

**PROFILE OF CARE GIVEN TO PATIENTS WITH BLUNT
CHEST INJURY WITHIN THE FIRST 48 HOURS**

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Research Report

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DECLARATION

I, Elijah Nyangena, declare that this research report is my own work. It is being submitted for the degree of Master of Science (Nursing) in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

Elijah Nyangena
Elijah Nyangena

9th Sept. 1998
Date

DEDICATION

To my wife

JANE

For her constant support, profound understanding and endless patience, without
whom this work could not have been possible.

To my sons

ABNER and NATHAN

For bringing sunshine and motivation into my life

To my parents

NYANGENA and KWAMBOKA

for their unfailing support and encouragement

ABSTRACT

Blunt chest injury provides a specific challenge to care due to the possibility of concealed injuries and complications that may cause significant morbidity and mortality. A high index of suspicion for possible injury to the organs of the chest cavity is essential in both initial and subsequent assessment. Rapid resuscitation, airway management and definitive therapy are essential for successful patient outcomes. Associated injuries of the head, abdomen and skeleton may increase morbidity and mortality.

This study arrived at describing the nature of the case that blunt chest injury patients were receiving the role of nursing in the provision of quality care was also considered. A survey research design using a checklist to obtain data was utilized. Data collection was by means of a record review. The sample comprised sixty records of patients who were admitted to the trauma unit between 01-01-1997 and 30-06-1998. The setting of this research as the trauma unit of a large academic hospital in Johannesburg, South Africa.

The study revealed that: (i) all the sample subjects received a thorough initial assessment and no missed injuries were identified, (ii) more than half of the patients spent over one hour before admission to the trauma ICU/ward, (iii) pedestrian vehicle accidents are often fatal while motor vehicle accidents are the commonest cause of injury, (iv) nurses are good providers of care but poor in prescribing and documenting such care, (v) pain assessment and psychosocial care are often given the least attention, (vi) the majority of trauma victims are the young and economically active.

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CHAPTER 1

BACKGROUND TO THE STUDY

1.0 INTRODUCTION

Studies from South Africa and overseas agree that trauma is the commonest cause of death for individuals under the age of 40 years and the commonest cause of death in all ages (Robertson & Redmond, 1994). Fifty percent (50%) of all trauma deaths occur in hospitals. A third ($\frac{1}{3}$) of the deaths are preventable and often result from misdiagnosis or delay in initiating appropriate therapy (Demetriades, 1989). Yet such patients are often resilient and if optimally treated, they should have a normal life expectancy. The outcomes of trauma treatment depend on accurate initial assessment and optimum care.

Blunt chest injuries are a cause of high mortality and morbidity in victims of motor vehicle accidents, crush injuries, falls from height, sports injury and assault. Twenty-five percent (25%) of all trauma deaths result from blunt chest injuries (Linton, 1990).

According to Robertson and Redmond (1994), there are three peaks in general trauma deaths. First is the 50% deaths that occur within 30 minutes of injury due to brainstem injury or intrathoracic disruption. The second peak is the 30% deaths that occur within 4 hours due to airway obstruction or loss of intravascular volume. Twenty-five percent (25%) of these deaths can be prevented by rapid definitive therapy which may involve surgery or intensive therapy. The third peak is the 20% trauma deaths that occur in a few days to weeks due to sepsis, multiple organ failure or acute respiratory distress

syndrome. These deaths can be reduced by rapid prehospital evacuation, aggressive resuscitation and early surgical intervention.

The initial presentation of blunt chest injuries may be misleading. Pain and muscle splinting may obscure underlying injuries leading to underassessment. Concealed injuries should be anticipated in patients who have been involved in high speed accidents. Sudden deceleration or acceleration cause shearing forces within the chest wall. These forces are likely to cause intrathoracic injuries such as pulmonary contusion, cardiac contusion, major vessel injury and airway disruption. Major vessel injury and cardiac contusion unless they are observed for, may be recognised only when arrhythmias or respiratory distress present (Linton, 1990).

As stated by Schwartz, Cayten, Mangelsen, Mayer and Hanke (1992), disruption of the airways and oesophagus may cause delayed yet significant complications, that manifest as early as one day after injury. It is therefore essential that such complications are anticipated and prevented from the time of admission.

It is essential that in the resuscitation of blunt chest injuries, diagnosis and therapeutic procedures to be carried out simultaneously on an individual (McCabe, 1996). The trauma unit should be adequately staffed with experienced and expert personnel. The unit should also be close to support services such as operating theatres, laboratories and radiology.

The overall physical and emotional consequences of trauma are devastating to those injured, family and friends. Prevention is the only rational approach to reduce the high medical, economic and social costs associated with general trauma and loss of lives. The three cornerstones in accident prevention are education to adopt low risk behaviour, legislation to enforce safety precautions and engineering of safer products and environment (Robertson & Redmond, 1994).

As in general trauma, the emphasis on blunt chest injuries is on rapid prehospital evacuation following the accident and prompt treatment on arrival in the hospital. On arrival in the trauma unit, a rapid assessment is done to identify all injuries. Life-threatening injuries are identified and treated, further deterioration of the patient's condition is prevented and treatment that must commence before definitive therapy is initiated. Investigations are done and necessary changes are made in the immediate management (Robertson & Redmond, 1994).

This research describes the assessment and care that was given to patients with blunt chest injuries during the first 48 hours following injury and admission to the trauma unit of the hospital.

1.1 PROBLEM STATEMENT

The first few hours following injury are critical in general trauma. A significant number of patients may die due to inadequate initial treatment. The successful management of injured patients pivots on accurate initial assessment and rapid intervention to gain control of the airway, breathing and circulation (Muller, 1991).

The concept of the first "golden hour" holds the key to success in trauma patient management. Precious time may be lost due to delayed prehospital evacuation of the injured patients. Patients who are not in obvious pain or have no external signs of injury may not receive immediate attention on arrival in the trauma unit. Time-wasting may lead to development of complications that are avoidable. It is essential that the trauma patient receive definitive therapy (operative or intensive care therapy) within one hour following injury.

