seven (score=7) is the "highest possible quality". Refer to table 7.10 for experts' overall assessment.

Table 7.10 Experts 'assessment of overall quality

Expert	Overall quality of guideline	TOTAL
Expert 1	7	7
Expert 2	6	6
Expert 3	5	5
Expert 4	7	7
Expert 5	7	7
Expert 6	6	6
Expert 7	7	7
TOTAL	**45**	**45**

The standardised domain score = $\frac{\text{Obtained score – minimum possible score}}{\text{Maximum possible score – minimum possible score}}$

$= \frac{45-7}{49-7}$

$= 90.4\%$

A score of 90.4% was obtained for the overall quality of the guidelines.

The experts made the following comments:

- *"This research provides a clear guideline for nurses for the management of burns and it actually recommends alternative methods in patient care. Patient advocacy is taken into consideration in this research."*

On the second aspect on overall assessment, experts were asked to comment as to whether they would: recommend this guideline for use by indicating 'yes', 'yes with modifications' or 'no'. This overall assessment was used to make a judgement of the quality of the guidelines. Refer to table 7.11 for experts' overall assessment.

Table 7.11 Experts' overall assessment

Expert	**Overall Assessment**
Expert 1	Yes
Expert 2	Yes with modifications
Expert 3	Yes with modifications
Expert 4	Yes
Expert 5	Yes with modifications
Expert 6	Yes with modifications
Expert 7	Yes

The guidelines for the management of burn wounds by nurses were recommended by 42,9% whilst 57.1% of the experts recommended the guidelines but with modifications. None of the seven experts said they would not recommend the guidelines.

Each of the proposed guidelines were discussed with its synthesised conclusions from the structured observations (Chapter Five) and semi - structured interviews (Chapter Six), with its recommendations from the findings from the integrative review (Chapter Four) in relation to the strength of the evidence according to the hierarchy of evidence (DiCenso, Guyatt, & Ciliska, 2005: 34).

Where consensus was reached on the individual guidelines, no changes were made. Where disagreement occurred, recommendations were made by the experts on additional literature sources with contradictory or augmenting arguments informed by their expertise and experience.

The researcher was able to benefit from the multidisciplinary team discussion as new perspectives were given to topics that were not within the researcher's area of speciality such as infection control. The experts also contributed to finding practical solutions to recommendations made in the literature that would not necessarily be practical in the South African context, such as regulating the temperature of the environment by setting air conditioners to the recommended room temperature. In South Africa resources are often limited and an alternative suggested by the panel of experts for example would be to maintain the patient's temperature by keeping the patient warm with blankets.

A discussion on the integration and synthesis of conclusions and development of guidelines follow.

7.5 INTEGRATION AND SYNTHESIS OF CONCLUSIONS AND DEVELOPMENT OF BEST PRACTICE GUIDELINES

Integration and synthesis involved the clustering of conclusions from the structured observation in Chapter Five and semi - structured interviews in Chapter Six to form a new and complete picture of current practice through inductive reasoning. Conclusions were organised according to the themes of the nursing process starting with Dressing preparation, Assessment, Diagnosis, Intervention and finally Outcome and Evaluation.

The development of the recommendations in the guidelines was done by means of deductive reasoning. Following integration and synthesis of the conclusions systematically developed statements in the form of recommendations were developed to address each integrated and synthesised conclusion. The researcher included the citation that informed the guideline. The evidence was categorised according to the strength of evidence which is also presented along with a rationale for the recommended guidelines. Evidence was categorised using an adaptation of Muir Gray's technique for categorising the strength of evidence (adapted by McSherry, Simmons, & Abbott, 2002:11).

Refer to table 7.12 for the strength of evidence.

Table 7.12 Strength of evidence (Muir Gray, 1997 adapted by McSherry, et al., 2002:11).

Class	Strength of evidence
I	Strong evidence from at least one systematic review of multiple well-designed randomised controlled trials
II	Strong evidence from at least one properly designed randomised controlled trial of appropriate size
III	Evidence from well-designed trials without randomisation, single group pre-post, cohort, time series or matched case-control studies
IV	Evidence from well-designed non-experimental studies from one or more than one centre or research group
V	Opinions of respected authorities based on clinical evidence, descriptive statistics or reports of expert committees

The recommendations for guidelines are presented in table 7.13.

Table 7.13 Best practice guidelines for the management of burn wounds by nurses.

	Integrated and Synthesised Conclusions	**Guideline**	**Guideline informed by:**	**Strength of evidence**	**Rationale**
DRESSING PREPARATION					
	Nurses were task orientated and introductions to patients and explanations of procedures were not done routinely. Effective communication is an important part of nursing and is vital in creating a therapeutic relationship.	Build a therapeutic relationship with patient by introducing or re-introducing him or herself, discussing needs and treatment plans and procedures, considering clients values and preferences where possible before onset of dressing. A step- by- step informed protocol to be set up by hospitals to inform nurses and patients on the rights and responsibilities of both parties in the treatment plan. Evaluation tool is tick box by patient	Fleisher, Berg, Zimmermann, et al., 2009.	I	By having the agreed protocol in place that informs the key elements to be covered to build rapport will allow for consistency and a measurable tool that facilitates building rapport.
		Engage patient as part of evidence based practice in discussion of treatment plans and have client centred care.	College of Nurses of Ontario, 2006.	V	As part of evidence based practice patient preference has to be considered (DiCenso, et al., 2005). This enables a therapeutic relationship to be built.

	Dressing preparation mainly covered collecting of material needed and wiping of dressing trolleys. This limited preparation could have been due to the vagueness of training or absence of guidelines. Adequate dressing preparation reduces dressing time and includes air current; equipment and surfaces as well temperature of procedure room.	Close windows and doors and switch off any electric fans or air conditioners.	Leaper, Schultz, Carville, et al., 2012 ; Mulder, Small, Botma, et al., 2002.	V Very limited research is available on this topic and further research is advised.	Transmission of infection between burns patients occurs through airborne transmission and or direct or indirect contact (Bache, Maclean, Gettinby, et al., 2013; Rafla &Tredget, 2011; Gould, 2009). Open windows, fans and air conditioners cause airflow and therefor increase the risk of infection.
		In patients with >25% TBSA hydrotherapy and common dressing rooms should be used cautiously if at all. It is preferable that dressings be changed at the patient's bedside. The decision whether to use communal dressing room or patients' bedside should be based on availability of resources and patients' infection criteria profile as per Cutting, White, Mahoney, et al., 2005 criteria for clinical indicators and signs of infection.	CDC, 2007 ; Weber & McManus, 2004.	I	Risk associated with hydrotherapy and common treatment rooms are related to the use of water sources and surfaces that are frequently contaminated with Gram negative organisms (Church, Elsayed, Reid, et al., 2006; Weber & McManus, 2004). Acinetobacter spp. survives in surface dust for months, E. coli and Klebsiella spp on the other hand may survive more than a year in dry surroundings (Kramer, Schwebke & Kmapf, 2006).

		Housekeeping surfaces are to be cleaned with detergent. If a trolley is used at the bedside (non- critical medical equipment surface) it should be disinfected with a registered germicidal product that has a low or intermediate level disinfectant before and after use.	CDC, 2008.	I	Environmental surfaces could contribute to cross contamination by nurses from hand contact with contaminated surfaces, medical equipment or patients (CDC, 2008).
		Sterile instruments must be used for open, raw and infected wounds, furthermore clean instruments may be used on healed wounds as the skin is already intact.	Hart, 2007 ; Mulder, et al., 2002.	V Very limited research is available on this topic and further research is advised.	Sterilisation renders an instrument free from organisms and spores. Due to limited resources single use sterile blades can be used if scissors are not available. Disinfecting through the use of chemicals, for instance scissors, also renders the instrument free from organisms provided the manufactures instructions are followed. Cleaning is achieved by use of detergent, water and paper towel and is only suitable for low risk items and not direct contact with open wounds (CDC, 2008).

		Ambient room temperature should be 20 ^{0}C - 25 ^{0}C	Hooper, Clifford, Fetzer, et al., 2010; NICE, 2008; AORN, 2006	I	When the temperature of the wound falls below core body temperature wound healing is delayed and can increase hospital stay to 2.6 days. Wounds heal most effectively when patient temperature between 36^{0}C – 38^{0}C (McGuiness, Vella & Harrison, 2004)
		Maintain normothermia by monitoring patient temperature before and after procedure and taking corrective measures if patient is hypothermic before the dressing procedure. Apply warming devices for example a blanket to patient and expose only the area being worked on.	McGuiness, et al., 2004	III Limited research is available on this topic and further research is advised.	Temperature loss is limited to the temperature of underlying tissue and therefore interventions aimed at increasing temperature of underlying tissue may increase healing. It takes approximately three to four hours for a wound activity to resume after a dressing change (McGuiness, et al., 2004).
Guiding question 5: What are the ideal wound / surroundings temperature?	All cleaning solutions were applied at room temperature. When the temperature of the wound bed falls below the core body temperature, healing can be delayed, increased risk of wound infections, all of which lead to an increased average length of hospital stay.	Fluids should be warmed to body temperature prior to cleansing in order to maintain an optimum wound healing environment. This can be done by placing the solution in a jug of heated water heated to 40^{0}C as measured by a standard thermometer for 30 minutes (Mulder, et al., 2002:149)	Lloyd- Jones, 2012; Fernandez & Griffiths, 2012; Magson-Roberts, 2006; McGuiness, et al., 2004.	I	Wounds heal more effective at normal core body temperature (McGuiness, et al., 2004; McCullogh& Knight, 2002; Whitney, Salvadalena & Mich, 2001; Kloth, Berman & Dumit-Minkel, 2000).

	Hand washing was frequently carried out, but not all aspects were carried out consistently for the duration of the study. Most healthcare-associated infections (HCAI) are thought to be transmitted by the hands of healthcare workers and hand washing is the most effective means to reduce infection.	Hand should be washed hands before touching the patient, after removing dressings and re-applying gloves to start wound dressing, after body fluid exposure risk, after touching the patient, after touching the patients' surroundings. Hand washing technique. When washing hands with soap and water, wet hands and apply soap to all surfaces. Rinse with water and dry thoroughly with a single use towel. Use clean running water whenever possible. Avoid using hot water (luke warm is preferable) as repeated exposure to hot water may increase risk of dermatitis. Use towel to close taps. Dry hands thoroughly using a method that does not re-contaminate hands. If the quality of water is not assured an alcohol based hand rub should be used before donning gloves. Apply a palm-full of alcohol-based hand rub and cover all surfaces of the hand. Allow hands to dry.	WHO, 2009a. WHO, 2009a. WHO, 2009a. WHO, 2009a.	I I I I	Hand washing is the key to prevention of hospital acquired infections (WHO, 2009a; Naikoba& Hayward, 2001). The use of alcohol hand rub is a less labour intensive means of hand cleaning and is more likely to assure hand hygiene than having to go to basin during procedure and risk contamination. Alcohol hand rub have proved to be effective in reducing the time it takes to effect decontamination of the hands compared with using soap, water and paper towels (Preston, 2005; Pittet, 2003).

		Soap and alcohol based hand rub should not be used concomitantly. Hand washing should be followed by alcohol hand rub, i.e. use an alcohol based hand rub as the preferred means for routine hand antisepsis in five moments for "hand washing", if hand are not visibly soiled in which case soap and water is the preferred method for hand cleaning.	WHO, 2009a.	I	
		Other aspects of hand hygiene. Do not wear artificial nails or extenders when having direct contact with patients. Keep natural nails short.	WHO, 2009a ; CDC, 2007.	I	Long nails can be an area where micro-organisms breed and are harboured.
	Gloves were used in all instances during dressing changes. In most cases the same pair of gloves where used from beginning to end of the dressing procedure. There seem to be confusion in the selection of type of glove to be worn with ongoing debate between sterile and non- sterile gloves.	Gloves should be worn regardless of hand washing or hand rubbing.	WHO, 2009a.	I	Efficacy of wearing gloves in preventing hospital acquired infections has been proven in in many studies (WHO, 2009a).

		None sterile gloves should be worn during dressing change. Gloves should be single use and single care situation within the same patient i.e. gloves should be changed between different areas and different procedures on the same patient. As well as between patients.	WHO, 2009a.	I	The rationale for wearing gloves will indicate the choice of glove required. Aseptic non-touch technique is used in wound care and non- sterile gloves are acceptable (Gottrup, Holstein, Jørgensen, et al., 2001). Non-sterile gloves provide adequate infection control if linked with effective hand decontamination (Flores, 2008).
	Nurses wore gowns over their uniforms during dressing changes, but the same gown was worn for several patients. Sometimes plastic aprons were worn during dressing changes that was replaced with each new dressing.	Based on risk assessment (%TBSA) a full body gown should be used on larger percentage burns (>15% TBSA).	Bache, et al,. 2013 ; CDC, 2011.	I	Performing a dressing change on a patient with a 15 % TBSA burn, a mean of 29 bacterial cfu/25 cm2 was found if they wore no protective clothing (plastic apron or gown) and 11 bacterial cfu/25 cm2 if a plastic apron was worn. For large burns of for example 50% TBSA 469 cfu/plate when wearing 'no apron', with the majority of samples collected from the forearms, arms, shoulders and chest: areas that of skin and uniform which would not be protected by the apron or cleaned during hand washing (Bache, et al., 2013)

ASSESSMENT					
Guiding question 1: How should burn wounds be assessed at macro-level?	Nurses reported that wound assessments were done by doctors on admission. Terminology varied for example second degree and full thickness. Burn wound assessment should cover the size of the burn and the depth of the, in other words burns must be classified.	**Depth terminology** Burn wound depth assessment should be epidermal, superficial dermal, deep dermal and full thickness. **Depth method** Lase Doppler Imaging (LDI) appears to be the most accurate method of burn depth assessment.	Existing guidelines (SA Burns Society, 2012) Jaskille, Ramella-Roman, Shupp, et al., 2010; Jaskille, Shupp, Jordan, et al., 2009; Devgan, et al., 2006.	V No studies were found that tested validity or reliability of the methods and were informed by expert opinion. Further research is advised. V Limited studies were found as LDI is fairly new technology.	Variation in terminology describing burn depth varies between first-fourth degree to superficial to full thickness. To date no consensus has been reached on the exact classifications of burns (Klasen 2004). The clinical implications are variation in interpretation and miscommunication amongst the multi-disciplinary team. Recent literature uses superficial to full thickness wounds **(**Devgan, Bhat, Aylward, et al., 2006; Watts, Tyler, Perry, et al., 2001). Older literature uses first to fourth degree (Feller &Archambeault, 1973; Johnson, 1994).

	Nurses reported that the "Rule of Nines" was used by doctors to assess burn size.	**Size** Lundt& Browder has been proven to be the most accurate method of size estimation.	Hettiaratchy & Papini, 2004; Wachtel, Berry, Wachtel, et al., 2000.	II	Though Lundt & Browder is not perfect because of identified flaws by Minimas (2007), and its age, suitability for everyone, it is the most reliable method that has been tested and validated. Its ease of use and familiarity also counts in favour of it.
Guiding question 2: How should burn wounds be assessed at micro level?	Nurses had a freestyle format for wound observation and the information reported on was limited. The TIME framework is a useful practical tool used to identify the barriers to healing and implementing a structured plan of care to remove the barriers that delay wound healing with the ultimate goal to promote wound healing.	**T**issue management **I**nfection control and **I**nflammation **M**oisture imbalance; **E**pithelial edge of Advancement	Leaper, et al., 2012; Sibbald, Orsted, Coutts, et al., 2006; European Wound Management Association, 2004; Sibbald, Orsted, Schultz, et al., 2003.	I	The TIME framework it is widely accepted and used by wound care practitioners around the globe. It has been incorporated into Best Practice Recommendations for chronic wounds 2006 based on RNOA guidelines. TIME was first presented at 2003 annual meeting of European Wound Management Association and has since been cited in wound management papers, guidelines, protocols and consensus documents (Leaper, et al., 2012).

DIAGNOSIS					
Guiding question 3: What is the correct terminology for burn wounds?	The terminology used by nurses was basic for example beefy to describe granulating wounds. Terminology used in wound care varies amongst the different professionals and could lead to ambiguity. Standardisation of terminology will clarify the communication amongst the multi-disciplinary team.	A three part statement The first component is a nursing diagnosis, second component refers to the nursing diagnosis and the third component is the corresponding signs and symptoms. For example the medical diagnosis is partial thickness burns: proposed diagnosis: Impaired tissue integrity (nursing diagnosis) *RT (related to) partial thickness burn (etiology and medical diagnosis) *AEB (as evidence by) altered epidermis and dermis (signs and symptoms). The defining components may assist the nurse in identifying patient goals, measurable patient outcomes criteria and relevant nursing interventions.	DeLaune & Ladner, 2011; Muller Staub, 2006.	I	The multidisciplinary team approach's efficacy is well documented with nurses forming an integral part of the team (Smart, 2009; Naude & Bruwer, 2006; Gottrup, 2004a; Gottrup, Holstein, Jørgensen, et al., 2001). The vagueness of the current nursing diagnosis continues to segregate nurses and does not portray nurses as critical thinkers.

INTERVENTION					
Guiding question 4: What is the best cleaning solution for burn wounds?	Nurses reported that often the choice of cleaning solution is not clear. The decision on how to clean and with which solution is often based on ritualistic clinician preference.	Potable (drinkable) tap water should be used as wound cleansing agent.	Fernandez & Griffiths, 2012, 2008; JBI, 2008.	I	The use of tap water was not associated with an increase in infection with no statistical difference compared to normal saline (Fernandez & Griffiths, 2012; JBI, 2008).
Guiding question 6: Should an aseptically clean or sterile method be used for dressing?	Nurses reported that they maintained aseptic technique, but in practice a clean technique was observed. Variability in procedure results in variability in technique leading to confusion as to what is the acceptable standard of aseptically clean or sterile.	Aseptic non-touch technique (ANTT) for wound management with the aim to prevent the transmission of microorganisms to wounds, or other susceptible sites, to reduce the risk of infection.	Rowley, Clare, Macqueen, et al., 2010; Gillespie & Fenwick, 2009; Flores, 2008; Hart, 2007, Preston, 2005; Larwood, Anstey, & Dunn, 2000.	II	ANTT is a simple and effective way of preventing contamination of the wound bed. Studies have proven it a safe and effective technique (Rowley & Clare, 2009; Larwood, et al., 2000).
	Nurses verbalised that blisters should be de- roofed. Lots of controversy exists on blisters with some arguing that blisters should be de-roofed to allow for better access and management of the wound itself and others saying that if left intact it will heal faster.	Consider blister size: small blisters (<6mm) may be left intact. Large blisters (>6mm) should be debrided as they are more likely to rupture spontaneously. Large blisters should be debrided to prevent mechanical pressure on underlying tissue and exposure of wound bed to blister fluid associated complications.	Sargent, 2006.	I	Due consideration for the size, type and location of the blister should inform the decision whether to debride the blister or not. However, the TIME framework supports removal of non-viable tissue and therefor blisters should be de-roofed unless contraindicated as per the guidelines for example a thick walled blister.

		Consider blister type: Thin walled blisters should be debrided because they are likely to rupture and occur on hair lined surfaces which increases risk of infection. Thick walled blisters on palms and soles of feet may be left intact as they are less likely to become infected and debridement is associated with a high level of patient discomfort and limited mobility. **Consider functional and aesthetic outcomes:** Blisters should be debrided when their presence impedes the functional ability of the patient. Blisters should be debrided to allow faster wound healing with associated decrease in scarring. **Consider patient comfort:** Small blisters may be left intact as a natural method of pain control.			

		Strive for ease of care: Use blister management strategies that involve debridement followed by application of dressings which do not require frequent change.			
Guiding question 7: What are the differences between dressings?	Nurses verbalised an overload of conflicting messages regarding dressings and had a general idea of what the dressing's activity on the wounds are. Wound care market is flooded with many different dressings, without an improvement of knowledge in wound care products it may be used incorrectly for the wrong indication or duration possibly leading to delayed healing and wastage of resources.	Superficial and partial thickness burns may be managed with hydrocolloid, silicon nylon, antimicrobial (containing silver), polyurethane film and biosynthetic dressings. There was no evidence to support the use of silver sulphadiazine (SSD). The use of SSD should be reduced (limited) in management of burn wounds as SSD was consistently associated with poorer healing outcomes than other dressings.	Wasiak, Cleland, Cambell, et al., 2013. Wasiak, et al., 2013;Storm-Versloot, Vos, Ubbink, et al., 2010; Atiyah, Costagliola, Hayek, et al., 2007.	I I	In Cochrane review hydrocolloid, silicon nylon, antimicrobial (containing silver), polyurethane film and biosynthetic dressings performed consistently better than the current practice standard of SSD (Wasiak, et al., 2013). Even though SSD is still on the WHO Essential Model list (WHO, 2013), and is still the standard of care in many burns units recent studies are proving that SSD has increased pain scores, longer time to heal rates, with more dressing changes and more nursing time compared to other dressings (International consensus document, 2012.) In a Cochrane review of 26 trails SSD has no effect on infection and slows down healing in patients with partial thickness burns (Storm-Versloot, et al, 2010).

		An alternative to SSD in the treatment of burns is honey dressings.	Jull, Rodgers & Walker, 2008.	I	Topical honey is better than conventional dressings for healing acute burns (Song & Salcido, 2011; Malik, Malik & Aslam, 2010; Jull, et al., 2008, Moore, Smith, Campbell, et al., 2001).
		The application of topical negative therapy falls outside scope of practice of the nurse. It is neither indicated nor contra- indicated for the management of burns.	Dumville & Munson, 2012.	I	This guideline is mentioned for completeness; however a Cochrane review found that there is a lack of evidence and that much more research is needed (Dumville & Munson, 2012).
Guiding question 8: Open vs. closed method of dressing?	Nurses reported that wounds are best managed closed. Despite the advances in wound management and the acceptance of the concept of moist wound healing the debate of open or closed method of dressings is ongoing with faces for example being managed "open" whilst the rest of the body is "closed".	Moist wound healing encourages re- epithelialisation and all wounds should therefore be closed.	JBI, 2002; Wiechula, 2003.	I	Desiccated wound tissue is more prone to complications such as increased depth of surface tissue necrosis, impediment to surface epithelial cell migration, decreased surface oxygen available for healing and bacterial killing, impaired nutrient flow to surface and increased infection risk, scarring, or pain and heals more slowly than moist tissue (Eaglstein, 2008; Bolton, 2007; Demling & DeSanti, 2004).

