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Chris Hani Baragwanath Academic Hospital Postoperative Analgesic Therapy Observational Survey.

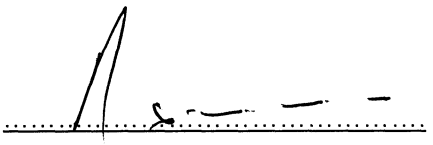
Mabhidli Mduduzi Amos Mashinini

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Masters of Medicine in the branch of Anaesthesia

Johannesburg, 2013

DECLARATION

I, Mabhidli Mduduzi Amos Mashinini, declare that this research report is my own work. It is being submitted for the degree of Masters of Medicine in the branch of Anaesthesia at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.



Signature

27th day of FEB month, 2013

DEDICATION

To my wife and friend Liemo, my son Sizwe and especially my daughter S`bongiseni who was always willing to help where she could. Without your love, understanding and unfailing support, this task would have been impossible to accomplish.

Chris Hani Baragwanath Academic Hospital Postoperative Analgesic Therapy Observational Survey.

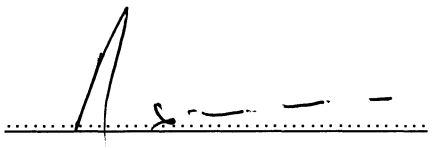
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PRESENTATIONS ARISING FROM THIS STUDY

1. Presented as a poster at the 15th World Congress of Anaesthetists (WCA), Buenos Aires, Argentina, April 2012
2. Presented as a poster at the Faculty of the Health Sciences Research Day and Postgrad. Expo, University of the Witwatersrand, 19th September 2012

ABSTRACT

INTRODUCTION

A large scale survey conducted in Western Europe in 2005, has identified deficiencies in the postoperative pain management with regards to, among others, provision of patient information, use of protocols and evaluation of pain.

Chris Hani Baragwanath Academic Hospital services a predominantly black population in the low socio economic bracket. The huge service load experienced by the hospital exerts an enormous pressure on scarce resources, thus compromising the ability of health professionals to execute good postoperative pain management practices. Anecdotal evidence suggests that postoperative pain management at Chris Hani Baragwanath Academic Hospital is suboptimal. Surgical wards were identified as areas where the need and the application of institutional programs may improve the overall quality of pain management.

OBJECTIVES

The aim of this survey was to establish current postoperative pain management practices, for surgical patients at Chris Hani Baragwanath Hospital, and thereby identify potential areas of improvement.

METHOD

The investigation was prospective, cross-sectional, observational survey and the study population comprised doctors responsible for the assessment and management of

postoperative pain in adult patients. A standardized multiple choice questionnaire, adopted from a survey conducted in European hospitals and adapted to our environment, was used to collect data anonymously. Data analysis was done using Statistica 8.0(T), and presented using percentages. Answers provided by the respondents to all sections of the questionnaire were compared to the minimum acceptable requirement as defined by the Steering Committee of the European Postoperative Analgesic Therapy Observational Study.

RESULTS

The response rate was 70%, and 92% of respondents were surgeons. For 98% there was no organization, or a specific budget provided. For 56% there was no onsite training provided to the personnel. According to 37%, patients were not informed preoperatively on postoperative pain management, and for 44% preoperative information was provided to patients only in specific situations. Balanced analgesia was used by 41% for major surgery. Fifty six percent declared that patients were treated on a regular basis in the wards and, 44% only when the patient was complaining of pain. For 78% there were no written protocols in place. Pain was not assessed by 40%, and 39% assessed only if patients complained of pain. When pain was assessed, standard tools for pain assessment were not used by 30% of respondents. Intramuscular administration of opioids is the most commonly used analgesic technique (73%) in the first 24 hours after major surgery and multimodal pain therapy is used by more than 75% of respondents. Only 1% of respondents assess patient satisfaction with postoperative pain management on discharge.

CONCLUSION

The results from this survey highlight deficits that exist in the management of postoperative pain management, despite the availability of sophisticated systems of drug delivery in the hospital. The inadequacies are universal encompassing all aspects of postoperative pain management. Major contributors are financial constraints, low level of expectations with regards to adequate pain relief, lack of commitment in the full utilization of the available resources and skills.

Improvement in the quality of postoperative pain management will require:

1) re- education of attitudes with emphasis on greater awareness of the importance of management of postoperative pain.

2) Active involvement by the anaesthetists in reorganizing the pain services.

3) Involvement of nurses and surgeons, without their active support, acute pain management will not be optimal.

4) Optimal utilization of the existing resources and skills by developing simple procedure specific treatment protocols and flow charts for common procedures.

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CHAPTER 1 – INTRODUCTION

1.1 Introduction

Postoperative pain is the most common form of acute pain [1-3]. It can be a consequence of surgery [1, 4, 5], and is the commonest symptom in the postoperative period [3]. In most patients, it is preventable by the use of a number of appropriate interventions including adequate analgesia [5]. Routine postoperative pain management largely remains unsatisfactory, despite much progress in our understanding of pain physiology, analgesic pharmacology, and the availability of well established treatment regimens [1, 2, 6, 7].

A large scale survey conducted in Western Europe in 2005, has again identified deficiencies in the management of postoperative pain with regard to health professionals` knowledge of pain management, patient information, evaluation of pain, and protocols. This survey has also demonstrated an increase in the use of multimodal therapy and a frequent use of epidural analgesia after major abdominal surgery [8].

At Chris Hani Baragwanath Academic Hospital (CHBAH) there is no Post Anaesthesia Care Unit or Acute Pain Service. The huge service load experienced at CHBAH exerts enormous pressure on available scarce resources, thus compromising the ability of health professionals to execute good postoperative pain management practices. In many parts of the world, anaesthetists are in the forefront of the provision of postoperative analgesia. This arises because of familiarity with the pharmacology of analgesics, knowledge about pain pathways and skills in the

techniques needed to offer multiple forms of pain control [9]. However, at Chris Hani Baragwanath Academic Hospital, contrary to this trend, involvement of the anaesthetist in postoperative pain management is limited to theatre, recovery room and the Intensive Care unit/ High Care area. Once the surgical patient is transferred to the ward, postoperative pain management is largely the responsibility of the surgeon. This may introduce variability in some aspects of postoperative pain management. Surgical wards are being identified as areas where the need and the application of institutional programmes, may improve the overall quality of postoperative pain management.

I have conducted a survey on postoperative pain management practices in the surgical wards at Chris Hani Baragwanath Academic Hospital, in order to update and complement the picture of the current pain management practices being used and to identify which programmes are necessary to improve postoperative pain management.

To the best of my knowledge, no survey of this type has been previously conducted in South Africa.

1.2 Problem statement

At the Chris Hani Baragwanath Academic Hospital, postoperative pain management in the surgical wards appears suboptimal.

1.3 Aim

The aim of this survey is to assess the current state of postoperative pain management practices for surgical patients at CHBAH.

1.4 Objectives

1.4.1 Primary objective:

To determine the level of adequacy of postoperative pain management at CHBAH as compared to the minimum acceptable requirement as defined by the Steering Committee of the European survey of Postoperative Analgesic Therapy Observational Study (PATHOS)[8] with regards to:

a) presence or absence of pain management organisation,
b) staff training on postoperative pain management,
c) provision of information on postoperative pain management to patients,
d) postoperative pain treatment practice in specified major and minor surgical procedures,
e) specific written postoperative pain management protocols,
f) evaluation and documentation of postoperative pain.

1.4.2 Secondary objective:

To identify potential areas of improvement, and programmes that will facilitate improvement of postoperative pain management.

1.5.1 Ethical clearance:

Approval has been obtained from the Human Research Ethical Committee (HREC) of the University of the Witwatersrand (Protocol number M070360) (See attached appendix A)

1.5.2 Postgraduate approval:

The study has been approved by the Postgraduate committee of the University of the Witwatersrand, Faculty of the Health Sciences (see attached appendix B).

1.5.3 Site approval:

Permission to conduct the study at Chris Hani Baragwaneth Hospital has been granted by Hospital Management (see attached appendix C)

1.5.4 Verbal consent:

Verbal consent was obtained from each doctor prior to participating in the survey. Only doctors who consented took part in the survey.

1.6 Study limitations/Problems.

1.6.1 Sample size

It may be restricted since it is limited by the number of surgical units /specialities available at Chris Hani Baragwanath Academic Hospital.

1.6.2 Contextuality

The study is contextual in terms of the chosen study site, and therefore the data may not necessarily be applicable to other sites.

1.6.3 Participants categorisation

Participants targeted, were those involved in theatre for operations taking place over a period of four months.

1.7 Research assumptions

1.7.1 Definitions:

The following definitions were used in this study:

Balanced analgesia / Multimodal analgesia: Use of a combination of different analgesics or classes of analgesics; or the use of more than one analgesic technique to produce analgesia through multiple mechanisms and thus achieving optimal pain relief with minimal side effects.

Rescue analgesia: Is analgesia produced by a drug dosage that is given on an as needed basis in order to treat pain that breaks through the regular schedule in a patient receiving an "around the clock" drug regimen.

Pre-emptive analgesia: This refers to the concept that analgesic medication or intervention, administered prior to surgical tissue injury, may produce a greater effect than the same medication or intervention administered following surgery. The theoretical basis for pre-emptive analgesia, relates to the fact that analgesia given before tissue injury blocks the development of neuronal hyperexcitability (wind-up or hyperalgesia), both in the periphery and the central nervous system, in response to acute tissue injury.

Minimum effective analgesic concentration (MEAC): This is the minimum plasma concentration of a drug at equilibrium with receptor drug concentration, and at which effective analgesia is produced.

1.8 Study design

This is a prospective cross-sectional observational study.

1.9 Summary of methodology

A sample participant size of 120 doctors was selected. This sample is comprised of all those doctors responsible for assessment and management of postoperative pain in adult patients, in both the surgical and intensive care departments. The targeted surgical wards represent greater than 70% of CHBAH inpatients receiving postoperative analgesia. The study took the form of a standardised multiple choice questionnaire adapted from a similar survey conducted in European hospitals. Doctors were approached to complete the questionnaire, and verbal consent was obtained from each doctor prior to participating in the survey. Only doctors who consented to take part in the survey were included. No patient information was included in the survey. The participating doctors were given the option of completing the questionnaire on the same day (if time permitted) or completing it at a time convenient to them, and submitting it within the study period.

The anonymously completed questionnaires were collected at a specified place, in a sealed envelope, and then returned sealed to an independent statistics company for

data capturing and processing. The data was analysed using Statistica 8.0(T) software package and is presented using frequencies and percentages.

Answers provided by the respondents to all sections of the questionnaire were compared to the minimum acceptable requirement as defined by the Steering Committee of the European study of Postoperative Analgesic Therapy Observational Survey (PATHOS) [8]. (See attached appendix E). The European Steering Committee was made of members from anaesthesia and surgery who are experts in postoperative pain management across Europe. The minimum requirements as defined by the committee were compiled from answers on minimal acceptable care, provided by each of the experts in the committee. These answers were combined, and the minimum requirements of the Committee were defined as the combined answers where the consensus amongst members was greater than 50% [8].

The analysis is descriptive, providing answers for each question.

CHAPTER 2 – LITERATURE REVIEW

2.1 Introduction:

Acute postoperative pain can be a result of surgery [4,5]. Previous studies have highlighted the perception that it was a necessary consequence of surgery [7], and that it is limited in its duration and also serves a protective function in that its total elimination could mask signs of surgical complication [10]. This view has changed due to better understanding of opioid analgesic mechanisms. While opioids prevent central sensitisation and augment descending inhibitory pathways, they do not block incident pain [11]. Thus, if a patient develops acute abdominal pain related to recent surgery, it is unlikely that opioid analgesia will disguise clinical signs to the extent that the diagnosis cannot be made. Adequate analgesia does not mask abdominal pain [11, 12].

Inadequate relief of pain is of global concern [1,2,3,4]. The need to address these inadequacies is well reported [13-16].This is particularly true in developing countries, such as South Africa, where a high service load exist due to high "patient to staff" ratios and also poorly developed or nonexistent postoperative pain services. Postoperative pain is a potent trigger of stress response, and is thought to be an indirect cause of adverse effects on various organ systems [17].

2.2 Pathophysiology of postoperative pain.

Pain in the perioperative period represents a combination of multiple mechanisms; including 1) nociceptive transduction from mechanical injury, as in a scalpel cutting

the skin [18, 19], resulting in the activation of high threshold peripheral sensory (nociceptor) neurons. This pain signals the presence, location, intensity, and duration of an obnoxious stimulus and fades once the peripheral driving force is removed [18].

2) the inflammatory response that follows tissue injury, leading to heightened pain sensitivity [18, 19]. Mediators released from damaged cells lead to a reduction in the threshold of nociceptors that innervate the inflamed tissue (peripheral sensitisation), and also trigger the nociceptors which send afferent impulses (via the dorsal root ganglion) to the spinal cord. These nerves produce sensory neuropeptides, such as substance P, which will exert their effect both peripherally and centrally. In the periphery, it will increase the excitability of the peripheral somatic and visceral nociceptive nerve terminals. This will lead to peripheral hyperalgesia, associated with exaggerated response to normal sensory input.[19, 20]. The neuropeptides centrally increase the excitability and enhanced nociceptive transmission in the dorsal horn. Repetitive transmission of nociceptive impulses into the dorsal horn will in turn increase transmission by up-regulating receptors [21]. This phenomenon although evoked within minutes can outlast the precipitating tissue injury for several hours or days. The changes, however, are generally reversible, and normal sensitivity of the system is eventually restored [18]. It has been suggested that in the absence of nerve damage during surgery, neuronal sensitization plays an important role since it drives acute postoperative pain until the surgical wound is healed [18, 20, 22, 23].

3) Neuropathic pain. This arises after injury to nerves or to sensory transmitting systems in the spinal cord and brain [14]. Damage to the afferent transmission system, causes partial or complete loss of input from local and descending inhibition of neurons to the nervous system. This leads to negative sensory phenomena, such as loss of temperature, or touch, or pressure sensations [18]. Peripheral nerve

damage occurring during surgery may eventually lead, to development of neuropathic pain and hence chronic pain. Maladaptation of central sensitization has also been implicated [14].

Acute Postoperative pain has certain unique characteristics [24]:

- Constant, surgically related pain, frequently described as aching in nature and ordinarily near the surgical site.
- Acute exacerbation of pain added to the basal pain, and due to activities such as coughing, getting out of bed, physiotherapy, and dressing changes.
- Regularly it is a self limiting condition with progressive improvement over a relatively short period.

Acute pain is a complex sensation, which extends beyond simple nocioceptive input. The central processing of acute pain is modulated strongly by emotive elements such as fear, anxiety or depression, and also by previous experience of pain [25, 26]. Current treatments are largely the result of applying existing techniques to control pain symptoms, rather than a specific attempt to control or minimise the physiologic, sensory, affective, cognitive, behavioural and sociocultural events leading to pain response [25]. It is difficult to quantify the contribution of these elements in the overall experience of acute pain observed in the individual patient. Therefore, treatment is often empirical, which may contribute to inadequate management of pain in surgical patients [23, 27-29]. This has been well documented, and despite its universal occurrence, our understanding of the causes, and our ability to treat postoperative pain is still incomplete.

Chronic pain is defined as "pain that persists beyond the usual course of an acute disease or after a reasonable time for healing has occurred" [30, 31]. It can be

nociceptive, neuropathic, or mixed [31]. Psychological mechanisms and or environmental factors, frequently play a major role in the development of chronic pain [31]. Predictive factors for the developing chronic pain include preoperative pain, repeat surgery, severe postoperative pain, and a surgical approach with a high risk of nerve damage[18, 31].

More than 50% of patients continue to have severe pain after surgery and trauma. Evidence shows that inadequate analgesia increases the risk of postoperative complications and may lead to chronic pain [32]. Surgery and injuries are believed to contribute to at least 25% of the burden of chronic pain [31]. Chronic post surgical pain is more common than realised, especially after certain types of surgery. Examples are thoracotomy [27] and mastectomy [33, 34] Poorly controlled postoperative pain is thought to increase the subsequent likelihood of developing chronic pain [30, 33, 35, 36]. Postsurgical chronic pain can be the consequence, either of ongoing inflammation, or much more commonly, a manifestation of neuropathic pain, resulting from surgical injury to major peripheral nerves [18]. In most affected patients, postsurgical chronic pain closely resembles neuropathic pain [18]. Major nerves traverse the surgical field of most of the surgical procedures associated with chronic pain. Damage to these nerves is probably a prerequisite for the development of postsurgical chronic pain [18, 34]. In a subset of patients, a continuous inflammatory response, such as after inguinal hernia repair, can contribute to a maintained inflammatory pain [33]

There are two kinds of neuroplasticity [18]. One is associated with essentially reversible changes in the `software` of the system, and operates during inflammatory pain. The other, is associated with alteration of the `hardware` itself after nerve

injury. Consequently there is no simple continuum from acute to chronic pain that correlates with the duration or intensity of peripheral injury [18].