In blunt chest trauma some injuries may be missed during the initial assessment. This may be due to reduced pain sensation or the injuries may not be radiologically obvious at the time of admission (Pitcher & Beale, 1995; Price & Cho, 1995). A high index of suspicion is therefore essential during initial and subsequent assessment.

A review of literature indicates that concealed injuries, delay in initiating definitive therapy and complications may cause significant mortality and morbidity following blunt chest injuries. A fair amount of study has been done overseas on this subject. There is limited research literature available on the subject in South Africa and especially in the field of nursing.

This study focused on the care that was given to blunt chest injured patients during the first 48 hours. The following research questions were addressed:

- What is the incidence of blunt chest injuries as a result of trauma?
- What immediate injuries were sustained?

- What specific chest complications occurred within 48 hours following initial trauma?
- What associated complications developed within 48 hours?
- What medical and nursing interventions were documented in the records?

1.2 OBJECTIVES

The objectives of this research were:

- To determine the incidence of blunt chest injuries.
- To describe the initial assessment of blunt chest injuries.
- To determine the specific chest injuries.
- To identify the patient outcomes within 48 hours of admission.
- To describe the documented medical and nursing care that was given.

1.3 PURPOSE OF THE STUDY

The purpose of this study was to describe the profile of care of patients with blunt chest injuries within 48 hours and to discuss the implications for nursing practice.

1.4 SIGNIFICANCE OF THE STUDY

A considerable amount of study appears to have been done on blunt chest injuries in the United States of America and Europe. There is limited research literature available in South Africa on the subject and especially in the nursing field.

Trauma is the third commonest cause of death in all ages of which 25% is by blunt chest injuries (Linton, 1990). Research needs to be done on this subject to identify the

nature of care the patients are receiving at present. It is also essential to explore and highlight the role of nursing care in achieving positive trauma care outcomes.

1.5 LIMITATIONS OF THE STUDY

- The sample size was small within the limited time frame. Generalizeability of the findings are therefore limited to the hospital and the Johannesburg region. The method may however be utilized elsewhere.
- Paucity of nursing literature on this subject was a serious problem.
- The completeness of the records could not be guaranteed. There were certain areas where complete information was not available e.g. time of injury, arrival and departure from A & E to the Ward/ICU and incomplete documentation of nursing care especially in the trauma ward. Provision for the nursing process on the ICU charts was blank.

1.6 DEFINITION OF TERMS:

Accident and Emergency Department: The receiving and admitting department for trauma victims. The point of first contact with the healthcare team of the hospital.

Blunt Chest Injuries: Damage to the chest wall or its contents by non-penetrating force.

Concealed Injury: Injury that is not easily recognizable during initial assessment or routine investigations.

Management: Treatment or care.

Patient Outcomes: Patients' response to treatment including possible occurrence of complications during the first 48 hours.

Profile of Care: Medical and nursing care received by a patient.

Trauma ICU: The major trauma intensive care unit of the hospital.

Trauma Ward: The ward for admission of minor to moderately injured patients.

Trauma Unit: Includes the Accident and Emergency (A & E) Department, major trauma ICU and Trauma Ward of the hospital.

1.7 LIST OF ABBREVIATIONS

A & E: Accident and Emergency Department (Casualty).

COPD: Chronic Obstructive Pulmonary Disease.

CT: Computerised Tomography Scan

ECG: Electro Cardiograph.

GCS: Glasgow Coma Scale

GIT: Gastrointestinal Tract

HIV: Human Immunodeficiency Virus

ICU: Intensive Care Unit

MVA: Motor Vehicle Accident

PVA: Pedestrian Vehicle Accident

TB: Tuberculosis

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

Blunt chest trauma is the commonest form of chest injury following motor vehicle accidents. This may be life-threatening when associated with other injuries (Oh, 1990). If mortality and morbidity are to be minimized, swift assessment and resuscitation are carried out simultaneously. The trauma team leader must know his/her priorities as respiratory and circulatory resuscitation will take precedence over everything else. It is generally recognized that the nature of care the patient receives during the first few hours following injury will determine the recovery outcome.

According to Moore, Mattox and Feliciano (1988), chest injuries account for 25% of all trauma related deaths. Blunt chest trauma accounts for 70-80% of all chest injuries due to motor vehicle accidents. An understanding of the mechanism of injury is essential for delivering optimal care and designing preventive strategies.

In order to facilitate the management of blunt chest injuries, the American College of Surgeons Trauma Committee (Schwart *et al*, 1992) has divided these injuries into two groups. First are the immediate life-threatening injuries which include airway obstruction, tension pneumothorax, open pneumothorax, massive haemothorax, flail chest, aortic disruption and cardiac tamponade. The second group are the relatively life-threatening injuries such as pulmonary contusion, diaphragmatic rupture, tracheobronchial tears, oesophageal perforation and myocardial contusion. Fifty

percent (50%) of all chest trauma deaths have been known to be due to injury to the lungs and pleurae (Moore, Mattox & Feliciano, 1988; Schwartz *et al*, 1992).

According to studies by the American College of Surgeons, it was found that 50% of all blunt chest injuries involve the chest wall, 26% involve the lungs, 25% involve haemothorax, 20% involve pneumothorax and 21% miscellaneous. Twenty-five percent (25%) of all chest injury patients experience complications that may eventually lead to death. These studies further suggest that with preventive strategies and early surgical intervention, 30-70% of mortality could be eliminated (Schwartz *et al*, 1992).

Although most blunt chest injuries may be severe, less than 10-15% of the victims require surgical intervention. Most of the blunt chest injuries can be treated non-operatively by applying the fundamental principles of trauma management such as oxygenation, pain control, fluid volume replacement, chest tube thoracostomy and controlled ventilation (Robertson & Redmond, 1994). It is essential that the trauma team have sufficient experience and expertise in therapeutic interventions in order to deliver optimum care during the crucial phase of patient care.