	There is uncertainty about which treatment is the most effective for facial burns, and, consequently, there are large variations in practice some using open method with ointment and others advocating for the closed method.	A referral is recommended for nurses as per the referral criteria to a burns unit (facial burns)(SABS, 2012).However, if immediate referral is not possible nurses are to apply either of the recommended dressings. A Cochrane review concluded that further research is recommended as insufficient high quality research and evidence to enable conclusions to be drawn about the effects of topical interventions on wound healing in people with facial burns exist in terms of skin substitutes and topical ointment. However, skin substitutes were cautiously favoured in one end point in terms of healing rate.	Hoogewerf, Van Baar, Hop, et al., 2013.	I	Facial burns are to be managed in burns units. In burns units it falls under the scope of practice of the doctor and since not enough evidence exist (Hoogewerf, et al., 2013); the decision is informed by doctors' preference.

Guiding question 9: Ointment vs. dressing?	Even though nurses knew the different types of dressings and their indications, they did not explain how the active ingredients of the dressings were related to its functions for example that the silver is an antimicrobial dressing. Recent years have seen an introduction of many dressings with new ones added constantly. Nurses were vague on answering how the product selection is made. The decision on which product is prescribed by the doctor, however nurses do advocate (in the absence of a doctor) and the decision is often informed by preference to the company representative, promotional activities by commercial companies, sponsorships and tenders and are not evidence informed.	The decision on whether to use an ointment or a dressing should be informed by the objective in the TIME framework, the indication for the product, the location of the wound and evidence.	Mulder, 2009a, 2011; Boateng, Matthews, Stevens, et al., 2008.	V Very limited research is available that compares ointments to dressings. Only one such systematic review was found (Bradley, Cullum, Nelson , et al., 1999); the findings from this review were inconclusive However, several RCT were found that compared various dressings to SSD and the conclusions were that dressings were better than SSD (International consensus,	Effective wound management depends on a number of different factors such as type of wound, healing process, patient conditions, environment and properties of different dressings (Boateng, et al., 2008). The choice of ointment versus dressing must be informed by: research evidence, clinical setting and circumstances, health care resources, clinical expertise and patient preference (DiCenso, et al., 2005). WHASA has grouped the products available on the South African market in categories and an informed nurse will be able to use professional judgement based on sound knowledge, skills and guidelines to make a decision.

				2012). The results in favour of the dressings are not necessarily because of the effectiveness of the dressing, but because of the ineffectiveness of SSD.	
OUTCOME AND EVALUATION					
Guiding question 10: How is wound healing measured? Guiding question 11: What measuring tools are available?	Nurses reported that wound healing was measured through observation in reduction in size. No tool was used to assess healing. The periodic assessment of wound healing is important to evaluate the progress of the wound and to determine the effectiveness of the nursing interventions in order to either continue on the nursing plan or to change and have a modified plan. In order to encourage continuity of care and improve communication amongst all health workers a standardised tool will avoid	Pressure Ulcer Scale for Healing (PUSH) instrument for assessment of wound healing.	Pillen, Miller, Thomas, et al., 2009.	I	This tool has been designed for pressure ulcers, but has been tested in leg and venous ulcers but not in burns yet. An alternative tool is the Baber Measuring Tool (BMT), but it has not been tested for validity or reliability since its development (Baber, 2008).

	ambiguity.				
Guiding question 12: What pain measurement scales are available?	Nurses do enquire about patients' pain and do routinely administer analgesics. However, pain was measured subjectively but interpretation could be varied as pain scales were seldom used. First and only intervention with regards to pain management was the administration of medication.	Assessment: Screening is essential for effective pain management. If patient can self -report: Numeric rating scale if patient unable to self-report or behavioural rating scale Treat/ Manage **Non pharmacological:** Relaxation therapy, reassess after 30 minutes. Non pharmacological interventions must not be seen as separate from pharmacological, but should be used to complement each other. It can be divided into physical (e.g. massage, exercise) and psychological (e.g. music, relaxation techniques, distraction	Registered Nurses Association of Ontario, 2013.	I	Nurses have the most contact with the patient and if the screen is positive for pain nurses are in the unique position to make a decision an implement some form of pain relief (RNOA, 2013).

		Administer pre-procedural analgesia and or non-pharmacologic interventions (e.g. relaxation therapy) Treat pain first, then sedate **Pharmacological** Non neuropathic pain- IV opioids +/- non opioidanalgesics Neuropathic pain- gabapentin or carbamazepine + IV opioids. Administered as per doctor's prescription.			
	Even though nurses are obliged to document their nursing activities there seemed to be a ritualistic throughout the documentation for example: Dressing done. No complaints raised by patient. This was neither informative nor specific.	Nurses are to be trained how to document their contribution to healthcare correctly as opposed to the freestyle format. Using the TIME framework, for assessment; planning; implementation; evaluation; as well as the three-part diagnosis, the nurse's role as independent critical thinker will clearly defined as part of the multidisciplinary team.	DeLaune & Ladner, 2011; Muller Stuab, 2006.	I	An evidence based model will guide documentation completion. This model is specific, measurable; evidence based and will allow for more effective communication amongst nurses and the rest of the multidisciplinary team.

		Nurse managers regularly review documentation using a reliable instrument Q-DIO (Quality of Diagnoses, Interventions and Outcomes) to measure and report on accuracy of documentation.	Muller Stuab, 2006	I	This will allow for consistency.

The revised guidelines were distributed to the panel of experts electronically and the revised guidelines were accepted with the new modifications.

7.6 SUMMARY

The recommended guidelines were reviewed through a NGT using the AGREE II instrument for the development of guidelines for the management of burn by nurses. The expert panel assessed the quality of the guidelines, refined and further developed the guidelines and made recommendations for the South African context. The results from the nominal group delivered the following results: the guidelines for the management of burn wounds by nurses were recommended by 42, 9% whilst 57.1% of the experts recommended the guidelines with modifications. After implementing the recommended modifications the experts voted 100% that they would recommend the guidelines for use in clinical practice. Table 7.14 summarizes the methods used to derive at recommendations.

Table 7.14 Summary of methods

Methods used to analyse the evidence	Integrative review (Whittemore & Knafl, 2005)	Chapter Four
Methods used to collect/select the evidence	Multiple electronic databases Journal hand searches and reference lists of relevant articles Comments of experts, textbook chapters by experts and guidelines that met the inclusion criteria	Chapters Two and Four
Methods used to assess the quality and strength of the evidence	Weighting according to a rating scheme (DiCenso, Guyatt, & Ciliska, 2005: 34), hierarchy of evidence.	Chapters Two and Four
Method of guideline validation	Peer reviewed by panel of experts	Chapter Seven
Methods used to gather data	Consensus panel : Nominal Group Technique (Green & Thorogood, 2014)	Chapter Seven
Methods used to formulate the recommendations	Expert Consensus (AGREE II) (Brouwers, Kho, Browman, et al., 2010).	Chapter Seven

7.7 CONCLUSION

The conclusions drawn in Chapter Seven were used for the development of guidelines for the management of burn wounds by nurses. An evaluation of the study is presented in Chapter Eight.

CHAPTER EIGHT LAYOUT

CHAPTER 8	8.0 Introduction		
	8.1 Evaluation of the study	8.1.1 Step one: Evaluation of quantitative research	8.1.1.1 Comprehension 8.1.1.2 Comparison 8.1.1.3 Analysis phase 8.1.1.4 Evaluation phase
		8.1.2 Step two: Evaluation of qualitative research	8.1.2.1 Descriptive vividness 8.1.2.2 Methodological congruence 8.1.2.3 Analytical interpretation of preciseness 8.1.2.4 Philosophical and theoretical connectedness 8.1.2.5 Heuristic relevance
		8.1.3 Step three: Evaluation of achievement of objectives	
	8.2 Limitations		
	8.3 Recommendations	8.3.1 Nursing practice 8.3.2 Research 8.3.3 Nursing education	
	8.4 Summary		
	8.5 Conclusion		

CHAPTER EIGHT

EVALUATION OF THE STUDY, RECOMMENDATIONS AND LIMITATIONS

8.0 INTRODUCTION

In the previous chapter the verification of the guidelines for the management of burn wounds by nurses were presented. This chapter concludes the study. The evaluation of the study, limitations and recommendations for practice, nursing education and nursing research are presented in Chapter Eight.

8.1 EVALUATION OF THE STUDY

The study was evaluated according to the research critique process as described by Burns & Grove, (2007:447-480). The study was evaluated in three steps. Step one was an evaluation of the quantitative aspects of the study. Step two evaluated the qualitative aspects of the study. Step three was the evaluation of the study in relation to achievement of each of the objectives.

An intellectual research critique is a careful, complete examination of a study to judge its strengths, weaknesses, logical links, meaning and significance (Burns & Grove, 2007:445). According to Burns & Grove (2007:447), critiquing research involves the use of a variety of critical thinking skills in the application of knowledge of the research process and includes four critical thinking phases namely, comprehension, comparison, analysis and evaluation. Evaluating this research critically proved to be a difficult task for the researcher because of the amount of time and dedication spent on the study. However, the researcher attempted to be as objective as possible acknowledging potential bias.

8.1.1 Step one: Evaluation of quantitative research

8.1.1.1 Comprehension: Understanding the terms and concepts in the study and identifying the steps in the research process.

An overview of the study is provided in Chapter One. The background of the study was described and the objectives, research questions, research problems and purpose of the study were explained.

A description of the conceptual framework that guided the study was provided as well as an overview of the technical definitions in burn wound management.
A description of the research design and methodology was given. Measures used to ensure trustworthiness were briefly described and ethical considerations were taken into account as stipulated.

Chapter Two described, in depth, the research design and research methodology utilised. The study was conducted in three phases each with its own objective.

The purpose of this study was to describe the best available evidence for the management of burn wounds and to explore and describe what nurses' currently practice in the management of burn wounds in a single burn unit with the aim being that of developing guidelines for the management of burn wounds by nurses.

The purpose of the study was achieved through the following research objectives:

- Explore and describe the best available clinical evidence in relation to burn wound management by conducting an integrative review.
- Describe the current practice on the management of burn wounds according to the themes of the nursing process through the observation of burn wound dressing procedures with assistance of a quantitative checklist.
- Describe the current practice on the management of burn wounds according to the themes of the nursing process through qualitative semi-structured interviews.
- Verify the findings from Phases One and Two by having a Nominal Group using the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument by experts in the field.

Throughout the research process the researcher, as a novice researcher, was continuously challenged with deciding between, as an example, triangulation versus a mixed method study design; discovering that inductive and deductive reasoning were not the only two methods, but that abductive reasoning was also a reasoning strategy.

To best answer the research questions the researcher opted for a mixed methods, QUAN (quantitative) QUAN+ QUAL (quantitative and qualitative), non-experimental, explanatory sequential, descriptive design (Polit & Beck, 2012: 608-612; Creswell & Plano Clark, 2011: 104). The mixed method design was chosen as it allowed for a greater depth perspective into the findings. The design was sequential, indicating the timing of data collection (Polit & Beck, 2012: 608; Creswell, 2009: 206), as the quantitative data was firstly collected through an integrative review (Phase One, Chapter Four).
This was then followed by the parallel collection of quantitative data through structured observation (Phase Two (a), Chapter Five) and qualitative data through semi structured interviews (Phase Two (b), Chapter Six). Sequential explanatory strategies are characterised by the collection and analysis of quantitative data followed by qualitative data; weight is given to the quantitative data and informs or expands the qualitative data (Creswell, 2009: 211; Teddilie & Tashakkori, 2006: 21). Since no intervention was introduced, the study was non- experimental (Polit & Beck, 2012:735; LoBiondo- Wood & Haber, 2010: 582).

Chapter Four introduced the literature search stage with systematic reviews advocated for the development of guidelines. After exploration, the researcher discovered that a systematic review would not comprehensively lend itself to the depth required for this study as it would include only randomised controlled trials and excluded the qualitative aspects which are important for nursing practice. This too took the researcher out of her comfort zone in an attempt to find research on the methodology of integrative reviews, their application in health sciences as well as their application in nursing.

The nominal group technique used in Chapter Six was not as widely published in the literature as its counter parts, the Delphi survey and focus group discussions, which again required the researcher having to consult studies in the health sciences that were not nursing studies, in an attempt to gain an understanding of the process as these were not widely published in nursing. This exploration meant that the researcher had to continuously refer back to the literature to ensure that the methodology was correct to address the research objective and that there was indeed place for it in nursing.

8.1.1.2 Comparison: Knowledge about what each step of the research process should be like, and the ideal is compared to the reality. Because this research is novel and descriptive not many comparison studies could be found. However, for the methodology the researcher used Polit & Beck (2012), Creswell & Plano Clark, (2011), LoBiondo- Wood & Haber (2010), Creswell (2009) and Teddilie & Tashakkori (2006), to inform the mixed method methodology in Chapter Two.

In Chapter Four the researcher used the process of conducting and integrative review by Whittemore & Knafl (2005).

Chapter Five was based on study by Nonino, Anselmi & Dalmas (2008), for structured observation on the dressing procedure.
For the nominal group in Chapter Seven, Varga-Atkins, Bunyan, McIsaac, et al., (2011), Potter, Gordon, & Hamer (2004), Carney, McIntosh & Worth (1996), and Gallagher, Hares, Spencer, et al., (1993), were used to inform the methodology. The AGREE II (Brouwers, Kho, Browman, et al., 2010), instrument was used for the verification of guidelines.

The researcher continuously compared each step of the process to processes described in the literature to be able to detect at an early if the process was off track in order to correct it timeously so as not to jeopardise the credibility of the study.

8.1.1.3 Analysis phase: Critique of the logical links connecting one study element with another.

Throughout the research process the researcher conducted the study as a sequence of building blocks with the end in mind. The problem was that no guidelines were in place to inform nursing practice. Consequently all the steps taken in the research process were systematically and carefully thought out and implemented so as to be able to make available guidelines for the management of burn wounds by nurses to ultimately inform practice, education, research and improve patient outcomes.

8.1.1.4 Evaluation phase: The meaning and significance of the study findings are examined.

There are no unanimous standards or guidelines in South Africa that inform nursing practice in burn wound management and consequently there are variations in wound care practices with some of the methods and techniques being outdated and not evidence based.

An integrative review of all available national and international sources on the management of burn wounds was done in Chapter Four.
The integrative review was conducted in order to provide a rigorous review of the quality research evidence, expert practitioners' opinions, patients' preferences and available resources to deliver recommended care necessary in order to develop evidence based guidelines for the management of burn wounds by nurses.

It enabled the researcher to explore: 1) what is known on the subject of burn wound management; 2) what is the quality of this knowledge and; 3) what should be known regardless of whether the methodology is experimental or non-experimental. The integrative review was unique as it comprehensively described all aspects of the management of burns wounds, including preparation, assessment, diagnosis, implementation and evaluation. No such review was ever conducted.

Chapter Five's objective was to describe the current practice of nurses. Since wound care is not regarded as a speciality in South Africa a description of the current practice enabled the researcher to identify strengths, weaknesses and gaps in the current practice in order to make recommendations for areas of improvement in clinical practice, education and research.

Chapter Seven delivered evidence based guidelines that achieved one hundred percent acceptance and recommendation by experts in the field of burn and wound management.

8.1.2 Step two: Evaluation of qualitative research

8.1.2.1 Descriptive vividness

The study purpose, significance and interpretations must be articulated in such detail that the reader has a sense of personally experiencing the event and clearly understanding the significance of the findings.

The study purpose was discussed comprehensively with the contextual background integrated with the importance of the study in Chapter One. A paucity of research on the management of burn wounds by nurses was found in the literature.

This study focused on the practical aspects of burn wound management from a nurse's perspective and, in particular, what is permissible according the regulating body for nurses in the South African context. The setting (context) was described briefly in Chapter One with a more detailed description included as an attachment. Inclusion of the appendix of the context in the text detracted from the study, but it is important that the reader understand the geographical and historical context of the setting as it will provide vividness to the reader.

Chapter Three was a synopsis of the nursing process. The purpose of describing the nursing process was to orientate the reader as to the framework on which this study was built.

By expounding on the nursing process the reader is given insight into the researcher's thought patterns and reasoning techniques which laid the foundation for the rest of the study.

Chapter Six described the interviews conducted with nurses on the management of burns wounds. From the interviews, categories and subcategories emerged that added a wealth of information with regards to beliefs and attitudes, nurses' understanding of burn wound management, labelling or description of wound care, knowledge, skills and nurses' concerns and needs with regards to burn wound management. Without an exploration and the subsequent description the strengths, weaknesses and gaps in current practices would have been unknown which means that the current situation would remain unchanged, despite the evident essential need for change.

Quotations from the nurses added depth to understanding what the current practice is and increased the researcher's understanding of the phenomenon under investigation as it augmented the observed behaviour. Excerpt of reflective journal included in appendix.

8.1.2.2 Methodological congruence

Requires knowledge of the methodological approach the researcher used and whether this approach was consistent with the philosophical basis of the study. Methodological congruence includes four sub-standards that review the adequate documentation of participants, careful attention to the procedural approach, adherence to ethical standards, and auditability.

a. Adequate documentation of participants

The participants are described in detail in Chapter Two along with the rationale for selection criteria. The expert panel is described in Chapter Seven. Purposive sampling was used throughout the qualitative process of fulfil the research objectives.

In Chapter One, a context of the study is provided for readers to understand the context and to determine transferability of the findings to their respective settings.

b. Careful attention to the procedural approach

The researcher's assumptions are described in Chapter One of the study but are reflected throughout the entire study like a thread that holds the study together. Health is defined by wholeness and as such the nurse's actions with regard to a patient with burn/s must be guided by a conceptual model that encourages the wholeness, integrity and unity of all the structures being conserved in the person. Levine's Conservation model fulfils this requirement (Levine, 1991: 3), and was adopted for this study because it includes principles that assists in explaining the key concepts involved in the management of the patient with burn wounds.

In Chapters Six and Seven the researcher acted as a research tool gathering qualitative data from nurses.

In Chapter Six an interview schedule guided the interviews with pre-planned questions as well as probing questions to further explore nurses' thoughts, beliefs and understanding of wound management. The method described by Tesch (Tesch, 1990 in Creswell, 1994:155), was used to analyse the data gathered from the interviews. The data collection procedures are provided in detail and justified in relation to their contribution to the overall purpose of the study.

c. Adherence to ethical standards

This research is ethical and did not infringe on the rights of nurses or patients. The ethical principles of non-maleficence, beneficence, autonomy, justice and truth telling were maintained throughout the study.

In order to ensure ethical research, approval was obtained from the Postgraduate Committee, Faculty of Health Sciences from the University of the Witwatersrand and ethical clearance was obtained from the Committee for Research on Human Subjects (Medical). The ethical clearance number is M090109. Permission was obtained from the hospital Research Committee, Head of Department and the Head of Nursing services at the tertiary academic hospital. A meeting was held with the Head of Nursing services to present the proposed research. The unit manager of the burns unit received information about the research and her consent was sought and given. The researcher also obtained written consent from the nurses and patients where observations were conducted. The panel of experts were given packs containing a covering letter, proposed recommendations, consent letters, manual and AGREE II instrument for their involvement in the study.

Confidentiality was obtained by restricting data to the researcher, statistician and research supervisors. The following individuals received information letters:

- Chief Executive Officer of the Hospital
- Deputy Director of Nursing Services
- Head of Surgery Departments
- Unit manager of the burns unit
- Nurses in the burns unit (department/ward)
- The panel of experts

With regards to copyright, consent was not required in order to use the AGREE II instrument. The document may be used for educational purposes, quality assurance programmes and critical appraisal of clinical practice guidelines without the consent of the developers.

d. Auditability

Evidence from data was used to support arguments using the words of the participants and/or from field notes (Corbin & Strauss, 2008:123). Mason (2002:182), suggests that the making of convincing arguments is based on a relational process between an idea and data. Four ways of approaching arguments are, according to Mason (2002:176), as follows:

(i) arguing evidentially, whereby what is relevant is presented logically and appropriately to support arguments in relation to the data;

(ii) arguing interpretatively or narratively, whereby the argument is linked to the data meaningfully or reasonably, and therefore the evidence is used to support the interpretation and to illustrate that it is valid and appropriate in nuance;

(iii) arguing evocatively or illustratively, whereby the argument evokes understanding or empathy towards the data on the phenomenon, and thus facilitates experiential understanding. In this regard, evidence is used to illustrate or convey the meaning that supports the evocative argument;

(iv) arguing reflexively or multi-vocally, whereby the argument illustrates a range of meaningful experiences, understandings or perspectives encountered in the data, including critique and indications of gaps or omissions in knowledge about the phenomenon under study;

In this study the researcher used these four ways of arguing the phenomenon under study, the data and evidence accessed. For each category and sub-category that emerged from the data, quotations from participants, literature support and the relevance in the study is provided. The number of the participant referenced the extracts from the transcripts followed by the relevant page of the transcript, for example: 1:6 (participant number one (1) and six (6) the page number of the transcript). Field notes are also inserted where relevant, in brackets.

8.1.2.3 Analytical and interpretative preciseness

Throughout the study the researcher continuously consulted experts in the field on burns and wound management to determine:

i. if there were any other sources the researcher could refer to, to ensure that all sources were included in the integrative review;

ii. if the researcher's interpretations of the data were correct;

iii. what treatment modalities are current practice;

iv. what the latest developments are that were presented at symposiums and conferences in relation to burns.

The categories and sub categories that emerged from Chapter Six contributed to the larger picture of current practice.

The researcher returned the proposed guidelines to the experts for review after the nominal group.