2.3 Postoperative pain management guidelines.

The problem of inadequate pain relief, has been increasingly recognised as a priority by both national and international organisations. These include amongst others, the International Association for the Study of Pain (IASP), American Pain Society (APS) [37] and the South African Society of Anaesthetists (SASA)[38]. To address this concern, these organisations have published guidelines for health professionals involved in postoperative pain management. Although these organisations represent diverse multidisciplinary groups of professionals and cultures; central to their guidelines on acute postoperative pain management, is acknowledgement and emphasis of several basic issues, which include the following [39, 40]:

1) Providing patients with information and education on pain, and on pain management.

One of the reasons cited for inadequate postoperative pain relief, is the lack of preoperative patient education regarding postoperative analgesia [41]. Preoperative patient education is one of the goals of acute pain management guidelines. This is the case in most centres around the world [39]. Preparing the patient to understand their responsibilities in pain management is important, and must be part of the overall strategy for any acute pain program [25].

The aims of providing patient information should be to educate patients on postoperative pain and analgesia, and to instruct them on the use of assessment

tools, and to address expectations regarding the management of pain. This also encourages discussion regarding any questions or concerns about pain and its management [42, 43]. Patient information should form part of the multimodal strategy for postoperative analgesia. This is because patient preparation and education may improve postoperative outcome [44]. Patient information can encourage more realistic expectations, improve compliance and enhance the ability to effectively interact with pain management techniques [45]. It simplifies postoperative care and improves patient safety. In one study, the analgesia requirement was reduced by half when the anaesthetist spent time before surgery explaining pain and how to reduce its severity [45]. Other studies have shown that verbal and written information, if presented sensibly, can reduce postoperative pain and anxiety [46].

Although adequate pain information does not always result in clinically significant improvement in pain management outcomes, it does provide health professionals with an opportunity to interact with patients and to empathise with them. This in turn may lead to the patient regaining autonomy, and may positively affect their recovery [45]. In one study, 89% of patients thought that information sheets about postoperative pain were useful [47].

2) Analgesia and prevention of pain.

One of the aims of postoperative pain treatment is to provide subjective comfort [48]. In addition, it aims to inhibit trauma-induced nocioceptive impulses in order to blunt autonomic and somatic reflex responses to pain. Subsequently, this enhances restoration of function by allowing the patient to breathe, cough and move easily [48, 49]. Fear of uncontrolled postoperative pain is a primary concern in many patients about to undergo surgery [7, 34, 50]. Pain accompanies more than 23 million surgical

procedures each year, but is believed to be managed inadequately in more than half of these patients [7, 51, 52]. Although pain is a predictable part of postoperative experience, inadequate management of it is common [53]. In most patients, pain is preventable, or at least controllable, by use of a number of appropriate analgesic strategies. However, in a significant proportion of patients pain relief leaves much to be desired and this has profound implications [7, 53].

Inadequate relief of severe postoperative pain, not only affects patient' wellbeing, but also has the potential to increase perioperative morbidity, mortality, and the length of hospital stay [17, 54-56]. Clinical outcomes resulting from ineffective postoperative pain management include deep vein thrombosis, pulmonary embolus, myocardial ischemia, myocardial infarction, pneumonia, poor wound healing, and insomnia [50]. Associated with these complications, are economic and medical implications as also is patient dissatisfaction with medical care [17]. Appropriate management of postoperative pain, which entails prevention and aggressive treatment is therefore not only an ethical imperative [8, 9, 44], but can also minimise consequences, and improve surgical outcome. Thus potentially shortening the recovery period, improving quality of life, and optimising resources [9, 28, 57, 58].

3) Variability in the analgesic requirements.

Among patients there is wide variability in the dose of opioids required to control postoperative pain, even when doses are adjusted for weight [44]. Drugs may not even produce identical response when given to the same patient on different occasions[59]. The variation in the dose results from both pharmacokinetic and pharmacodynamic factors [60], also variability in patient perception of pain [41]. This pharmacologic variability, mandates that we abandon the idea of one correct dose of

opioids for the control of postoperative pain, and that we be prepared to occasionally administer doses far less or far greater than we would consider customary. The analgesic requirement varies widely according to type and severity of surgery performed [44, 60]. The use of routine orders for analgesics, where a fixed dose is administered usually by intramuscular route, is likely to fail for the majority of patients [41]. Although convenient, it does not allow for rapid adjustment of plasma opioid concentration to suit the needs of the patient at any instant. Inadequate dosing is one of the major causes of inadequate analgesia [41].

Some of the elements that influence analgesic requirement and consumption include [1, 59].

Patient factors:

- Age
- Sex
- Pre operative analgesic use.
- Past history of poor pain management.
- Coexisting medical conditions such as substance abuse or withdrawal, hyperthyroidism, or anxiety disorder.
- Cultural factors and personality.
- Pre-operative patient education.

Other factors:

- Site of operation: thoracic and upper abdominal operations are associated with the most severe pain.
- Individual variation in response to pain threshold.

- Attitude of the ward staff.

4) Benefits of regular scheduled dosing of analgesic agents and the need to provide rescue analgesia for break through pain.

Patients with continuous or frequent pain, are usually given fixed scheduled doses to prevent pain from recurring and to provide continuous relief. In the early postoperative period, the effectiveness of opioid analgesia is improved by regular around-the-clock dosing in order to prevent the recurrence of severe pain [41]. The regimen for medication should generally, in addition to provision of around-the-clock analgesia, also provide rescue doses for the management of exacerbations of the pain not covered by regular dosages [24]. This helps facilitate pain relief, and the amount of rescue medication required, provides a guide for dose escalation. It is generally identical to that administered on a continuous basis, and is usually approximately 5% to 15% of the 24-hour baseline dose. The frequency with which the rescue dose can be administered depends on the time to reach peak effect for the particular drug and also the route of administration [24].

5) Benefits of multimodal analgesia.

Multimodal analgesia is currently recommended for effective postoperative pain control [61, 62]. Multimodal analgesia is achieved by combining different analgesics that act by different mechanisms, resulting in additive or synergistic analgesia, lower total doses of analgesics, and fewer side effects [63-65]. It decreases pain scores, and

decreases the requirement for postoperative analgesia in different surgical procedures [27, 64].

Multimodal analgesia is discussed in detail under multimodal analgesic strategies. (see page 37)

6) Frequent assessment and documentation of pain.

Therapeutic regimens in medicine should be monitored by assessing their effects [26]. Assessment is a systematic process, and, with the appropriate tools and documentation procedures, it enhances the clinician's ability to evaluate pain [66]. Such evaluation enables the clinician to achieve the goals of increased comfort and improved functioning. In the clinical setting, assessment is an essential activity that must occur prior to the initiation of therapy and also throughout treatment [67]. The goals of assessment are to assist in establishing a baseline, in selecting interventions, and in evaluating patient response to treatment [68].

The first step in providing postoperative analgesia is to ensure adequate assessment of the patient`s pain [44]. Postoperative pain is a dynamic phenomenon, which changes rapidly in response to a variety of influences. These include movement, dressing change, and physical therapy. Therefore, its management is dependent upon the need for frequent assessment, and also rapid response to changes in pain experienced by the patient [9, 40, 44].

All health professionals involved in the care of patients with pain, have an essential role to play in this process [9, 67]. Accurate and frequent assessment, and documentation of response to postoperative pain therapy, is the key to successful pain management [41]. It is the only way of individualising therapy with regards to its

effects and side effects [39]. Assessment must be regular and must be performed both at rest and on movement [9, 21, 41]. Assessing pain only at rest is of little value because, it is pain during movement or deep inspiration that is more discriminatory of the analgesia efficacy [21]. Lack of frequent assessment of pain to determine the efficacy of analgesia has been cited as one of the reasons for inadequate postoperative pain relief [41].

Patient satisfaction is one of the most important factors in the assessment of surgical outcome [66]. One of the American Pain Society (APS) quality assurance standards on acute pain, specifies that patient satisfaction with pain management should be assessed [68]. Evaluation of patient satisfaction with postoperative pain management at the time of discharge, is also important, because it may give insight into the assessment of postoperative pain, and also the effectiveness of pain control from the patient`s point of view [69]. Additionally, it evaluates the success of patient education. Patient satisfaction is a complex measure with analgesia being one of the most important determining factors [51, 70]. However, it may be difficult to interpret patient satisfaction, because it may be contributed to by many aspects of postoperative care. These aspects include effectiveness of analgesia, perceived safety of analgesia techniques, and the side effects of treatment. As a result it may not be a particularly discriminatory measure of success of pain treatment [71].

Documentation of pain assessment formalises the pain assessment process, and is pivotal to the provision of individualised care from both professional and legal perspectives [72]. Lack of documentation implies that assessment was not done or was not completed. In the past legal decisions have been rendered in the patients favour because of the absence of documentation. From a professional perspective,

without completely documented information, postoperative pain management can neither be well formulated nor formalised.

Pain is a subjective and extremely variable experience [1, 41]. Although experienced health professionals may be able to estimate the degree of pain suffered by the patient, it is widely accepted that the amount of suffering can only be assessed by the patient concerned [26]. Consequently, the only way to accurately monitor pain, is to discuss it with the patient, in order to understand the postoperative pain experience from the patient's perspective [1, 9, 41, 57].

In evaluating pain, a unidimentional scale is used. With this scale the patient is asked to define severity of the pain itself. This scale is limited by a lack of sensitivity [26].

A simple verbal rating scale (VRS) uses words such as `none`, `mild`, `moderate`, and `severe` in order to provide a description of intensity, and also an acceptable degree of variation between individuals [26, 73].

The numerical rating scales as above allow for a greater degree of sensitivity, and additionally they circumvent the usual wide freedom of choice presented by "visual analogue scores", which some patients find confusing [26].

Visual Analogue Score (VAS) is currently being used widely as a sensitive and valid measure of pain intensity. It is a sensitive, simple, efficient, minimally intrusive, and reproducible method that correlates well with other reliable methods [73-75]. The scale consists of a line (the VAS line), usually 10 cm in length, which indicates extremes of the sensation being measured. The left side represents no pain and the right side represents unbearable pain. Some authors, as indicated above, claim that the VAS

is confusing. However, it has been reported that only 7% of patients failed to use it after a single explanation [76]. Some patients' found the VAS confusing because they do require some degree of both wakefulness and coordination in order to complete it [26]. The VAS may also be difficult to use in the postoperative period because of the effects of the anaesthetic, sedation, nausea, or even blurred vision. Patients with motor problems might also experience difficulty in completing the scale [74, 75]. To some extent this may be circumvented by the use of slide rule devices, which may then be processed electronically [26].

The "Faces Pain Scale" is another scale which has been described. It is more useful in those patients with whom communication may be difficult, or where a language barrier exists [77].

Multi-dimensional scales have also been described e.g. "Magill Pain Questionnaire", which assesses pain under three dimensions: sensory, affective and evaluative [10,70-71]. Although this is useful in chronic pain states, it is too cumbersome for repeated evaluations of acute pain states in clinical practice [26].

All patients experiencing acute pain, should have an assessment of the adequacy of their analgesia. This should be as normal as recording blood pressure and heart rate by using simple unidirectional scales that provide some degree of feedback [70].

7) Training of personnel, and ongoing education

Personnel training and education is crucial for any pain management program. It should raise awareness about the current inadequacy of pain treatment and also patient`s anticipation of a high level of pain relief [47].

In practice, training should include an overview of the relevant anatomy, physiology, and pharmacology. It should also delineate the goals of therapy, and additionally address the knowledge and skills required with reference to the effects and safe use of available treatment options. Regarding analgesia, it should provide clear practical instructions with reference to the dose of analgesia, an approach to inadequate analgesia, patient monitoring, potential treatment complications and their management; and should also define the responsibility and accountability of each member of the team. Thus avoiding the problem of conflicting orders.

In the majority of cases, anaesthetists play a leading role in these structures This is as the result of familiarity with analgesics and with regional analgesic techniques [7, 70]. Surgeon involvement is also important, since the formal responsibility of treating surgical patients in the wards rests with the surgeons [70].

The role played by nurses in postoperative pain management cannot be overemphasised. They spend more time with patients in pain than any other health professional [57]. They are the first line surgical patient health care provider, because in many instances, after the prescription of medication has been made, pain management becomes an interaction between the patient and the nurse [37]. Overall, the ward nurses are more likely than other health professionals to educate patients about pain and pain management [57]. Pain is the most frequently encountered clinical presentation in the surgical wards[41, 78], It is also one of the most frequently listed diagnoses in nursing care plans [66]. Nurses are therefore more able to appreciate the effectiveness of treatment [41, 78]. On the other hand inadequately

trained nurses are likely to perpetuate and maintain the barrier to adequate management of pain [41, 47].

Acute pain management will not be optimal without active support of the surgeons and ward nursing staff.

A prerequisite for successful management of postoperative pain and optimal patient recovery, is the use of dynamic analgesic protocols that aim to maximise benefits whilst minimising adverse events [49]. Protocols have been developed to promote a consistent standard of care [79]. These help to establish the importance of a formal and structured approach to pain management. They standardise clinical practice and reduce the risk of errors [70]. Consequently, they promote safety and create a framework for customarisation of care [39]. These protocols serve as ongoing educational and informational references, and as such should be readily available to each patient and be religiously applied.

2.4 Postoperative pain management techniques.

A major goal of postoperative pain management is to improve postoperative morbidity through better pain control.

Various postoperative pain management techniques are discussed below:

2.4.1 Opioids.

Historically, opioids have been the primary analgesic medication for postoperative pain [24, 42]. All opioids in clinical use produce analgesia by the same molecular mechanism. They bind to G-protein coupled opioid receptors with inhibition of the

adenyl cyclase, subsequently leading to activation of inwardly rectifying K+ channels, and reducing calcium influx [80]. This results in inhibition of transmitter release, and ultimately a decrease in neuronal excitability [80].

Opioids are effective analgesics, and are the mainstay of postoperative pain management, especially for moderate to severe postoperative pain [6, 81]. The effects of pain are mediated by opioid receptors in the central nervous system, which attenuate pain related sequelae [42]. Peripheral opioid receptors can also provide analgesic effects in humans [82]. The potency of individual opioids correlates with their affinity for their respective receptors. Pure agonists opioid drugs have no apparent ceiling effect to analgesia. As the dose is raised, the analgesic effect increases until either analgesia is achieved, or dose-limiting adverse effects occur [24].

Modern postoperative pain treatment places emphasis on early mobilisation and discharge [83]. Systemic opioids represent the standard approach to postoperative analgesia for the majority of surgical patients. However, several aspects limit their widespread use in conventional regimes and thus the achievement of optimal pain relief. In general, increasing the dose not only causes an increase in analgesia, but also consequent side effects including nausea and vomiting, sedation, ileus, bladder dysfunction, constipation and respiratory depression [1, 24]. These side effects inhibit patients from early mobilisation and discharge. In addition, patients on opioids after major surgery, also experience less analgesic effect during movement, thus further restricting them from early mobilisation [84]. Maximum analgesic effect is obtainable only at extremely high doses in a high proportion of patients; in turn increasing the risk of potential side effects such as respiratory depression [26].

The use of opioid analgesics for management of pain, demands frequent patient assessment and also readiness to re-evaluate the therapeutic plan in the setting of either inadequate relief, or subsequent adverse effects [24].

The most common routes of administration of opioids are oral (PO), rectal (PR), intravenous injection (IV), intra muscular injection (IM), subcutaneous injection (SC), intrathecal, and epidural.

Oral route:

The oral route of administration is inexpensive, simple to apply, and also causes less discomfort than injections. It can work just as well as injections [41, 81], but it has a slower onset and a delayed time to maximum effective pain relief, compared to the parenteral route [24].Although some reports have stated that adequate analgesia may be achieved using the oral route, this route is generally regarded as unsuitable for the administration of strong opioids in the early postoperative period [24, 85]. It is usually reserved for minor ambulatory surgery and also in the latter part of the postoperative period after major surgery [26].

There are several disadvantages to the oral route [26]:

1) Delay in gastric emptying is common after surgery. This may lead to failed analgesia due to lack of absorption. More seriously, large volumes of the drug dumped into the small intestine when gastric motility resumes, may result in overdose at a time when the patient might be under less surveillance,

2) Nausea and vomiting in the postoperative period could preclude the use of oral administration,

3) Prediction of adequate dosage is more difficult than for parenteral administration because of considerable first pass metabolism in the liver, which greatly reduces the bioavailability of oral opioids [26].

Parenteral route:

Parenteral routes are preferred for patients that require rapid analgesia, or those requiring very high doses that cannot otherwise be conveniently administered [24].

Intramuscular injection (IM):

The IM route is a conventional therapy for management of postoperative pain. It comprises prescription of IM administration using fixed doses of an opioid on an `as required` (prn) basis. Although painful to patients, and offering no pharmacokinetic advantage [24], there is accumulated experience in its use. IM thus represents familiar practice that requires no special equipment. The gradual onset of analgesia by this method, permits observation of the gradual onset of any possible overdose [26]. This traditional approach to postoperative pain (giving routine orders for IM administration of opioids "as needed)," has been shown to be unable to achieve pain relief in more than 50% of patients [4]. It is associated with the highest percentage of patients experiencing inadequate analgesia. IM is generally viewed as the least effective technique compared to epidurals, PCA and IV [71]. It is one of the most important factors contributing to the inadequacies of postoperative pain management [41]. There are a number of reasons for these poor results [26]:

1) Responsibility for management of the patient is usually delegated by the prescriber the (surgeon/anaesthetist) to the nurse in a busy ward.