2.1 PATHOPHYSIOLOGY OF CHEST INJURIES

The lungs and heart physiologically and anatomically function together to effect circulation and oxygenation as a continuous integrated process. Injury to either will affect the other with often devastating results (Robertson & Redmond, 1994). Chest injuries affect the chest wall and its muscular actions on breathing and motion, respiratory dynamics, pleural space, breathing conduits and lung parenchyma. Chest

injuries may also involve the heart and the circulatory dynamics of the great vessels. Blood loss may cause hypovolaemia and shock (Schwartz *et al* 1992). Of grave concern is the fact that chest injuries impair more than one physiologic mechanism but show minimal signs initially. Respiratory alterations, circulatory changes and pain may not always be obvious at first. This may lead to underassessment of injury. In addition, therapy may silently worsen pathology e.g. a contused lung is more conducive to absorb intravenous fluid (Schwartz *et al*, 1992).

Robertson and Redmond (1994) summarise the pathophysiology of chest injuries into three processes:

- **Ventilation perfusion mismatch:** This occurs when a non-perfused lung is ventilated resulting in hypoxaemia. The cause of ventilation perfusion mismatch may be aspiration, lung contusion, simple pneumothorax and pain due to muscular injury or fractures to the sternum and ribs.
- **Hypovolaemia** This may result from lung lacerations, intercostal and mammary artery injury which can cause significant bleeding and haemothorax. Bleeding from small vessels may be self-limiting. Bleeding from major vessels may be fatal and immediate intervention is needed.
- **Mechanical obstruction:** This may be caused by tension pneumothorax and cardiac tamponade which prevent cardiac filling. Expanding haematoma may compress the venae cavae preventing venous return and reducing cardiac output.

As suggested by Calhoon and Trinkle (1997), the body's response to trauma goes beyond the systemic physiology and biochemistry. Recent studies indicate that there are complex cellular and molecular responses involving the endothelial cells with neutrophils and platelets to produce lysosomes and free radicals. More studies into the subcellular and molecular physiology are needed to reveal more secrets of the body's response to trauma. However, this is not within the scope of this research.

2.2 CAUSES OF BLUNT CHEST INJURIES

Blunt chest trauma is injury to the chest wall or its contents without communication to the external environment. Blunt chest injuries may be caused by direct impact, deceleration, rotatory and shear forces, sports injuries and constant compression mechanisms.

2.2.1 Direct Impact

May cause significant injuries whose severity can be assessed by knowledge of the force, duration, mass of the patient and contact area. Ejection, steering wheel impact, windshield impact account for the majority of injuries during motor vehicle accidents (Trunkey & Lewis, 1985; Classen, 1995). Direct impact injuries may also result from pedestrian accidents, motor cycle and bicycle accidents.

2.2.2 Deceleration and Rotatory Forces

Deceleration forces are associated with high speed accidents and falls from heights. As the body comes to a sudden stop, the organs continue to move forward at the same speed, consistent with Newton's law of motion. Blood vessels and tissues are

torn from their attachment e.g. major thoracic vessel injury, airways injury and pulmonary contusions (Linton, 1990). Rotatory forces tend to cause tearing injuries by a tumbling action (Trunkey & Lewis, 1980).

2.2.3 Shear Forces

Shear forces are normally seen in pedestrian vehicle accidents. As the vehicle passes over the victim, the organs are pushed forward and they are torn from their nutrient blood supply. Extensive tissue damage is common (Trunkey & Lewis, 1980).

2.2.4 Constant Compression Forces

Constant compression mechanism by known forces have been reported to cause blunt chest injuries though they are uncommon. Reber, Castelli and Scheidegger (1995), reported cases of blunt chest injuries by constant compression mechanisms, such as conveyor belts and electric gates. Though the victims become rapidly hypoxic and unconscious, only minor injuries and complications were noted. Recovery was complete without sequelae.

2.2.5 Sports Injuries

Sporting activities have been receiving increasing attention as a cause of blunt chest injuries. A study by Maron, Poliac, Kaplan and Mueller (1995), indicate that victims who received unexpected blows to the chest collapsed immediately from cardiac arrest. It has been speculated that the cardiac arrest is due to ventricular arrhythmia induced by an abrupt precordial blow delivered at an electrically vulnerable phase of

ventricular excitability. This mechanism of injury needs more study to increase the knowledge of the phenomena.

In a similar study by Heymann and Culling (1994), a case is reported of a 42 year old man who sustained a myocardial infarct after a blow to the chest while playing cricket. The pathophysiology of the infarct has been subject to much discussion but it is still unresolved.

2.3 CLINICAL PRESENTATION OF BLUNT CHEST INJURIES

Patients with serious blunt chest injuries may show minimal signs and symptoms of injury initially (Schwartz *et al*, 1992; Linton, 1990). Muscle splinting with high emotional state decreases sensory responsiveness and pain awareness. Therefore, a high index of suspicion is essential for quick diagnosis. Literature shows that resuscitation is often done late because the severity of injury was underassessed or missed (Robertson & Redmon, 1994).

In 90% of cases, history taking is important in arriving at the correct diagnosis and to determine the energy exchange during the crash. History helps to raise suspicion e.g. in falls from height, death of another occupant in the same vehicle, steering wheel deformity. The clinician also looks for signs suggestive of respiratory insufficiency, hypotension, cardiac tamponade, cardiac arrest, pain or sucking chest wound (Schwartz *et al*, 1992; Moore, Mattox & Feliciano, 1988). In addition, a quick physical examination is done to exclude dullness on percussion, differential breath sounds between hemithoraces, reduced breath sounds, upper extremity hypertension presence of murmurs or bruit and a wide or deviated mediastinum. Sensory deficits

may be indicative of spinal cord or nerve injury (Schwartz *et al*, 1992). Also laboratory and radiologic investigation are important tools in diagnosis.