8.1.2.4 Philosophical and theoretical connectedness

The assumptions of the researcher guided the intellectual activity and scientific inquiry in the research process. Levine's Conservation model fulfilled this requirement (Levine, 1991: 3), and was adopted for this study because it includes principles that helped explain the key concepts involved in the management of the patient with burn wounds.

In this study the word person refers to both the nurse and the patient. The researcher believes that the person is a "bio-psycho-social" being with spiritual elements. The researcher believes that the "whole" person is important and that the patient's wound cannot be nursed in isolation from the rest of their being and neither can the nurse's beliefs and attitudes be separated from their skills and knowledge.

Nursing is a systematic process whereby the nurse enters into a partnership with the patient to maintain, facilitate and promote health through nursing interventions. Therefore, the systematic approach of the nursing process was used as a framework throughout the study. It formed the basis of the integrative review (Chapter Four), the structured observation (Chapter Five) and the semi structured interviews (Chapter Six). The nursing process is also used to structure the guidelines for the management of burn wounds by nurses.

Health is a dynamic state that ranges from a high level of wellness to a terminal state over time. Due to the fact that burns are a devastating condition, health is emphasized. Health in this study means that the person has adapted and has maintained his or her integrity, in other words, achieved wholeness.

The environment is the total context in which the person exists. The environment refers to the physical, social, cultural, political and economic conditions of the person. In this study the environment was the burns unit.

All citations and literature were referenced. The integrative review is thorough and extensive, which supports the philosophical and theoretical stances adopted in this study to explore and describe the best available evidence on the management of burn wounds.

8.1.2.5 Heuristic relevance

a. Intuitive recognition

The researcher, in writing up this study, provided definitions of the terminology and then expanded on that terminology. This was done to ensure clarity and consistency throughout the text.

In Chapter Six and Seven the researcher attempted to capture the dialect of the participants by piloting the words seen in the literature to ensure that the word selection was understandable and acceptable. Not being English first language, the researcher had to take additional classes in scientific writing to ensure that:

- the researcher was understood whilst conducting the interviews; and
- the written language was acceptable to the reader.

In Chapter Six, participants' words were quoted as they were spoken without the researcher attempting to translate them or to paraphrase them in order to present the excerpts uncontaminated to the reader.

The researcher was advised in the writing classes to keep the language simple and understandable and to avoid pompous words to ensure that the reader was able to recognize and relate to the study and its findings.

b. Relationship to existing body of knowledge

Prior to the onset of this study, a literature review was done to determine if the intended study had been done before. The researcher discovered that studies have been done in chronic wound management but mostly from a medical perspective. The nursing studies that were found were very few, but these focused mainly on certain aspects of wound management. No studies in the literature were found on burn management from a nursing perspective. None of the studies found covered the whole spectrum of burn management. No study was found that gave a holistic view on current practice covering both objective (Chapter Five) and subjective data (Chapter Six).

An extensive search of the current body of knowledge was done in Chapter Four. As this study is novel, comparisons where possible, were made and referenced (Chapters Five and Six).

This study is unique as it clarifies the unrecognized contribution the nurse plays in the management of burn wounds and adds clear guidelines to a body of knowledge that can be used in resource-rich and resource-poor hospitals that are practical and user friendly.

c. Applicability to nursing practice, research and education

The findings have immediate relevance to nursing practice, research and education as presently there is a need for standardised practice and education. The findings from this study serve as a motivation for recognition of wound care as a speciality as variable practices lead to variable outcomes. This study identified the gaps in wound care and the need to improve clinical practice.

Chapter Seven resulted in evidence based guidelines which incorporated the views of experts in the field. Suggestions for further studies are presented as recommendations in this study.

8.1.3 Step 3: <u>The evaluation of the study is provided in relation to achievement of each of the objectives.</u>

The first objective was to explore and describe the best available clinical evidence in relation to burn wound management by conducting an integrative review.

An integrative review of all available national and international sources on the management of burn wounds are presented in Chapter Four. Chapter Four relates to Phase One of the research design and research method and addresses the first objective of the study. The integrative review was conducted in order to provide a rigorous review of the quality research evidence and expert practitioners' opinions. The process for conducting the integrative review was applied as described by Whittemore & Knafl (2005). The purpose of the integrative review was to identify, analyse and synthesise results from independent studies in order to determine the current available knowledge on the management of burn wounds (Burns & Grove, 2007:508-509). The integrative review was chosen for this study as it allowed the researcher to identify the quality research findings, expert practitioners' opinions and resources necessary for the management of burns by nurses.

It enabled the researcher to explore: 1) what is known on the subject of burn wound management; 2) what is the quality of what is known and; 3) what should be known regardless of whether the methodology is experimental or non-experimental.

The process for the review included a problem identification stage, a literature search stage, a data evaluation stage, a data analysis stage and a presentation stage (Whittemore & Knafl, 2005).

The first objective was achieved as shown in Chapter Four.

The second objective was to describe the current practice on the management of burn wounds according to the themes of the nursing process through the observation of burn wound dressing procedures with assistance of a quantitative checklist.

This objective relates to Phase Two described in the research design and research method. A mixed methods, QUAN (quantitative) →QUAN+ QUAL (quantitative and qualitative), non-experimental, explanatory sequential, descriptive design (Polit & Beck, 2012: 608-612; Creswell & Plano Clark, 2011: 104), was used; this mixed method design was chosen as it allowed a greater depth in the perspective to the findings. The design was sequential indicating the timing of data collection (Polit & Beck, 2012: 608; Creswell, 2009: 206), as the quantitative data was collected first through an integrative review (Phase One, Chapter Four), followed by the parallel collection of quantitative data through structured observation (Phase Two (a), Chapter Five) and qualitative data through semi structured interviews (Phase Two (b), Chapter Six).
Sequential explanatory strategies are characterised by the collection and analysis of quantitative data followed by qualitative data; weight is given to the quantitative data and informs or expands the qualitative data (Creswell, 2009: 211; Teddilie & Tashakkori, 2006: 21).

Since no intervention was introduced, the study was non-experimental (Polit & Beck, 2012:735; LoBiondo- Wood & Haber, 2010: 582). According to Polit & Beck (2012: 725), a descriptive research's main objective is the accurate portrayal of people's characteristics or circumstances and/or the frequency in which they occur. As such, this study set out to describe the best evidence and current practice of the management of burn wounds by nurses.
The second objective was achieved as shown in Chapter Five.

The third objective was to describe the current practice on the management of burn wounds according to the themes of the nursing process through qualitative semi-structured interviews.

This objective was achieved through a qualitative, descriptive research design. Semi-structured interviews were selected as a means of data collection because of two primary considerations. Firstly, semi-structured interviews were selected to augment the data gathered during observation in order to enhance the researcher's understanding of the nurses' current practice on the management of burn wounds as this enabled more probing for information and clarification of answers.

Secondly, the varied professional, educational and experience of the sample group precluded the use of a single method of data collection, in other words just doing structured observation; so the interviews sought a narrative description and explanation.

The third objective was achieved as shown in Chapter Six.

The fourth objective was to verify the findings from Phases One and Two by having a nominal group using the AGREE II instrument by experts in the field.

The fourth objective relates to Phase Three of the research design and research method. The guidelines for the management of burn wounds by nurses were verified by seven purposively selected specialists in the management of burns and wound management.

The purpose of verifying the guidelines was to assess the quality of the guidelines, refine and further develop the guidelines and ensure the content validity of the guidelines. The conclusions drawn in Chapter Seven were used for the development of guidelines for the management of burn wounds by nurses.

The fourth objective was achieved as shown in Chapter Seven.

Next the limitations of the study are discussed.

8.2 LIMITATIONS

- During structured observation, the researcher did not distinguish between different characteristics of the population for example the levels of education, seniority, designation, years of experience, type of education (for example diploma or degreed nurse). Inferences could therefore not be drawn in terms of different practices or behaviours from any specific group.

- The researcher did not take into account that unless an intervention is done certain behaviours will remain unchanged. If the researcher recorded the observations for a specific nurse, the researcher would have been able to present what category of nurse was responsible for which acts such as explaining procedure to the patient and omissions for example, not washing hands.

- It is acknowledged that though the nursing documentation was observed, more attention could be paid to the cardex (the recording of interventions in the patient's personal daily notes) in the form of an audit.

- The guiding questions on the interviews were quite direct and might not be considered as an ideal qualitative research interview guide which should seek to elicit 'emic' data.

- The study was descriptive and an experimental study will still be required to test the impact of the guidelines on patient outcomes.

- The patients subjective experience, wants and needs were not explored.

- Single centre study and transferability might come under question.

- The study was conducted over a five-year period. This protracted period might be considered a limitation, but due to the size of the study the time is justified. To date, however, no guidelines exist.

- The researcher was a novice scholar. Notwithstanding her extensive reading and studying of methodology a certain level of uncertainty always remained in the background which might have come across in the writing.
- For the duration of the study the researcher had three supervisors at three periods which might be apparent to the reader as each supervisor contributed their own personal style and voice to the study which lends a unique character to the study.

The discussion on the recommendations follows.

8.3 RECOMMENDATIONS

Recommendations are provided for the implementation of the guidelines for the management of burn wounds by nurses in clinical nursing practice, research and nursing education.

8.3.1 Nursing Practice

Recommendations for the implementation of the guidelines for the management of burn wounds are provided:

- Prior to implementation of the guidelines, a 'tool kit' for implementation needs to be developed. This 'tool kit' needs to contain recommendations for the implementation of the guidelines.
- Following development of the 'tool kit', the guidelines should be presented to the Department of Health to be adopted as a standard of care in hospitals nationally. Once adopted, the guidelines will be presented to the South African Burns Society (SABS), Wound Healing Association of South Africa (WHASA) and hospital management teams. The 'tool kit' will provide recommendations as to how the guidelines should be implemented, updated and monitored. A roll out of the guidelines will start in Gauteng Province (the Johannesburg/Pretoria region in South Africa).
- Outcome indicators to evaluate the successful implementation of the guidelines will need to be developed and measured. Adaptation to the guidelines will be necessary following measurement of the outcome indicators.
- The use of the guidelines will develop problem-solving, decision-making and critical thinking skills by nurses in wound care and reduce the inappropriate variations presently in practice.
- The guidelines will define the nurses' contribution to the multidisciplinary team and promote collaboration and recognition of the contribution of the nurses as independent practitioners to the management of burn wounds.
- The guidelines will inform practice and promote the efficient use of resources.

8.3.2 Research

Recommendations for further research are provided:

- Further research/field work is required to develop the 'tool kit', determine the 'outcome indicators' and to further develop guidelines.
- Further research is recommended to measure the changes in outcomes after the implementation of guidelines in practice compared to the findings of this study.

- Patient satisfaction surveys or interviews, which could contribute meaningful empirical data regarding patient preferences relating to the explanation of procedures, decision making and effectiveness of pain control measures.
- These guidelines can be refined by empirical data, and in turn could be tested as part of a post-doctoral nursing study.
- Further research on the implementation of a "tri diagnosis" for wound care and the effectiveness use of standardised terminology.
- Further research into the safety of silver dressings is required in view of discrepancies found in the literature.

8.3.3 Nursing Education

Recommendations for nursing education are provided:

- Nursing education on the management of burn wounds requires elaboration in the undergraduate or basic diploma in the nursing curricula. The guidelines on the management of burn wounds may serve as a content guide for curriculum development.
- Refresher courses should be offered to all nurses on wound management and the guideline can form the basis of such training to provide a focus for continuing education.
- Hospitals' clinical departments should use the guidelines as a standard of care to facilitate appropriate care based on the best available scientific evidence and broad consensus.

8.4 SUMMARY

The purpose of this study was to describe the best available evidence for the management of burn wounds by nurses and to explore what nurses' current practice in the management of burn wounds are in a single burns unit with the aim of developing guidelines for nurses.

When the purpose of this study was achieved, evidence-based guidelines were developed on the management of burn wounds by nurses with the intention of informing the following:

- nursing practice on the management of burn wounds;
- nursing education on the training on management of burn wounds;
- to support the implementation of the guidelines;
- to create an organisational awareness of guidelines.

The purpose of the study was achieved through the following research objectives:

- Explore and describe the best available clinical evidence in relation to burn wound management by conducting an integrative review.
- Describe the current practice on the management of burn wounds according to the themes of the nursing process through the observation of burn wound dressing procedures with assistance of a quantitative checklist.
- Describe the current practice on the management of burn wounds according to the themes of the nursing process through qualitative semi-structured interviews.
- Verify the findings from Phase One and Phase Two by having a nominal group using the AGREE II instrument by experts in the field.

This study is unique because the guidelines for the management of burn wounds by nurses **are the first to be developed internationally**. The **research design and method for the development of the guidelines are unique**, as the researcher **combined an integrative review with research findings**. A **mixed method research design** was used in the study which again contributed to its uniqueness as no such study has been done to date in South Africa. The **extensive and detailed integrative review addressed every possible aspect of the management of burn wounds** compared to previous work that only covered a single aspect. The **description of current practice has never been done in South Africa** from a quantitative or qualitative perspective. The **qualitative research gave the opportunity for nurses to verbalise their needs to improve current practic**e. The most unique element of this study was that it **combined the best available evidence on wound management to current practice and delivered guidelines that were reviewed by a multidisciplinary panel of experts and was accepted as quality guidelines by the panel**.

8.5 CONCLUSION

This study successfully described the best available evidence on the management of burn wounds as well as described current practice and resultantly produced evidence based guidelines for the management of burn wounds by nurses.

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Appendix A

Faculty of Health Sciences
Medical School, 7 York Road, Parktown, 2193
Fax: (011) 717-2119
Tel: (011) 717-2745

Reference: Ms Tania Van Leeve
E-mail: tania.vanleeve@wits.ac.za
17 October 2008
Person No: 0010877M
PAG

Ms EA Andrews
8 Tessa Place
Albermarle
Germiston
1401
South Africa

Dear Ms Andrews

Doctor of Philosophy: Approval of Title

We have pleasure in advising that your proposal entitled "*An evaluation of best practice guidelines for woundcare in patients with burns*" has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

Appendix B

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Ms Ethel Andrews

CLEARANCE CERTIFICATE	Protocol M090109
PROJECT	Nursing Education An Evaluation of Best Practice Guidelines for Wound Care in Patients with Burns
INVESTIGATORS	Ms Ethel Andrews
DEPARTMENT	Nursing Education
DATE CONSIDERED	09.01.30
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 09.03.18 CHAIRPERSON .....
(Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Professor J Bruce

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. I agree to a completion of a yearly progress report.

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Appendix C

Ethel Andrews
8 Tessa Place
Albemarle
Germiston
1401

Chief Executive Officer / Head of Trauma / Director of Nursing Services

REQUEST FOR PERMISSION TO CONDUCT RESEARCH WITHIN THE BURN UNIT

I, Ethel Andrews, from the University of the Witwatersrand request permission to conduct research within the Burn Unit. The research is in fulfilment of my PhD. The title of the research is 'An Evaluation of Best Practice Guidelines for Wound Care by Nurses In Patients with Burns'. The aim of this research is to identify and describe strengths, weaknesses and gaps in nurses' knowledge in the management of burn wounds. The secondary purpose is to describe what the best evidence is for the management of burn wounds and to develop a framework for training nurses on the management of burn wounds to be used in nurse education settings and in clinical nursing practice to improve patient outcomes in Gauteng.

With your permission I hope to conduct the study using the following:

- A semi structured interview with nurses involved in wound care
- Structured observation of nurses during wound dressing changes to support data from the questionnaire

Informed written consent will be obtained from the nurses. Informed consent will be obtained from the patients for the researcher to be present during dressing changes. Nurses will participate voluntarily and will not have any penalties should they refuse to participate or withdraw. Confidentiality and anonymity is assured by not using any names or identifying information on the questionnaire. Access to data will be restricted to the researcher, statistician and the research supervisors. Data collection instruments will be destroyed once data has been analysed. A summary of the results will be made available to the hospital.Feedback will be given to participants once study is complete. All staff will be trained on best practice guidelines once the study is complete.

Should I obtain your permission, I would like commence the research as soon as possible. The study has been approved by the Postgraduate Committee as well as the Ethics Committee of the University of the Witwatersrand.

Yours sincerely,

Ethel Andrews
Tel: 0765922656 or 0118654933

Appendix D

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 13 June 2012

TITLE OF PROJECT: An evaluation of best practice guidelines for woundcare in patients with burns

UNIVERSITY: Witwatersrand:

Principal Investigator: Ms Ethel Andrews

Department: Nursing Education

Supervisor (If relevant):

Permission Head Department (where research conducted): The student is to get discuss the project with the Chief Nursing Services Manager

Date of start of proposed study: 2012

Date of completion of data collection: 2013

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Hospital. The CEO /management of Chris Hani Baragwanath Hospital is accordingly informed and the study is subject to:-

- **Discussions and permission being sought from the Head of the Burns Unit and chief Nursing services manager.**
- Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.
- the Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- the MAC will be informed of any serious adverse events as soon as they occur
- permission is granted for the duration of the Ethics Committee approval.

.....

Recommended

(On behalf of the MAC)

Date: 13 June 2012

.....

Approved/Not Approved

Hospital Management

Date: 20/06/12.

Appendix E

Ethel Andrews
8 Tessa Place
Albemarle
Germiston
1401

Chief Executive Officer / Head of Trauma / Director of Nursing Services

REQUEST FOR PERMISSION TO CONDUCT RESEARCH WITHIN THE BURN UNIT

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Should I obtain your permission, I would like commence the research as soon as possible. The study has been approved by the Postgraduate Committee as well as the Ethics Committee of the University of the Witwatersrand.

Yours sincerely,

Ethel Andrews
Tel: 0765922656 or 0118654933

E DEGIANNIS

18

Appendix F

Ethel Andrews
8 Tessa Place
Albemarle
Germiston
1401

Chief Executive Officer / Head of Trauma / Director of Nursing Services

REQUEST FOR PERMISSION TO CONDUCT RESEARCH WITHIN THE BURN UNIT

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- Structured observation of nurses during wound dressing changes to support data from the questionnaire

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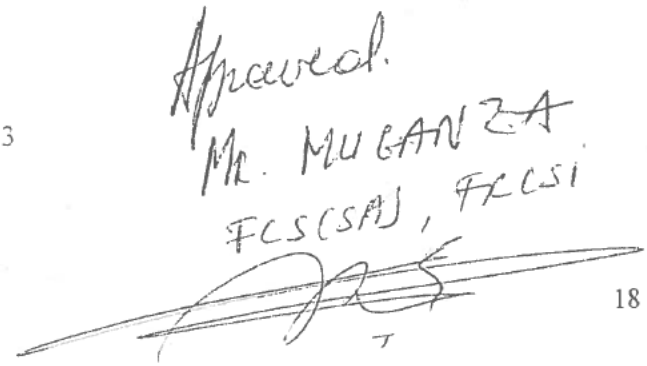
Should I obtain your permission, I would like commence the research as soon as possible. The study has been approved by the Postgraduate Committee as well as the Ethics Committee of the University of the Witwatersrand.

Yours sincerely,

Ethel Andrews
Tel: 0765922656 or 0118654933



Appendix G

Ethel Andrews
8 Tessa Place
Albemarle
Germiston
1401

Chief Executive Officer / Head of Trauma / Director of Nursing Services

REQUEST FOR PERMISSION TO CONDUCT RESEARCH WITHIN THE BURN UNIT

I, Ethel Andrews, from the University of the Witwatersrand request permission to conduct research within the Burn Unit. The research is in fulfilment of my PhD. The title of the research is 'An Evaluation of Best Practice Guidelines for Wound Care by Nurses In Patients with Burns'. The aim of this research is to identify and describe strengths, weaknesses and gaps in nurses' knowledge in the management of burn wounds. The secondary purpose is to describe what the best evidence is for the management of burn wounds and to develop a framework for training nurses on the management of burn wounds to be used in nurse education settings and in clinical nursing practice to improve patient outcomes in Gauteng.

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- Structured observation of nurses during wound dressing changes to support data from the questionnaire

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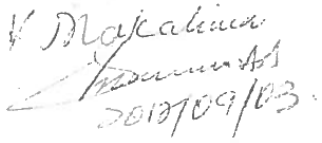
Should I obtain your permission, I would like commence the research as soon as possible. The study has been approved by the Postgraduate Committee as well as the Ethics Committee of the University of the Witwatersrand.

Yours sincerely,

Ethel Andrews
Tel: 0765922656 or 0118654933



Appendix H

Appendix I

Information sheet and Consent Form

For nurses participating in semi structured interview and structured observation during dressing changes

Dear Colleague

My name is Ethel Andrews and I am a student at the University of the Witwatersrand. As part of my Doctoral studies I am required to do a research study to determine what nurses' current knowledge on wound management in patients with burns are. I will also explore the literature to determine what the best practise guidelines are for wound care in patients with burns and make recommendations to improve clinical practise.

Since you are working in a burn unit I would like to invite you to participate in this study. Should you agree you will be required to participate in an informal interview and to allow me to be present during wound dressing procedures.

Your name or any other identifying information will not be used at any time. Although the data will be analysed, neither names nor identifying data will be recorded nor written in this thesis or any other work derived from this data.

Participation is entirely voluntary. Refusal to participate or to withdraw from this study will not hold any risk or penalties.

You will not derive any direct benefit from participation in this study. However, the completed study will assist in the improvement of management of the wounds on patients with burns.

If you have any queries, please contact me on 076 592 2656. Should you wish to be informed of the results of the study; a summary of the findings will be made available on request.

I_____ _____ hereby agree to participate in the study conducted by Ethel Andrews. I fully understand the content of the information above provided to me. I understand that I am expected to:
* participate in an informal interview
* do dressing changes with the researcher present.

I understand that my participating in the study does not involve any risk or penalties. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from the study at any stage without any penalty. I have been assured that personal results will be confidential but that the findings from the study will be published.

I, the undersigned hereby agree to participate in the study.