2) Nursing staff vary widely in their degree of rapport with the patient.
3) Analgesic requirements vary widely according to the type and severity of surgery.
4) Analgesic requirements vary widely as a result of pharmacodynamics and pharmacokinetics variations between patients.
5) Administration of adequate doses of analgesic can be inhibited, because of the onset of side effects such as nausea and vomiting, or respiratory depression.

The disadvantages of the IM route are:

- it is painful,
- steady blood concentration levels are difficult to achieve, leading to a discrepancy between time of injection and onset of pain relief.
- The patient is dependent on nursing staff for analgesia

The continued use of IM on as needed basis, despite its inadequacies, lies in its simplicity, in its familiarity, and in its convenience in any poorly resourced environment where it does carry a degree of inherent safety. However if strict criteria for administration of intramuscular injection are adhered to, by regular around the clock dosing to prevent recurrent severe pain and regular pain scoring, especially in early postoperative period [26,46,69], it can be an effective analgesic technique. This is likely to be associated with an increase incidence of side effects[85].

Subcutaneous route:

The subcutaneous route may provide a very effective method of pain relief. The onset of pain relief occurs about the same time as it does with IM, however the injection is less painful and its effects last longer[81]. Unless the dosage is timed appropriately, there are still periods of unrelieved pain.

Subcutaneous opioids via an indwelling catheter are widely used as alternatives to traditional IM and SC injections. They cause less pain for the patient than repeated IM and SC stabs [86], whilst maintaining a similar speed of onset and duration of action of intramuscular injection [87, 88].

The added benefit of indwelling subcutaneous catheter is that it can be used for injecting antiemetics such as cyclizine, further reducing the number of painful intramuscular injections for the patient [89].

Intravenous route:

The intravenous route may be used to administer single or multiple boluses, continuous infusions, or patient controlled analgesia devices (PCA).

Bolus administration: Repeated bolus injections produce wide fluctuations of plasma opioid concentration, and are sometimes complicated by the occurrence of toxicity at Cmax or pain breakthrough at the trough [24]. To obtain effective analgesia, the provider maintains a steady plasma concentration of opioids in the region of MEAC. This varies widely between individuals. Consequently, it is not possible to predict a specific dose regimen for a particular patient in advance [26].This approach requires high surveillance in order to detect respiratory depression [29].

The continuous intravenous route: This provides pain control only as long as steady state levels are maintained above the minimal effective analgesic blood concentration [24]. The potential for overdose and respiratory depression is high, and this method should only be used in high dependency nursing areas where the inherent problems of respiratory depression can be rapidly diagnosed and treated [26].

Patient – Controlled Analgesia (PCA) route:

PCA is a concept of analgesic parenteral administration, where the patient self-administers doses of analgesics as needed. It is reliant on the fact that the patient knows best when the dose of analgesia is needed [44, 85]. With this technique, the patient takes control of his or her own postoperative pain [81]. The technique may be used to administer opioids subcutaneously, intramuscularly, intravenously or by extra dural route [85].

Intrathecal /Epidural route.

The target for spinally administered opioids is the dorsal horn opioid receptors [42]. When activated, these receptors (which are located primarily presynaptically on the primary afferent nocioceptve fibres) inhibit the transmission of nocioceptive impulses to higher order neurons. This effect is segmental (limited to areas of the cord receiving drug) and specific, thus sparing motor function [44]. The spinal route bypasses the blood brain barrier, unlike the intravenous administration of morphine, and allows a high concentration of the drug to be placed close to the spinal opioid

receptors [44].The discovery of these receptors in the dorsal horn of the spinal cord, led to the development of intraspinal opioid delivery techniques [90].

Administration of opioids into the subarachnoid space may produce a marked and selective inhibition of small A and C fibres involved in the transmission of pain sensation [80]. A pure μ receptor agonist exerts its action by opening potassium channels and simultaneously reducing calcium influx, resulting in inhibition of transmitter release [80]. It also has a direct postsynaptic effect, causing hyperpolarisation and a reduction in the neuronal activity. Intrathecal opioids exert their effect primarily at the level of the spinal cord, but systemic absorption may cause an effect on peripheral receptors [91]. Both subarachnoid and epidural injections of opioids have been used to provide prolonged postoperative analgesia [65, 85].

In order for the epidurally administered opioid to produce spinally mediated analgesia, it must initially move from the epidural space to the subarachnoid space, and then from the cerebral spinal fluid (CSF) it must penetrate the spinal cord to reach the site of action in the dorsal horn [44].

Lipid solubility becomes important in the extracellular space. This is a property that best determines the opioid drug behaviour as a spinal analgesic. Increasing lipid solubility actually decreases the ability of the opioid to diffuse into the spinal cord. It also increases the likelihood that the drug will preferentially end up in the white matter instead of the grey matter [92]. Therefore, increasing lipid solubility also decreases spinal cord bioavailability of spinally administered drugs. The delivery of low opioid doses near the sites of action in the spinal cord, may decrease supraspinally mediated adverse effects [44, 93].

Opioid selection for intraspinal delivery is influenced by several factors [24]. Hydrophilic drugs like morphine have a prolonged half life in the cerebral spinal fluid, and undergo significant rostral spread. This can lead to late respiratory depression. Morphine produces analgesia through the spinal mechanisms, whether administered intrathecally or epidurally. On the other hand lipophilic opioids, such as bolus fentanyl, have less rostral spread and may be preferable for segmental analgesia at the level of spinal infusion [94]. Highly lipophilic drugs, like Fentanyl, especially with continuous infusion, produce nonsegmental analgesia as a result of systemic uptake and redistribution to the brain. It is important to inject lipid-soluble drugs close to the level of the spinal cord receiving noxious stimuli [44]. Thus, the current evidence would suggest that there is little reason to use a continuous infusion of Fentanyl and other lipophilic drugs as sole agents into the epidural space for postoperative analgesia.

The technique possesses the advantage of prolonged analgesia without the motor autonomic block produced by the local anaesthetic in the epidural space [91]. The potential disadvantages, however are, respiratory depression, itching, and urinary retention [85]. The potential morbidity for these procedures indicates the need for a well trained clinician and also long term monitoring [24].

2.5 Recent advances in postoperative pain management.

2.5.1 Pre-emptive analgesia.

Peripheral tissue injury can lead to hyperexcitability and neuronal plasticity in the spinal cord dorsal horn that is responsible for the maintenance of postoperative pain

[19].This finding provides a rational basis for pre-emptive strategies, which might reduce the peripheral neuronal barrage associated with tissue damage. Thus reducing or eliminating postoperative pain [95]. Findings in animal studies and in people, indicate that some of the acute neuroplastic responses (central sensitization) that follow tissue injury, can be prevented by aggressive early pain relief [17]. This involves the administration of pain relief before surgery to reduce central sensitization [20, 81]. The data from randomised clinical studies is not generally favourable, although a few positive studies have been reported [96]. In a number of studies, a small dose of opioids given before incision is made, prevents central sensitization. This is achieved by diminishing the sustained hyperexcitability of the central nervous system caused by intraoperative painful stimuli. Conversely, suppressing established neuronal hyperexcitability, requires very large doses [97].

A number of agents have been used for this purpose. These include nonsteroidal anti-inflammatory drugs (NSAIDs), opioids, paracetamol, ketamine, gabapentanoids and local anaesthetic agents. In one study, pre emptive analgesia showed an overall beneficial effect in selected analgesic regimens, that was most pronounced after epidural analgesia, local wound infiltration, and systemic NSAIDs administration [98]. Pre-emptive analgesia can be used as part of multimodal/balanced analgesia.

2.5.2 Patient Controlled Analgesia (PCA).

PCA represents a significant advance in postoperative pain management [26, 85]. The concept may be regarded as a closed loop system, where the patient determines the dose required to maintain adequate analgesia [26, 85]. By self administering frequent small doses of analgesic, the patient can adjust the dosage for their own pharmacokinetic and pharmacodynamic uniqueness, and thus rapidly achieve and

maintain effective plasma concentrations of opioids [26, 81, 85]. The objective is to maintain a steady state plasma concentration of the drug. For example; opioid, in the region of MEAC by establishing a feedback loop where the patient controls his own plasma drug concentration according to need [26, 44]. The principle is simple: whenever the patient pushes the button of an electronic and mechanical device, it delivers a small amount of analgesia directed into the venous or subcutaneous line. These devices are programmed according to the patients physical characteristics, to the pain intensity experienced, and to the analgesic used. Most often opioids are used. Typically, the dose (bolus) of the opioid and the shortest possible time interval between the two boluses (lock out time) will be programmed. A continuous low dose (background infusion) of analgesia can be selected to be delivered per time period [26, 85]. Theoretically, there is improved analgesia and patient satisfaction, because patients may independently titrate the analgesia to their individual level of pain [81, 99]. PCAs are now widely used in daily clinical practice, and they represent an important step towards optimised postoperative management. PCAs are highly recommended as techniques for the control of pain in the postoperative setting [26, 39, 50, 100].

The distinct advantage of PCA is the ability to alter pain relief rapidly in preparation for various daily challenges, including physiotherapy [81]. However, there are potential limitations to the use of PCA [26, 81, 85]:

1) the need for a cooperative patient, self motivated to control the pain,

2) patients and staff require regular and clear instructions, in order to meet patient expectations. This can be time consuming.

3) life threatening complications have been reported in relation to PCA and opioids.

Although the PCA, a standard form of therapy for effective management of pain is inherently safer than other forms of IV administration, it is not without potential life threatening complications. These are associated with the administration of intravenous opioids via PCA device. Respiratory depression is the most feared complication [101, 102].

Errors may occur when using PCA equipment, however it is the opioid and not the device that causes respiratory depression. This may arise due to PCA failure or deprogramming of the software that runs the infusion pump device [102].

Other possible contributing factors include misprogramming by the staff members [85], or patient tampering with the device or it may be syringe siphoning effect; where the administration set allows for backflow of opioids into the maintenance/primary administration set [103, 104].

Uncontrolled flow of solution from PCA is prevented by the presence of a mechanical motor which ensures a positive motion of fluid when PCA is in usage. However, when it is switched off, then the mechanical motor is not active, and there is no flow [103].

A further safety measure to prevent the inadvertent syringe siphoning is the incorporation of an anti-siphon valve in the administration sets which helps to prevent uncontrolled flow of opioids into the maintenance line. Within the PCA administration set, a Y connector allows a connection of the maintenance/ primary administration set. The check valve (integrated into the Y connector) ensures that the fluid with opioid from the PCA does not flow back into the maintenance or the primary administration set [103, 104].

In an effort to protect patients from a potential PCA event, a PCA end tidal carbon dioxide ($EtCO_2$) module has been incorporated in PCA pumps; which continuously monitor the patient`s $EtCO_2$ and respiratory rate [105].

The $EtCO_2$ monitoring can detect the patient's respiratory depression with respiratory monitor, enabling the nurses and clinicians to rescue patients before any respiratory complication sets in. This helps provide an added safety net for critical patients with risk factors unprotected by programming safety [104, 106].

4) The administration of the drug ceases during sleep resulting in the plasma concentration falling below MEAC and hence intermittent pain for that patient. It may take several demands to restore adequate analgesia[26].

In one study, PCA with opioids was found to be more analgesic than conventional opioid analgesia. There was evidence that there were fewer postoperative pulmonary complications and also improved patient satisfaction as compared to conventional opioid analgesia [99].

Although PCAs may seem expensive in comparison with conventional treatment using IM on request, the reduced nursing workload achieved by PCA, may offset some of the costs [28].

2.5.3 Local anaesthetics: single shot, or as a continuous infusion, or wound infiltration.

Local anaesthetics are a powerful class of analgesic drugs in the management of localized postoperative pain. They block the transmission of neural impulses through a mechanism involving membrane sodium channel blockade [42, 107]. Neurons have membrane-bound proteins that are composed of one large alpha subunit and one or two smaller beta subunits. These serve as voltage-gated sodium and potassium channels that produce membrane depolarisation following chemical, mechanical and electrical stimulation [107, 108]. Voltage-gated sodium channels exist in three states: resting, activated (open), and inactivated[109, 110]. If the depolarisation exceeds threshold level, voltage-gated sodium channels are activated, allowing a sudden influx of sodium ions, thus generating an action potential [107].

Local anaesthetics have a much greater affinity for the sodium channel, in both the activated and the inactivated state, than in the resting state [107]. They can also block calcium and potassium channels, and also N-methyl -D- aspartate (NMDA) receptors to varying degrees [111]. Local anaesthetics bind the alpha subunit, and block the voltage-gated sodium channels of the cells [77-79]. Once the channel is blocked, transmission of the impulse is stopped and hence the action of the nerve is blocked, with the resultant expected clinical effect [13]. Consequent to the increasing concentration of the local anaesthetic, neural impulse conduction slows the rate of rise. The magnitude of the action potential thus decreases, and the threshold for excitation is raised progressively. Eventually, an action potential can no longer be generated and the impulse propagation ceases [79]. Sufficient local neural membrane sodium channel blockade, inhibits propagation of the neural impulse in sensory, motor, and autonomic nerve fibres [44].

The effect of local anaesthetics on nerve fibres, varies according to the size of the nerve fibre, whether it is myelinated or not, the concentration achieved, and the duration of contact. Spinal nerve roots contain varying mixtures of nerve fibres [13]. Smaller and myelinated fibres are generally more easily blocked than larger and unmyelinated ones [112]. Depending on the concentration used, local anaesthetics can provide analgesia by selectively blocking small nociceptive fibers, or complete anaesthesia by also blocking larger sensory fibres [44]. Direct injection of local anaesthetic drugs close to peripheral nerves, major nerve terminals, or nerve roots; produces analgesia by blocking conduction of afferent inputs [44].

Experimental studies suggest that a neural afferent block applied before injury, may reduce post injury hypersensivity to pain. Recent evidence suggests that surgical trauma induces the process of central nervous system sensitisation. Thus contributing to and enhancing postoperative pain [18]. Central sensitisation is not only generated during surgery, but also postoperatively as a result of the inflammatory response by the damaged tissue. This kind of knowledge provides a rational basis for pro active, pre-emptive, and postoperative analgesic strategies. These will reduce the neuronal barrage associated with tissue damage [18, 27, 44].

For small to moderate and relatively superficial surgical procedures, infiltration of the surgical wound with a long acting local anaesthetic, produces up to 4 hours of pain relief [25, 26]. For a longer duration of analgesic effect, placement of a small catheter into the surgical wound, or near the local innervations, with a continuous infusion of dilute concentration of local anaesthetic with disposable infusion devices, is a common practice [28-30]. For example, as in continuous extra pleural block[27], or in a continuous femoral block.

This blockade of peripheral nerves can reduce pain and also allow early mobilisation [81]. This blockade may be used as a pre-emptive analgesia, which is continued intraoperatively and also in the postoperative period. Another advantage of the blockade, is a reduction in the use of opioids and their consequent side effects [81]. In some situations such as thoracic and orthopaedic surgery, the blockade has been documented to provide superior relief to other alternate techniques [27].

Limitations of these drugs include a limited duration of action, limitation in the distribution of analgesic effect, and a relatively narrow therapeutic index.

2.5.4 Epidural analgesia.

Epidural analgesia has been used for some time to provide high quality postoperative analgesia following many types of surgical procedures[113]. Epidural catheters can be inserted at various levels of the spine. One of the most important steps in obtaining successful postoperative analgesia with an epidural catheter, is to choose the correct insertion site [114]. For example, thoracic surgical procedures, T5-6 or T6-7 levels are commonly utilised to provide metameric analgesia over the thorax. For abdominal surgical procedures, T7-8 down to T10-11, levels are commonly used to provide metameric analgesia over the abdomen. This focused approach to a catheter insertion site, provides both an effective means of producing analgesia as well as motor and sensory sparing of the lower extremities. This allows the patient to ambulate without difficulty [114]. In case of lower extremity surgery, catheter insertion in the lumbar region produces effective analgesia, but often limits ambulation due to motor and sensory effects.

Common epidural solution components include local anaesthetic, opioids and adrenaline.

Local anaesthetic drugs, at low concentration cause neural blockade of A- delta and C- fibres, the pain conducting fibres, and the sympathetic fibres [44, 109, 112]. High concentrations inhibit A-alpha motor neurons.

While local anaesthetic agents can inhibit pain transmission completely, several factors limit their usage:

a) Low dose local anaesthetic alone is often inadequate for thoracic and upper abdominal procedures
b) Dense blockade for lower abdominal and lower limb procedures may lead to immobility, which is undesirable
c) Sympathetic fibre blockade leads to vasodilatation. This carries implications for postoperative fluid management, and the appearance of hypotension.