Among the signs indicating serious intrathoracic injury is hypotension which indicates the presence of shock. Shock must be recognized to be readily corrected. Blood pressures should be continually monitored non-invasively or invasively via an arterial line. Pneumothorax and haemothorax must be differentiated from a ruptured diaphragm. A mediastinal haematoma is determined whether it is caused by cardiac or thoracic great vessel injury. Pneumomediastinum may be due to pulmonary barotrauma or it may signify critical injury to the trachea, bronchi or oesophagus. Signs and symptoms suggestive of other body system injury should also be checked (Schwartz *et al*, 1992). Other signs and symptoms will depend on the specific injury.

2.4 IMMEDIATE MANAGEMENT

The current management of trauma requires a team approach. A didactic set of guidelines is recommended. The Advanced Trauma Life Support is the most widely adopted system at present. The key elements include primary survey/resuscitation phase, secondary survey and definitive therapy which may involve surgery. Life threatening conditions are recognized and treated promptly (McCabe, 1996). It is therefore essential that the patient receives definitive therapy within the first hour following injury to maximize recovery and prevent complications.

In the severely injured patient, assessment and resuscitation are carried out simultaneously since time wasting may be disastrous. The priority of care is to

maintain the functions of respiration, circulation, mentation and to protect the spinal cord (Demetriades, 1989).

As suggested by Oh (1990), the immediate priorities of managing blunt chest injured patients are:

- **Airway and oxygenation:** Clear the airway of blood clots, mucus or foreign body. If the patient is breathing spontaneously, give oxygen by face mask at a rate of 8-10ℓ/min which gives 40-60%. If the patient cannot maintain own airway, or is severely hypoxaemic, intubation and assisted ventilation may be done.
- **Pneumothorax:** Tension pneumothorax is an emergency. Decompression may be done by a wide bore needle inserted into the pleural space at the anterior or mid axillary line 4th intercostal space. However, the standard treatment is by inserting an intercostal tube under sterile conditions.
- **Cardiac tamponade:** May be suspected in a patient exhibiting hypotension with raised venous pressures. Tension pneumothorax and heart failure must be ruled out. Emergency treatment is by needle aspiration under continuous ECG monitoring. Where necessary, prompt thoracostomy may be done for decompression.
- **Extrathoracic injuries:** A quick head to toe examination is done to rule out associated injuries of the head, neck, abdomen, pelvis and extremities. Assessment is best done before administration of analgesia.

- **Gastric decompression:** Gastric distension carries the risk of regurgitation, vomiting and aspiration especially in patients with associated head injury. A nasogastric tube is passed in all cases of severe blunt chest injuries.
- **Pain relief:** Pain is controlled in the early stages by low dose narcotic analgesia such as morphine 2-5mg. High doses of narcotic analgesics may depress respiration. Effective pain relief often relieves respiratory distress in patients with rib or sternal fractures.
- **Mechanical ventilation:** Mechanical ventilation may be considered after the initial management in the case of severe hypoxaemia or hypercobia, significant head injury, gross flail chest and respiratory distress.

2.5 NURSING MANAGEMENT

The care of the trauma patient requires a team approach of which nursing forms an integral part. After the initial stabilisation in the accident/emergency department and/or operative intervention, the blunt chest injured patient is transferred to the trauma ICU or ward for intensive therapy. The nurse takes responsibility to constantly monitor the patient's progress through the acute phase till discharge. The nurse must be able to notice early changes in the patient's condition, take appropriate action, and prevent complications. Nursing management also involves collaboration with health care team members, to co-ordinate patient care. This requires considerable skill and knowledge (Adam & Osborne, 1997). With good nursing management, the potential complications of blunt chest injuries in the first 48 hours can be anticipated and prevented and the recovery outcomes improved.

The ICU staff are informed of impending admission to make necessary preparation and anticipate any eventualities. The priority in patient care is to maintain the airway, breathing and circulation. If mechanical ventilation is required, the ventilator is set with adequate oxygen supply. The suction apparatus is also tested and ready. The nurse also prepares for continuous ECG monitoring, assessment of haemodynamic stability at the bedside and pulse oxymetry.

The patient management in ICU depends on the severity and alteration in the clinical status. The priorities are to stabilize the airway, breathing and circulation. A record of baseline observations is done for heart rate and rhythm, blood pressure, central venous pressure, respiration, ventilator settings, temperature and neurological status (Adam & Osborne, 1997).

Correct positioning of the patient is done depending on the injury. The chest injured patient may be nursed in Fowler's position. With accompanying spine injury the patient may remain flat. Fractured extremities are carefully supported and positioned.

When the patient's condition has been stabilized, a full nursing assessment is done. Deficits are noted and appropriate action is taken. All nursing diagnoses and interventions are documented to note deviation from the baseline. If the patient is haemodynamically unstable, ventilatory support inadequate or in pain, these must be corrected first.

Specific observations for blunt chest injured patients include:

- **Respiratory rate and depth.** Note the quality of respiration, use of accessory muscles, respiratory rates above 24/minute or less than 6/minute and oxygen saturation below 90% by oximetry.
- **Chest movements and air entry.** Check symmetry of the chest and equal air entry in all lobes. Be alert to patients who may be having underlying respiratory disease.
- **Respiratory pattern.** Note respiratory patterns that may be indicative of central nervous injury such as Cheyne-Stokes respiration.
- **Skin.** Examine the skin for bruises, lacerations, and abrasions which may indicate underlying injury. The colour and temperature is checked for perfusion status. Also feel for subcutaneous emphysema which may be indicative of barotrauma or injury to the airways and oesophagus.
- **Pain.** Ask the patient for the presence of pain and rate it on a pain scoring scale from zero to ten (0-10) to describe the intensity. Provide adequate pain relief by low dose narcotic analgesia such as morphine, intercostal nerve block or epidural analgesic (Adam & Osborne, 1997; Demetriades, 1993). A patient with adequate pain relief will breathe more deeply, cooperate with physiotherapy and clear secretions more effectively.
- **Psychological.** Trauma is a sudden experience which does not allow the patient and family time to adapt to the situation. Therefore, high stress levels and anxiety may be experienced. The anxiety may even be higher in intubated and ventilated patients in ICU due to the inability to talk.