_____ _____

(Participant) (Researcher)

Appendix J

Information Letter and Consent form

For patients in the burn unit where the wound dressing procedure carried out by the nurses will be observed

Dear Patient

My name is Ethel Andrews and I am a student at the University of the Witwatersrand. As part of my Doctoral studies I am required to do a research study to evaluate what current are for wound care in patients with burns.

Since you are admitted in the burn unit I would like to invite you to participate in this study. Should you agree you will be allowing me to be present during the dressing procedure.

Your name or any other identifying information will not be used at any time. Although the data will be analysed, neither names nor identifying data will be recorded nor written in this thesis or any other work derived from this data.

Participation is entirely voluntary. Refusal to participate or to withdraw from this study will not hold any risk or penalties.

You will not be harmed, victimised or derive any direct benefit from participation in this study.

Please feel free to ask any questions you might have with regards to your participation in the study.

I_____ hereby agree to participate in the study conducted by Ethel Andrews. I fully understand the contents of the information above provided to me. I understand that the researcher will be present during dressing changes. I understand that my participating in the study does not involve any risk or penalties. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from the study at any stage without any penalty. I have been assured that personal information will be confidential but that the findings from the study will be published.

I, the undersigned hereby agree to participate in the study.

_____ _____

(Participant) (Researcher)

_____

(Date)

Appendix K

INFORMATION LETTER

For verification of guidelines

My name is Ethel Andrews and I am a student at the University of the Witwatersrand. As part of my Doctor of Philosophy degree, I developed **guidelines for nurses for the management of partial thickness burns**.

I would like to invite you to verify the guidelines. Should you agree your involvement would entail your reading the guidelines and assessing it using the AGREE II Instrument in your 'verifiers' package'. **The purpose of verifying the guidelines is to assess the accuracy and quality of the guideline, refine and further develop the guideline, ensure the content validity of the guideline, to assesses the benefits, any potential harm and cost of the recommendations as well as the practical issues related to implementation of the guideline**.

The AGREE II Instrument has a user's manual attached. Please could you rate the guideline on the 7-point scale from 7 for 'strongly agree' to 1 for 'stronglydisagree'. In addition to the 7-point scale, a box for your comments is provided. Finally, a section for overall assessment of the guideline is provided at the end of the AGREE II Instrument. With respect to the guideline, you would either: 'strongly recommend', 'recommend with modifications' or 'would not recommend'.

Your anonymity is guaranteed, neither names nor identifying data will be recorded in the written thesis nor in any article published from the data if you so choose. However, due recognition will be given if you so choose. Participation is entirely voluntary; refusal to participate or to withdraw at any time without explanation is assured. If you have any queries about the verification of the guideline, please contact me at (011) 865 4933 (home) or on 076 592 2656. The results of the verification process and a copy of the final BPG will be made available on request.

Please could you verify the guideline and return your assessment recorded on the AGREE II Instrument by the 11 April 2014. There will be a focus group discussion on the guidelines; the provisional date is Friday, 11 April 2014 at Holiday Inn Milpark at 7am.

Thank-you for taking the time to read this information letter

Yours sincerely

Ethel Andrews

Appendix L

CONSENT FORM

For verification of guidelines

I [illegible] fully understand the contents of this information letter. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from this verification process at any stage without penalty. I have been assured that my anonymity and confidentiality will be maintained if I so choose.

I acknowledge that the guidelines remain the intellectual property of Ethel Andrews and the University of the Witwatersrand and that the document with the recommendation of guidelines has been made available to me on the understanding that its contents will not be disclosed or discussed with any third parties.

I hereby give consent to verify the guideline.

[signature]
(Participant)

6 April 2014
(Date)

Appendix L

CONSENT FORM

For verification of guidelines

I _____ fully understand the contents of this information letter. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from this verification process at any stage without penalty. I have been assured that my anonymity and confidentiality will be maintained if I so choose.

I acknowledge that the guidelines remain the intellectual property of Ethel Andrews and the University of the Witwatersrand and that the document with the recommendation of guidelines has been made available to me on the understanding that its contents will not be disclosed or discussed with any third parties.

I hereby give consent to verify the guideline.

_____

(Participant)

_____

(Date)

Appendix L

CONSENT FORM

For verification of guidelines

I Ciarans Govan fully understand the contents of this information letter. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from this verification process at any stage without penalty. I have been assured that my anonymity and confidentiality will be maintained if I so choose.

I acknowledge that the guidelines remain the intellectual property of Ethel Andrews and the University of the Witwatersrand and that the document with the recommendation of guidelines has been made available to me on the understanding that its contents will not be disclosed or discussed with any third parties.

I hereby give consent to verify the guideline.

(Participant)

10/4/14

(Date)

Appendix L

CONSENT FORM

For verification of guidelines

I ELIAS NDOBE fully understand the contents of this information letter. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from this verification process at any stage without penalty. I have been assured that my anonymity and confidentiality will be maintained if I so choose.

I acknowledge that the guidelines remain the intellectual property of Ethel Andrews and the University of the Witwatersrand and that the document with the recommendation of guidelines has been made available to me on the understanding that its contents will not be disclosed or discussed with any third parties.

I hereby give consent to verify the guideline.

(Participant)

10/04/2014

(Date)

Appendix L

CONSENT FORM

For verification of guidelines

I Estonie D Mathews fully understand the contents of this information letter. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from this verification process at any stage without penalty. I have been assured that my anonymity and confidentiality will be maintained if I so choose.

I acknowledge that the guidelines remain the intellectual property of Ethel Andrews and the University of the Witwatersrand and that the document with the recommendation of guidelines has been made available to me on the understanding that its contents will not be disclosed or discussed with any third parties.

I hereby give consent to verify the guideline.

Ms E.D Mathews
(Participant)

11 April 2014
(Date)

Appendix L

CONSENT FORM

For verification of guidelines

I Mr. K M MUGANZA fully understand the contents of this information letter. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from this verification process at any stage without penalty. I have been assured that my anonymity and confidentiality will be maintained if I so choose.

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I hereby give consent to verify the guideline.

(Participant)

09/04/2014

(Date)

Appendix L

CONSENT FORM

For verification of guidelines

I Karin Swart fully understand the contents of this information letter. I have been offered the opportunity to ask questions and these have been answered to my satisfaction. I understand that I may withdraw from this verification process at any stage without penalty. I have been assured that my anonymity and confidentiality will be maintained if I so choose.

I acknowledge that the guidelines remain the intellectual property of Ethel Andrews and the University of the Witwatersrand and that the document with the recommendation of guidelines has been made available to me on the understanding that its contents will not be disclosed or discussed with any third parties.

I hereby give consent to verify the guideline.

(Participant)

11/04/2014

(Date)

Appendix M

Levine's Conservation framework

The aim of the conceptual framework is to provide context for the study and to define and mark the boundaries of the concepts being investigated. The key concepts will be described as well as the relationships that exist between the concepts. Polit & Hungler (1995) made reference to a number of conceptual frameworks and models used in nursing practice. These models constitute formal explanations of what the nursing discipline is according to the developer's point of view. Fawcett (1989) noted that four central concepts are commonly used in models of nursing. These are *the person*, *the environment, health* and *nursing.*

The nursing profession is not static and is continuously evolving. Ever since Florence Nightingale started writing her notes on nursing, more theories and models about the nursing profession were developed; one of these is Levine's Conservational Theory. This model has been widely used in several disciplines in nursing including wound care (Leach, 2006). This study will align itself with Levine's Conservation model to contribute to clinical practice and in so doing improve wound care outcomes. In an attempt to systematically explain the conceptual framework the researcher will discuss the theoretical components which will include the basic assumptions of Levine's Conservation framework, concepts and the relationships that exist in detail.

The Conservation model was originally developed as an organizing framework for undergraduate nurses (Levine, 1973). According to Schaefer (1991) Levine made a significant contribution to the "why" of nursing actions. The researcher hypothesizes that if nurses understand the why of their actions in wound care through the conservation of energy, structural, personal and social integrity and not just doing things the way it has always been done burn patients will be exposed to good nursing practices that enhance a care approach that embrace wholeness and health along with cost effective care.

COMPOSITION OF CONSERVATION MODEL

According to Levine (1973) "nursing is human interaction". Levine states that "the nurse enters into a partnership of human experience where sharing moments in time leaves a mark forever on each patient" (Levine, 1977). As a human science the profession of nursing integrates the adjunctive sciences such as chemistry, biology, anatomy and physiology, psychology, sociology, anthropology, philosophy and medicine to develop the practice of nursing.

Three major concepts form the basis of the model and its assumptions:

1) Adaptation
2) Wholeness
3) Conservation

The goal of Levine's Conservation Model is to promote adaptation and maintain wholeness using the principles of conservation. The model guides the nurse to focus on the influences and responses at the organismic level. The nurse accomplishes the goals of the model through the conservation of energy, structure, and personal and social integrity (Levine, 1967).

Adaptation is the ongoing process of change whereby individuals retain their integrity within the realities of their environments (Levine, 1989) Change is the life process; adaptation is the method of change according to Schaefer (1991) and conservation is the outcome of adaptation. Adaptation is achieved through the "frugal, economic, contained, and controlled use of environmental resources by the individual in his or her best interest" (Levine, 1991). Schaefer (1991) stated that every individual possesses a range of adaptive responses that is unique to that individual.

Wholeness is based on Erikson's (1964) description of wholeness as an open system: "Wholeness emphasizes a sound, organic, progressive mutuality between diversified functions and parts within an entirety, the boundaries of which are open and fluid." Wholeness exists when the interactions or constant adaptations to the environment permit the assurance of integrity according to Levine (1991). Nurses promote wholeness through the use of the conservation principles. Their recognition of an open, fluid, constantly changing interaction between the individual and the environment is the basis for holistic thought, which views the individual as whole. Wholeness is health; health is integrity. Health is a pattern of adaptive change, the goal of which is well – being according to Schaefer (1991).

Conservation is the product of adaptation. Conservation is from the Latin word conservatio, meaning "to keep together" (Levine, 1973). "Conservation describes the way complex systems are able to continue to function even when severely challenged" according to Levine (1990). Through conservation, individuals are able to confront obstacles, adapt accordingly, and maintain their uniqueness. "The goal of conservation is health and the strength to confront disability" in all situations in which nursing requires (Levine, 1973). The primary focus of conservation is keeping together of the wholeness of the individual. Although nursing interventions may deal with one particular conservation principle, nurses must also recognize the influence of other conservation principles according to Levine (1990).

Numerous theories have been developed by nurses over the years that provide different explanations of the nursing discipline. Likewise the Conservation Model shares four central or major concepts: **person, environment, health and nursing**. In addition to this, Levine's Model also discussed that person and environment merge or become congruent over time. Levine (1988) referred to these concepts as common places of the discipline in that they are necessary for any description of nursing.

The ***person*** is a holistic being who constantly strives to preserve wholeness and integrity and one "who is sentient, thinking, future-oriented, and past-aware." The wholeness (integrity) of the individual demands that the "isolated aspects…can have meaning outside of the context within which the individual experiences his or her life" (Levine, 1973). The person is also described as a unique individual in unity and integrity, feeling, believing, thinking and whole system of system. According to Levine (1973), the person can be defined as an individual, an individual in a group (family), or an individual in a community (Pond, 1991). Persons are in constant interaction with the environment, responding to change in an orderly, sequential pattern and thus they adapt to forces that shape and reshape the essence of the person according to Schaefer(1991).

The ***environment*** completes the wholeness of the person. The individual has both an internal and external environment.
The *internal environment* combines the physiological and pathophysiological aspects of the individual and is constantly challenged by the external environment. The internal environment also is the integration of bodily functions that resembles *homeorrhesis* rather than *homeostasis* and is subject to challenges of the external environment, which always are a form of energy.

Homeostasis is a state of energy sparing that also provides the necessary baselines for a multitude of synchronized physiological and psychological factors, while *homeorrhesis* is a stabilized flow rather than a static state.

The internal environment emphasizes the fluidity of change within a space-time continuum. It describe the pattern of adaptation, which permit the individual's body to sustain its well-being with the vast changes which encroach upon it from the environment.

The *external environment* includes those factors that impose on and challenge the individual. Acknowledging the complexity of the external environment, Levine (1973) adopted the three levels of the environment identified by Bates (1967): the perceptual, operational, and conceptual.

The *perceptual environment* is that portion of the external environment which individuals respond to with their sense organs and includes light, sound, touch, temperature, chemical change that is smelled or tasted, and position sense and balance. The *operational environment* is that portion of the external environment which interacts with living tissue even though the individual does not possess sensory organs that can record the presence of these factors and includes all forms of radiation, microorganisms, and pollutants. In other words, these elements may physically affect individuals but are not perceived by the latter.

The *conceptual environment* is that portion of the external environment that consists of language, ideas, symbols, and concepts and inventions and encompasses the exchange of language, the ability to think and experience emotion, value systems, religious beliefs, ethnic and cultural traditions, and individual psychological patterns that come from life experiences.

Health and disease are patterns of adaptive change, the goal of which include well- being (Levine, 1971). Health is implied to mean unity and integrity and "is a wholeness and successful adaptation". The goal of nursing is to promote health. Levine (1991) clarified what she meant by health as "the avenue of return to the daily activities compromised by ill health. It is not only the insult or the injury that is repaired but the person himself or herself. It is not merely the healing of an afflicted part. It is rather a return to self-hood, where the encroachment of the disability can be set aside entirely, and the individual is free to pursue once more his or her own interests without constraint." Levine (1971) argues that disease represents the individual's effort to protect self- integrity, such as the inflammatory system's response to injury. Disease according to Levine (1973) is unregulated and undisciplined change and must be stopped to prevent death.

Nursing involves engaging in human interactions according to Levine (1973). Individuals seek nursing care when they are no longer able to adapt. The goal of nursing is to promote adaptation and maintain wholeness (health) and realizing that every individual requires a unique and separate cluster of activities. The goal is accomplished through the conservation of energy and structural, personal and social integrity. Levine (1977) stated that "the nurse enters into a partnership of human experience where sharing moments in time—some trivial, some dramatic—leaves its mark forever on each patient".

Levine's Conservation Model discusses the way in which the ***person and the environment*** become congruent over time. It is the fit of the person with his or her predicament of time and space. The specific adaptive responses make conservation possible occur on many levels; molecular, physiologic, emotional, psychologic, and social. These responses are based on three factors (Levine, 1989): historicity, specificity and redundancy.

1. *Historicity* refers to the notion that adaptive responses are partially based on personal and genetic past history. Each individual is made up of a combination of personal and genetic history, and adaptive responses are the result of both.

2. *Specificity* refers the fact that each system that makes up a human being has unique stimulus-response pathways. Responses are stimulated by specific stressors and are task oriented.

   Responses that are stimulated in multiple pathways tend to be synchronized and occur in a cascade of complimentary (or detrimental in some cases) reactions.

3. *Redundancy* describes the notion that if one system or pathway, is unable to ensure adaptation, then another pathway may be able to take over and complete the job. This may be helpful when the response is corrective (e.g., the use of allergy shots over a lengthy period of time to diminish the effects of severe allergies by gradually desensitizing the immune system). However, redundancy may be detrimental, such as when previously failed responses are re-established (e.g., when autoimmune conditions cause a person's own immune system to attack previously healthy tissue in the body).

A change in behaviour of an individual during an attempt to adapt to the environment is called an *organismic response*. It helps individual to protect and maintain their integrity. There are four types, namely:

(1) Flight or fight: An instantaneous response to real or imagined threat, most primitive response

(2) Inflammatory: response intended to provide for structural integrity and the promotion of healing

(3) Stress: Response developed over time and influenced by each stressful experience encountered by person

(4) Perceptual: Involves gathering information from the environment and converting it in to a meaning experience

KEY CONCEPTS: Conservational principle

The central concept, of Levine's theory is *conservation* (Levine, 1989). When a person is in a state of conservation, it means that individual adaptive responses conform to change productively, and with the least expenditure of effort, while preserving optimal function and identity. Conservation is achieved through successful activation of adaptive pathways and behaviours that are appropriate for the wide range of responses required by functioning human beings.

Levine advocated that nursing is a human interaction and proposed *Four Conservation Principles* of nursing which are concerned with the unity and integrity of individuals. The framework includes: energy, structural integrity, personal integrity, and social integrity.

I. ***Conservation of energy***: Conservation of energy pertains to actions or activities that limit or preserve a person's energy which is very much needed for a person to function normally or facilitate healing process i.e. balancing energy input and output to avoid excessive fatigue. It includes adequate rest, nutrition and exercise. Energy conservation depends on the free exchange with the environment so that living systems can constantly replenish their energy supplies (Levine, 1973). Conservation of energy is integral to the individual's range of adaptive responses. The conservation of structural integrity depends on an intact defence system that supports repair and healing and that is responsive to the challenges from the internal and external environment according to Schaefer (1991). For this study conservation of energy is important since we know that a sick person spends more energy than in normal state even during rest. Due to the presence of wounds, the immune system in an attempt to bring healing and fight infection are spending energy. Nurses are in a position to conserve patient energy by promoting wound healing. For instance, nurses may select wound treatments that restore skin integrity and minimize energy expenditure, ultimately resulting in timely wound healing, earlier discharge, reduced healthcare expenditure, and less emotional trauma.

II. ***Conservation of structural integrity***: Refers to maintaining or restoring the structure of body preventing physical breakdown and promoting healing.

This is of vital importance because the person's anatomical structure is the framework where everything in a person transcends. In burns specific nursing interventions that conserve structural integrity include proper positioning and range-of-motion, active as tolerated and passive as medically permitted, exercises to prevent musculoskeletal deformities, massage, change of position and keeping the skin well moist and hydrated to prevent pressure ulcers, burn depth conversion to deeper wounds and early mobilization and chest physiotherapy to prevent complications of bed rest and contractures.

III. ***Conservation of personal integrit***y: Recognizes the individual as one who strives for recognition, respect, self-awareness, selfhood and self-determination.

The conservation of personal integrity recognizes the individual who establishes his or her wholeness in response to the environment. It acknowledges that individuals strive for recognition, respect, self-awareness, humanness, holiness, independence, freedom, selfhood and self- determination (Schaefer,1991). It is the recognition and respect of a person's dignity and personhood.

Nursing interventions aimed at conserving personal integrity include protecting and respecting patient privacy, possessions, and defence mechanisms and supporting personal choice. The nurse must not fail to recognize that one source of the person's esteem or dignity is his independence. Thus, the nurses' goal in weaning the patient from dependence to independent is important. Without sufficient energy and, in the case of wound care, intact skin integrity, dependence on other individuals is almost certain. Therefore, interventions that conserve energy and restore structural integrity will arguably re-establish independence. Thus, dressings and interventions that hasten healing and ultimately shorten wound duration may reduce client dependency on others. Effective wound management also may restore patient self-worth and personal integrity.

IV. **Conservation of social integrity**: An individual is recognized as someone who resides with in a family, a community, a religious group, an ethnic group, a political system and a nation. Conservation of social integrity is there for the management and accommodation of the person's relationships specially his or her support system

Conservation of social integrity recognizes that individuals function in a society that helps establish the boundaries of the self. Social integrity is created by family and friends, workplace and school, religion, personal choices and cultural and ethnic heritage (Levin, 1996). With its political and economic controls, the health care system is part of the social system to which individuals belongs. Levine (1991) contends that conservation of integrity is essential to assuring wholeness and providing the strength needed to confront illness and disability. A change from an independent role to dependency on the healthcare system creates conflict for the individual. It can also add strain in the family because of the financial concern that comes with hospitalization.

ASSUMPTIONS

Levine's Model also discusses other assertions and assumptions:

- The nurse creates an environment in which healing could occur.
- A human being is more than the sum of the part
- Human being respond in a predictable way
- Human being are unique in their responses
- Human being know and appraise objects ,condition and situation
- Human being sense ,reflects, reason and understand
- Human being action are self-determined even when emotional
- Human being are capable of prolonging reflection through such strategists raising questions
- Human being make decision through prioritizing course of action
- Human being must be aware and able to contemplate objects, condition and situation
- Human being are agents who act deliberately to attain goal
- Adaptive changes involve the whole individual
- A human being has unity in his response to the environment
- Every person possesses a unique adaptive ability based on one's life experience which creates a unique message
- There is an order and continuity to life change is not random
- A human being respond organismically in an ever changing manner
- A theory of nursing must recognized the importance of detail of care for a single patient with in an empiric framework that successfully describe the requirement of the all patient
- A human being is a social animal
- A human being is an constant interaction with an ever changing society
- Change is inevitable in life
- Nursing needs existing and emerging demands of self-care and dependent care
- Nursing is associated with condition of regulation of exercise or development of capabilities of providing care

Nursing Implications

According to Levine, a nurse can implement either supportive or therapeutic interventions (Schaefer, 1990).Supportive interventions prevent deterioration of health; therapeutic interventions promote healing and restore health (Leonard and Levine, 1990). With regard to burn wound management dressings focus on external environment, the internal environment would be all other factors affecting wound healing such as nutrition, hydration, pain control etc.

Conclusion

Levine's conservation model provides a basis for making effective wound management choices in order to improve wound healing and consequently improve individual well-being and quality of life. The relationship between effective wound management and positive patient outcomes draws on Levine's four conservation principles, about which the author states: Every activity requires an energy supply because nothing works without it. Every activity must respect the structural wholeness of the individual because well-being depends on it. Every activity is chosen out of the abilities, life experience, and desires of the "self"' who makes the choices. Every activity is a product of the dynamic social systems to which the individual belongs (Levine.1991)

Appendix N

Background of Soweto

Soweto is an urban area of the city of Johannesburg in Gauteng, South Africa, bordering the city's mining belt in the south. Its name is an English syllabic abbreviation for *South Western Townships*. The Area = 106.44 km^2 (41.10 sq mi) with an estimated population (2011) of 1,271,628.

Map of City of Johannesburg



History

The history of Soweto was propelled by the increasing eviction of black South Africans by city and state authorities. Black South Africans had been drawn to work on the gold mines that were established after 1886. Two further townships were laid out to the east and the west of Johannesburg in 1918. Townships to the south west of Johannesburg followed, starting with Pimville in 1934 (a renamed part of Klipspruit) and Orlando in 1935. Industrialization during World War I drew thousands of black workers to the Reef.