The various problems experienced with individual agents, resulted in the use of combinations of epidural local anaesthetic drugs, together with an opioid. Neuraxial administration of opioids in conjunction with local anaesthetics, improves the quality of intraoperative analgesia, decreases intraoperative discomfort, and prolongs the duration of postoperative analgesia [62, 65, 115-118]. In fact, the combinations of local anaesthetic and opioids, are the most frequently used epidural infusion solutions. These are associated with superior analgesia (with a reduced side effect profile) as compared to any drug used in isolation [1, 119]. In general, the relative amounts in combination, are often modified in order to reduce unwanted side effects and improve analgesia. A number of studies have shown synergism between spinal opioids and local anaesthetics [1, 65]. This will lead to improved preoperative pathophysiolology and a decrease in postoperative morbidity. Regional analgesia not only provides better analgesia than systemic opioids at rest, but also with movement [120]. It has been shown to be superior in providing potent and more

effective analgesia than the traditional parenteral opioids. Other advantages include hastening recovery of bowel function, (probably due to an opioid sparing effect), better respiratory function, and facilitation of physiotherapy [81, 113]. It may improve graft patency in peripheral vascular surgery, and may reduce deep vein thrombosis in the lower limbs and during pelvic surgery [81].

2.5.4 Multimodal pain management strategy.

Sufficient pain relief is a prerequisite for optimal recovery. This relief can be achieved through multimodal analgesia. It provides an effective and profound postoperative pain relief with beneficial physiologic effects on different organ systems during the postoperative period. It therefore has great potential to enhance postoperative recovery [27]. Present evidence suggests that multimodal strategy is the most important technique for the treatment of postoperative pain [48, 121]. A multimodal strategy for postoperative analgesia should begin prior to the surgical procedure, because patient preparation and education can improve postoperative outcome [44].

Postoperative pain is a major postoperative adverse outcome that causes distress to patients and also prolongs stays in hospital. The use of opioids, non-steroidal anti-inflammatory drugs or paracetamol, in isolation, does not provide effective pain relief for most moderate or severe pain [48]. In addition, these drugs are associated with side effects such as nausea and vomiting, unwanted sedation, bleeding and hepatic toxicity [122]. Therefore, sufficient pain relief that allows normal functioning, cannot be achieved after major surgery with any single analgesic without side effects or the need for surveillance [9, 121, 123].

Experimental studies indicate that several systems are involved in the modulation of pain perception [49, 65, 124]. Multimodal analgesia entails administration of analgesics

acting on these different systems to alleviate perioperative pain. Combining drugs allows reliable analgesia with low doses of each component [84]. The concept of balanced analgesia takes advantage of the added or synergistic effects of combining multiple agents. This approach allows reliable analgesia with a low dose of each component. Resulting in concomitant reduction of side effects, owing to the lower dose of the individual drugs [62]. Theoretically, balanced analgesia can be achieved by the combination of opioids (which act mainly centrally); regional blocks (which attenuate pain related signals from the nervous systems), non steroidal anti-inflammatory drugs (which act peripherally), paracetamol (which acts centrally), ketamine (which acts centrally) and an alpha 2 agonist also acting centrally.

Nonsteriodal anti-inflammatory drugs (NSAIDs) are cyclooxygenase inhibitors. Prostaglandins and thromboxanes are generated by tissue trauma and mediate nocioception by sensitization of peripheral nocioceptors in synergy with other chemical mediators. They not only produce pain in the periphery, but they also contribute to postoperative pain through an action in the central nervous system [124].

NSAIDs block the synthesis of prostaglandins by inhibition of the enzyme cyclooxygenase (Cox) [123, 125].The analgesic and hyperalgesic actions of Cox inhibitors have traditionally been attributed to inhibition of peripheral prostaglandine synthesis in inflamed tissue[126].This hyperalgesia suppressing effect is achieved by reducing the concentration of prostaglandins in the periphery and centrally (spinally), thus inhibiting the initiation of pain signals. This is caused by decreasing levels of inflammatory mediators generated at the site of tissue injury [44, 127]. There is

evidence that some Cox inhibitors do penetrate into the central nervous system (CNS), and consequently decrease central prostaglandin production in postoperative patients[126]. However, NSAIDs also have prostaglandin-independent effects in the periphery [128]. Two isoenzymes of Cox have been identified, and inhibitors of both produce opioid sparing effects in postoperative pain patients [125].

NSAIDs have several advantages over opioids: they have no hemodynamic effects, cause no respiratory depression, or slowing of gastric emptying, or small bowel transit time. Potential risks of their use, include increased bleeding, gastro intestinal damage, renal impairment, and possible interference with wound healing [124]. With short term administration in the postoperative period, and avoidance in patients with risk factors, these side effects are generally negligible. Cox 2 selective inhibitors have the same analgesic efficacy as non selective Cox drugs, but do not mediate adverse effects of inhibition of platelets aggregation. Cox 2 selective inhibitors operate by sparing physiological tissue prostaglandin production, and, whilst inhibiting inflammatory prostaglandin release, offer the potential of effective analgesia with fewer side effects than the non selective NSAIDs. However, this desired outcome has been achieved only partially [129].

The Cox 2 selective inhibitors and non selective NSAIDs have been associated, in patients with risk factors, with potential side effects such as cardiovascular events. Constitutive Cox 1 is found in most cells and platelets. It promotes platelet aggregation, thrombosis and vasoconstriction. In contrast; the inducible Cox 2 is stimulated by inflammatory cytokines and other factors in most cells, it is proinflammatory via PGE_2 and antithrombotic and vasodilatory (i.e. atheroprotective) via PGI_2 [130].

Cox 2 Inhibitors (Coxibs) were developed to promote analgesia and antiinflammatory benefits without the hemorrhagic risk, by disabling Cox 2 and conserving Cox- 1[131, 132].

Vascular homeostasis involves a balanced Cox 1 and Cox 2 activity. Cox 2 does not inhibit thromboxane A_2 synthesis, thromboxanes A_2 is a stimulant for platelets aggregation and a powerful vasoconstrictor and as a result increases the risk of thrombosis. These effects are opposed by prostacyclin which is produced largely by Cox 2 especially in vascular tissues and probably more so in diseased vessels [131]. Therefore Cox 2 inhibition without Cox 1 inhibition leads to a preservation of the synthesis of vascular thromboxanes A_2 and inhibit the production of vasodilatory prostacyclin; tipping the balance in favour of coronary vasoconstriction and thrombosis. In addition, prostacyclin feeds back negatively on synthesis of thromboxanes A_2, so that when prostacyclin synthesis is reduced by Cox 2 selective inhibition, it leads to greater production of prothrombotic thromboxanes A_2 [133].

Although the Coxibs induced anti-inflammatory effects may be beneficial in atherosclerosis progression, the prothrombotic effect of Coxibs may be harmful during plaque rupture and coronary thrombosis associated with acute coronary syndromes. This harmful effect may explain the myocardial infarction related deaths in randomized clinical trials [131]. Both non selective NSAIDS and Coxibs have been implicated in increased BP and fluid retention and rarely as a cause of heart failure [130, 134].

Patients at risk of thrombosis are those with a history of myocardial infarction, angina, coronary artery stents or risk factors such as hypertension, hyperlipidemia, smoking, diabetes and obesity. Uncontrolled inflammation found in conditions such

as Rheumatoid Arthritis is an independent risk factor for accelerated cardiovascular disease. If the patient is elderly, the risk is further increased [42, 132].

NSAIDs are inadequate as sole analgesics for severe pain. They seem to work best when utilised with other agents, particularly in pain involving movement [63, 135]. These drugs have proved valuable in the management of postoperative pain because of their opioid sparing effects and also the anti inflammatory effects [42, 54].

Intravenous paracetamol easily crosses the blood brain barrier, assuring central effects [123, 136, 137]. The mechanism of paracetamol action is unclear. Unlike opioids, paracetamol has no known endogenous high affinity binding sites and shares with NSAIDs the capacity to inhibit peripheral cyclooxygenase activity significantly [129, 137]. There is significant evidence of its central anti-nocioceptive effect, and potential mechanisms for this include inhibition of a central nervous system Cox 2, inhibition of a putative central Cox 3 that is selective for paracetamol [123, 137], and spinally modulation of inhibitory descending serotogenic pathways. This is achieved by stimulating the activity of the descending 5-HT pathways that inhibit nociceptive signal transmission in the spinal cord [137]. Intravenous paracetamol has an opioid sparing effect of 43 - 46% [122]. The biggest concern about paracetamol is the low therapeutic window, as even small amounts of over dosage can result in liver damage [42, 124]. Intravenous paracetamol has a safety advantage over the oral method by producing a more predictable plasma paracetamol concentration in the immediate postoperative period [42]. It may also aid in accurate administration of paracetamol to patients at higher risk or of over dose related to hepatotoxicity [129].

Gabapentanoids are a class of anticonvulsant drugs with hyperalgesic properties. Their mechanism of action in pain control is in the modulation of alpha 2 delta subunit of the presynaptic voltage gated – calcium channels of the neuronal cells of the brain and spinal cord [138]. This modulatory activity reduces the influx of calcium ions into the cell, in turn inhibiting the release of excitatory transmitters such as glutamate, involved in pain pathways and decreasing activation of alpha-amino-3-hydroxy-5-methyl-4-isoxazolepropionate receptors [138, 139].

These drugs seem to have a strong potential for perioperative use as analgesic adjuvants and acute hyperalgesic agents when used in conjunction with opioids and other analgesic agents [138, 140]. They can make a reasonable addition to any multimodal analgesic treatment plan [141].

In perioperative setting gabapentinoids help to produce a significant opioid sparing effect and improve analgesic efficiency of opioids both at rest and with movement [141]. In one study opioid sparing effect during the first twenty four hours after a single dose of 300 mg – 1200 mg gabapentin administered one to two hours preoperatively; ranged from 20 to 62%. There is also a reduction in opioid related adverse effects, but it is associated with an increase incidence of sedation and dizziness [140, 142].

Its many potent actions such as reducing opioid requirement; prevention and reduction of opioid tolerance; improvement of quality opioid analgesia; decrease respiratory depression; relief of anxiety and gastric sparing makes it an attractive drug to consider for control of pain in the postoperative period [140] .

Ladder of therapy for multimodal postoperative analgesia.

Multimodal strategy for management of postoperative pain may be presented in a stepwise structure[38], similar to the ladder of therapy for cancer pain developed by the World Health Organisation (WHO) [143]. Minor procedures, such as excisional biopsy, are expected to result in less postoperative pain, while larger or more extensive procedures including orthopaedic procedures, upper abdominal, or thoracic surgical procedures, generally result in more postoperative pain [42]. With regards to the type of procedures, i.e. minor or major, similar to the WHO pain ladder of therapy, treatment for each patient begins at step 1, with medication or interventions added in subsequent steps in response to increase pain intensity [42].

Step 1 includes non opioid analgesia administered in a continuous, around the clock dosing regimen, and also local anaesthetic infiltration of the surgical wound for minor surgical procedures.

Step 2 includes the addition of an opioid analgesic on an `as needed `basis for surgical procedures with moderate intensity of postoperative pain.

Step 3 includes addition of a major peripheral neural blockade, plexus blockade, and sustained-release opioid analgesic, as indicated for those patients undergoing more involved surgical procedures; or in those patients who might otherwise be expected to have a high postoperative opioid dose requirement.

Sustained-release opioid analgesics are potent pain-relieving medicines used primarily for the management of persistent moderate to severe pain requiring around the clock opioid analgesic for an extended period of time [144].

Opioid analgesics that are commonly used in sustained – release formulation are morphine, fentanyl and oxycodone [145].

These opioid tablets are specially formulated to release medication in a controlled fashion on an 8, 12 and 24 hours basis depending on the product. The tablet must be ingested whole and not crushed or chewed. Dose should not be adjusted any more frequently than once a day, every 2 to 4 days [139].

However these drugs are not suitable in the immediate post surgery period for acute pain due to slow onset (steady state is achieved at 2 to 4 days), problems with absorption in the presence of gastro-intestinal dysfunction post operatively or the immediate post operative nil per os order [145].They are however useful in the late postoperative period where opioid analgesic is required for an extended period (i.e. over 24 hrs)

The best possible pain control from a dose will be achieved once steady state is achieved, which for most commonly used opioids is after a day (within 2 – 4 days). If pain control is not achieved after twenty four hours, the routine dose can be increased by 25% to 50% for mild to moderate or 50% to 100% for severe uncontrolled pain [144].

The less frequent dosing with the preparation is likely to improve patient compliance. Although there are a variety of approaches; the medication is usually used for stable (well controlled) pain only [144].

However, with regards to the severity of pain, there are differences between palliative chronic pain and acute postoperative pain [41]. Palliative pain usually begins as mild pain and grows stronger, whereas postoperative pain is at its peak

immediately after surgery and become less severe with time. For palliative pain the start is at the bottom of the ladder upwards, adding stronger analgesics as needed. For postoperative pain, the start is at the top of the ladder downwards [38], using fewer and weaker analgesics over time until the patient has recovered and is pain free [41].

The literature supports the efficacy of balanced analgesia. In addition, there is little indication that a multimodal approach is associated with side effects greater than those resulting from single analgesic technique for perioperative pain management [146].

2.5.6 Alternative non pharmacologic therapies.

Although the accepted definition of pain includes the cognitive, emotional response to tissue damage, the role of psychological techniques in the relief of acute pain has been minimised [49]. A number of non pharmacologic therapies have been shown to reduce postoperative pain, to reduce postoperative analgesic requirement, to reduce perioperative anxiety, and to improve the patients` well-being [147]. These therapies should be considered for any patient, with interest or acceptance, as part of a component of multimodal pain management strategy. These therapies include the application of heat or cold, massage, exercise, transcutenous electrical nerve stimulation, and psychosocial support [147]. In one study, postoperative morphine requirement was reduced by 50%. In another study a 20-30% reduction in postoperative nausea was achieved with the use of preoperative intradermal acupuncture [148].

2.5.7 Peripheral opioids.

Whilst opioids are the mainstay of severe pain, they are far from perfect analgesics. Opioids have many significant adverse effects [6]. The majority of opioid side effects are associated with their action on the central nervous system [80]. Research has now focused on the peripheral effects of opioids at the site of tissue damage, with the hope of developing drugs that do not cross the blood brain barrier and activate peripheral opioids receptors only. This in turn avoids centrally mediated actions and many adverse effects [82, 129]. In the periphery, during inflammation, immunocompetent cells seem to produce opioid peptides [82]. The role of inflammatory cells in peripheral opioid analgesia is still being investigated.

Clinical studies have demonstrated that small doses of morphine applied peripherally to the site of tissue damage, can produce significant analgesia with minimal side effects. For example, intra-articular morphine gives analgesia after knee surgery in a dose dependent manner [82].

2.5.8 Introduction of APS.

For many years, more advanced techniques for the management of postoperative pain have been neglected by specialists in anaesthesiology and surgery, even though there is sufficient evidence for their superiority. The often cited reasons for failure to implement such necessary techniques, is the extensive investment required in equipment, drugs and personnel, especially in times of financial constraints on health services worldwide.

Despite improved awareness regarding the importance of postoperative pain management and advances in pain relief, many studies and surveys describe an

unacceptably high incidence of significant pain following surgery [29, 47, 57, 149-151]. Reasons for this are mostly logistical, but also include difficulties with pain assessment, and poor knowledge of pain management [35].

Recognition of this suboptimal management of postoperative pain has triggered corrective efforts in many parts of the world. These efforts include the introduction of Acute Pain Services (APS) and more modern therapeutic strategies, by anaesthetists, surgeons and other concerned pain management groups [48]. Multidisciplinary acute pain service with specific staff and resources, has been shown to provide a framework in which postoperative pain can be managed more effectively, and in which staff and patients can be provided with up to date education regarding pain and its management [21, 152]. A formal APS is an organization dedicated to the management of acute pain in surgical patients experiencing acute pain [29]. It is a relatively new innovation, which has been developed to improve the management of postoperative pain. Although a proposal for establishment of an organisation for the management of postoperative pain relief, with special attention to a team approach, was proposed more than forty years ago, it was only in the mid 1980s that the first APS were introduced. In the United States, they were introduced for the first time in 1985 [79]. The goals of developing and implementing APS were [39].

1) to improve postoperative analgesia by assuming responsibility for the day- to-day management of postoperative pain
2) to promote training in methods of postoperative pain management
3) to apply and advance new analgesic methods and ensure the safety of these methods

4) to provide an organisational framework for an appropriate level of care and monitoring, adjusted to the clinical condition of the patient and to the technique used

5) to establish programs for the identification and management of complications, through in-service training for the medical and nursing staff involved in the management of postoperative pain
6) To conduct audits and clinical research on the efficacy and outcomes of the existing methods and on the new methods of treatment.

Since 1985 a number of APS have been established in major hospitals world-wide, furthermore a provision of an APS is presently a prerequisite for the accreditation for training by the Royal College of Anaesthetists [153], and the Australian and New Zealand College of Anaesthetists [132].

Recommendations for the structure of the APS were originally oriented around a multidisciplinary approach that used medical, nursing, pharmaceutical, and psychological expertise [79]. However, in practice, the majority of these disciplines are strictly physician based, with about one quarter being multidisciplinary, and another quarter being strictly nurse based [29]. In 80% of APS surveyed, the anaesthetist headed the pain management programs, and in 94% the anaesthetist was a member of the management team [7, 70].