Useful nursing interventions to relieve anxiety include:

- Supporting and augmenting the patients coping mechanism.

- Communicating caring and understanding through attentiveness, voice tone and touch.
- Provide information to patients in sufficient detail to understand what is going on.
- Encourage and support relatives by listening and providing information using more than one channel e.g. verbal and written. Allow relatives as much time as possible with the patient. A Spanish study by Zazpe, Margall, Otano, Perchena and Asiain (1997), on meeting the needs of family members of ICU patients, indicates that though most physical needs of patients are generally met, there are certain aspects of information and comfort of ICU environment that are least met.
- Ensure adequate rest for the patient and prevent sleep deprivation.

2.6 SPECIFIC BLUNT CHEST INJURIES

2.6.1 Rib Fractures

Rib fractures are common in blunt chest injuries and may occur in up to 58% of the patients with chest trauma (Wilson & Walt, 1996). Rib fractures are usually associated with lung contusion or laceration, haemothorax and pneumothorax. Fractures to the first and second ribs indicate that considerable force was involved. This may be associated with severe injuries including myocardial contusion, bronchial injury and major vascular injury. The best clinical indicator for rib fractures is pain, crepitus and local tenderness. Up to 50% of rib fractures do not show on initial radiographs if they are incomplete or non-displaced and may be missed (Robertson & Redmond, 1994). Multiple rib fractures may compromise respiration due to pain, muscle spasm and secretion retention (Linton, 1990).

Effective pain relief must be given in rib fractures. In mild to moderate pain, non-steroidal anti-inflammatory drugs may be useful. In severe pain, intercostal nerve block and epidural analgesics are given. Narcotic analgesics such as morphine must be given carefully to avoid respiratory depression (Wilson & Walt, 1996).

2.6.2 Flail Chest

Flail chest occurs in 10-20% of patients with blunt chest injuries. Flail chest compromises respiration by reducing tidal volume, increasing respiratory workload and compressing the lung beneath the segment. Hypoventilation, hypoxaemia, intrapulmonary shunting and reduction of cardiac output result (Robertson & Redmond, 1994).

Diagnosis of flail chest is clinical. Although a flail chest increases the work of breathing, the main cause of hypoxia is underlying lung contusion. Therefore, selective management of flail chest without mechanical ventilation is advocated. The treatment should be individualized and ideally in an ICU where the patient can be constantly monitored (Oh, 1990; Wilson & Walt, 1996).

2.6.3 Pneumothorax

Pneumothorax occurs in up to 50% of blunt chest injured patients and is often associated with rib fractures (Robertson & Redmond, 1994). Pneumothorax can be identified by physical examination while X-rays may sometimes fail to show intrapleural air. The patient may manifest signs of respiratory distress and hypotension.

Pneumothorax is corrected by tube thoracostomy. Untreated pneumothorax can cause chest infection within 24-48 hours, while obstruction of the bronchi or bronchioles by mucous plugs may cause atelectasis.

Recent studies indicate that small pneumothoraces (<20% of lung volume) can resolve on their own without chest tube drainage (Schwartz *et al*, 1992; Johnson, 1996). Tension pneumothorax is however a medical emergency that must be drained immediately by inserting a needle through the second intercostal space anteriorly.

2.6.4 Haemothorax

Blood in the pleural space may be due to bleeding from rib fractures, lung laceration or thoracic vessels. Over 300ml of fluid is needed to show in an upright chest X-ray. The pleural space can accommodate up to 30-40% of the patient's own volume. Mortality from massive haemothorax is 50-75% (Baxt, 1985).

Diagnosis of haemothorax is done clinically and by erect chest X-ray. Treatment is by placement of an intercostal drain. Thoracotomy may be done in unresponsive cases where bleeding exceeds 300ml/hour or 1500-2000ml in 12-24 hours (Wilson & Walt, 1996).

Much controversy exists concerning the use of prophylactic antibiotics in patients with chest tubes due to pneumothorax or haemothorax. Various studies however suggest that use of antibiotics can reduce the incidence of intrathoracic infections (Wilson & Walt, 1996).

2.6.5 Tracheobronchial Injuries

Injuries to the trachea and bronchi are uncommon but may occur following severe trauma. Eighty percent (80%) of tracheobronchial injuries occur 2.5cm from the carina. Ten percent (10%) of the patients may be asymptomatic following injury while others portray serious signs of respiratory distress, cyanosis, dyspnoea, haemoptysis and surgical emphysema (Henderson, 1995). Diagnosis can be confirmed by bronchoscopy and surgical repair is the treatment of choice. The majority of patients recover fully following repair while some develop stenosis at the repair site. Seventy-four percent (74%) of all tracheobronchial tears are transverse, 18% longitudinal and 8% complex (Paganatis, Symbass, Alexander, Justicz & Rickets, 1992). Complex injuries are very rare.

2.6.6 Pulmonary Contusion

Pulmonary contusion occurs following shearing, compressive or crush injuries and the effects may take up to 48 hours to develop (Robertson & Redmond, 1994). Pathologic changes include capillary damage, interstitial and alveolar oedema which cause physiologic shunting. This process produces hypoxaemia.

In the majority of patients, chest radiograph changes are seen in 4-6 hours following injury while in others the changes are seen in 24 hours. Blood gas changes are a good indicator of lung injury as they occur sooner than X-ray changes. Presenting signs are dyspnoea, haemoptysis and respiratory failure (Demetriades, 1993). The management of lung contusion is aimed at treating hypoxaemia and the provision of adequate pain relief. Assisted ventilation may be required in severe cases. However,

patients with unilateral lung contusion seem to respond poorly to conventional mechanical ventilation but can benefit from synchronised independent lung ventilation by a double lumen endotracheal tube (Wilson & Walt, 1996).