They were also propelled by legislation that rendered many rural Black Africans landless. Informal settlements developed to meet the growing lack of housing. After the Afrikaner-dominated National Party gained power in 1948 and began to implement apartheid, the pace of forced removals and the creation of townships outside legally designated white areas increased.

In 1956 townships were laid out for particular ethnic groups as part of the state's strategy to sift black Africans into groupings that would later form the building blocks of the so-called "independent homelands.

Demographics

As Soweto was counted as part of Johannesburg in South Africa's 2010 census, Soweto's population is 1,271,628. It has been estimated that 40% or about one-third of the city's total population live in Soweto.

Housing

The area is mostly composed of old "matchbox" houses, or four-room houses built by the government, that were built to provide cheap accommodation for black workers during apartheid. However, there are a few smaller areas where prosperous Sowetans have built houses that are similar in stature to those in more affluent suburbs. Many people who still live in matchbox houses have improved and expanded their homes, and the City Council has enabled the planting of more trees and the improving of parks and green spaces in the area. Hostels are another prominent physical feature of Soweto. Originally built to house male migrant workers, many have been improved as dwellings for couples and families.

Suburbs

By 2003 the Greater Soweto area consisted of 87 townships grouped together. Estimates of how many residential areas make up Soweto itself vary widely. Many parts of Soweto rank among the poorest in Johannesburg, although individual townships tend to have a mix of wealthier and poorer residents. The economic development of Soweto was severely curtailed by the apartheid state, which provided very limited infrastructure and prevented residents from creating their own businesses. Roads remained unpaved, and many residents had to share one tap between four houses, for example. Soweto was meant to exist only as a dormitory town for black Africans who worked in white houses, factories, and industries.

Transport

The suburb was not historically allowed to create employment centers within the area, so almost all of its residents are commuters to other parts of the city.

Rail: Metrorail operates commuter trains between Soweto and central Johannesburg.

Road: The N1 Western Bypass skirts the eastern boundary of Soweto. There is efficient road access for many parts of the region along busy highways to the CBD and Roodepoort, but commuters are largely reliant on trains and taxis. Minibus taxis are a popular form of transport. In 2000 it was estimated that around 2000 minibus taxis operated from the Baragwanath taxi rank alone. A bus rapid transit system, commonly known as Rea Vaya provides transport for around 16 000 commuters daily. PUTCO buses has for many years provided bus commuter services to Soweto residents.

Chris Hani Baragwanath Hospital

The Imperial Military Hospital Baragwanath, named after Cornishman John Albert Baragwanath, was built in 1941 during the Second World War to serve as a British Military Hospital. John Albert Baragwanath initially owned the situated site as a hostel, The Wayside Inn, until the British Government paid £328,000 to make it a hospital. Field-Marshal Jan Smuts noted during the opening ceremonies that the facility would be used for the area's black population after the war. In 1947 King George VI visited and presented medals to the troops there. From this start grew Baragwanath Hospital (as it became known after 1948), reputedly the world's largest hospital. In 1997 another name change followed, with the sprawling facility now known as Chris Hani-Baragwanath Hospital in honour of the South African Communist Party leader who was assassinated in 1993 Chis Hani.

Chris Hani Baragwanath Hospital is the third largest hospital in the world, occupying around 173 acres (0.70 km2), with approximately 3 200 beds and about 6 760 staff members. It is one of the 40 Gauteng provincial hospitals, and is financed and run by the Gauteng Provincial Health Authorities. It is a teaching hospital for the University of the Witwatersrand Medical School, along with the Charlotte Maxeke Johannesburg Academic Hospital, Helen Joseph Hospital and the Rahima Moosa Mother and Child Hospital.

(Taken from Chris Hani Baragwanath website on 28/3/12; updated on wikipedia on 21 September, 2014).

Checklist for validity of systematic review literature (Ciliska, et al., 2001:100)

	YES	NO	N/A
Are the results valid?			
Is the study a randomised control trial?			
Does the study provide a clear description of the research methodology?			
Does the study provide a clear description of how validity was ensured?			
Are the results consistent with other similar studies?			
What are the results?			
Was the management effective or not (supported with statistical analysis)?			
Was there a significant difference in the results (supported with statistical analysis)?			
Was the estimate of the effect/ difference precise (statistical evidence)?			
Will the results help practice?			
Will the results apply to the patients in my specific practice scenario?			
Is the management usable in my clinical setting?			
Were all- important clinical outcomes considered?			
Will the management address my specific patient values and preference?			

Appendix P

Critical Appraisal Worksheet for Systematic Reviews

Appraiser: _____ Date: ___/___/____

Citation: _____

What is the clinical question that this study addresses? Put the question in PICO format.

Population: _____

Intervention: _____

Control (if applicable): _____

Outcome: _____

I. ARE THE RESULTS OF THIS SYSTEMATIC REVIEW VALID?

1. Did the systematic review address a focused, sensible clinical question?	
2. Did the search for relevant studies include: • An appropriate literature search? • Searching relevant bibliographies? • Talking to experts in the field to identify unpublished studies or those "in press"? • A search of non-English language journals?	
3. Were the primary studies included of high methodologic quality? (RCTs for therapy, appropriate gold standards for diagnostic tests, etc)	
4. Was the search for and quality assessment of trials reproducible (were both carried out, with agreement, by more than one person)?	

II. WHAT ARE THE RESULTS?

1. Were the results consistent from study to study? Was a test for heterogeneity performed?

2. What are the overall results of the review? Report results using whatever measures of effect were calculated (RRR, ARR, likelihood ratios, odds ratios, sensitivity, specificity, standard deviation, etc).

3. How precise are the results (what are the confidence intervals for the measures of effect)?

III. HOW CAN THE RESULTS TO PATIENT CARE

1. How similar are my patients to the patients in the review?

2. If a sub-group analysis was performed, the following conditions will increase its credibility:

- Was there a large difference in treatment effect across sub-groups? ___
- Was there a highly statistically significant difference in effect between sub-groups? ___
- Was the subgroup hypothesis stated at the beginning of the systematic review? ___
- Were there only a few sub-groups analyzed, or were many examined? ___
- Is there indirect evidence to support a sub-group conclusion ("biologic plausibility", etc.)? ___

3. Were all clinically important outcomes considered?

4. Are the benefits worth the costs and potential risks?

CLINICAL BOTTOM LINE

1.

2.

3.

Appendix Q

QUALSYST TOOL

Checklist for assessing the quality of quantitative studies (Kmet, Lee & Cook, 2004: 4)

	Criteria	YES (2)	PARTIAL (1)	NO (0)	N/A
1	Question/ objective sufficiently described?				
2	Study design evident and appropriate?				
3	Method of subject / comparison group selection or source of information/ input variables described and appropriate?				
4	Subject (comparison group, if applicable) characteristics sufficiently described?				
5	If intervention and random allocation was possible, was it described?				
6	If interventional and blinding of investigators was possible, was it reported?				
7	If interventional and blinding of subjects was possible, was it reported?				
8	Outcome and (if applicable) exposure measure (s) well defined robust to measurement/ misclassification bias? Means of assessment reported?				
9	Sample size appropriate?				
10	Analytic measurement described/ justified and appropriate?				
11	Some estimate of variance is reported for the main results?				
12	Controlled for confounding?				
13	Results reported in sufficient detail?				
14	Conclusion supported by the results?				

QUALSYST TOOL

Checklist for assessing the quality of qualitative studies (Kmet, Lee & Cook, 2004: 5)

	Criteria	**YES (2)**	**PARTIAL (1)**	**NO (0)**	**N/A**
1	Question/ objective sufficiently described?				
2	Study design evident and appropriate?				
3	Context for the study clear?				
4	Connection to a theoretical framework / wider body of knowledge?				
5	Sampling strategy described, relevant and justified?				
6	Data collection methods clearly described and systematic?				
7	Data analysis clearly described and systematic?				
8	Use of verification procedure (s) to establish credibility?				
9	Conclusions supported by results?				
10	Reflexivity of the account				

Appendix R

Citation	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Macro Assessment					
Monstrey, Hoeksema, Verbelen, et al., 2008	Review	Not stated	V	Not stated	This review has shown that burn assessment is aided by many techniques. Traditionally, there has been too much emphasis on burn depth assessment which is not entirely appropriate. Although bedside clinical evaluation remains the most widespread and least expensive method for depth diagnosis, it is accurate only about 2/3 of the time and is limited by poor inter-rater reliability. LDI being the most favourable option – is currently advocated for optimal delineation of the depth of acute burn wounds and for prognosis and treatment guidance.
Jaskille, Ramella-Roman, Shupp., et al. 2010	Review	To explain LDI technology, to understand what it is capable of and what its limitations are, and then, to critically review the current burn literature on LDI	V	Not stated	Although more uniform and systematic research is needed, LD has brought technology closer to provide a reliable adjuvant to the clinical prediction of healing
Devgan, Bhat, Aylward, et al., 2006.	Essay	To review current research on modalities useful in the assessment of burn wound depth with emphasis on the relative costs and benefits of each technique	V	PubMed and Cochrane computerized databases were used for data retrieval. In addition, bibliographic references from prior reviews of burn depth were reviewed. All peer-reviewed, English-	Of the depth assessment modalities currently used in clinical practice, LDI and ICG (Indocyanine green) video angiography offer the best data-supported estimates of accuracy. Until the future of new modalities unfolds, a combination of clinical evaluation and another modality—thermography, biopsy, or, ideally, ICG video angiography or LDI—is advised to best assess the depth of

<table>
<tr><td></td><td></td><td></td><td></td><td>language articles relevant to the topic of burn depth measurement were reviewed, including those focusing on animal and human populations. Where appropriate, conclusions drawn from review articles and expert analyses were included.</td><td>acute burn wounds.</td></tr>
<tr><td>Atiyeh, Gunn, & Hayek, 2005</td><td>Review</td><td>Not stated</td><td>V</td><td>Not stated</td><td>Description of methods of burn depth assessment given.</td></tr>
<tr><td>Jaskille, Shupp, Jordan, & Jeng, 2009.</td><td>Review</td><td>Not stated</td><td>V</td><td>Not stated</td><td>
<table>
<tr><th>Technique</th><th>Level of evidence</th></tr>
<tr><td>Radio active isotopes</td><td>Technology assessment
Animal work</td></tr>
<tr><td>Non Fluorescent dyes</td><td>Technology assessment
Animal work
Technology assessment
Animal work</td></tr>
<tr><td>Fluorescent dyes
Tetracysline
Fluorescein
Indocyanine green</td><td>
Class II
Class II and III
Class II</td></tr>
<tr><td>Thermography
Active dynamic thermography</td><td>Class II
Technology assessment</td></tr>
</table>
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</table>

Photometry	Class II
Liquid crystal thermo indicating film	Class III
Nuclear magnetic resonance	Technology assessment
Pulse ultrasound	Class II
Doppler ultrasound	Class II
Laser Doppler Imaging	Technology assessment Class II and III

Class I:
Evidence provided by prospective, randomized, controlled trials with appropriate design, methodology and sufficient patient numbers; the “gold standard” of evidence-based medicine

Class II:
Evidence supported by studies in which clearly reliable data are collected prospectively and/or retrospectively: such studies include observational studies, cohort studies, prevalence studies, and case-control studies.

Class III evidence
Evidence provided by clinical series, comparative studies, case reviews, case reports, and expert opinion.

					Technology assessment The assessment of technology does not lend itself to organization as a class of evidence; devices may be evaluated in terms of accuracy, reliability, therapeutic potential, and cost effectiveness. (Gibran, 2006: 438)

Citation	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Wachtel, Berry, Wachtel & Frank, 2000.	Randomised controlled trial	To determine the accuracy and variability of burn size calculations using four Lund and Browder charts currently in clinical use and two Rule of Nine's diagrams. To assess the variation between observers estimating the area burned from standard burn area chart drawings made on a number of burn area charts currently in clinical use. To assess the bias introduced by the burn area chart itself and examined some other problems and uncertainties associated with the use of burn area charts and drawings	II	Twenty-six patients with burns of varying sizes, shapes and locations were given alphabetical letters A to Z. Ten burns from this sample were randomly selected and uniform artist's drawings were made to represent the second and third degree burns. These drawings were duplicated precisely on six different forms of which one is the original Lund and Browder chart, three are modified Lund and Browder charts and two are burn area charts that were converted to represent the Rule of Nine's. The resulting 60 different simulations were used in the study. These simulations were randomized to each	The study showed that variability in estimation increased with burn size initially, plateaued in large burns and then decreased slightly in extensive burns. The Rule of Nine's technique often overestimates the burn size and is more variable, but can be performed somewhat faster than the Lund and Browder method. More burn experience leads to less variability in burn area chart drawing estimates. Irregularly shaped burns and burns on the trunk and thighs had greater variability than less irregularly shaped burns or burns on more defined anatomical parts of the body.

				member of the estimation team in 10 packets of six simulations each, along with general instructions on how to complete the assigned burn size estimations. Twenty four different estimated completed the estimation of burn size. In addition, each estimator was given open-ended written and oral questionnaires that were used to determine the problems encountered in estimating.	
Minimas, 2007	Review	To evaluate the reliability, concurrent and construct validity, acceptability and readability of the Lund and Browder chart as well as identify the weaknesses of the chart.	II	Not stated	The application of clinimetric principles is required for the evaluation and revalidation of even long established wound assessment tools such as the Lund and Browder chart. Concurrent validity of the chart based on computerised planimetry standards appears high. Evaluation of the instrument's construct validity with current anthropometric data is required. The LB chart does not take into account obesity, breast size, pregnancy status, and amputated body parts, all of which may affect the calculated TBSA.

					Healthcare professionals using the LB char t should be formally trained and made aware of its weaknesses.

Micro Assessment					
Citation	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Sibbald, Orsted, Schultz, Coutts & Keast, 2003	Review	To enhance the evidence base that may be lacking to create an updated examination of practices	I	DARE (the Database of Abstracts of Reviews of Effects • The Cochrane Library, • TRIP (Turning Research Into Practice) • Health Technology Assessments (HTA reviews). This review presents a consensus from two expert groups: the International Wound Bed Preparation Advisory Board and the Canadian Chronic Wound Advisory Board.	This article updates the wound bed preparation model and examines the evidence base and expert opinion regarding infection The number of wound care concepts, algorithms, and guidelines has increased considerably in recent years. Unfortunately, the evidence base to support the recommendations inherent in these instruments is not always available, published, or appropriately searched. The finding that unhealthy granulation tissue may be the result of persistent inflammation or infection and may delay healing underscores the importance of combining key wound care concepts with expert opinion to optimize patient outcomes. Studies to examine outcome validity and reliability are warranted.
European Wound Management Association (EWMA). 2004. Position Document: Wound Bed Preparation in Practice.	Consensus document	To advance the understanding of the concepts of wound bed preparation by examining how the components of TIME are translated into the practical management of different wound types.	V	Not stated	TIME framework is not linear: different wounds require attention to the different elements. This position document reinforces the importance of integrating TIME into an overall programme of care that addresses all other aspects of the patient's treatment.

Sibbald, Orsted, Coutts & & Keast. 2006.	Review	Not stated	I	Not stated	Identify and Treat the Cause IV Address Patient-centred Concerns IV Provide Local Wound Care IV • Assess and monitor the wound history and physical characteristics (location + MEASURE*). IV • Debride healable wounds by removing non-viable, contaminated or infected tissue (through surgical, autolytic, enzymatic, mechanical or larval [biologic] methods). Non-healable wounds should have only non-viable tissue removed; active debridement to bleeding tissue is contraindicated. Ib • Cleanse wounds with low-toxicity solutions (such as normal saline or water). Topical antiseptic solutions should be reserved for wounds that are non-healable or those in which the local bacterial burden is of greater concern than the stimulation of healing. III • Assess and treat the wound for increased bacterial burden or infection (distinguish from persistent inflammation of non-bacterial origin). IIa • Select a dressing that is appropriate for the needs of the wound, the patient and the caregiver or clinical setting. IV • Evaluate expected rate of wound healing. If suboptimal, reassess recommendations 1 to 9. III–IV • Use active wound therapies (biological agents, skin grafts, adjunctive therapies) when other factors have been corrected and healing still does not progress. Ia–IV Provide Organizational Support IV

Sibbald, Goodman, Woo, et al., 2011	Review	Builds and expands on previous work	I	Not stated	Treat the cause IV Patient-centered concerns IV Assess and support individualized concerns IV Provide education and support to the person and his/her circle of care [including referral to increase adherence (coherence) to the treatment plan. IV Local wound care • Gently cleanse wounds with low-toxicity solutions: saline, water and acetic acid (0.5-1.0%). Do not irrigate wounds where you cannot see where the solution is going or cannot retrieve (or aspirate) the irrigating solution. Ib • Debride: Healable wounds - sharp or conservative surgical, autolytic, mechanical, enzymatic, biological (medical maggots); Non-healable and maintenance - conservative surgical or other methods of removal of nonviable slough. IV • Assess and treat the wound for superficial critical colonization/Deep infection/ Abnormal Persistent Inflammation (mnemonic NERDS), deep infection (mnemonic STONEES), or persistent inflammation: any 3 NERDS - treat topically: Non-healing, ↑Exudate, Red-friable tissue, Debris, Smell; any 3 STONEES - treat systemically: ↑Size, ↑Temperature, Os, New breakdown, ↑exudate, ↑Erythema/Edema (cellulitis), Smell; Persistent Inflammation (non-infectious): Topical/or systemic anti-inflammatory. IIa

					Select a dressing to match the appropriate wound and individual person characteristics. IV • Healable wounds: Autolytic debridement: alginates, hydrogels, hydrocolloids, acrylics; • Critical colonization: silver, iodides, PHMB, honey; • Persistent inflammation: anti-inflammatory dressings. • Moisture balance: foams, hydrofibers, alginates, hydrocolloids, films, acrylics • Non-healable, Maintenance Wounds: chlorhexidine, povidone-iodine • Evaluate expected rate of wound healing: Healable wounds should be 30% smaller by week 4 to heal by week 12. Wounds not healing at the expected rate should be reclassified or reassessed, and the plan of care revised. III-IV • Use active wound therapies (skin grafts, biological agents, adjunctive therapies, etc.) when other factors have been corrected and healing still does not progress (stalled wound). Ia-IV Provide organization support IV
Dryburgh, Smith, Donaldson, et al., 2008	Systematic review	The aim of this review is to determine the effect of different methods of debridement on the rate of debridement and healing of surgical wounds.	I	Cochrane review. n=5	Many methods are available to clinicians to debride surgical wounds. This review showed that there is insufficient valid research evidence to recommend any one particular method. There is a clear need for more research into which method is most effective, in removing dead tissue from surgical wounds that have become infected.

Cutting, White, Mahoney, et al. In: EWMA position paper on infection, 2005	Consensus document	The further development of the criteria for early recognition of wound infection.	III	An international, multidisciplinary Delphi group of 54 members was recruited. Individual members were purposively selected on the basis of possessing recognised expertise in their field. Members of the Delphi group were allocated to one of six panels related to their individual area of expertise. There were 8–10 members in each panel. These panels were set the task of generating criteria for infection in one of the six wound types: acute wounds (primary and secondary); arterial ulcers; burns (partial and full-thickness); diabetic foot ulcers; pressure ulcers and venous leg ulcers.	Cellulitis, malodour, pain, delayed healing or deterioration of the wound/ wound breakdown is criteria common to all wound types. Criteria ranked 8-9 were perceived as important diagnostic criteria. Criteria that were ranked lower may be considered as signposts of infection and may be important in the early recognition of infection.
European Wound Management Association (EWMA). 2006. Position Document:	Consensus document	Expansion of criteria for infection consensus document of 2005		Not stated	An integrated approach to managing wound infection Demystifying silver Topical management of infected grade 3 and 4 pressure ulcers

Management of wound infection.					Topical antimicrobials and surgical site infection
Bolton, 2007.	Evidence based report card	To explore the evidence supporting an operational definition of Moist Wound Healing and the healing outcomes associated with that operational definition as compared to non-moist wound healing modalities.	I	The author searched the National Institute of Health's National Library of Medicine MEDLINE electronic database from January 1966 through October 16, 2006, for the key words "wound dressing measure moisture" to identify support for an operational definition of processes that provide a moist wound environment and "wound healing dressings controlled" to identify controlled English-language studies that reported wound dressing effects on measures of wound healing, as well as derivative references and controlled studies meeting the subject criteria from conference proceedings in available files. Healing efficacy data were summarized from	Significant evidence exists that "lower wound dressing Water Vapour Transmission Rate (WVTR)" is associated with more rapid wound healing outcomes in both chronic and acute wounds (Strength of Evidence: Level 1). And Lower WVTR dressings were associated with faster healing than higher WVTR dressings (Strength of Evidence: Level 1).

				randomized and nonrandomized clinical and preclinical studies with outcomes evaluated in blind or unblended fashion, as well as systematic reviews, meta-analyses, and quasi-experimental trials measuring healing effects of wound dressings.	
Falanga, V. 2002	Review	To suggest that clinicians must remain alert to the concept of wound bed preparation and start re-evaluating commonly used therapeutic agents (enzymatic debriding agents) for opportunities to explore their other properties	V	Not stated	Wound bed preparation will likely lead to re-evaluation of emerging agents as well as established treatments for chronic wounds. Armed with greater understanding of what chronic wounds need, health workers will also start asking whether the properties of certain therapeutic agents support additional and innovative uses
European Wound Management Association (EWMA). 2013.	Consensus document	To provide an updated overview with regard to debridement and its methods together with a suggestion for an overall clinical algorithm which defines why, when and how of debridement. To describe the substantial amount of available debridement technologies, which all have potential advantages and limitations related to the various wound types and treatment setting.	V	Literature review with the addition of the authors' clinical expertise.	Debridement algorithm

Intervention					
Citation	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Storm-Versloot, Vos, Ubbink, et al., 2010.	Systematic review	To establish the effects of silver-containing wound dressings and topical agents in preventing wound infection and healing of wounds.	I	Cochrane review identified 26 RCTs (2066 patients).	Thirteen trials compared topical silver (in a variety of formulations - including silver sulphadiazine (SSD) cream) with non-silver dressings. One trial showed fewer infections with silver nitrate when compared with a non-silver dressing, but three trials showed significantly more infection with SSD than with the non-silver dressing. Six trials compared SSD/silver-containing dressings with non-silver dressings (nine dressings in total). Most comparisons (seven) found no significant differences in infection rates; one trial in a variety of wounds exhibited significantly fewer infections with SSD/ hydrocolloid, but another, in acute wounds, found significantly more infections with SSD. Some evidence from a number of small, poor-quality studies suggested that one silver-containing compound (silver sulphadiazine) has no effect on infection, and actually slows down healing in patients with partial thickness burns.