The introduction of APS lead to an increase in the use of specialised pain relief methods in the surgical wards. Typically, PCA and also epidural infusion of a mixture of local anaesthetics with or without an opioid [29]. Implementation of these methods may represent real advances in improving patient well-being, and also in

reducing postoperative morbidity [154]. There is evidence that such methods affect morbidity and the duration of hospital stay [61, 113, 151]. Continuous epidural analgesia with local anaesthetics, significantly improved postoperative pulmonary outcome [54] Ready *et al* were the first to highlight the favourable role of acute pain services in the postoperative care of surgical patients. These measures have been shown to be effective in improving patient wellbeing and satisfaction, and also improving surgical outcome [21, 155]. Available data indicates that implementation of APS or "APS like programs" is associated with significant decrease in patients` postoperative pain ratings [29, 116, 155, 156]. APS represents an instrument to improve pain relief in that it has introduced newer, and more superior methods to control postoperative pain.

The cost of establishing and maintaining APS is very high [39, 70], and the source funding has become a major problem in the adoption of APS by many hospitals [21]. The use of sophisticated, superb analgesic techniques is not universally available, and their use can only be justified in selected patients[39]. Previous studies have also shown that better pain relief can be attained by effective use of the existing IMI methods, rather than sophisticated techniques [70, 155]. Nurse-based anaesthetist driven pain services were introduced on the premise that analgesia can also be achieved by use of simple, non invasive techniques using analgesics that are available in every hospital and can be administered by the nurse [41]. These services help to cut down costs and to increase access of pain service to every patient after surgery. Such structures put emphasis on formal organisation, training of surgical nurses, standard regular recording of each patient`s pain intensity, and the recording of treatment efficacy on a vital signs chart [155].

Postoperative surgical outcome depends on multiple pathophysiological mechanisms. These include surgical technique, anaesthetic method, and general

postoperative care. However, adequate pain relief, is still a prerequisite for improvement in outcome [84].

Despite many advances in the provision of pain services, acute pain after surgery remains a significant cause of morbidity [51, 91, 153].

CHAPTER 3 - RESEARCH METHODOLOGY

3.1 Research Design.

The survey was a prospective cross-sectional observational study.

Prospective: only individuals giving verbal consent were included in the study. These were tracked in time, until the required data was collected.

Cross-sectional: data was collected from participants at a single given period. There were no follow-ups of participants following data collection.

Observational: the data was collected without any intention of intervening in any aspect of the management of the participants.

This research design was chosen because it provides an appropriate means of conducting a survey of the current status of postoperative pain management practices at Chris Hani Baragwanath Academic Hospital. By accurately assessing the difficulties associated with the current practice of postoperative pain management, plans and policies can be developed for future improvements in the management of postoperative pain.

3.2 Study site.

The study was conducted at Chris Hani Baragwanath Academic Hospital, in Soweto, Johannesburg. The hospital is a 2800-bed tertiary public hospital that services a predominantly black population in the low-income bracket.

3.3 Study method.

The study took the form of a standardised multiple choice questionnaire prepared for capturing and analysis by Ukwenza Studios (Statistics Company). The format of the questionnaire is adopted from a similar survey conducted in European hospitals [8] (appendix D), and adapted to our environment. The questionnaire was validated in the European study by performing six pilot interviews prior to the survey [8].

The questionnaire consisted of seven sections:

1. Background information
2. Staff training
3. Patient information
4. Postoperative pain treatment practice
5. Treatment protocols
6. Pain evaluation and follow–up
7. Personal opinion

3.4 Study Population.

The study population consisted of doctors currently responsible for the assessment and management of postoperative pain in adult patients. These were doctors at Chris Hani Baragwanath Hospital, in the surgical and intensive care departments. The targeted surgical wards represented greater than 70% of in-patients receiving postoperative analgesia.

3.5 Study period.

The study took place over a period of four months. Permission to perform the study was granted by the Hospital Chief Executive Officer. Ethical clearance was granted by the Human Research Ethical Committee of the University of the Witwatersrand.

3.6 Study sample.

The study population was all doctors in adult surgical wards at the hospital, responsible for postoperative pain management. Because of the small population size, all doctors from each of the relevant surgical departments were included as a study sample, following consultation with a biostatistician and also with the recommendation of the Postgraduate Committee. In those larger departments consisting of more than one unit, e.g. General Surgery, Gynaecology, Obstetrics, Orthopaedics; doctors from each unit were included in the study sample. Should all the doctors have participated, the anticipated sample size would have been 120 doctors.

Doctors were approached and requested to complete the questionnaire. Additionally a verbal consent was obtained from each doctor prior to participating in the survey. Only doctors who consented to take part in the survey were included. No patient information was included in the survey. The participants were given the option of completing the questionnaire on the same day (if time permitted) or complete it at a time convenient to them and submit the completed questionnaire within the study period.

3.6.1 Inclusion criteria:

Doctors were included from the following surgical wards:

Maxillo - facial surgery

Plastic surgery

Vascular surgery

Burns unit

High Care Area

Orthopaedics

General Surgery

Obstetrics

Gynaecology

3.6.2 Exclusion criteria:

The following specialities have been excluded:

a).Paediatric surgery

b).Ophthalmology

c).Neurosurgery

d).Day Case surgery

e).Ear, Nose and Throat Surgery

The Paediatric surgery and Day Case surgery were excluded because the study is on adult inpatients` wards. Ophthalmology and ENT Surgery were excluded because the extensive use of regional blocks and local infiltration for pain control and Neurosurgery is excluded because of the minimal use of opioids in the perioperative period so as not to influence the mental status of the patients.

3.7 Data collection

The questionnaire was distributed to the appropriate doctors by the investigator. The anonymously completed questionnaires were collected at a specified place, in a sealed envelope, and then returned sealed to an independent statistics company (Ukwenza Studios) for data capturing and processing.

3.8 Data analysis

Data analysis was handled by the Biostatistics Department and the accuracy of data input was performed using double entry for all collected questionnaires. These included both nominal and numerical variables. The data was analysed using Statistica 8.0(T) and output of nominal variables have been presented using frequencies and percentages.

Answers provided by the respondents to all sections of the questionnaire were compared to the minimum acceptable requirement as defined by the Steering Committee of the European study of Postoperative Analgesic Therapy Observational Study (PATHOS)[8]. (appendix E).

The analysis is descriptive, providing answers for each question.

3.9 Funding

The administrative costs, costs of printing the questionnaires, capturing and processing of data were covered by a research grant from Bristol–Myers Squibb and by the Department of Anaesthesia at Chris Hani Baragwanath Hospital

CHAPTER 4 - RESULTS

Questionnaires were distributed to 120 potential participants. These were doctors who were responsible for postoperative pain management in the surgical wards of 11 departments at Chris Hani Baragwanath Academic Hospital over a period of 4 months. 84 completed questionnaires were received, representing a response rate of 70%, and these were subjected to analysis.

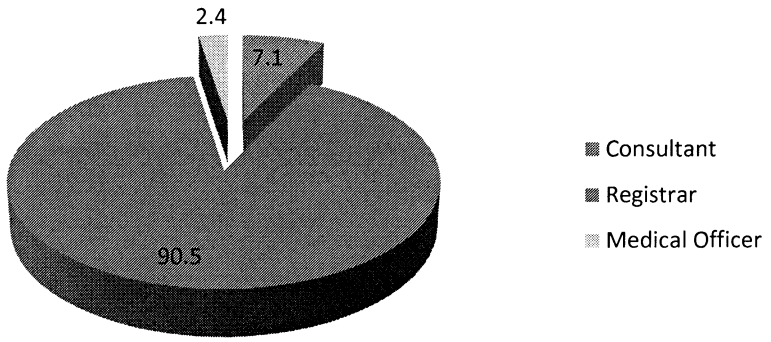


FIGURE 4.1 Percentage distribution of respondents by rank

The distribution percentage by rank of respondents, is depicted on the pie graph in *figure 4.1* above, 91% of respondents were registrars.

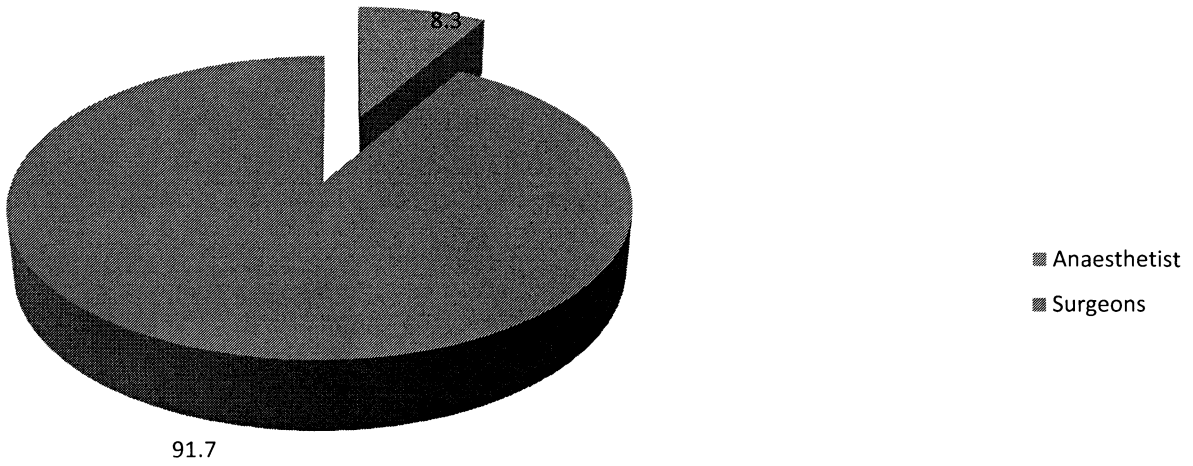


FIGURE 4.2 Percentage distribution of respondents by profession.

Ninety two percent of the respondents were surgeons. Anaesthetists being less than 10% as depicted in *figure 4.2* above.

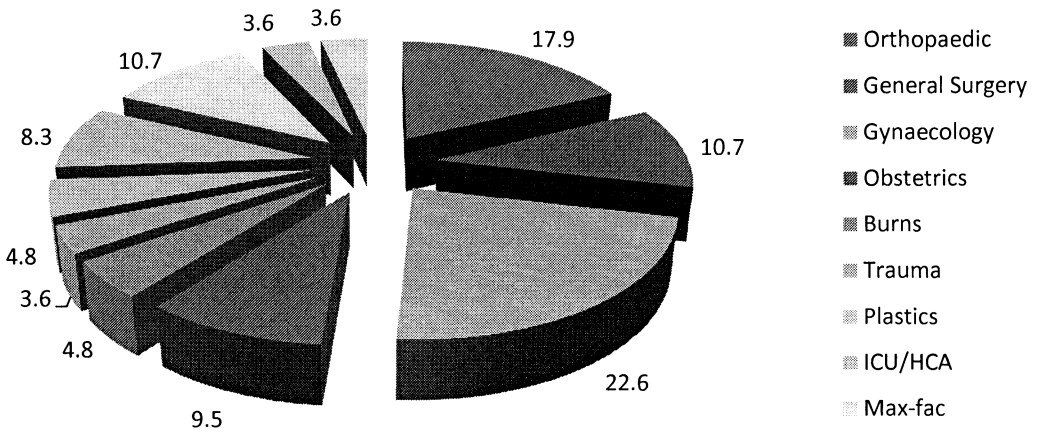


FIGURE 4.3 Percentage distribution of respondents in the surgical wards

There were 84 respondents in total. The highest number of respondents (23%) came from the gynaecology department as shown in the above *figure 4.3.*

4.0 Responses to key questions.

4.1 Personnel training. (*section 2*)

Minimal requirement defined by the Steering Committee[8]: Training should be provided to all categories, i.e. anaesthetists, surgeons, ward nurses, and recovery room nurses.

Table 4.1 Respondents` awareness of provision of postoperative pain management training for health care providers.

Category of health care providers	Level of awareness of provision of training by respondents. n = 84 (%)
No training provided	47(56.0)
Surgeons only	3 (3.8)
Anaesthetists only	15 (17.9)
Ward nurses only	7 (8.3)
Recovery room nurses only	2 (2.4)
Others (all categories)	10 (11.9)

Ninety nine percent of respondents indicated that there was no acute pain service organization, and 100% of respondents indicated that there was no specific budget provided for postoperative pain management training.

Fifty six percent of respondents indicated that there was no onsite training provided to the personnel (anaesthetists, surgeons, nurses) and 30% (18% +12%) of respondents indicated that there was onsite postoperative pain management training provided for anaesthetists (*Table 4.1).*

According to 66% of respondents, training for ward nurses was provided predominantly by surgeons and for 68% of respondents, training for recovery room sisters was provided predominantly by anaesthetists.

4.2 Patient information. (*section 3*)

Minimal requirement defined by the Steering Committee[8]: Preoperative information should be delivered systemically to all patients, either in writing or orally. All four aspects of information must be addressed i.e. therapeutic options available for postoperative management, mode of administration of analgesics, degree of pain, and pain relief expected, and pain assessment tools must be addressed.

Table 4.2 Provision of postoperative pain management information in the preoperative period. n=81%

Patient not informed	30 (37.0)
Patient informed specifically orally and or in writing	36 (44.5)
Informed systematically orally	15 (18.5)
All aspects of information provided	0 (0.0)
Less than four aspects provided	51 (63.0)

According to 37% of respondents, patients were not informed preoperatively about postoperative pain management, 44% indicated that information on postoperative pain management was provided to patients only in specific situations; only 19% indicated delivery of the information was done systematically, and no respondents provide information that addressed all four of these aspects. Surgeons were indicated by 32% of respondents as being in charge of providing postoperative pain management information to patients.

4.3 Postoperative pain treatment practices. (*section 4*)

Table 4.3(a) First-line analgesic treatment used, according to respondents during the first 24 hours in the ward for Major Surgery.

Treatment options	Types of Surgery					
	Abdominal n = 82(%)	Orthopaedic n =82(%)	Obsts/Gynae n =82(%)	Max-facial n =82(%)	Plastics n =82(%)	Burns n= 82(%)
Oral opioids	1 (1.2)	1 (1.2)	4 (4.9)	0 (0.0)	2 (2.4)	1 (1.2)
IM/SC opioids	19 (23.5)	10 (12.1)	19 (23.1)	7 (8.5)	2 (2.4)	3 (3.7)
IV opioids	6 (7.4)	1 (1.2)	5 (6.1)	2 (2.4)	3 (3.7)	1 (1.2)
PCA opioids	1 (1.2)	5 (6.1)	2 (2.4)	3 (3.7)	0 (0.0)	0 (0.0)
Oral non opioids	7 (8.6)	1 (1.2)	7 (8.5)	3 (3.7)	2 (2.4)	3 (3.7)
IM/SC non opioids	10 (12.3)	7 (8.5)	10 (12.1)	6 (7.3)	1 (1.2)	1 (1.2)
IV non opioids	None prescribed					
Intrathecal analgesia	2(2.5)	4(4.9)	3(3.7)	0 (0.0)	0 (0.0)	0 (0.0)
Epidural analgesia	3(3.7)	5(6.1)	5(6.1)	0 (0.0)	1(1.2)	1(1.2)
Peripheral nerve block	2 (2.5)	2 (2.4)	2 (2.4)	2 (2.4)	0 (0.0)	1(1.2)

IM opioids are the most popular mode of analgesia with 74% of respondents, followed by IM non opioids with 42% of respondents for major surgery. IV opioids are used to some extent in Abdominal surgery, Gynaecological surgery, Obstetrics, and Plastic surgery, most probably in the setting of HCA/ICU. IV non opioids were not used at all by the respondents. PCA opioids are used to some extent by respondents in Orthopaedics (6%) and Maxillo-facial (4%), neuraxial analgesia in Orthopaedics (11%, n= 9), Gynaecology/Obstetrics (9.8 %, n= 8).

Table 4.3(b) First-line analgesic treatment used, according to respondents during the first 24 hours in the ward for Minor surgery.

Treatment Options	Abdominal Surgery n = 82(%)	Orthopaedic Surgery n =82(%)	Gynae/Obst Surgery n= 82(%)	Max-facial Surgery n=82(%)	Plastic Surgery n= 82(%)	Burns n= 82(%)
Oral opioids	4 (4.9)	2 (2.4)	4 (4.9)	0 (0.0)	1 (1.2)	1 (1.2)
IM/SC opioids	13 (16)	9 (11)	9 (11)	6 (7.3)	1 (1.2)	1 (1.2)
IV opioids	3 (3.7)	3 (3.7)	1 (1.2)	0 (0.0)	2 (2.4)	0 (0.0)
PCA opioids	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Oral non opioids	15 (18.5)	7 (8.5)	20 (24.4)	5 (6.1)	4 (4.9)	3 (3.7)
IV non opioids	None prescribed					
IM non opioids	12 (14.8)	5 (6.1)	8 (9.8)	5 (6.1)	0 (0.0)	1 (1.2)
Intrathecal analgesia	1 (1.2)	3 (3.7)	4 (4.9)	0 (0.0)	0 (0.0)	1 (1.2)
Epidural analgesia	1 (1.2)	1(1.2)	1 (1.2)	0 (0.0)	0 (0.0)	0 (0.0)
Peripheral block	2 (2.40)	1 (1.20)	0 (0.0)	2 (2.4)	1 (1.2)	1 (1.2)

The most popular analgesic mode used was oral non opioids (67%), followed by IM/SC opioids (38%) and IM non opioids (38%). Neuraxial analgesia was used to some extent by respondents in Orthopaedics (6%), and Obstetrics (6%). IV non opioids were not used at all by the respondents.