There is still some controversy on the type and amount of fluid that can be administered in lung contusion. Blood loss, however, can be replaced by blood or its products and crystalloids kept to a minimum (Wilson & Walt, 1996).

When atelectasis and pneumonia can be prevented, the lungs usually improve rapidly after 48-72 hours. Mortality is estimated to be 43-50% (Schwartz *et al*, 1992).

2.6.7 Myocardial Contusion

The exact incidence of cardiac injury after blunt chest trauma is unknown but it has been estimated to be between 16-76% (Wilson & Walt, 1996; Linton, 1990). The most common causes of blunt chest trauma are high speed motor vehicle accidents, falls from height, blast injuries and sports injuries. Possible injuries from blunt cardiac trauma include pericardial tear, cardiac rupture, septal injuries, valve injuries, coronary vessel injury, myocardial contusion and cardiac tamponade.

Myocardial contusion has been reported to be the most common visceral injury responsible for death immediately after trauma. Over 90% of all cardiac injuries involve myocardial contusion (Wilson & Walt, 1996).

Myocardial contusion may lead to rhythm and/or conduction disturbances and reduction in cardiac reserve. In previously healthy persons, it may go unnoticed.

Diagnosis of myocardial contusion is done by ECG which shows ST-T wave changes and elevation in cardiac enzyme CPK-MB. The treatment involves continuous monitoring, oxygen, analgesia and correction of hypotension by inotropic support (Wilson & Walt, 1996).

2.6.8 Cardiac Tamponade

Cardiac tamponade develops with an accumulation of 150-200ml of fluid in the pericardial sac following blunt chest injuries. Bleeding may result from myocardial contusion, cardiac vessel injury or pericardial tear (Linton, 1990; Baxt, 1985).

Diagnosis is made from presenting signs such as tachycardia, reduced cardiac output with hypotension, venous hypertension and weak peripheral pulses. Treatment is by pericardiocentesis. A thoracostomy may be required in unresponsive cases (Adam & Osborne, 1997).

2.6.9 Aortic Injury

Approximately 80-90% of patients with blunt chest injuries to the thoracic great vessels, especially the aorta, die at the scene of the accident and 50% of the remaining die in 48 hours if not adequately treated. One in every six fatal accidents involve aortic injury (Wilson & Walt, 1996; Linton, 1990).

Injury results in internal tear. If the adventitia flap remains 10-20% of patients survive to reach hospital. The common sites of rupture are at the isthmus and ascending aorta (Schwartz *et al*, 1992).

The majority of patients with traumatic aortic injuries show evidence of haemorrhage, reduction of peripheral pulses and signs of associated injuries. Specific signs of aortic injury may be lacking in some patients (Wilson & Walt, 1996; Geldard, 1997). The signs of aortic rupture include wide mediastinum, trachea deviation to the right, left-sided haemothorax, blurring of aortic knuckle shadow, deviation of nasogastric tube to the right and depression of the main bronchus. Treatment of aortic injury is by emergency surgical repair (Robertson & Redmond, 1994; Geldard, 1997).

It is generally agreed that injury to the 1st and 2nd ribs and sternum may indicate possible injury to the aorta. A study by Lee, Harris, Duke and Williams (1997), found no correlation between thoracic skeletal injuries and acute traumatic aortic tear. It is suggested that diagnosis be based on the mechanism of injury, clinical findings and radiographic evidence.

2.6.10 Oesophageal Injury

Blunt oesophageal injury is very rare but may prove fatal if it is diagnosed late and treatment is not accomplished in 12-24 hours. In spite of advancement in technology, mortality from oesophageal injury ranges between 5-66% depending on the time treatment was accomplished after injury (Wilson & Walt, 1996). The cervical oesophagus is involved 70% of the time.

Oesophageal injury produces signs similar to the adjacent organs. Leakage of regurgitated acidic gastric contents cause chemical mediastinitis. Suppurative mediastinitis may follow which becomes rapidly lethal if not treated promptly (Wilson & Walt, 1996).

The signs of oesophageal perforation include pain, fever, hoarseness, dysphagia, respiratory distress and surgical emphysema of the neck and mediastinum (Schwartz *et al*, 1992). Injury is confirmed by radiographic investigation. Operative repair and antibiotic therapy constitute the treatment. Common complications are sepsis, fistula formation and strictures.

2.6.11 Diaphragmatic Injury

Approximately 5% of blunt chest injured patients requiring thoracostomy or laparotomy are found to have ruptured diaphragm while 30% are missed during the initial assessment. The onset may be acute presenting with respiratory distress and bowel sounds audible in the chest or it may be delayed for months or years (Linton, 1990; Wilson & Walt, 1996).

A study by Guth, Pachter and Kim (1995), shows that 88% of diaphragmatic ruptures were diagnosed in 24 hours while 12% were missed during initial assessment. The missed diaphragmatic injuries have been attributed to the presence of obvious injuries requiring urgent attention and lack of 100% reliability of the CT scan and diagnostic peritoneal lavage for the right hemidiaphragm injuries.

2.7 ASSOCIATED INJURIES

Blunt chest injured patients often have polytrauma involving head injury, abdomen, and extremities. An American study by Price and Cho (1995) indicates that blunt chest injured patients were found to have associated injuries to other parts of the body. These injuries included pelvic and femur fractures, renal injury, ruptured bladder, pelvic haematoma and spinal fractures. Some of these injuries were identified on subsequent assessment.

In a South African paediatric study by Pitcher and Beale (1995), it was found that blunt chest injuries indicate a transmission of force to axial and truncal structures and are frequently associated with head, abdominal and skeletal injuries. The associated injuries raise the mortality and morbidity significantly. Isolated chest injury was found to have a mortality of 5%, increasing to 14% when associated with other organ injury and 35% when associated with head injury.