Bache, Maclean, Gettinby, et al. 2013.		To address the hypothesis that the level of contamination received by health care workers would be related to the size of the burn and the time taken for dressing change.	III	Bacterial contamination was assessed by contact plate samples (n=20) from initially sterile gowns worn by HCW during dressing burns patient/ bed changes. Analysis of 24 gowns was undertaken.	Relationship between size of the burn and levels of HCW contamination and time taken for dressing/ bed change were best described by exponential models. Burn size correlated more strongly (R^2 =0.82, p,0.001) than time taken (R^2=0.52, p<0.001), with levels of contamination received by the HCW. Contamination doubled with every 6-9% increase in burn size. Burn size was used to create a model to predict bacterial contamination received by HCW carrying out dressing/ bed change. This may help with the creation of burn specific guidelines on protective clothing worn by HCW caring for patients with burns.
Weber & McManus, 2004.	Essay	Not stated	V	Not stated	A comprehensive review of the epidemiology of infection in the burn patient, including factors affecting risk of colonization and infection and outbreaks that have occurred on burn units. Strategies for infection prevention and control, including unique characteristics, guidelines for culturing and surveillance, isolation of patients, environmental concerns, use of antibiotics, and recommendations for infection prevention at specific sites.
Cutting. & White, 2004.	Review	The focus of this article is to review of the published literature on wound infection criteria for acute and surgical wounds, diabetic foot ulcers, venous and arterial leg ulcers, pressure ulcers and burns.		For this study the multidisciplinary panel consisted of 54 international experts. Through Delphi process criteria for arterial ulcers, acute or surgical	The key to identifying wound infection is to look for the subtle signs. The clinical indicators of infection require revision as knowledge advances. The clinical indicators vary in different wound types. Critical colonization may not only herald

				wounds, partial thickness and full thickness burn wounds were identified.	infection but also demonstrates as yet unrecognised signs of infection.
World Health Organization 2009	Guidelines	To promote natural ventilation design for infection control in health care To describe the basic principles of how to design, construct, operate and maintain an effective natural ventilation system for infection control	I	A two-day multidisciplinary consensus meeting on the scope and main elements on use of natural ventilation for infection control A systematic review of the literature covering the association between ventilation and infection, and natural ventilation solutions WHO external panel review and outline of the main recommendations WHO internal and external peer review	To help prevent airborne infections, adequate ventilation in health-care facilities in all patient-care areas is necessary. *Overall ranking: Strong recommendation* For natural ventilation, the following minimum hourly averaged ventilation rates should be provided: • 160 l/s/patient (hourly average ventilation rate) for airborne precaution rooms (with a minimum of 80 l/s/patient) (note that this only applies to new health-care facilities and major renovations); • 60 l/s/patient for general wards and outpatient departments; and • 2.5 l/s/m3 for corridors and other transient spaces without a fixed number of patients; however, when patient care is undertaken in corridors during emergency or other situations, the same ventilation rate requirements for airborne precaution rooms or general wards will apply. • The design must take into account fluctuations in ventilation rate. • When natural ventilation alone cannot satisfy the recommended ventilation requirements, alternative ventilation systems, such as hybrid (mixed-mode) natural ventilation should be considered, and then if that

					is not enough, mechanical ventilation should be used. *Overall ranking: Conditional recommendation* When designing naturally ventilated health-care facilities, overall airflow should bring the air from the agent sources to areas where there is sufficient dilution, and preferably to the outdoors. *Overall ranking: Conditional recommendation* For spaces where aerosol-generating procedures associated with pathogen transmission are conducted, the natural ventilation requirement should, as a minimum, follow Recommendation 2. Should the agent be airborne, Recommendations 2 and 3 should be followed. *Overall ranking: Conditional recommendation*
Halcomb, Griffiths & Fernandez, 2008.	Systematic review	To identify the best available evidence that investigates the role of patient isolation practices as a single intervention strategy in the minimisation of nosocomial MRSA transmission.	I	A systematic search for relevant published or unpublished English language literature was undertaken using electronic databases, the reference lists of retrieved papers and the Internet. This extended the search published in the original review. Databases searched included: Medline, CINAHL, EMBASE, Cochrane Library and Joanna Briggs Institute Evidence Library. All	There is some evidence that cessation of single room isolation and cohorting of MRSA patients does not increase nosocomial MRSA transmission when hand-washing compliance and standard precautions are maintained. Indeed, there is some evidence that reduced MRSA transmission can be achieved by improving compliance with contact precautions alone. The low level of hand hygiene compliance reported in the literature suggests that staff compliance with isolation practices is a significant factor in evaluating any infection-controlled intervention in the clinical setting. While staff compliance data are conflicting, regular audit and feedback of performance may improve compliance.

				English language research reports published between 1990 and August 2005 that focused on the role of isolation practices on the nosocomial transmission of MRSA in adult, paediatric or neonatal acute care settings were eligible for inclusion in the review. Studies that evaluated multiple infection control strategies or control of MRSA outbreaks were excluded. The main outcome of interest was the incidence of new cases of MRSA. The secondary outcome was staff, visitor and patient compliance with the isolation practices. Seven studies met the inclusion criteria	
Singh, Devgan, Bhat, et al., 2007.	Review	To reviews current knowledge of the pathogenesis, molecular and cellular mechanisms, local and systemic factors, and treatment modalities related to wound conversion.	I	All peer-reviewed, original, and review articles published in English-language literature relevant to the topic of burn	Burn wound progression is complex and caused by additive effects of inadequate tissue perfusion, free radical damage, and systemic alterations in the cytokine milieu of burn patients, leading to protein denaturation and necrosis. Even though

				wound conversion on animals and human subjects were selected for this review. After assessing data relevance, independent extraction by a sole reviewer was performed. Data were tabulated according to the following categories: pathogenesis, mechanisms, local and systemic factors, and treatment.	insufficient evidence exists for causal inferences, infection, tissue desiccation, edema, circumferential eschar, impaired wound perfusion, metabolic derangements, advanced age, and poor general health play important roles. Although consensus-building research is ongoing, current mainstays of treatment include adequate fluid resuscitation, nutritional support, and local wound care, with an emphasis on topical antimicrobial agents and biosynthetic dressings. Identifying early indicators by elucidating possible interacting or synergistic mechanisms and by developing preventative strategies will enhance prevention and treatment.
Horan, Andrus & Dudeck, 2008. CDC	Essay	Not stated		Not stated	Since 1988, the Centers for Disease Control and Prevention (CDC) has published 2 articles in which nosocomial infection and criteria for specific types of nosocomial infection for surveillance purposes for use in acute care settings have been defined.[1,2] This document replaces those articles, which are now considered obsolete, and uses the generic term ‘‘health care–associated infection’’ or ‘‘HAI’’ instead of ‘‘nosocomial.’’ This document reflects the elimination of criterion 1 of clinical sepsis (effective in National Healthcare Safety Network [NHSN] facilities since January 2005) and criteria for laboratory–confirmed bloodstream infection (LCBI). Specifically for LCBI, criterion 2c and 3c, and 2b and 3b, were removed effective in NHSN facilities since January 2005 and

					January 2008, respectively. The definition of ‘‘implant,’’ which is part of the surgical site infection (SSI) criteria, has been slightly modified. No other infection criteria have been added, removed, or changed.
World Union of Wound Healing Societies (WUWHS). 2008. Principles of best practice: Wound infection in clinical practice.	Consensus document	Not stated	V	Not stated	Principles of best practice Diagnosis Management Topical antimicrobial therapy Systemic antibiotic treatment
Gillespie & Fenwick, 2009.	Essay	To define aseptic technique and wound field concept in the context of wound dressing To underline the fundamental differences and similarities between aseptic technique and wound field concept Make recommendations for clinical practice based on the literature.	V	Not stated	Clarifies the differences between aseptic technique and wound field and suggest that both have similar outcomes providing the principles of minimising and eliminating risk associated with contamination.
Perelman, Francis, Rutledge, et al., 2004	Prospective randomised control trial	To determine whether the rate of infection after repair of uncomplicated lacerations in immune- competent patients is comparable using clean non-sterile gloves versus sterile gloves.	II	A prospective multi-center trial enrolled 816 individuals who were randomized to have their wounds repaired by using sterile or clean non-sterile gloves. The attending physician or resident completed a checklist describing patient, wound, and	There was no statistically significant difference in the incidence of infection between the 2 groups. The infection rate in the sterile gloves group was 6.1% (95% confidence interval [CI] 3.8% to 8.4%) and was 4.4% in the clean gloves group (95% CI 2.4% to 6.4%). The relative risk of infection was 1.37 (95% CI 0.75 to 2.52). This study demonstrated that there is no clinically important difference in infection rates between using clean non-sterile gloves

				management characteristics. The patients were provided with a questionnaire to be completed by the physician who removed their sutures at the prescribed time and indicated the presence or absence of infection. When follow-up forms were not returned, a telephone call was made to the patient to determine whether he or she had experienced any wound complications.	and sterile gloves during the repair of uncomplicated traumatic lacerations.
Aziz, 2009.	Essay	Not stated	V	Not stated	It concludes that improvement in aseptic technique could be achieved by implementation of a single unified approach to aseptic technique that can be standardized and audited annually, such as the aseptic nontouch technique (ANTT)
Rowley, & Clare, 2009.	Trail without randomisation	To better understand how effectively the implementation process was working in different trusts.		A convenience sample of acute trusts (*n* = 7) was reviewed. The trusts used the recommended ANTT implementation framework and applicable audit tools. Feedback was	All seven trusts had found the ANTT implementation process an effective tool for standardising aseptic practice across large clinical workforces. Data reviewed from five of the trusts suggests the process impacted positively on HCAI trends. Limitations include appreciating ANTT implementation alongside other infection control interventions. More controlled studies appear to be warranted,

				requested regarding the implementation process as well as healthcare associated infection (HCAI) trends mapped before and after ANTT implementation.	especially now that ANTT is the most common standard aseptic technique in NHS hospitals
Pratt, Pellowe, Wilson, et al., 2007.					
Gammon, Morgan-Samuel & Gould, 2008.	Review	To examine from international research: the extent to which practitioners comply with infection control precautions; the pertinent issues that are considered influential in compliance; what strategies have been evaluated to instigate positive behaviour changes amongst practitioners and the effect of these interventions.	I	Literature review where relevant evidence was identified using several electronic databases, from 1994 to 2006, with number of key terms utilized. Data were extracted by using key headings, which facilitated analysis. Thirty-seven studies were appraised. Twenty-four related to measuring practitioner compliance and 13 studies that evaluated the effect of a research intervention on compliance. In addition, other studies were included which examined the specific reasons for suboptimal compliance, or	Compliance to infection control precautions is internationally suboptimal. The evidence confirms that compliance to specific aspects of standard/ Ups (universal precautions) varies, and practitioners are selective in their application of recommended practice. Compliance does improve following a structured intervention; however, research fails to indicate for how long the intervention affects practitioner compliance, or whether compliance after a period of time returns to the norm.

				discussed infection control precautions generally.	
Rowley, Clare, Macqueen, et al., 2010	Essay	To update the theoretical and practice framework expanding on the foundations set by ANTT v1	V	Not stated	ANTT is based upon the identification and protection of key-parts and key sites at all times. Aseptic key-parts must only come into contact with other aseptic key-parts or key-sites. All procedures must be risk assessed. ANTT risk assessment is based on a defined assessment of the technical difficulty of the procedure, the competency of the HCP and the risk posed in the immediate physical and air environment.
Joanna Briggs Institute (JBI). 2006, 2008	Systematic review		I	Fourteen RCTs were eligible for inclusion of which four trials involved patients with lacerations, one trial each involved patients with traumatic wounds, open fractures or ulcers, and seven studies involved patients in the postoperative period. The studies evaluated patients in hospital emergency departments, wards and community settings. No trials were	1. Adults with lacerations and postoperative wounds, potable tap water may be an effective cleansing solution. However, the choice of solution should reflect patient preference and a formal economic evaluation. (Grade B) 2. Chronic wounds in adults may be cleansed using potable tap water if normal saline is unavailable. (Grade B) 3. Potable tap water may be used for cleansing simple lacerations in children. (Grade A) 4. Boiled and cooled water is an effective wound cleansing solution in the absence of normal saline or potable tap water. (Grade C) 5. Irrigation with 1% povidone-iodine is effective in reducing the infection rate in contaminated wounds. (Grade B) However

				identified that used EUSol, hydrogen peroxide or chlorhexidine solutions	there is no evidence of the optimal time that Povidone Iodine should be left in place. (Grade E).
Fernandez & Griffiths, 2008, 2012	Systematic review	To assess the effects of water compared with other solutions for wound cleansing	I	Cochrane review	The use of tap water to cleanse acute wounds in adults and children was not associated with a statistically significant difference in infection when compared to saline (adults: RR 0.66, 95% CI 0.42 to 1.04; children: RR 1.07, 95% CI 0.43 to 2.64). No statistically significant differences in infection rates when wounds were cleansed with tap water or not cleansed at all (RR 1.06, 95% CI 0.07 to 16.50). There is no evidence that using tap water to cleanse acute wounds in adults or children increases or reduces infection. In the absence of potable tap water, boiled and cooled water as well as distilled water can be used as wound cleansing agents.
Centers for Disease Control and Prevention. 2003	Systematic review	To develop environmental infection control guideline that reviews and reaffirms strategies for the prevention of environmentally mediated infections, particularly among heath care workers and immunocompromised patients.	I	Articles dealing with outbreaks of infection due to opportunistic microorganisms and epidemiological or laboratory experimental studies were reviewed as well as guidelines and standards from organizations.	Infection control strategies and engineering controls when consistently implemented are effective in preventing opportunistic, environmentally related infections in immunocompromised populations.

World Health Organization (WHO). 2009.	Systematic review	To develop guidelines for hand hygiene in health care	I	A core group of international experts in the field of infection control with expertise in hand hygiene participated in writing an advanced draft document. The objectives were to develop a document of essential aspects of hand hygiene in health care and evidence based and consensus based recommendations. The draft was piloted to provide local data on the resources required to carry out the recommendations to generate feasibility, validity, reliability and cost effectiveness of interventions. Eight pilot sites from seven countries representing the six WHO regions were included. The experts then updated their text and guidelines were finalised. Approval was obtained by consensus.	Guidelines on hand hygiene in any situation in which health care is delivered either to a patient or a specific group

World Health Organization (WHO), 2008.	Reviews	Not stated	I	Working groups of international experts were created to review the literature and experiences of clinicians around the world and to achieve consensus on safety practice.	Guidelines for safe surgery
Atiyeh, Costagliola, Hayek, et al., 2007	Review	Not stated	V	Not stated	
Boateng, Matthews, Stevens, et al., 2008.	Review	Not stated	V	Not stated	Review discusses the common wound healing dressings, their key advantages and shortcomings and the need for dressings with improved properties.
Moore, Smith, A., Campbell, et al. 2001.	Systematic review	To investigate topical honey in superficial burns	I	Studies with RCT using honey and a comparator. Main outcomes were relative benefit and number needed to treat to prevent an outcome relating to wound healing time or infection rate.	Confidence that honey is a useful treatment for superficial wounds or burns is low. There is biological paucity.

Citation	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Hart, 2007	Essay	Not stated	V	Not stated	
Edwards &Harding,	Essay	Not stated	V	Not stated	An appreciation of the factors affecting

2004					colonization to infection can help clinicians with interpretation of clinical findings and microbial investigations in patients with chronic wounds. An understanding of the physiology and interactions within multi species biofilms may aid the development of more effective methods of treating infected and poorly healing wounds. The emergence of guidelines has helped to optimize clinical management.
Green, 2012	Essay	Not stated	V	Not stated	
Church, Elsayed, Reid, et al., 2006	Essay	Not stated	V	Not stated	
Ribeiro, Heath, Kierath, Rea., et al. 2010	Review	To review the management of burns complicated by exposure to contaminated water leading to burn wound infections. To describe commonly reported organisms from various water sources, the appropriate initial empirical antimicrobial chemotherapy and to present the clinician with a proposed algorithm for managing these serious infections	III	Three case studies were reviewed	Early recognition of these infections, with aggressive surgical debridement, and high-doses of appropriate antimicrobials, contributed to successful outcomes for patients. A review of the organisms known to cause soft tissue infections from different water sources and provide a suggested management algorithm
Mayhall, 2003.	Essay	Not stated	V	Not stated	
Liao, Andresen, Martin, et al. 2010	Trail without randomisation	To determine the potential infection risk of domestic plastic wrap used to treat acute burns wounds by assessment for the presence of clinically significant micro-organisms.	III	Ten plastic wrap samples were collected from a roll that had been opened for several months on the burns ward at our institution. Plastic wrap	No significant growth on any agar plate after incubation.12 cm from the centre of the plastic sheet were aerobically sterile. Data suggest that the potential for plastic wrap to act as a fomite when used as an acute burn wound dressing is extremely low.

				was imprinted directly onto horse-blood agar plates. The plates were incubated for 72 h in aerobic conditions with 5% CO2	
Stevens, Bisno, Chambers, et al. 2005	Infectious Diseases Society of America Guidelines.				
Kingsley, Jones, 2008.	Comparative descriptive design	To determine if systemic C-reactive protein (CRP) measurements could be used as a diagnostic marker for wounds whose healing is delayed by the effects of wound bed bio-burden.	III	A comparative descriptive design with a survey method was used. Patients with wounds healing by secondary intention with a duration of 4 weeks or more were placed into wound infection continuum groups based on clinical features. N=64 Wound features for each patient were listed to enable analysis of CRP results within and between groups. CRP was also analysed for all patients as a single group against individual wound features. Exclusion were patients	CRP levels were found to be significantly higher for patients in the spreading infection group, but no differences in levels were found to distinguish the other groups. Higher CRP levels were found to be statistically significant when several clinical features were present in wounds irrespective of study grouping, these were necrotic tissue, wet wounds, malodour, recent wound extension and redness of >2cm on surrounding skin. This study cannot support CRP as a diagnostic marker for determining between wounds in different groups in the infection continuum known as colonisation, critical colonisation and local infection and cannot be used alone to indicate the need for antimicrobial treatment in these groups.

				with acute wounds.	
Rafla & Tredget, 2011.	Review	Not stated	V	Not stated	Modern aspects of the epidemiology, diagnosis, management, and prevention of burn wound infections and sepsis
Rowley-Conwy, 2010	Review	This article aims to review the literature and establish best practice in prevention and treatment of infection in patients with major burns.	V	Not stated	The article considers the causes and clinical features of wound infection, and examines systemic and local methods of prevention and treatment
Shankar, Melstrom & Gamelli, 2007.	Essay	Not stated	V	Not stated	Inflammation and sepsis represent major challenges to the critically ill burn patient, and studies improving our knowledge of inflammation and sepsis after burn injury are vital to improving patient outcomes
Mayhall, 2003. (Open vs closed)	Essay	Not stated	V	Not stated	
Li,Chen & Kirsner, 2007.	Essay	Not stated	V	Not stated	
Schultz, Walker, Elligsen, et al., 2013	A retrospective chart review		III	A retrospective chart review of all adult acute burn injury patients admitted over a 1 year period	It was determined that heart rate _110 bpm, systolic blood pressure _100 mmHg and intubation were the best predictors of sepsis ($p < 0.05$); and fraction of inhaled oxygen >25% and maximum temperature _39 8C were the best predictors of infection ($p < 0.05$).
White, Swales & Butcher, 2012.	Essay	Not stated	V	Not stated	
Mahar, Padiglione, Cleland, et al.	A retrospective chart review	To identify the risk factors for, and outcomes of Pseudomonas aeruginosa bacteraemia in adult burns patients	III	All adult burns patients who developed a Gram-negative bacteraemia over a period of 7 years	The only factor predicting P. aeruginosa bacteraemia as a first episode (compared to another Gram-negative) was prior isolation of Pseudomonas at other sites (wound sites,

2010.				were included. Retrospective data analysed included patient demographics, organisms cultured, antibiotic susceptibility patterns, isolation of P. aeruginosa in non-blood isolates, treatment, length of stay and mortality. Forty-three patients developed a Gram-negative bacteraemia over the study period, 12 of whom had Pseudomonas bacteraemia during the course of their admission. In eight patients (18.6%) P. aeruginosa was the first Gram-negative isolated.	urine or sputum). Overall length of stay was less in patients who developed P. aeruginosa as a first episode, mainly because of increased mortality in this group. Prior non-blood isolates of P. aeruginosa could have correctly predicted the sensitivity pattern of the strain of P. aeruginosa organism in 75% of patients who did not receive appropriate initial antibiotics. Prior colonisation with P. aeruginosa predicts P. aeruginosa in blood cultures, as opposed to other Gram-negative bacteria. Clinicians should have a high index of suspicion for P. aeruginosa bacteraemia where a septic burns patient has a prior history of non-blood P. aeruginosa cultures. Empirical antibiotic regimes based on the antibiotic-sensitivity patterns of previous non-blood P. aeruginosa isolates in each patient should be given at the time blood cultures are taken.
Santy, 2008	Essay	Not stated	V	Not stated	
Collier, 2004.	Essay	Not stated	V	Not stated	The prevention of wound infection should be a primary management objective for all healthcare practitioners. Infections of the surgical wound are one of the most common hospital acquired infections and are an important cause of morbidity and mortality. Management of a wound infection must also include an emphasis on reducing the risk of

					cross infection. The routine use of antibiotics is not justified for colonised or infected wounds. Silver and iodine wound management products play an important role in the treatment and prevention of infection if used appropriately
Barbut, Yezli, Mimoun, et al., 2013	Pre- test post-test experiment	Not stated	III	We investigated the impact of an infection control bundle on the incidence of nosocomial MRSA and A. baumannii in our burns unit, comparing a pre-intervention period (December 2006–August 2008) with an intervention period (September 2008–December 2009). The bundle comprised regular hydrogen peroxide vapour (HPV) disinfection of the rooms following discharge of patients colonized or infected by multidrug-resistant bacteria, pre-emptive cohort isolation of newly admitted patients before being proven culture	The incidence of nosocomial MRSA infection or colonization fell by 89.3% from 7.22 to 0.77 cases/1000 patient days ($p < 0.0001$) and A. baumannii fell by 88.8% from 6.92 to 0.77 cases/1000 patient days ($p = 0.002$) in the intervention period with no further outbreaks of these organisms occurring in this period. The infection control bundle resulted in a significant reduction in the incidence of nosocomial MRSA and A. baumannii in our burns unit and prevented further outbreaks of these organisms.