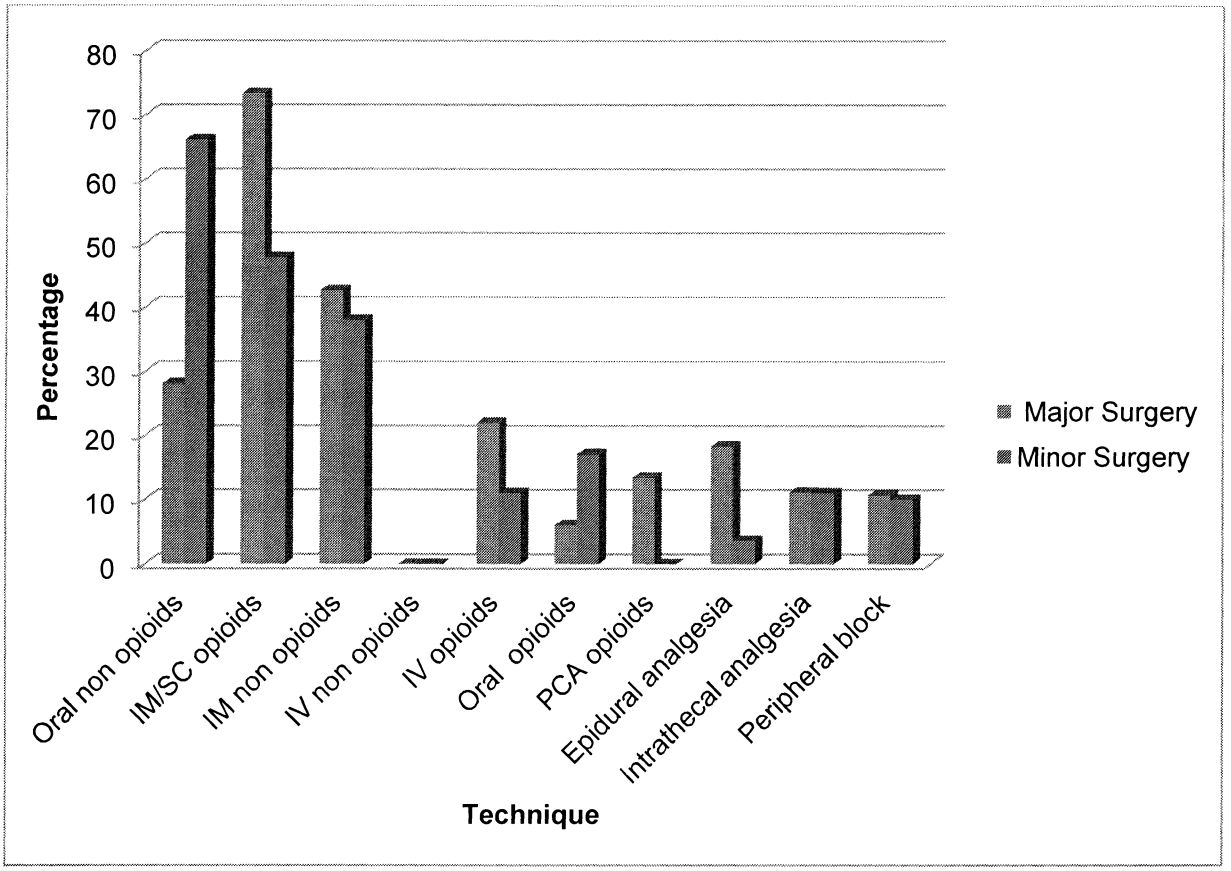


FIGURE 4.4 commonly used analgesic techniques.

For major surgery, IM opioids were the most popular mode of analgesia (74%), followed by non opioids (42%) and for minor surgery oral non opioids (67%) followed by IM non opioids (38%) and IM/SC opioids (38%). As a first line of treatment in the first 24 hrs, IV non opioids were not used at all by the respondents in the first 24 hours.

Proportion of patients on balanced analgesia

Minimal requirement defined by the Steering Committee [8]: Balanced analgesia must be used in more than 75% of patients. i.e. a combination of drugs and /or techniques should be used.

Table 4.3(c) Respondents using balanced analgesia on more than 75% of their patients.

Percentage of respondents using balanced analgesia on more than 75% of their patients.	Type of Surgery n = 83 (%)	
	Minor	Major
	22 (26.5)	34 (41.0)

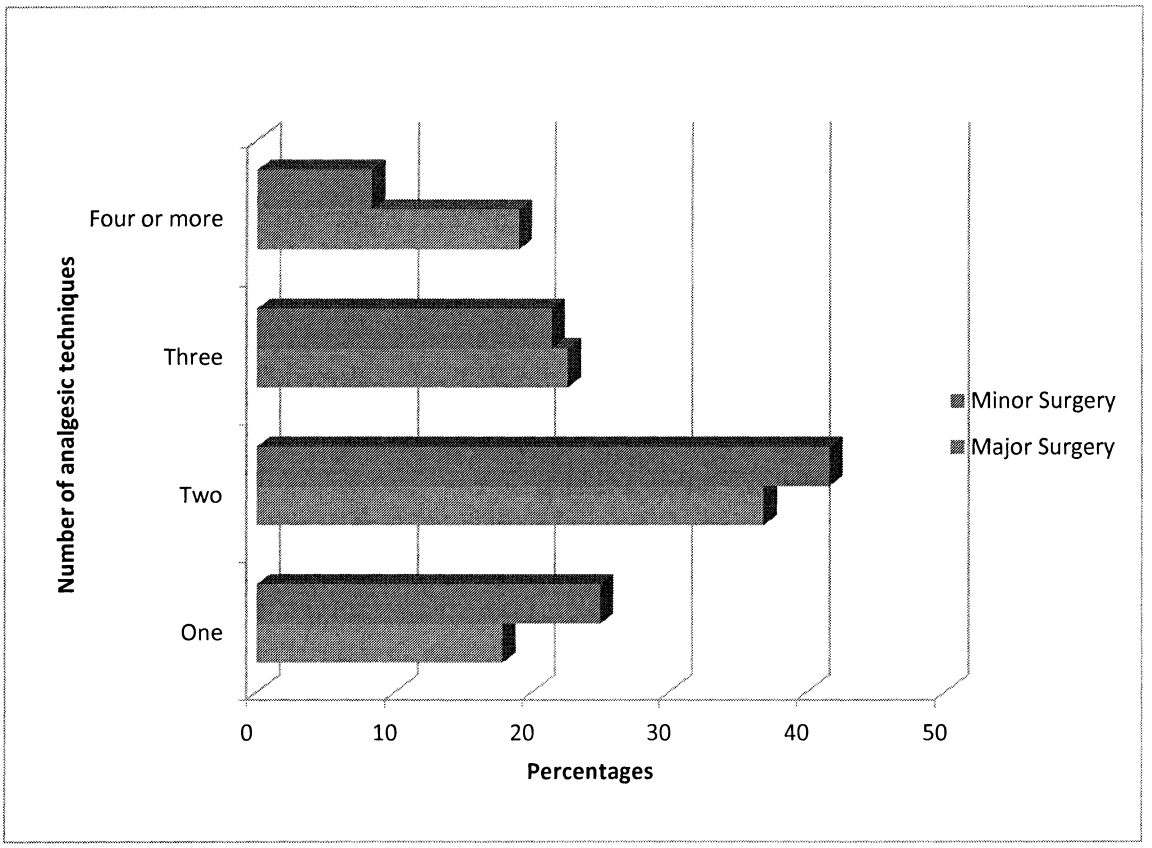


FIGURE 4.5 Percentage of respondents with patients on balanced analgesia.

Balanced analgesia was used by more than 82% respondents for major surgery, and more than 75% of respondents for minor surgery.

Forty one percent of respondents for major surgery, and 27% of respondents for minor surgery, indicated that more than 75% of their patients were on balanced analgesia

Table 4.3(d) Postoperative pain treatment practice

Prescription. n = 83 (%)	Yes	No
On transferring patient to the ward, is postoperative pain treatment continued as prescribed in the recovery room	57 (68.7)	26 (31.3)
Is the anaesthetist consulted when changes are made to postoperative pain treatment when patient is transferred from the recovery room	6 (7.1)	78 (93.0)

On transferring the patients from the recovery room to the ward, 69% of respondents continued with medication as prescribed. However, if changes were to be made, 93% of respondents, would not consult with the anaesthetist about the changes.

For 56% of respondents, postoperative pain treatment was evaluated on a regular basis in the ward, and for 44%, it was evaluated when a patient complained of pain. For 89% respondents, postoperative pain management audit was not done.

4.4 Protocols.(*section 5*)

Minimal requirement defined by the Steering Committee[8]: Written postoperative pain management protocols should be in place for all patients for treating postoperative pain in the ward.

Table 4.4 Availability and application of protocols.

Availability of written, specific protocols for management of post operative pain in the ward. n = 82(%)	
For all patients	11 (13.4)
For specific cases	7 (8.6)
No protocols	64 (78.1)
Application of written protocols in daily practice. n = 83 (%)	
No protocols	63 (75.9)
Rarely	14 (16.9)
Always	6 (7.2)

The majority of respondents (78%) reported absence of written protocols for the management postoperative pain of any patients. For 8.6% of respondents, protocols were applied only to specific patients, and for 13% respondents, protocols were applied to all patients. In departments where protocols exist, they were rarely applied

(17%), and for 90% of respondents there were no specific written critical/clinical pathways at CHBAH.

4.5 Pain evaluation and follow up. (*section 6*)

Minimal requirement defined by the Steering Committee[8]: Provide regular assessment of pain, on a fixed schedule at least once a day, at least at rest, with documentation in patient`s file. Provide threshold pain level at which rescue analgesia is mandatory.

Table 4.5(a) Pain evaluation. n=83(%)

Not assessed	33 (39,8)
VAS	3 (3.6)
VRS	18 (21.7)
VNS	4 (4.8)
Other (questioning patient, vital signs)	25 (30.1)
At rest	46 (55,4)
On movement	4 (4.8)
Fixed schedule once a day	17 (20.4)
Only when patient is complaining of pain	33 (39.3)

Pain was not assessed by 40% of the respondents and a further 39% would assess only if the patient complained of pain. Only 5% of respondents assessed pain during movement.

Table 4.5(b) Pain assessment follow up.

Pain evaluation follow up.	Not assessed	Yes	No
Documentation of postoperative pain scores in the patients chart. n = 84(%)	45 (53.6)	1(1.2)	38(45.2)
Determination of threshold at which rescue analgesia is mandatory. n = 84(%)	35 (41.7)	8(9.5)	41(48.8)
Completion of satisfaction evaluation by patient on discharge. n = 84(%)		1(1.2)	83(98.8)

Less than 2% of respondents documented postoperative pain scores in the patient`s chart, and only 10% will prescribed mandatory rescue analgesia for a determined threshold. 99% of respondents did not complete a patient satisfaction evaluation on discharge.

4.6 Personal opinion. (section 7)

4.6.1 Tools to aid postoperative pain management.

TABLE 4.6(a) Tools to aid postoperative pain management.

Tools to aid postoperative pain management. n = 83 (%)	Tools to aid dissemination of preoperative patient information		Tools to aid personnel training	
	n	(%)	n	(%)
Leaflets	63	(76.0)	39	(47.0)
Leaflets and website	10	(12.1)	11	(13.3)
CD-ROM			2	(2.4)
DVD/VIDEO	2	(2.4)	4	(4.8)
Website			2	(2.4)
Leaflets and slide	3	(3.6)		
Others	5	(6.0)	25	(30.1)

Leaflets were popular amongst respondents as tools to aid personnel training (47%) and delivery of patient information (76%).

4.6.2 Influence of postoperative pain management on outcome.

TABLE 4.6(b) Influence of postoperative pain management on outcome

Outcome measure	Level of impact.			
	High	Medium	Low	No influence
Patient comfort and satisfaction. n = 82(%)	75(91.5)	7(8.5)		
Postoperative morbidity. n = 82(%)	41(50.0)	36(44.0)	3(3.7)	2(2.4)
Postoperative mortality. n =81(%)	21(25.9)	35(43.2)	16(19.8)	9(11.1)
Length of stay. n = 81(%)	23(28.4)	49(60.5)	5(6.2)	4(4.9)
Recovery. n = 82 (%)	37(45.1)	41(50.0)	4(4.9)	
Cost. n = 81 (%)	26(32.0)	32(39.5)	19(23.5)	4(4.9)

Patient comfort and satisfaction ranked the highest (92%), followed by morbidity (50%). Mortality ranked the least (24%).

CHAPTER 5- DISCUSSION

5.1 Introduction

This chapter will be a discussion of the study results, their interpretation, the implication for clinical practice of the issues raised by the study and the possible limitations. The main finding of this study, is that inadequacies exist in the management of postoperative pain. The documented inadequacies have been confirmed in other studies [1, 6, 7, 57, 100]. Areas identified in this study that need attention include:

- disorganized postoperative pain management programs,
- limited financial support
- limited anaesthetist involvement in postoperative pain management
- inadequate in-service training for medical and nursing staff on postoperative management
- poor adherence to the major pillars of postoperative pain guidelines. These include evaluation of pain, development and use of protocols, and provision of postoperative pain management information to patients in the preoperative period.

5.2 Profile of respondents.

Data from our study indicate that the majority of respondents (91%) were registrars (*figure 4.1*), and that less than 10% of respondents were anaesthetists (*figure 4.2*),

probably in ICU/HCA settings. This underlines the point that although anaesthetists were better trained and skilled at managing postoperative pain, and were able to use highly effective analgesic techniques; their role in postoperative pain management at CHBAH remained minimal. These findings may reflect a gap in effective postoperative pain management.

5.3 Postoperative pain management organisation.

According to more than 98% of respondents, there was no postoperative pain management organization. Of greater concern, was that approximately the same percentage of respondents indicated that there was no budget provided for postoperative pain management. This suggests that postoperative pain management had to compete with other health care needs for the scarce resources. In addition, the limited resources in the public health sector often compromised the ability of nurses and doctors to provide optimal analgesia. Lack of financial resources was a major contributor to constraints that hindered effective service delivery including postoperative pain management.

5.4 Personnel training.

For 56% of respondents, there was no formal educational program provided on management of postoperative pain at CHBAH. According to 18% of respondents the principal group that receive such regular training were anaesthetists (*Table 4.1*). Although the percentage was low, it represented the highest percentage of any category of health care professionals provided with formal in-service training. This

highlights the favourable position occupied by anaesthetists in terms of skills and knowledge in postoperative pain management, especially as compared to surgeons and nurses. The specialty of anaesthesiology brings an exceptional level of interest and expertise to the team involved in postoperative pain management [7]. Consequently, they are in a unique position to provide leadership in the integration of pain management into other areas of postoperative care. They can contribute further to quality care by developing and directing perioperative analgesic programs, in collaboration with other health care providers where appropriate. However, currently their contribution to postoperative pain management in surgical wards at CHBAH is minimal. Health care providers in pain management need to see perioperative pain care as a continuum, rather than as separate entities of preoperative, intraoperative and postoperative care.

There is insufficient training in postoperative pain management provided for all health care professionals, and more so with surgeons and nurses. The lack of training provision, and financial support, to health care professionals is of concern since it highlights the low priority postoperative pain management holds in overall patient care at CHBAH.

5.5 Provision of postoperative pain management information in the preoperative period, to patients.

Thirty seven percent of respondents did not provide preoperative information to patients, and 45% provided information only in special circumstances. However, only 19% of respondents provided systematic preoperative information, predominantly verbally. None provided more than three aspects of information, and 33% of

respondents indicated that surgeons were in charge of providing postoperative pain information to patients (*table4.2*).

Although these results are consistent with results elsewhere [157, 158] they fall far short of the recommended standard set by the committee[8]. This is of concern, because the current literature survey supports the significance of preoperative provision of postoperative pain management information to patients, as part of the overall strategy for prevention of postoperative pain [100]. These factors may reduce anxiety; enhance the ability to cope, improve expectation, compliance and ability, and to effectively interact with pain management techniques. Individuals who are better informed about their surgery would be expected to exert greater control over their situation by requesting medication [25].

The low key involvement of healthcare providers in this area of practice, as demonstrated in our study, could possibly be accounted for by; the lack of knowledge about the importance of preoperative visits and patient education, the low importance attached to postoperative pain management, the constraints placed on the overburdened staff members with limited time at their disposal, or the minimal involvement of anaesthetists in postoperative pain management after theatre at CHBAH. The minimal involvement of anaesthetist is of concern because studies completed elsewhere have shown that patient-physician interaction is more satisfactory with anaesthetists than with other physicians [7]. This effect may partially explain why postoperative care is better organized overall in anaesthetist driven pain centres.

In a developing country such as South Africa, and particularly at CHBAH which serves a predominantly low socio-economic population; preoperative education or

information provision may be of prime importance. This is because these South African patients, when compared to patients in European hospitals [8], are less educated and consequently have poorer knowledge of pain and its ramifications. Furthermore, their ability to seek and access information is limited. Thus they may be more dependent on the information provided by their health care providers.

Some of the reasons commonly proposed for poor patient/provider communication with regards to postoperative pain management in our setting include:

1) lack of time available to providers because of heavy work load

2) multicultural and linguistic barriers: it is often difficult to find an interpreter in a busy ward

3) lack of accountability for adequate pain management. The responsibility of disseminating information to patients by health care providers is shared by several, and as a result no clear-cut line of responsibility exists for postoperative pain management.