2.8 COMPLICATIONS OF BLUNT CHEST INJURIES

Various complications have been recorded due to blunt chest injuries. Baldt, Bankier, Germann, Poschl, Skrbensky and Herold (1995), identify possible complications such as persistent haemopneumothorax, lung abscess, lung perforation, empyema, pulmonary haematoma, chest tube malposition and damage to the thoracic great vessels by the chest tube.

Reber, Castelli and Scheidegger (1995), identify complications such as respiratory failure, post-traumatic pleural effusion pneumonia atelectasis, herniation of abdominal

contents into the chest via perforated diaphragm causing intestinal obstruction, pulmonary oedema and bleeding. Patients with myocardial dysfunction may experience arrhythmias, cardiac arrest and cardiac failure (Heymann & Culling, 1995).

Oh (1990), Schwartz *et al.* (1992), and Moore *et al.* (1988), state blunt chest injuries complications such as sputum retention, pain, bronchospasm and barotrauma in ventilated patients. Systemic sepsis, multiple organ failure, hypotension and acute respiratory distress syndrome have been recorded.

Whilst many of these complications may occur soon after injury, with prompt and adequate preventive care they could be avoided. Since psychological needs are not an obvious cause of mortality and morbidity, psychosocial complications have not been given attention in the literature.

2.9 PROGNOSIS OF BLUNT CHEST INJURIES

An Australian study cited by Oh (1990), gives the following mortality pattern following blunt chest injuries. Isolated chest injury has a mortality of 5.3%, respiratory sepsis 35.6%, head with respiratory injury 33.9%, exanguination 18%, age over 60 years 37.5% and flail chest 42%.

Similar findings are given in a South African study by Pitcher and Beale (1995). The majority of blunt chest injured patients recover fully while a small proportion may experience residual symptoms (Linton, 1990).

2.10 CONCLUSION

In this chapter relevant literature regarding blunt chest injuries has been discussed. The literature forms the basis of the data collection checklist which was developed for this research.

Blunt chest injuries provide a specific challenge to healthcare due to the fact that many injuries (e.g. rib fractures, ruptured diaphragm and major vessel injury), may show no or minimal signs initially. Hence the possibility of missed or concealed injuries. It is generally recognized that the first few hours following injury are crucial. The assessment and care given in the first 48 hours can determine the recovery outcomes.

Though the literature review has highlighted useful information, the following observations can be made.

- There is still little research literature in South Africa on this subject. Of much concern is the fact that empirical research literature in nursing on trauma in general and chest trauma in particular is almost lacking.
- Pain management and psychological needs have not been given adequate attention.
- Since much of the research literature on this subject is based on the medical model, the role of nursing management in the care of blunt chest injured patients has not been given attention.

CHAPTER 3

METHODOLOGY

3.0 INTRODUCTION

In this chapter the research methodology will be described. Reasons for the research design chosen will be given. The setting and population will be described. The sampling process will be explained and the data collection process will be described.

3.1 RESEARCH METHODOLOGY

The subjects for this research represent a select group. Descriptive quantitative research methodology was used to answer the study questions.

3.2 THE SETTING

The research setting was a large urban academic hospital in Johannesburg. Blunt chest injuries are commonly seen in this hospital due to the frequency of accidents and assault. This is also a referral hospital for the Johannesburg region.

3.3 RESEARCH DESIGN

A cross sectional descriptive survey was utilized in which data were obtained from patient records using a checklist. According to Wilson (1993), a survey generally serves the purpose of describing characteristics, opinions, attitudes and behaviours as they currently exist in a population. The survey design is most suited in this study to describe the various aspects of blunt chest injuries care in the first 48 hours.

3.4 POPULATION

The population for this research comprised all the patients who were admitted to the Trauma Unit of the hospital due to blunt chest injuries during the period of 1-1-1997 up to 30-6-1998 i.e. a period of 18 months. Approximately 148 subjects were identified from the admission registers, to be eligible for the study.

3.5 SAMPLE

The sample consisted of 60 patient records. The sample size was decided following consultation with a statistician in the statistics department of the University of the Witwatersrand. The sample was divided into two groups, Group I and Group II, in order to give proportional representation for the patients admitted in 1997 and 1998.

Group I: Comprised 40 records of patients who were admitted to the Trauma Unit due to blunt chest injuries from 1-1-1997 to 31-12 1997.

Group II: Comprised 20 records of patients who were admitted to the Trauma Unit due to blunt chest injuries from 1-1-1998 to 30-6-1998.

The exclusion criteria for both Group I and Group II were:

- Age < 18 years
- Death on arrival
- Penetrating chest injuries.

3.6 SAMPLING PROCESS

The sample for this research was expected to be constant to adequately represent the population. The eligible subject records were identified from the admission registers of the Trauma Unit of the hospital. The subjects were then listed in the order of their admission. Only hospital numbers were recorded and names were avoided to ensure anonymity.

Group I: systematic random sampling was utilized to select the sample. Every second subject record in the list was selected until 40 were obtained. The sampling of each second record was based on a statistical formula.

Group II: convenience sampling was done according to the order of admission till the desired number of 20 subject records was obtained. Convenience sampling was utilized in order to obtain the desired number of records within the time frame of the study.

3.7 DATA COLLECTION

Record review was utilized to obtain the desired data from the two sample groups as follows:

Group I: retrospective review of records of patients who were admitted to the Trauma Unit due to blunt chest injuries during 1-1-1997 to 31-12-1997.

Group II: concurrent review of records of patients who were admitted to the Trauma Unit due to blunt chest injuries during 1-1-1998 to 30-6-1998.