				negative, cohorting of colonized or infected patients, installation of two air disinfection systems in the corridors of the unit and improvement of material storage. We also investigated the microbiological efficacy of HPV disinfection by sampling the environment before and after HPV treatments.	
Percival, 2004.	Review	To address the potential role that microbial communities and associated biofilms may play in wound healing.	I		Communities of micro-organisms are likely to exist within their own microenvironment (biofilm) in wounds Microbial interactions and biofilms may have a significant effect on wound healing and infection Further research is needed to facilitate deeper understanding of the relationship between biofilm communities and wound pathophysiology in order to promote wound healing and infection control.
Scanlon, 2005.	Essay	Not stated	V	Not stated	Infection and colonisation are explained and options for management discussed,
Ayliffe, 2000.	Essay	Not stated	V	Not stated	

Preston, 2005.	Essay	Not stated	V	Not stated	The practice of aseptic technique is causing concern for patient safety. Glove culture is emerging as a threat to controlling infection risks. Poor hand hygiene practices continue to be observed. Hand disinfectants are only effective if applied for longer than 30 seconds. Risk assessment should precede all aseptic technique procedures. Education strategies are needed to visualize microbial fallout.
Hebl, 2006.	Essay	Not stated	V	Not stated	Guidelines on prevention of surgical site infections
Flores, 2008.	Essay	Not stated	V	Not stated	
Bree-Williams & Waterman, 1996	Trial without randomisation	To establish if nurses' actions when carrying out 'aseptic technique' using the 'gloves technique' are simple and based on up-to date knowledge and do not incur unnecessary wastage.		A sample of convenience was used involving 21 trained nurses Observation and formal interviews were used to collect quantitative and qualitative data	Results showed that not all nurses in the sample applied a 'simple aseptic technique' The rationale for the practice of aseptic technique was not always research based, though other aspects of wound management were derived from research findings The study highlighted other areas of aseptic technique which require investigations
Flores, 2007	Essay	Not stated	V	Not stated	

Reference	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Grey, Enoch & Harding. 2006.	Essay	Not stated	V	Not stated	
Fletcher. 2007.	Essay	Not stated	V	Not stated	
Williams, C. 2009	Essay	Not stated	V	Not stated	
Mulder, M. 2009b	Essay	Not stated	V	Not stated	
Keast, Bowering, Evans, et al., 2004.	Essay	Not stated	V	Not stated	
Doughty, 2004.	Essay	Not stated	V	Not stated	
Dowsett, 2009	An experimental pre-test–post-test design	To examine the impact of delivering an educational programme using the concept of WBP and the associated TIME framework on community nurses' wound care knowledge and practice	II	Data was collected using questionnaires, non-participant observation and recording of data from patients' clinical records	The TIME framework is a useful tool for delivering wound care education and can make significant improvements to wound care practice
Sibbald, Woo, & Ayello, 2008	Essay	Not stated	V	Not stated	The importance of treating the cause and addressing patient centered concerns prior to optimising local wound care. The three important components of local care are: debridement, infection and inflammation, moisture balance (DIM). If wound bed preparation is optimised and healing is stalled, the additional E or the edge of non-healing wounds represents the potential use of advanced active therapies to stimulate healing.
Dowsett & Newton, 2005.	Essay	Not stated	V	Not stated	The TIME framework has been developed as a practical tool for managing patients with wounds. The wound bed preparation 'care cycle'

					focuses care on the patient and their underlying condition. Patient progress and response to treatment should be regularly evaluated.
Schultz & Dowsett, 2012.	Essay	Not stated	V	Not stated	Increased understanding of the link between infection and inflammation and elevated levels of proteases in chronic wound beds led to the eventual development of dressings that contain collagen fibres Another recent discovery that reinforced the importance of limiting infection and inflammation in wound beds was the discovery that a majority (~60%) of chronic wounds contained bacterial biofilms Complementing the development of dressings that reduce protease activities is the recent development of rapid, point-of-care detectors that assess the levels of active MMPs in wound fluids Although wound bed preparation and TIME was initially developed to target chronic wounds, it has also been used by clinicians caring for acute wounds Many burn surgeons have been practising key principles of wound bed preparation and TIME since the 1970s The concept of wound bed preparation and the TIME framework has gained international recognition as a framework that can provide a structured approach to wound management
Schultz, Sibbald, Falanga, et al., 2003	Essay	To provide an overview of the current status, role, and key elements of wound bed	V	Not stated	Wound bed preparation provided a rational and systematic approach to the management of non-healing wounds, which could be

		preparation.			supported with reference to the underlying cellular environment. This document will contribute to informing the medical community about the potential benefits of wound bed preparation as part of a more systematic—and ultimately, more effective— approach to wound management.
Schultz, Barillo, Mozingo, et al., 2004.	Review	To trace the development of the concepts of WBP and explain how to apply systematic wound management using the TIME acronym — tissue (non-viable or deficient), infection/inflammation, moisture (imbalance) and edge (non- advancing or undermined).	V	Not stated	Advancement in wound care products came through a better understanding of the biology of chronic wounds Wound assessment is a prerequisite of wound management A number of wound assessment tools exist allowing determination of wound progress Chronic wounds may have persistent inflammation present containing high levels of proteases Advances in the understanding of chronic wounds has led to the development of wound bed preparation paradigm Wound bed preparation requires debridement, moisture balance and bacterial balance WBP has now been redefined as the global management of the wound to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic measures The understanding of wound bed preparation has matured overtime Wound bed preparation has provided a rationale for some of the interventions that have been historically applied to chronic

					Wounds advancement has seen the development of TIME within the WBP Recently this TIME concept has been redefined and is becoming widely accepted TIME is built on the WBP foundation utilising the concepts of debridement, moisture balance and bacterial balance Factors known to affect the bacterial balance in chronic wounds include the number and types of micro-organisms present, their virulence and host factors Specialised dressing can be used to achieve and maintain bacterial balance A moist environment is required for optimal healing Newer moist, interactive dressing provides moisture balance within the wound environment While not possible to see senescent or abnormal cells with the naked eye, the signs of a non-advancing epidermal margin are obvious after a little experience Different dressings provide different effects At present WBP and TIME have focussed solely on chronic wounds but those treating acute wounds see an evolution of the concept into their clinical arena as a distinct possibility
Vowden & Vowden, 2002.	Essay	Not stated	V	Not stated	The aim of wound bed preparation is to create an optimal wound-healing environment by producing a well vascularised, stable wound bed with minimal exudate.

					Bacterial load has a direct impact on wound healing. The management of the bacterial load by either local or systemic therapy is important in wound management. Necrosis is related to bacterial load and can be managed by debridement. A number of alternative methods of debridement are available. Debridement is often a gradual process; the choice of methods will depend on the wound status, the time frame for debridement and the available skills and resources. Chronic wound exudate can slow or prevent wound healing and can reflect changes in bacterial load. The management of exudate ranges from absorptive products through negative pressure devices to compression. In chronic wounds cellular dysfunction and senescence delay healing. These dysfunctions often extend beyond the wound bed and may reflect the underlying disease process. The complex nature of these biochemical abnormalities indicates the need for greater understanding of the mechanism underlying non-healing in chronic wounds.

World Health Organization (WHO). 2013.	Information document	Not stated		Not stated	List of essential medicines
Larson & Lusk, 2006	Trial without randomisation	To develop standardized tools for the evaluation of hand washing technique in the clinical setting.	III	A questionnaire was used to evaluate the extent to which the clean- dirty rankings on Fulkerson's scale correlated with rankings assigned by health care personnel	Methods to evaluate handwashing
Gottrup, Apelqvist & Price, 2010	Position document	To develop consistent and reproducible approach to defining, evaluating and measuring appropriate and adequate outcomes in both RCT and clinical studies in wound management.	V	Not stated	Provides recommendations on how to achieve rigorous outcomes in studies on wound management and describes an approach that will enable the design of RCT and clinical studies to be both consistent and reproducible.

Depth of the burn excluded

Citation	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Monstrey, Hoeksema, Verbelen, et al., 2008	Review	Not stated	V	Not stated	This review has shown that burn assessment is aided by many techniques. Traditionally, there has been too much emphasis on burn depth assessment which is not entirely appropriate. Although bedside clinical evaluation remains the most widespread and

					least expensive method for depth diagnosis, it is accurate only about 2/3 of the time and is limited by poor inter-rater reliability. LDI being the most favourable option – is currently advocated for optimal delineation of the depth of acute burn wounds and for prognosis and treatment guidance.
Butcher & Swales, 2012	Essay	Not stated	V	Not stated	

Reference	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Livingston & Lee, 2000	Non experimental single centre study	To measure the TBSA in a series of patients to determine what formula would be appropriate for estimating fluid resuscitation in burned obese patients.	IV	Detailed body surface area measurements were made in 47 patients: 18 were of normal weight, 6 were moderately obese, and 23 were seriously obese. Published tables of similar measurements for infants were reviewed to determine how the rule of nines applied to these populations. The contribution of the major body segments to the overall body surface area was calculated and	Proposed modifications to the rule of nines provide better estimates of surface area for infants and obese adults

				compared to estimates that would be derived for these segments from the rule of nines.	
Amirsheybani, Crecelius, Timothy, Pfeiffer, et al., 2001.	Non experimental single centre study	This study sought to determine the natural history of the growth of the hand to permit development of a readily available, bedside means of estimating hand area and body surface area.	IV	Bilateral hand tracings were obtained from 800 volunteers ranging in age from 2 to 89 years. The area of each tracing was determined using an integrating planimeter. The height and weight of each individual were measured, and his/her body surface area was calculated. The palmar hand's percentage of body surface area was determined by calculating the quotient for hand area divided by body surface area. Additionally, the width of the hand was measured from the ulnar aspect at the palmar digital crease of the small finger to the point where the thumb rested against the base of the index finger. The length of the hand was	In adults, the area of tracing of the outline of the hand is 0.78 percent of the body surface area, whereas in children, this number tends to be slightly higher. When using the palmar method 0, 78 percent should be used as opposed to 1 percent as it allows a more accurate determination of the TBSA than the 1 percent estimate, which may lead to an overestimation of the size of a burn wound in adults.

				measured from the middle of the interstylon to the tip of the middle finger. These two figures were multiplied together to obtain a product which approximated the area of the hand. Based on the most commonly used	

Reference	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Wiechula, 2003.	Systematic review	The aim of this systematic review was to determine the best available evidence related to the post-harvest management of split-thickness skin graft (STSG) donor sites.	I	Studies included in the review were those involving patients of any age examining interventions relating to the post-harvest	In comparing dressings within and between moist wound-healing dressing groups, the lack of studies of sufficient quality prevented determining a 'best dressing' for STSG donors. Moist wound-healing products have distinct clinical advantages over non-moist

				management of STSG donors and were intra-individual or randomized controlled trials. All studies were checked for methodological quality, and data were extracted using a data extraction tool. Many studies were combined in meta-analysis. The present report concerns studies examining moist and non-moist wound-healing dressings. Broad comparisons of moist wound-healing dressings against traditional non-moist dressings favoured moist wound-healing approaches in terms of healing rates, pain and infection.	products in the management of STSG donors. There is a strong case for further head-to-head studies comparing products within the moist wound-healing group.
Bolton, 2007.	Evidence based report card	To explore the evidence supporting an operational definition of Moist Wound Healing and the healing outcomes associated with that operational definition as compared to non-moist wound	I	The author searched the National Institute of Health's National Library of Medicine MEDLINE electronic database from January 1966 through October	Significant evidence exists that "lower wound dressing Water Vapour Transmission Rate (WVTR)" is associated with more rapid wound healing outcomes in both chronic and acute wounds (Strength of Evidence: Level 1). And Lower WVTR dressings were associated with faster

		healing modalities.		16, 2006, for the key words “wound dressing measure moisture” to identify support for an operational definition of processes that provide a moist wound environment and “wound healing dressings controlled” to identify controlled English-language studies that reported wound dressing effects on measures of wound healing, as well as derivative references and controlled studies meeting the subject criteria from conference proceedings in available files. Healing efficacy data were summarized from randomized and nonrandomized clinical and preclinical studies with outcomes evaluated in blind or unblended fashion, as well as systematic reviews, meta-analyses, and quasi-experimental trials measuring healing	healing than higher WVTR dressings (Strength of Evidence: Level 1).

				effects of wound dressings.	
Ubbink, Vermeulen, Goossens, et al. 2008.	Randomised controlled trial	To compare effectiveness and costs of gauze based vs occlusive, moist-environment dressing principles.	II	Patients received occlusive (i.e., foams, alginates, hydrogels, hydrocolloids, hydrofibres, or films) or gauze-based dressings until their wounds were completely healed. Primary end points were complete wound healing, pain during dressing changes, and costs. Secondary end point was length of hospital stay	The occlusive, moist-environment dressing principle in the clinical surgical setting does not lead to quicker wound healing or less pain than gauze dressings. The lower costs of less frequent dressing changes do not balance the higher costs of occlusive materials
World Union of Wound Healing Societies (WUWHS). 2007. Principles of best practice: Wound exudate and the role of dressings. A consensus document.	Consensus document	Not stated	V	Not stated	Principles of best practice What is exudate What exudate tells us Assessment and exudate Management of exudate

Reference	Methodology	Aim	Strength of evidence	Data collection/ sample size	Key findings
Vermeulen, Ubbink, Goossens, et al. 2005	Systematic review	To assess the effectiveness of dressings and topical agents on surgical wounds healing by secondary intention.	I	Systematic methodological appraisal and data extraction were performed by independent reviewers. Fourteen reports of 13 randomized clinical trials on dressings or topical agents (gauze, foam, bead, alginate and hydrocolloid dressing) for postoperative wounds healing by secondary intention were identified.	In general, no statistically significant differences in wound healing were found for various dressing comparisons (11 of 13 trials). Patients experienced significantly more pain (four of six trials) and were less satisfied when gauze was used (three of six trials). Gauze was inexpensive, but its use was associated with significantly more nursing time than dressing with foam (two of three trials). No substantial differences in hospital stay were found (four of five trials).Only small, poor-quality trials exist, rendering the evidence insufficient. Foam is best studied as an alternative to gauze and appears to be preferable in terms of pain reduction, patient satisfaction and nursing time

Appendix S

STRUCTURED OBSERVATION

Structured observation is a category of data collection. The definition of structured data collection according to Polit & Hungler (1995: 654), is an approach to collecting information from subjects, either through self-report or observations, wherein the researcher determines in advance the response categories of interest.

The purpose for conducting structured observation was to collect specific predetermined data.

For this study a checklist for a non-exhaustive system was used. This means that categories of behaviour that may or may not have occurred were listed. When behaviour occurred a check mark was made beside the appropriate behaviour.

An existing observational instrument was modified and used from a study titled: Quality assessment of the wound dressing procedure in patients at a university hospital (Nonino, et al, 2008).

Activity	Done
DRESSING PREPERATION Does the nurse introduce him or herself to the patient? Does the nurse explain the proposed procedure? Does the nurse prepare the material for the dressing beforehand? Does the nurse heat the cleaning solution? Does the nurse wash hand before starting the dressing procedure? Does the nurse maintain the integrity of the patient during the dressing procedure? **ASSESSMENT AND DIAGNOSIS** Was an assessment done on the wound? Cardex or verbal description? Was the wound classified? Type of burn wound and depth described. Was the location of the wound mentioned, described or considered? Was the appearance of the wound bed described? TIMES. Identification and management of the elements of TIMES. Was size of the wound described? TBSA Was pain control managed? Analgesia administered or non-drug methods for pain control. **DRESSING EXECUTION (INTERVENTION)** Did the nurse prepare the environment? Did the nurse open the packaging aseptically? Did the nurse check the expiry dates of products used? Was the "dirty" material kept separately from the clean field? Did the nurse use the prescribed solution for dressing the wound? Did the nurse keep a logical sequence throughout the procedure? Did the nurse keep asepsis technique throughout procedure? Does the nurse consider the pain complaints of the patient? **OUTCOME AND EVALUATION** Does the cardex reflect the nursing process with regards to wound management? Was the management based on the identification, recording and treatment of TIMES-related problems? Were referral pathways followed? Physio, Surgeon, Counsellor, etc. referral if needed?	

Appendix T

SEMI- STRUCTURED INTERVIEW SCHEDULE

A self-report is any procedure for collecting data that involves a direct report of information by the person who is being studied for example by interview or questionnaire according to Polit and Hungler (1995: 65). According to the same authors an interview is a method of data collection in which one person (the interviewer) asks questions of another person (respondent). A semi structured interview was conducted with the intention of it to be conversational and interactive in nature. The researcher wanted to address specific topics and ensured that these topics were covered and therefor had a pre-conceived list of questions to be asked. The literature refers to this list of questions as a topic guide. The definition of a topic guide (Polit and Hungler, 1995: 654) is a list of broad question areas to be covered in a semi- structured interview.

Research question: What is nurses' current practice on burn wound management?

The participants were asked the following questions:

- ***I would like to know from you what sort of preparation you do in preparing for a dressing?***
- ***Please describe what you look for when assessing a wound?***
- ***Kindly describe how you would go about doing a dressing on a patient in the following scenarios:***
  - ***on admission of new patient,***
  - ***routine dressing-change in the ward,***
  - ***Post discharge in out –patients,***
- ***Please tell me what you typically do after a dressing change?***

Probing questions included:

- ***Can you please tell me how one decides which dressing is appropriate for which wound?***
- ***I would like to know more about how you would describe the different depths of the burns?***
- ***Please explain how do you know if the wound is not getting better?***

Appendix U

APPRAISAL OF GUIDELINES fOR RESEARCH & EVALUATION II INSTRUMENT

The AGREE Next Steps Consortium

May 2009 ii

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I. INTRODUCTION

I. OVERVIEW

i) Purpose of the AGREE II Instrument

Clinical practice guidelines ('guidelines') are systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances (1). In addition, guidelines can play an important role in health policy formation (2,3) and have evolved to cover topics across the health care continuum (e.g., health promotion, screening, diagnosis).

The potential benefits of guidelines are only as good as the quality of the guidelines themselves. Appropriate methodologies and rigorous strategies in the guideline development process are important for the successful implementation of the resulting recommendations (4-6). The quality of guidelines can be extremely variable and some often fall short of basic standards (7-9).

The *Appraisal of Guidelines for Research & Evaluation (AGREE) Instrument* (10) was developed to address the issue of variability in guideline quality. To that end, the AGREE instrument is a tool that assesses the methodological rigour and transparency in which a guideline is developed. The original AGREE instrument has been refined, which has resulted in the new AGREE II and includes a new User's Manual (11).

The purpose of the AGREE II, is to provide a framework to:

1. assess the quality of guidelines;
2. provide a methodological strategy for the development of guidelines; and
3. inform what information and how information ought to be reported in guidelines.

The AGREE II replaces the original instrument as the preferred tool and can be used as part of an overall quality mandate aimed to improve health care.

ii) History of the AGREE Project

The original AGREE Instrument was published in 2003 by a group of international guideline developers and researchers, the AGREE Collaboration (10). The objective of the Collaboration was to develop a tool to assess the quality of guidelines. The AGREE Collaboration defined quality of guidelines *as the confidence that the potential biases of guideline development have been addressed adequately and that the recommendations are both internally and externally valid, and are feasible for practice* (10). The assessment includes judgments about the methods used for developing the guidelines, the components of the final recommendations, and the factors that are linked to their uptake. The result of the Collaboration's effort was the original AGREE Instrument, a 23-item tool comprising 6 quality domains. The AGREE Instrument has been translated into many languages, has been cited in well over 100 publications, and is endorsed by several health care organizations. More details about the original instrument and related publications are available on the Web site of the AGREE Research Trust (http://www.agreetrust.org/), the official body managing the interests of the AGREE Instrument.2

As with any new assessment tool, it was recognized that ongoing development was required to strengthen the measurement properties of the instrument and to ensure its usability and feasibility among intended users. This led several members of the original team to form the AGREE Next Steps Consortium (Consortium). The objectives of the Consortium were to further improve the measurement properties of the instrument, including its reliability and validity; to refine the instrument's items to better meet the needs of the intended users; and to improve the supporting documentation (i.e., original training manual and user's guide) to facilitate the ability of users to implement the instrument with confidence.
The result of these efforts is the AGREE II, which is comprised of the new User's Manual and 23 item tool organized into the same six domains, described here. The User's Manual is a significant modification of the original training manual and user's guide and provides explicit information for each of the 23 items. Table 1 compares the items of the original AGREE to the items in the AGREE II.

Table 1. Comparison of original AGREE and AGREE II items.