Although, awareness and expectation for better postoperative pain management must be improved among surgeons, it is important to encourage anaesthetists to play a prominent role in postoperative pain management in the surgical wards.

Provision of preoperative information to patients regarding their procedures, with particular respect to pain levels and potential complications during the postoperative recovery period, may be helpful or harmful. Such preoperative preparation will be more helpful if accompanied by an intense program that includes behavioural and cognitive means of dealing with the pain and stress, and also information regarding possible reaction and expectation during the recovery period [159]. This information

may also be harmful if it is presented with a negative set of conditions, which in turn may serve to heighten patient anxiety [160].

5.6 Protocols

Currently available literature suggests that institutional protocols are helpful in providing effective and continuous pain control [49, 100]. In this study, most respondents (78%) had no written protocols for their patients. In departments where protocols existed, they are rarely applied (19%) (*table 4.4*). This was a slightly higher result than in a similar study carried out in Europe, even though it follows a trend of poor usage of protocols, illustrated in previous national surveys [8]. For 90 % of respondents there was no specific written critical/clinical pathways at CHBAH.

This is disappointing, since protocols have been associated with better postoperative results and improved safety. Development of protocols is one of the cornerstones of postoperative pain management [100]. These help to standardize clinical practice, and also reduce the risk of errors [70] particularly in a teaching and training environment such as CHBAH. These protocols also help to establish the importance of a formal and structural approach to pain management [100]. They serve as ongoing educational and information references, from which improvement in procedure can be developed and implemented.

This failure to use protocols as found in a high percentage of respondents, is a reflection of low levels of awareness of postoperative pain management at CHBAH. This state of affairs can certainly be improved by improved education of medical and nursing staff.

The probable reasons for the poor usage of protocols may be as a result of many factors as follows:

1) lack of perspective regarding the significance of protocols.

2) lack of interest exhibited by the medical staff

3) lack of appropriate authority to enforce the proper use of protocols where they exist.

5.7 Pain evaluation and follow up.

There is widespread agreement that patients frequently receive insufficient treatment for their pain [5, 57]. Many reasons for these therapeutic inadequacies have been proposed. Amongst them is failure to assess pain properly.

In this study, pain had not been assessed by 40% of respondents (*table 4.5a*), compared with 33% in a European study[8]. With 39% of respondents, patient complaints were used as indicators to assess pain (*Table 4.5a).*

The current practice of management of acute pain at CHBAH promulgates the attainment of adequate pain control on the subjective assessment of medical and nursing personnel. This approach is of concern, especially in view of the findings from the study conducted by Grossman [43]. This study indicated that patients and caregivers frequently have divergent impressions of the severity of a patient's pain, and that the different impressions are most striking in patients with substantial pain.

Effectiveness of pain treatment can be measured from pain scores and pain relief reports [43, 161], and from the use of the numeric rating scale in order to assess the degree of postoperative pain [162]. It has been shown that the treatment of postoperative pain is improved by routine assessment [5, 67, 152]. One of the reasons given for under treatment of postoperative pain, is poor routine evaluation of pain severity. Unless the response to pain therapy is regularly evaluated, there can be no basis for rational individualized therapy [100].

The importance of pain assessment has been emphasized previously [57]. However, non assessment or inadequate assessment of pain also occurs in other hospitals [8,70,133,139], albeit at a lower percentage than CHBAH.

At CHBAH, where pain is assessed, the standard tools for pain assessment are not used (*table 4.5a*). The standard use of pain assessment tools such as visual analogue scales (VAS), could provide health care givers with accurate and reproducible results with regards to patient's pain [43]. This usage would be of major benefit in the appropriate adjustment of analgesia. These VAS scales have been shown to be reliable and valid in the measurement of pain, and in the evaluation of the results of therapeutic interventions [43, 73]. At the very least, making these scores available to patients on a daily basis should facilitate dialogue between health care providers and patients. This may raise awareness among health care givers regarding the patient's pain experience, and may substantially improve management of pain in the postoperative period.

It is well documented that medical and nursing personnel tend to underestimate the amount of analgesia required to maintain pain relief [43, 47]. After the initial prescribed dose, 49% of respondents made no attempt to assess the subsequent effect, in

order to adjust the dose to provide optimum pain relief when repeated at convenient intervals. Only 10% of respondents would prescribe mandatory rescue analgesia for a determined threshold (*table 4.5b*), in contrast to 40% in the European study[8].

Consensus exist that postoperative pain treatment should allow patients to move around more easily [84]. As a result, assessment of pain only at rest, may not differentiate efficacy between different treatment modalities as this may only be confirmed when pain is assessed during function (cough, mobilization etc) compared with assessing at rest [48]. In a survey done previously on pain assessment, it was found that the incidence of moderate to severe pain was much higher during movement than at rest. This stresses the importance of measuring pain during activity as a realistic assessment of the adequacy of pain relief [21, 84]. Only 5% of respondents assessed pain during movement (*table 4.5a*). Although inadequate, this result is consistent with trends in many parts of the world [161].

Routine evaluation and documentation encourages care givers to continually re-evaluate pain treatment, and to promptly respond to inadequate therapy [100]. In this study, only 1% of respondents documented pain scores in patient charts (*table 4.5b).* This is potentially a serious omission both legally and professionally. Accurate and frequent documentation of responses to postoperative pain therapy is the key to successful pain management. Without completely documented information, postoperative pain management can neither be well formulated nor formalized. In studies done in Europe [8] less than half of respondents documented their clinical assessments in patients files. This is consistent with data from other studies [73, 157, 163]. However, compared to this study, the figure may seem exceptionally high. In an under resourced environment, available time may be perceived by some health care providers as inadequate for documentation, nevertheless they need to appreciate

the inherent value in "planning for patient care" when documented assessments are available. For effective pain management, more education will be necessary in order to convince health care providers to complete and document assessments.

Evaluation of patient satisfaction with postoperative pain management at discharge, is also important, since it gives insight into the assessment of postoperative pain and the effectiveness of pain control from the patient perspective. This evaluation may also measure the success of patient education. The American Pain Society additionally emphasizes the need to assess outcome variables including, patient satisfaction with staff response, and also reporting pain and achieved satisfaction with relief of pain [164].

According to this study, CHBAH falls short of the set standard. This is because only 1.2% of respondents indicated that they make provision for completion of a patient satisfaction evaluation on discharge (*Table 4.5b*). This is not entirely surprising, as indicated previously, the majority of respondents do not assess their patients routinely.

5.8 Postoperative pain management practices.

Both epidural analgesia and peripheral continuous nerve blocks are acknowledged as providing the highest quality of pain relief [161, 165]. Epidural analgesia is also known to facilitate postoperative recovery [113]. There is evidence that continuous epidural local anaesthetic, or local anaesthetic opioid mixtures, provide a reduction in postoperative pulmonary morbidity in major abdominal and thoracic procedures [52, 66, 101]. They are most effective in providing dynamic pain relief after major surgery [1, 48,

[62, 118, 166]. Dynamic pain control potentially allows patients to participate in postoperative rehabilitation. This may facilitate recovery and improve patient outcome [84, 119].

At CHBAH epidural analgesia for abdominal surgery, and peripheral nerve blocks for orthopaedic procedures, are done on a regular bases. However, only patients who have confirmed HCA/ICU beds will benefit from the continued use of these analgesic techniques in the postoperative period. All other patients will have these analgesic techniques discontinued before they leave the recovery room. This is because of the nonexistent monitoring facilities and the nursing staff that is not appropriately trained to look after patients with such specific needs. High vigilance in the wards would be required, thus depriving the majority of surgical patients the benefit of these techniques. There is, however, evidence demonstrating that continuous epidural balanced analgesia is safe following major surgery, when provided in the surgical ward under the supervision of an acute pain service team [113]. An acute pain service team will need to identify patients to be treated safely with advanced analgesic techniques in the normal wards from those requiring a high dependency unit. This entails training nursing staff, who look after patients in the postoperative period, appropriately in all aspects of postoperative pain management. The presence of an organised pain service allows more patients with epidural to be care for in surgical wards and absence of this organisation puts extra burden on high dependency units [151].

It is not surprising then that a low percentage of respondents *(Table 4.3a,4.3b and figure 4.4*) have indicated the use of these techniques, which compares favourably with findings in Spain where no epidural analgesic technique was used [5]. However, this contradicts findings of other studies in other institutions demonstrating a large

usage of epidural analgesic technique [67, 152, 157]. In these institutions, there is an active involvement of anaesthetists in postoperative pain management teams. They initiate these analgesic techniques in the operation theatre or recovery rooms, and continue using them in the surgical wards for 24-48 hours depending on the type of surgery.

To improve the participation of anaesthetist in postoperative pain management, organizational changes of the present system may need to change. As part of their specialist training, registrars in anaesthesia at this institution are expected to carry out postoperative visits to patients who had complex procedures done or had regional blocks as part of their analgesia or had a difficult anaesthetic. This can be formalised, and with nursing staff that is appropriately trained in postoperative pain management in the ward, morning and afternoon rounds can be implemented. An anaesthetist should be available at all times as a consulting service to ward nurses and surgeons, and to assist in evaluating patients who are experiencing problems with any aspect of postoperative pain management, which the ward staff is not able handle. Appropriately trained nurses should play a major role in the management of postoperative pain.

PCA pumps were used by 13% of respondents (*Table 4.3a and figure 4.4*). Although this is consistent with a study done in Spain, where PCA was used in 2% of patients [5], it contrasts with a high percentage of usage in other European surgical wards where nearly a third of patients used PCA after major surgery [8]. The underutilization of PCA pumps is a reflection of the low level of involvement of anaesthetists in postoperative pain management. At CHBAH, lack of monitoring facilities and overburdened nursing staff in the surgical wards also contribute. My experience with PCA pumps in the surgical wards at CHBAH is that if anaesthetists fail to carry out

regular visits to supervise the PCA pump use and attend to pump related problems, surgeons and nurses will discontinue the pump at the slightest adverse event occurring to the patient even if the event is unrelated to the delivery system.

In this study *(Table 4.3a and figure 4.4*), intramuscular administration of opioids was the most commonly used analgesic technique (73%) in the first 24hrs after major surgery. Although this is consistent with studies elsewhere [70, 100, 115] it is contrary to findings in European hospitals where intravenous PCA and epidural analgesic techniques were commonly used. This is despite the complexity involved in the set up and monitoring of these techniques [8]. It is also contrary to findings in Spain, where intravenous non opioids are preferred [5]. In the case of epidurals, this may reflect a high level of skill possessed by the personnel involved in postoperative pain management in Europe which is predominantly anaesthetist-driven compared to the surgeon-driven management in our study. It may also suggest the existence of an organized pain service, which is lacking at CHBAH.

The greater use of intramuscular injection in the surgical wards is probably due to convenience, simplicity and familiarity with its use. This carries a degree of inherent safety. The gradual onset of analgesia allows observation of gradual onset of possible overdose. The poor results of intramuscular injection use, as required (prn), as an analgesic technique, are well documented [6, 37, 47, 167]. Comparing epidural, PCA and intramuscular injection as analgesic techniques; the intramuscular injection technique was found to be the least effective [70, 161]. However, other studies have found that if strict criteria for administration of intramuscular injection are adhered to, it can be an effective analgesic technique [26, 155, 161, 168].

In a number of studies as part of multimodal analgesia, intravenous injection of non opioids is used as part of first line treatment during the first 24 hrs after major surgery [5, 165]. However, this is not the case in this study (*figure 4.4*), because of the non availability of these drugs, in the surgical wards at CHBAH, due to cost considerations. In the future, this could change as the cost of these intravenous injections decline and their availability in the surgical wards consequently increases.

Previous studies have emphasized that sufficient pain relief cannot be achieved after major surgery with any single analgesic without side effects or the need for surveillance [62, 121, 135]. Recent studies regard multimodal pain therapy as the most important technique for the treatment of postoperative pain [50, 100, 135]. Pain relief is achieved through additive or synergistic effects using different drugs with different side effect profiles. This allows the use of a lower dose of individual drugs with a concomitant reduction of side effects [9, 62]. In addition, literature suggests that the side effects of multimodal approaches are no greater than those resulting from single analgesic techniques for postoperative pain management [9, 100].

It is reassuring therefore to note that 41% of respondents from our study had most of their patients (>75%) on balanced analgesia (*table 4.3c*) for major surgery. Even though this figure falls below the set minimum acceptable level, it is still in line with trends in the western world. Infact less than 18% for major surgery and less than 25% for minor surgery of respondents still used a single drug in the management of postoperative pain (*figure 4.5*). These results are an indication that the value of multimodal analgesia as a technique is beginning to be taken seriously by those involved in postoperative pain management.

In CHBAH, most of the postoperative pain prescribing is performed by surgeons. This is contrary to practice in other parts of the world, where it is done by anaesthetists in the first 24 to 48 hours. It is not surprising therefore that most of the prescribed analgesia is continued from the recovery room to the surgical wards in 100% of respondents and that if changes were to be made to the prescription, 93% of respondents saw no need to consult an anaesthetist *(Table 4.3d).*

5.9 Possible limitations to the study

5.9.1 Data collection:

This sample was limited by the number of surgical units/specialties available at CHBAH. Not all doctors involved in postoperative pain management were targeted; only those fulfilling the inclusion criteria were approached and these represent 80% of doctors responsible for postoperative pain management at CHBAH.

All respondents gave a verbal consent. However, voluntary participation by doctors meant that not all doctors involved in postoperative pain management could be accounted for.

The majority of respondents who completed the questionnaire were registrars. The registrars may have a less optimistic view regarding the current postoperative pain management practices than consultants or heads of respective units, and therefore accurate representation of the consultants cannot be assumed.

In this study, the focus has been on surgeons as respondents since they were identified as the doctors most responsible for perioperative pain management. Independent confirmation of the study`s findings by the surgeons would be desirable.

5.9.2 Data analysis:

The minimum standards against which our results are compared are based on the standards set for European hospitals. These hospitals are better resourced than our hospital. However, adherence to internationally recognized best medical practice and safety, by CHBAH, affords comparison with hospitals of any country or region, and therefore gives an indication of how well CHBAH compares with the rest of the world.

5.9.3 Weightings:

Each respondent in the study has been given the same weighting irrespective of the number of patients in their charge, or the size of the unit /specialty they function in.

5.9.4 Contextuality:

This study was conducted at CHBAH (Johannesburg, South Africa), a large tertiary hospital serving a large population of predominantly low income black patients from Soweto and surrounding areas in Johannesburg. The clinical environment is not necessarily typical of other settings in South Africa. Neither is it typical of resource limited hospitals where postoperative pain management care is delivered. It does not reflect practices of other health care facilities, and therefore the results may not be applicable to other population groups. Additionally, these results do not necessarily provide any insight into postoperative pain management strategies in other institutions, even those that are smaller or more efficient than CHBAH.

CHAPTER 6- CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

The results from this survey highlight deficiencies that exist in the management of postoperative pain despite the availability of sophisticated systems of drug delivery at the hospital. The inadequacies are universal, encompassing all aspects of postoperative pain management. Major contributors to these inadequacies are financial constraints and lack of commitment to the full utilization of the available resources and skills. The knowledge and skills possessed by anaesthetists is grossly underutilised.

6.2 Conclusions

This survey was designed to obtain comprehensive information on institutional procedures and practice patterns on postoperative pain management at CHBAH. It was influenced by a survey carried out in European hospitals, and also by the 1995 ASA guidelines which contain widely endorsed recommendations. These include individualised preoperative planning of pain control options, education of all staff involved in postoperative pain management, assessment and documentation of pain intensity and the effectiveness of pain control, and also the use of multimodal analgesia. The current status of postoperative pain management at CHBAH is inadequate, and the findings from this survey are consistent with previous reports from surveys undertaken elsewhere [1, 6, 7, 57, 70, 100]. They provide the current understanding of the potential challenges that CHBAH still faces in adequately

managing postoperative pain. Recommendations for improvement are contained in a joint report from an international College of Surgeons and the then College of Anaesthetists [151,170]. A key recommendation from this report was the development of multidisciplinary acute pain services in all hospitals undertaking acute surgery. In the past, these services utilising specific staff and resources, have been shown to provide a framework in which postoperative pain can be managed more effectively. Staff and patients can be provided with up to date education regarding pain and its management. At CHBAH, the budgetary constraints make such a comprehensive, multidisciplinary postoperative pain control team unrealistic. The cost of such a service is astronomical. Sophisticated analgesic techniques such as an epidural and patient controlled analgesia may be unnecessary for the majority of patients. In most centres with an Acute Pain Service, only about 25% of all patients undergoing surgery will need these techniques [17, 39].

Postoperative pain continues to be a huge burden at CHBAH even though there are numerous simple methods of monitoring and recording postoperative pain. The high number of patients, and consequent overloaded surgical wards, the lack of facilities and limited nursing staff (who are often the sole providers of postoperative analgesia in the surgical wards) has inevitably lead to a standardized provision of postoperative analgesia. This is often inadequate for many patients.