Original AGREE Item	**AGREE II Item**
Domain 1. Scope and Purpose	
1. The overall objective(s) of the guideline is (are) specifically described.	No change
2. The clinical question(s) covered by the guideline is (are) specifically described.	The health question(s) covered by the guideline is (are) specifically described.
3. The patients to whom the guideline is meant to apply are specifically described.	The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.
Domain 2. Stakeholder Involvement	
4. The guideline development group includes individuals from all the relevant professional groups.	No change
5. The patients' views and preferences have been sought.	The views and preferences of the target population (patients, public, etc.) have been sought.
6. The target users of the guideline are clearly defined.	No change
7. The guideline has been piloted among end users.	Delete item. Incorporated into user guide description of item 19.
Domain 3. Rigour of Development	
8. Systematic methods were used to search for evidence.	No change in item. Renumber to 7.
9. The criteria for selecting the evidence are clearly described.	No change in item. Renumber to 8.
NEW Item 9. The strengths and limitations of the body of evidence are clearly described.	No change

10. The methods for formulating the recommendations are clearly described.

No change

11. The health benefits, side effects, and risks have been considered in formulating the recommendations.

Appendix V(i)

Interview 3
Title: Evaluation of the management of burns by nurses
Date: 10 Aug 2012
Venue: CHB
Time: 14h00-14h45

Introduction (5-10 min)
The interviewer (researcher) discussed the purpose of the study with the interviewee (participant), which was to describe the best available evidence for management of burn wounds by nurses and to explore what nurses' current practice in the management of burn wounds are in a single burns unit.

R: Before we begin the interview I would like to confirm that you have read and signed the informed consent form. And that you understand that participation is voluntary and that you may refuse to answer any questions or may choose to withdraw from the interview at any time. Okay?

P: Yes. Okay.

R: Are you still happy to participate in the study?

P: Yes. No problem.

Preliminary question (2 min)
The interviewer (researcher) made small talk to set the participant at ease. An ice-breaker question was asked about unrelated topics about the weather.

R: This was a cold winter for me. I can wait for summer.

P: Yes me too. I am tired of all this thick clothes.

Laughing.

R: I really appreciate your willingness to do this interview with me. Thank you so much for your time. Do you have any questions?

P: No nothing.

R: So if you ready we can start.

Main questions (45-60 minutes)

R: Please tell me what sort of preparation you do in preparing for a dressing?

P: Okay. I start with damp dusting so that I know when I start I don't still have to worry. I wipe all the surfaces, on top of the cupboards and the trolleys so that I know that before I start with the dressing the place is clean. You can't work in a dirty place.

R: Uh hu.

P: Then I collect all the dressings I think I will need…So I don't have to run up and down during the dressing. Mxm. That wastes time. This ward can get so busy. If you don't work fast you will be busy the whole (emphasizing whole) day. Mxm. Oh ho.

R: I see.

Silence.

R: How do you prepare yourself?

Long silence

P: We change in the morning when we come into the ward in the morning.

R: Okay, I see. Then what happens?

P: Okay. Then I fetch the patient and take him to the dressing room.

R: I see. So by this time you would have dusted the surfaces and collected all your dressing material. What then happens next?

Silence

P: Yes. We give pain medication before we start.

R: So there you are with the patient in the dressing room. Please explain to me what happens next?

P: I start to remove the dressing and start to clean the wounds.

R: Uhh uh. So before you start with the dressing, please describe what you look for when assessing a wound?

P: Normally the doctor does the assessment when the patient is admitted. For e.g. he will say 40% full thickness for example.

R: So the nurses are not involved in that process? What I mean is don't the nurses assess the wound ever? (This question came very close to the previous question, not allowing the participant to respond to the first question. This was a mistake on the part of the researcher)

P: No, that's for the doctor.

R: I see. So when you open up the wound what is it that you look for… on the wound?

P: Okay. First I look at the wound to see if it is septic. When it is septic you will see brownish greenish puss. Then you know it's septic. Then I also smell that it is septic. When it is starting to dry I know its healing.

R: I see. Can you please tell me how one decides which dressing is appropriate for which wound?

P: Okay. Normally when the wound is septic we put Acticoat. But that is expensive so the doctor must say. Otherwise we put Melladerm or Flammazine.

R: So when do you put which one?

P: If the wound is clean, we put Flammazine… If it looks like sloughy, we put Melladerm because it pulls off the slough. Sometimes we put Intrasite… If its infected we put Acticoat or if the patient has Biobrane we put Acticoat.

Silence
P: Sometimes the doctor will say Betadine dressing. So it depends on what the doctor wants of if we can see we can also put Flammazine or Melladerm. But it's what the doctor wants.

R: Oh okay.

Silence

R: Kindly describe how you would go about doing a dressing on a patient on admission of new patient?

P: Okay. Say the patients comes in, the doctor will see the patient and admit the patient to the ward. The nurses will then complete all the forms and stabilize the patient. When the patient is okay we start to work on the patient. We do observations and put dressings on.

R: I understand. How do you do the dressing?

P: Okay. We take the patient to the dressing room and then we rinse the patient with the tap water. We sometimes wash with Hibiscrub you see. Then if the patient is for Flammazine dressing we will then start putting the Flammazine. If it is too big we will put it on the patient with a gloved hand. And then put the gauze. It is easier that way. If it is only a small wound we put the Flammazine on Jelonet and then put it on the patient. We then put the gauze to absorb the fluid. Burn patients have a lot of fluid. It's not pus. Pus comes later.

R: I see.

P: Ja. Then we cover it with bandages.

R: Okay. And pain medication.

P: Ja we give it. Before the dressing because burns are very sore.

R: I see.

Silence.

R: And Hand washing?

(Participant seems very irritated.)

P: Yes of course we wash hands before and after touching the patient! Mxm.

R: No. No that's not what I mean. I was just asking as one of the questions on my list. I am not saying you don't wash your hands. Please I am sorry if you thought I meant you don't wash your hands.

Participant folding her arms and sitting backwards in chair.

P: Ho.

R: I understand all you said about the preparation, and hand washing. Please explain how do you know if the wound is not getting better?

P: When the wound is not getting better it smells bad. Not like a normal wound. It smells like pseudomonas. You know that smell?

R: Yes.
P: So if a wound is not getting better it will have thick thick slough and a pseudomonas smell. It will be brownish blackish. When we clean it, it will bleed so easy. Sometimes it will be white on the side. Like how can I say. Whitish-greyish.

R: Like it is too wet?

P: Yes.

P: But the main thing is the smell. Yoh. When you are coming in by the unit, you can feel it. But I am used to now. But before. Eish.

Silence.

R: Okay. So it is the smell, the brownish- blackish colour, the fact that it bleeds easily and the whitish greyish colour on the wound margins. Edges?

P: Yes.

R: Okay. I see. So how do you know if a wound is getting better?

P: When the wound is getting better you can see the skin growing back. It almost looks like it is drying out as it is getting smaller and smaller. Sometimes it looks shiny. But not like biofilm shiny.

R: What do you mean biofilm shiny?

P: Ja the rep told us, that sometimes a biofilm will form and it prevents the dressing from working. It will look like shiny shiny. Then you know you must use Prontosan. But sometimes you can't say for sure which shiny is this. Then the Prontosan makes the wounds go deeper. Like the other time. That wound was almost healed, but yooh when we exposed it again it looked like raw meat again, beefy beefy. I felt so bad. Eish. But these things happen.

R: Okay. So tell me more about the healing wound.

P: Ja. The patient will tell you it's not too sore any more. You can see the colour coming back. And sometimes it start to itch. The itching is a good sign because then we know it is healing. But sometimes the patients scratch it and it becomes open again. Eish. That's not nice especially when the patient is ready to go home.

R: Do you sometimes notice a rash around the wound when it itches?.

P: Sometimes, but not always. Sometimes the wound will just open up for no reason. But sometimes the patient was scratching even in their sleep.

R: I see. What do you think caused the wound to open up again?

P: They say its infection. So then we change the dressing and put like Acticoat. It works.

Silence.

R: Who does the dressings when the patients go home?

P: They come back and then we do the dressings. It's here outside. We go there and change all the ones that were discharged. Sometimes there are many many. But sometimes it's okay then there are just a few.
R: Okay. So how to you do the dressing then.

P: By that time they are alright so we just put like Jelonet. Sometimes Flammazine, but most of the time they are fine and then it's just small small dressings.

Silence.

R: Please tell me what you typically do after a dressing change?

P: Okay. If the patient is here we take the patient back to the room. Or sometimes they want to sit outside in the garden. Then we pack up the dressings and throw away the dirty stuff. Like the bandages and empty bottles.

Silence.

P: Ja then I write the dressing was done. But sometimes if there are many many dressings I only write later.

R: So what do you write?

P: For e.g. I will write. Dressing done, date and time and my signature so they can see who did the dressing?

R: Is that all?

P: Yes.

R: Don't you write what the wound looked like and what you cleaned with?

P: Ja. I write. Flammazine dressing done. Or Melladerm dressing.

R: I see.

R: What about referral?

P: Referral?

R: Like if there was a problem with the hands for instance do you tell the physio or the doctor perhaps?

P: If there was a problem I tell the doctor.

Silence.

Conclusion (5 min)
This was the debriefing section of the interview. Asking the participant if there was anything else or if they were happy with the interview? If the participant understood the purpose of the study and an explanation of what was to happen with the findings.

R: Is there anything else you wish to add?

P: No I think I am fine.

R: Perhaps like something that you would like to make working here better?

P: (Laughing) More money!!!

Silence.

P: Mmm…I would like more training on other things. Sometimes I don't understand because all the reps try to push their products and that confuses…

R: Okay. So you would like more training. I see.

Silence.

R: Are you okay with the questions and how do you feel about doing the interview.

P: No I am fine.

R: Are you sure you understood the purpose of me asking you these questions?

P: Yes I understand.

R: I just want to remind you that nowhere will you name or identity be disclosed. Even if we do publish the data nobody will know it was you that gave me the information. Nothing will happen to you for speaking to me. Do you understand?

P: Yes.

R: Thank you again for your time and for answering the questions. So what will happen now is I am going to write this information down and take it back to Wits without your identity being revealed. We will then go through it and use this information to put together guidelines to help nurses in general make sure we give the patients the best possible care.

P: Okay.

Expression of thankfulness for time and participation
(All times were approximates that was only used as a guideline)

Appendix V (ii)

Interview 5
Title: Evaluation of the management of burns by nurses
Date: 15 April 2013
Venue: CHB
Time: 9h30-10h15

Introduction (5-10 min)
The interviewer discussed the purpose of the study with the participant (interviewee), which was to describe the best available evidence for management of burn wounds by nurses and to explore what nurses' current practice in the management of burn wounds are in a single burns unit.

R: Before we begin the interview itself I'd like to confirm that you have read and signed the informed consent form. And that you understand that participation is entirely voluntary and that you may refuse to answer any questions or may choose to withdraw from the interview at any time.

P: Yes. I understand.

R: And you are therefore happy to participate in the study?

P: Yes.

Preliminary question (2 min)
The interviewer (researcher) made small talk to set the participant at ease. An ice-breaker question was asked about an unrelated topic.

R: Can you believe how fast the time goes. It feels like the other day was Christmas and now we almost half way through the year again.

P: Eish. You telling me. And every year we say the same thing. We need to plan for Christmas. And every year it's the same story. (Laughing).

R: Thank you so much for your time, I really appreciate it. Do you have any questions before we proceed?

P: Yes. Is this like a test to see if I can do my job? (Laughing). No I am just joking.

R: (Laughing). No luckily it's not hey. It's just a conversation to try and find out what we are currently doing. This is just to try and find out how dressings are done. There are no right or wrong answers. It's just to find out how you do things at this hospital so that other hospitals can either learn from you or you can learn from them. We are just sharing the information amongst ourselves so that we can improve patient care.

P: I see. Okay. No problem.

R: Are you okay with that answer? Or do you have any other question?

P: No I'm fine.

Main questions (45-60 minutes)

R: Okay. Shall we proceed? I would like to know from you what sort of preparation you do in preparing for a dressing?

P: You mean like what do I do before the dressing?

R: Yes.

P: First I go to the dressing room and pack my trolley. I first wiped it obviously. I wipe it with Hibiscrub. All over. The whole trolley. Then I pack my equipment and supplies. The gauze and Opsite and stuff. Then I also wipe my scissor with Hibiscrub.

R: I see.

Silence.

R: Okay, then what happens?

P: Okay. Then I fetch the patient and take him to the dressing room. We don't do the dressings at the bed. I know in Milpark its nice cos I sometimes toggo (slang for work extra shifts) there. They dress the patient in the bed.

R: Uh hu. So by this time you would have checked what dressing the patient needs to get and what about pain medication?

P: We always administer pain meds before the procedure.

R: So there you are with the patient in the dressing room with your prepared trolley, analgesics were given, what happens next?

P: I wash my hands of course. Then I start to remove the dressing. Then I do the dressing. Here we all do dressings, sisters, nurses, everybody.

R: Okay. I understand. What about assessing the wound?

P: So the initial assessment is done on admission by the doctor. After that we just monitor the progress and don't "assess" it. You know. We just check it really.

R: I see. So when you say you just check it, what do you mean?

P: We monitor the progress. If it is converting or if it's too wet or like if it is infected or if there is hypergranulation.

R: I see. That sounds like assessment to me because you are looking and trying to make sense of what you see.

P: You right.

R: Okay. Then what?

P: Then we decide what to use if the doctor did not order anything.

R: You mean like the dressings?

P: Yes.

R: Can you please tell me how you decide which dressing is appropriate for which wound?

P: Infected wounds normally get Acticoat. But the doctor normally orders that. Otherwise we decide between Flammazine, Melladerm, Prontosan or whatever the wound needs. Intrasite or stuff like that.

R: So when do you put which one?

P: Like I said. It all depends on the condition of the wound. In burns we try our level best to try and prevent infection.

R: I see. Please can you explain to me typically what you would do when doing a dressing?

P: If there are blister we normally scrub the patient to remove them. The patient would have had analgesics. Then when it's clean we then either put on the prescribed dressing like Acticoat or Intrasite. If it's on an arm we elevate it. But if it's full thickness or very big the patient is dressed in theatre.

R: Uh hu.

Silence.

P: The wound normally show what is needed. Sometimes we put Intrasite. Sometimes Melladerm. Sometimes Acticoat. It just depends what the wound wants. Sloughy: Intrasite. Clean: Jelonet. Like that.

R: So when the wound is healing you would use Jelonet?

P: Yes.

R: Please explain how do you know if the wound is not getting better?

P: When it converts or if you don't see progress.

R: Progress ?

P: Ja. The edges don't advance. Or the wounds are bigger. When that happens normally the patients will have daily Betadine dressings or even Acticoat. If they are systemically sick then they are ventilated and get IV antibiotics.

Silence.

R: What about these patients with the large wounds?

P: What about them?

R: Like do you leave them open whilst you are maybe dressing the arm.

P: Never!!! These patients are here not by choice. Burns are not elective. We try and maintain their dignity and integrity. In the burns unit we try our level best to maintain patient's integrity.

R: Okay. I see.

R: Please tell me what you typically do after a dressing change?

P: You know the saying if it's not written it's not done. So I write and write and write. Sometimes it feels like we are nursing papers. (Laughing).But I worked too hard for my maroons. (Laughing).

R: So what sort of stuff do you write?

P: I write everything I did. If there are signs of infection or even healing. What I used. E V E R Y thing my sister. I don't take chances.

Silence.

R: What about if a patient need a referral?

P: To where?

R: I am sorry. What I meant is what if you notice a problem do you refer it to the physiotherapist or occupational therapist or even the doctor.

P: (Laughing) Of course. Mxm. You must be clear about what you asking. I thought you meant refer to Charlotte Maxeke or somewhere else. (Laughing)

R: (Laughing).We are almost at the end of the interview, but I would like to know about communicating problems, "referral"(gesturing with hands)

P: With handover we report any problems that there was. But we also record it in the cardex.

R: I see.

Silence.

Conclusion (5 min)
This was the debriefing section of the interview. Asking the participant if there was anything else or if they were happy with the interview? If the participant understood the purpose of the study and an explanation of what was to happen with the findings.

R: Is there anything else you wish to add?

P: Yes. You know all the companies claim their product is the best and want you to use their product instead of the other companies. Perhaps I think if we can have a poster with pictures of the different wounds it can help us to ask them specific questions about their products on the different wounds. Because now when the wound is exposed you might realize that what they said is not right for the wound you are seeing.

R: Are you okay with the questions and how do you feel about doing the interview.

P: No I am fine.

R: Are you sure you understood the purpose of me asking you these questions?

P: Yes I understand.

R: I just want to remind you that nowhere will you name or identity be disclosed. Even if we do publish the data nobody will know it was you that gave me the information. Nothing will happen to you for speaking to me. Do you understand?

P: Yes.

R: Thank you again for your time and for answering the questions. So what will happen now is I am going to write this information down and take it back to Wits without your identity being revealed. We will then go through it and use this information to put together guidelines to help nurses in general make sure we give the patients the best possible care.

P: Okay.
Expression of thankfulness for time and participation
(All times were approximates that was only used as a guideline)

Appendix W

TO WHOM IT MAY CONCERN

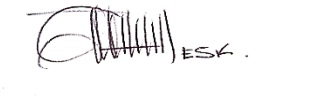
22nd September 2015

This letter serves to confirm that the thesis entitle "***The management of burn wounds by nurse***s" submitted by **Ethel Althea Andrews, student number 0010877M,** has been edited and checked for grammatical errors and content layout from a typographical perspective for ease of reading and presentation.

I wish Mrs. Andrews all the success with her thesis which, to me as a layperson, in the field of nursing and all its intricacies and challenges was very interesting and enlightening.

It was a pleasure to work with Mrs. Andrews and I wish her all the best with her thesis and work ahead.

Yours sincerely



MRS J.G. HESK

Appendix X

Excerpt from reflective journal

Gibbs (1988) Describe, Feelings, Evaluation, Analysis, Conclusion, Action plan

Description/ The situation

At research setting with nurse participant. Interview 7. Purpose semi structured interview.

An appointment had been made to conduct the interview during the cause of the day. The purpose was to get a feel on what nurses know about wound management, how they express themselves, how the interpret and understand the observations they make in the wound and get a general understanding of where on the radar nurses place themselves in terms of wound management. This interview was conducted with a senior sister (registered nurse) in the unit. From past interactions I am aware that she ICU trained and this puts her at an advantage in terms of knowledge over some of her colleagues. She has worked in the unit for a long time.

As one cannot separate the nurses' feelings and attitude from their skill and competence I am fully aware that nurses that do not have a specific interest in wound care will respond differently to those who do have an interest.

She seemed content and happy to do the interview.

Feelings

I remember during the interview feeling surprised that the nurse was not as "passionate" about wound care as I perceived her to be as she was more senior in the unit. What was even more surprising is the fact that she in fact preferred not to do the wounds unless it was necessary. She would rather focus on the systemic part of patient care and have the junior nurses do the dressings. As the interview progressed I tried to explore what about wound care makes the nurse want to avoid it. It emerged that she perceives doing the dressings as imposing pain on the patient. This is understandable. I remember making supportive noises to encourage her to expand on the topic. Which she did. It was very clear that she cared for the patient, but her interest in wounds per se as minimal. I felt the interview was going in a different direction from where I wanted to go and acknowledged her feelings and re-introduced the question on how wound assessment was done. I felt that though her perceptions on pain and her feelings towards the pain were important it fell outside the scope of this study. Perhaps in a future study one can explore the psychological impact or perceptions of nurses in the burns unit.

I could not help but wonder how many of the nurses working in this unit do have an interest in wound care and if the "disinterest" was due to limited training as this nurse seems to have an affinity for books. Or perhaps because wound care is only a sub-section of more important parts of nursing like ICU. I wondered if wound care is only a job for junior nurses as this participant described it as such. I wondered was there a stigma attached to wound care such as that for bed pans? I remember thinking back as a student how dressings where the "punishment" for being a student. How I would dread being allocated the dressings and preferred the medicine trolley. Interesting how things have not changed.

As the interview progressed we continued to talk, but the nurses word selection was even though scientific, not always accurate. For example when she described an infected wound as septic. And that her conclusion is based on the smell of the wound. When probed she resorted back to her ICU training as spoke about increased white cell count and pyrexia. But how is that related to the topical signs of infection?? One cannot see an increased white cell count with the naked eye.

I recall being genuinely surprised and almost disappointed in the level of knowledge from a senior nurse. The interview was insightful. As even at senior level, where the nurse has a track record of adult learning, wound care is not being read or researched by this participant.

Who knew????

Evaluation/ Experience evaluated

Afterwards this interview prompted many questions by me. Like why is wound care seen as a step child to ICU? Is "passion" for wounds a requirement to dealing with burn patients? I wondered if junior nurses that are less trained then ICU qualified nurses would be able to adequately advocate or contribute to the multi-disciplinary team if the responsibility lies with them. I wondered if more formal training and recognition of wound care and not just a module taught in passing will make a difference in the "status" of wound care.

Who's responsibility is it to train nurses? Perhaps the problem lies in the lack of standards and recognition of wound care as a specialty.

I was disappointed in the interview outcome. But the conclusion was that regardless of ones "passion", wound care is not adequately taught and it is ritualistic as even professional nurses can distinguish between infected and non-infected. Or use words like "beefy", "pus" and "septic".

Analysis/ Reflections

What I did well? Steer the conversation in direction when it seemed it was diverting to more psychological aspects.

What I did that was not so well? Initially I entertained the diversion. Perhaps this was due to my limited experience in conducting interviews. I had an expectation of what I thought would be the responses from the participant.

Did the interview go as expected? No. This interview left me disappointed because I expected more. I assumed that one's level of education would translate into knowledge of wound care. I wrongfully presumed that more senior staff would be more conversant on the topic of wound care. However, this interview gave confirmation that there were clear gaps in knowledge. When I think of it now, I wonder then if the status quoi of wound care changed, would nurses be more interested in wound care?

Conclusions

I have drawn three conclusions from above reflection.

1. Nurses are not adequately trained.
2. Training should be across the board and not assumed that only students and junior nurses require training.
3. Nurses must want to know. You don't know what you don't know…

Action plan: Conduct another interview with another participant