6.3 Recommendations

The findings of this survey highlight the urgent need to implement cost effective strategies targeting medical and nursing staff, to implement simple measures such

as those recommended in well publicised guidelines on postoperative pain management, and to improve postoperative pain management delivery at CHBAH.

The findings suggest that improvement in the quality of postoperative pain management will require the following:

1) Re-education of doctors and nursing staff to change current attitudes with emphasis on greater awareness of the importance of managing postoperative pain. This may include provision of in-service training for medical and nursing staff, regular recording of pain intensity and treatment efficacy, optimal use of systemic opioids (including the use of PCA), peripheral acting analgesia, and regional analgesia techniques in appropriate patients. This must be concurrent with development and implementation of protocols and regular auditing processes.
2) Active involvement by anaesthetists in reorganizing the pain service. At CHBAH most patients are competing for the limited beds in the HCA. Patients are sent from theatre to the surgical wards which are greatly under resourced in terms of nursing personnel. For the majority of surgical patients who receive inadequate postoperative pain treatment in the surgical wards, reorganizing the pain service should include the establishment of acute pain management programs using the existing resources without requiring large expenditure. This is based predominantly on the premise that postoperative pain relief is improved by provision of education for the medical and nursing staff, correct pain assessment procedures, a more rational use of traditional methods of analgesia, and aggressive patient education. CHBAH is currently using a wide range of modern analgesia modalities without the benefit of a formalized pain service.

3) The involvement of appropriately trained nursing staff is essential, particularly emphasising that routine pain scoring is as important as recording vital signs. The use of pain charts by the nurses as part of the general routine clinical assessment of patients` vital signs (e.g. blood pressure, temperature), should raise awareness and therefore improve pain control [5].

4) The involvement of surgeons is important, since the formal responsibility of treating surgical patients in wards rests with them. Without the active support of ward nurses and surgeons, acute pain management will not be optimal.

5) In the early postoperative period, most patients continue to receive intramuscular or subcutaneous injection opioids because of the reasons stated previously. However, the introduction of simple procedure specific protocols (as recommended by Prospect [169]), flow charts and or stepladder algorithms on postoperative analgesia, a greater degree of flexibility in the administration of opioids with simple equipment such as a disposable PCA; would lead to considerable improvement in acute pain therapy at an affordable cost. A number of studies have shown that the effectiveness of opioid analgesia is improved by regular around the clock dosing to prevent recurrent severe pain [41, 69], especially,in the early postoperative period. The condition of patients after surgery is frequently dynamic, and analgesia needs may change at any time.

Recommended changes in the Department of Anaesthesia at CHBAH.

1. All these recommendations will require a dedicated 24-hour anaesthetic service. This service in collaboration with other appropriate healthcare providers, should be available at all times as a consulting service to ward nurses and surgeons, and to assist in evaluating patients who are experiencing problems with any aspect of postoperative pain management. This anaesthetic service should take over the prescription of pain medication in the first 24 hours, and also enforce a system of regular assessment of pain severity and the effectiveness of medication. This must include the use of rescue analgesia where appropriate.
2. There is a need for an acute pain team which can identify any group of patients needing to be treated safely with advanced analgesic techniques in the normal wards, and also those requiring a high dependency unit.
3. A dedication of essential resources to pain control will be needed to improve postoperative pain management. In collaboration with the existing high dependency unit, capital outlay may be required to establish a post anaesthesia care unit (PACU) driven by anaesthetists in collaboration with nurses, surgeons and others interested in postoperative pain management. This PACU would concentrate on the provision of care for patients where, the highly effective analgesic techniques such as "continuous epidural' and "nerve blocks" can be used and monitored for the selected patients in the first 24 to 48 hours.
4. For the majority of anaesthetists at the hospital (except in HCA/ICU), their involvement rarely extends beyond the operating theatre. They would be encouraged, as perioperative physicians, to follow-up their patients beyond

the operating room to the wards. In 1964, Egbert suggested that postoperative pain management could be improved if clinicians, and in particular anaesthetists, took greater interest in acute pain management: "……*if an anaesthetist considers himself a doctor who alleviates pain associated with operations he must realize that only part of his work is in the operating rooms; the patients need ward care by their anaesthetist as well* »(138).

The most immediate solution to our problems of postoperative pain management may lie in the development of an organization to exploit the existing expertise.

This survey recognizes the complexity of postoperative pain management delivery. It also provides an opportunity to re-organize the provision of pain service, to establish clear structure of responsibility for acute postoperative pain treatment, and to optimize patient care. In addition, it offers the opportunity to develop quality improvement systems for the patient in the postoperative period.

Anaesthetists, supported by surgeons and nurses, have a critical role to play in addressing these problems and in ensuring that quality care at CHBAH is regularly reviewed and addressed. Innovations such as the audit process are valuable because they engage stake holders in quality improvement processes, they generate local data for problem analysis, and they lead to local managerial action. Hospital administration needs to be made aware of the problems relating to postoperative pain management, since this may well lead to the dedication of the necessary resources needed to improve postoperative pain management in the hospital.

The findings of this study provide a current understanding of the potential challenges we are facing in adequately managing pain. They also help to identify areas requiring increased professional awareness, and to serve as basis to measure effectiveness of further development in relief of acute pain. In addition they also act as a reference for the future evaluation of interventional measures aimed at improving the management of postoperative pain. A re-audit is suggested once the recommendations have been implemented, as part of a postoperative quality improvement mandate.

It is hoped that these recommendations have the potential to remove some of the obstacles to optimal management of postoperative pain at CHBAH, enabling patients to have a more comfortable and pain free recovery from surgery.

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APPENDIX A Ethics Approval Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Mashinini

CLEARANCE CERTIFICATE	PROTOCOL NUMBER M070360
PROJECT	CH Baragwanath Postoperative Analgesic Therapy Observational Survey
INVESTIGATOR	Dr MMA Mashinini
DEPARTMENT	Department Anaesthetics
DATE CONSIDERED	07.03.30
DECISION OF THE COMMITTEE*	Approved subject to introducing

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 07.04.03 CHAIRPERSON .....
(Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Prof C Lundgren

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we 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 B Post- Graduate Committee Approval

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
31 March 2010
Person No: 8336824
PAG

Dr MMA Mashinini
Box 2102
Florida
1710
Florida, South Africa

Dear Dr Mashinini

Master of Medicine (in the specialty Anaesthesia): Approval of Title

We have pleasure in advising that your proposal entitled "*Chris Hani Baragwanath Postoperative analgesic therapy observational surgery*" 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 C Permission from the Hospital CEO

From: Arthur Manning [mailto: amanning@mweb.co.za]
Sent: 28 May 2007 04:17 PM
To: Chris Lundgren
Cc: Billa, Raymond R. (GPHEALTH)
Subject: Re: Letter to CEO

No problem in principle. I prefer reading the full research proposal and seeing the ethics approval.

----- Original Message -----

From: Chris Lundgren

To: amanning@mweb.co.za

Cc: Billa, Raymond R. (GPHEALTH) ; lines@pixie.co.za

Sent: Monday, May 28, 2007 8:55 AM

Subject: FW: Letter to CEO

Hi Arthur,

Could we please have your "blessing" on this one?

Regards

Chris

Prof Christina Lundgren

Chief Specialist and Head

Dept of Anaesthesia

Chris Hani Baragwanath Hospital

4402

Chris Hani

Baragwanath Postoperative Analgesic Therapy Observational Survey

Awareness of the importance of postoperative pain management is increasing daily. In order to update and complement the knowledge of current postoperative pain management practices and to identify the needs for improvement, we are conducting an anonymous survey.

This survey (Chris Hani Baragwanath Postoperative Analgesic Therapy Observational Survey, CHB-PATHOS) aims to identify the needs and potential areas for the improvement of postoperative pain management, focusing on the surgical wards. Results from this survey will provide a platform on which to build educational programs and tools.

Thank you in advance for your time in completing this questionnaire. We look forward to providing you with the results.

INSTRUCTIONS FOR COMPLETING THE QUESTIONNAIRE

1. The questionnaire will take approximately 15 minutes to complete.
2. Please answer all questions. If a subject is not applicable to your department, please check the box which indicates that it does not apply.
3. Please relate all questions to the general daily practices within the department where you are currently receiving this questionnaire.
4. Please keep in mind to answer all questions on behalf of the department even if the question relates to an activity that you do not necessarily perform yourself.
5. Please seal your completed anonymous questionnaire in the envelope provided.

4402

CHB-PATHOS Survey

Questionnaire

SURVEY OBJECTIVE:

Analyze current practices for the management of postoperative pain on the wards to identify areas needing improvement.

SECTION 1 - General background information*

*For this entire section, please refer to the place where you are presently completing this questionnaire.

1. Profession and post (e.g. Gynaecology registrar, Orthopaedic consultant)

2. Number of beds in the surgical ward(s) you are working with: *(please check all that apply)*

Surgical Ward(s)	Number of beds in the surgical ward(s):
Orthopaedic	☐ Beds
General	☐ Beds
Gynaecology	☐ Beds
Obstetrics	☐ Beds
Trauma	☐ Beds
Maxillo-facial	☐ Beds
Urology	☐ Beds
Plastic Surgery	☐ Beds
Vascular	☐ Beds
Burns	☐ Beds
Intensive Care Unit	☐ Beds

3. Is there an organization for postoperative pain management in your institution?

O Yes, Acute Pain Service (APS*)

O Yes, other kind of organization

O No

*An APS is a department or service with designated responsibilities and personnel, and a regular ward round dedicated to providing and monitoring postoperative analgesia.

SECTION 3 - Patient information

7. Are patients informed preoperatively about postoperative pain management in your institution?

- O Yes, systematically
  - ☐ in writing ☐ orally
- O Yes, if specific / difficult case
  - ☐ in writing ☐ orally
- O No

8. Who is in charge of informing patients about postoperative pain management? (please check all that apply)

- O Anaesthetists
- O Surgeons
- O Recovery room nurses
- O Nurses
- O Other
- O Patients not informed

9. Which of the following information is provided to patients regarding postoperative pain management? (please check all that apply)

- O Degree of pain and pain relief expected
- O Consequences of poorly controlled or untreated pain
- O How pain will be assessed and which tools will be used to assess pain (VAS, VRS, etc.)
- O Therapeutic options available for postoperative pain management
- O Adverse event profiles of different postoperative pain treatment options available
- O Mode of administration of analgesics
- O Patients not informed

Section 4 – Postoperative Treatment Practice

10. For the following situations after major surgery, what is the most common first-line analgesic regimen used during the first 24 hours on the ward(s) that you work with? (please check all that apply)

Analgesia	Major Abdominal Surgery (e.g colectomy)	Major Orthopedic, Plastic or Peripheral Vascular Surgery	Major Gynaecological Surgery (e.g. abdominal hysterectomy)	Major Maxillo – facial Surgery
Oral non - opioids				
Oral opioids				
IM/SC opioids				
IM non -opioids				
IV non - opioids				
IV opioids				
*PCA opioids				
Spinal anaesthesia				
Epidural analgesia				
Peripheral block				

*Patient Controlled Analgesia

11. For the following situations after minor surgery, what is the most common first-line analgesic regimen used during the first 24 hours on the ward(s) that you work with? (please check all that apply)

Analgesia	Minor Abdominal Surgery	Minor Orthopedic, Plastic or Peripheral Vascular Surgery	Minor Gynaecological Surgery	Minor Maxillo – facial Surgery
Oral non - opioids				
Oral opioids				
IM/SC opioids				
IM non -opioids				
IV non - opioids				
IV opioids				
*PCA opioids				
Spinal anaesthesia				
Epidural analgesia				
Peripheral block				

*Patient Controlled Analgesia

12. During the first 24 hours on the ward, in approximately what percentage of patients is balanced analgesia* usually used to manage postoperative pain?

Minor Surgery

- ○ 0 – 25 %
- ○ 26 – 50 %
- ○ 51 – 75 %
- ○ 76 – 100 %

Major Surgery

- ○ 0 – 25 %
- ○ 26 – 50 %
- ○ 51 – 75 %
- ○ 76 – 100 %

*Defined as combining at least 2 analgesic regardless of route of administration

13. When the patient is transferred to the ward:

13.1 Is the postoperative pain treatment continued as prescribed in the recovery room?

- O Yes
- O No

13.2 In general, if changes are made to the patients' treatment on the ward, is an anaesthetist or APS member consulted?

- O Yes
- O No

14. How is postoperative pain treated on the ward? (please check only one box)

- O On a regular basis
- O Only when the patient complains of pain

15. How often is the management of postoperative pain audited in your institution?

- O Every 6 months
- O Annually
- O Every 2 years
- O Other
- O Not audited

SECTION 5 - Protocols

16. Are there specific written postoperative pain management protocols in place for treating postoperative pain on the ward?

- O Yes, for all patients
- O Yes, for the following cases: (please check all that apply)
  - ☐ Patients with regional or central nerve blocks
  - ☐ Patients with special systemic strategies of analgesia such as PCA
  - ☐ Patients with specific types of surgery
  - ☐ Patients suffering from pain above a defined level
  - ☐ Patients with certain risk factors/medical history
  - ☐ Other _____
  - ☐ No written protocols

17. Are written protocols applied in daily practice?

- O Always
- O Often
- O Rarely
- O Never
- O No written protocols

18. Who created written protocols for use in the ward(s)? (please check all that apply)

- O National Society or Association
- O Hospital Multidisciplinary Committee or APS
- O Anaesthetists
- O Surgeons
- O Other _____
- O No written protocols

19. Are there specific written critical/clinical pathways* which include postoperative pain management in your institution?

- O Yes
- O No

* Critical or clinical pathways are defined as predetermined orders by pathology which include all aspects of treatment from admission to discharge, designed to improve patient care and limit the length of hospitalization after surgery.

SECTION 6 - Pain evaluation and follow-up

20. Which of the following is the most commonly used method to assess postoperative pain on the surgical ward(s)? (please check only one box)

O Visual Analogue Scale (VAS)

O Verbal Rating Scale (VRS)

O Verbal Numeric Scale (VNS)

O Other

O Pain is not assessed

21. How often following the surgical procedure is pain assessed on the surgical ward(s)? (please check only one box)

O On a fixed schedule, 1 to 2 times/day

O On a fixed schedule, 3 to 4 times/day

O Only when the patient complains of pain

O Other

O Pain is not assessed

22. Is postoperative pain routinely measured: (please check all that apply)

O At rest?

O On movement?

O Pain is not assessed

23. Are postoperative pain scores/measurements documented in the patient's chart?

O Yes

O No

O Pain is not assessed

24. Is there a threshold pain level at which rescue analgesia is mandatory?

O Yes

O No

O Pain is not assessed

25. Do patients complete an evaluation of their satisfaction with the postoperative pain management received at the end of their treatment?

O Yes

O No

SECTION 7 - Personal opinion

26. If tools were given to aid your institution in the following areas, which type of material do you think would be most appropriate?

26.1 Personnel training: (please check all that apply)

- ☐ Leaflets/booklets
- ☐ Slide sets
- ☐ CD-ROM
- ☐ DVD/Video
- ☐ Website

26.2 Patient information: (please check all that apply)

- ☐ Leaflets/booklets
- ☐ Slide sets
- ☐ CD-ROM
- ☐ DVD/Video
- ☐ Website

26.3 Protocol management: (please check all that apply)

- ☐ Guidelines / templates for establishing your own protocols within your institution

Protocols pre-fabricated by your peers based on the following criteria (please check all that apply):

- ☐ Type of surgery
- ☐ Expected level of pain after surgery
- ☐ Anaesthetic procedures (i.e., loco-regional or general anaesthesia)
- ☐ Other [ ]

27. For you personally, what is the influence of proper postoperative pain management on the following outcomes?

Outcomes	High Influence	Medium Influence	Low Influence	No Influence
Patient comfort and satisfaction				
Postoperative morbidity				
Postoperative mortality				
Length of stay				
Recovery time				
Cost				

CHRIS HANI BARAGWANATH POSTOPERATIVE ANALGESIC THERAPY OBSERVATIONAL SURVEY

Supported by a grant from Bristol-Myers Squibb

Appendix E Minimum acceptable requirements as recommended by the steering committee of the European study survey (PATHOS)

1. Personnel Training

Regular onsite training on postoperative pain management, for all categories should be provided i.e. for surgeons, anaesthetists, ward nurses and recovery room nurses

2. Patient Information

Preoperative patient information about postoperative pain should be delivered systematically to all patients, either in writing or orally addressing the following aspects:

- Therapeutic options available for post operative pain management.
- Mode of administration of analgesics.
- Degree of pain and pain relief expected
- Pain assessment tools

3. Postoperative Treatment Practice

- Combination of drug and or techniques for minor and major surgery.
- Greater than 75% of patients should have balanced analgesia for minor and major surgery
- Postoperative pain treatment prescribed in recovery room/ theatre to be continued.
- Changes of postoperative treatment when patient is transferred, to be done only after consultation with the prescribing doctor.
- Postoperative treatment to be addressed in the wards on a regular basis.

4. Protocols

Written postoperative management protocols to be in place for all patients for treatment of postoperative pain in the wards. Protocols are to be applied in daily practice.

5. Pain Evaluation and Follow Up

Pain assessment should be provided regularly on the surgical wards on a fixed schedule, at least once a day, at least at rest with documentation in the patient's chart, with a threshold pain level at which rescue pain is mandatory.