The focus of the record review was to examine the patients' initial status and assessment on admission as well as the management and progress during the first 48 hours following injury. The presence of blunt chest injuries, associated injuries, possible complications and documented interventions were checked for. All documentation included in the patients' hospital files were examined. Nursing notes were examined to identify documented patient needs and nursing interventions that were carried out.

Data that were collected related to the following time sequence; initial assessment on admission, assessment at 24 hours, assessment and outcomes at 48 hours.

For Group I sample, patients' files and microfiche were obtained from the records department of the hospital. For the Group II sample, the researcher checked in the Trauma Unit for admission of eligible subjects every 24 hours. The progress was then followed in the records till the end of 48 hours.

3.8 ANALYSIS OF DATA

Data was analysed by computer. Statistical help was sought from Statisticians in the Department of Statistics, University of the Witwatersrand and the Medical Research Council.

3.9 RESEARCH TOOL

Based on a thorough literature review, a checklist was developed to record the collected data. The checklist (Appendix A) was utilized to record the data on the patients' progress in the following sequence:

- Initial assessment at the Accident/Emergency department (A & E)
- Subsequent assessment and management in the trauma intensive care unit/ward.
- Documented nursing care.
- Patients' progress and outcomes at the end of 48 hours.

3.10 VALIDITY AND RELIABILITY

The checklist for this research was developed based on a thorough literature review that was done and the trauma unit charts. The checklist was judged by two consultants in the Trauma Unit. Valuable suggestions that were given were included in Parts 1 and 2 of the checklist, biographical data and immediate care. Reliability and validity were assessed by piloting the checklist. No research assistants were utilized for data collection. The researcher was the only instrument for data collection and therefore consistency was assured.

3.11 PILOT STUDY

The checklist was pretested on two records of patients and additions were made to the following items of the checklist:

- 1.2 - "Not recorded" : Where age was not recorded in the patient's notes.

- 3 - "None" : There were no associated injuries that existed.
- 4 - "None" : There were no pre-existing health conditions.
- 8.5 - "Reassuring relatives": To include care given to relatives as part of the nursing process.
- 10 - "Discharged home" : Patients who had been discharged home at the end of 48 hours.

3.12 DATA COLLECTION PROCEDURE

Data were collected by the researcher from 3-3-1998 up to 31-5-1998. All information was derived from the patients' hospital files. Retrospective record review was done in the records department of the hospital while concurrent record review was done in the Trauma Unit.

3.13 ETHICAL CONSIDERATIONS

Permission to conduct research was obtained as follows:

- The Committee for Research on Human Subjects (Medical) of the University of the Witwatersrand gave permission on 20-2-1998, protocol number 980119 (see Appendix B).
- The Superintendent of the hospital where the research was conducted gave permission on 20-2-1998 (see Appendix C).
- The Head of the Trauma Unit where this research was conducted gave permission on 4-3-1998 (see Appendix C).

- Patients' written consent was not needed in this study since only records were consulted. However, since records contain confidential information, a patient information sheet was sufficient. (see Appendix D).
- To ensure anonymity, only hospital numbers of patients were entered in the checklist. Names of patients and the healthcare team members involved in their care were not recorded.
- The identity of the patients or the healthcare team were not divulged in the report to ensure confidentiality.

3.14 CONCLUSION

In this chapter, the research process has been described. The design, method, sampling process and ethical issues have been discussed. The sample comprised of 60 records of patients in which data was collected by retrospective and concurrent record reviews. Ethical issues have also been addressed.

CHAPTER 4

PRESENTATION OF FINDINGS

4.0 INTRODUCTION

Data were coded and analysed by computer. Narrative and descriptive statistics such as frequencies and percentages were used to present the interpretation of data. Where applicable the McNamar's test for symmetry and the chi-square inferential statistics tests were applied. The McNamar's test was utilized to determine if there was significant difference between the GCS recorded in the A & E department and the Trauma ICU/Ward. The chi-square test was applied at various stages of data analysis to determine if the results of the variables that were tested were significant. The chi-square value of less than 0.05 is significant.

4.1 BIOGRAPHIC DATA

4.1.1 Incidence of Blunt Chest Injuries

Based on statistics from the admission registers of the Trauma Unit for 1997, the incidence of blunt chest injuries was 8%. The trend of admission due to blunt chest trauma during the first 6 months of 1998 indicates that this incidence is unlikely to change ($p = 0.3132$).

4.1.2 Age

More than half of the blunt chest injuries patients (63%) were young people aged between 18 and 47 years. Twenty percent (20%) were between 48 and 67 years of

age and 3% were over 68 years. The ages of 8 of the subjects (14%) were not recorded. The age distribution is also shown in Figure 4.1.

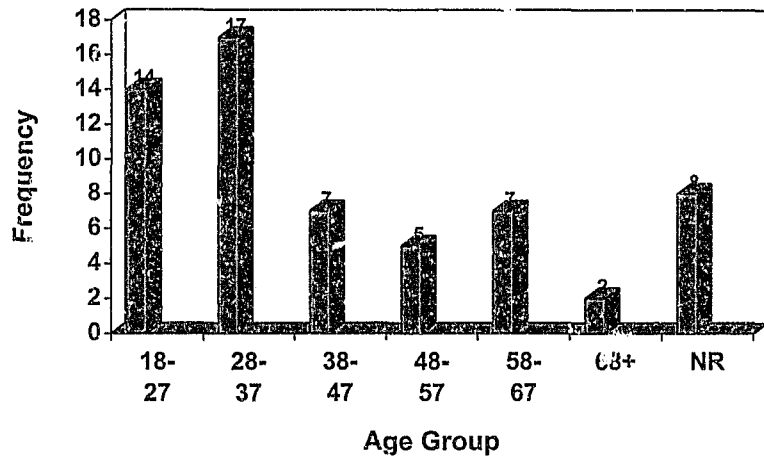


Figure 4.1: Age Distribution of the Sample (n = 60)

4.1.3 Gender

The majority of the blunt chest injury victims were males (62%), while females comprised 38%.

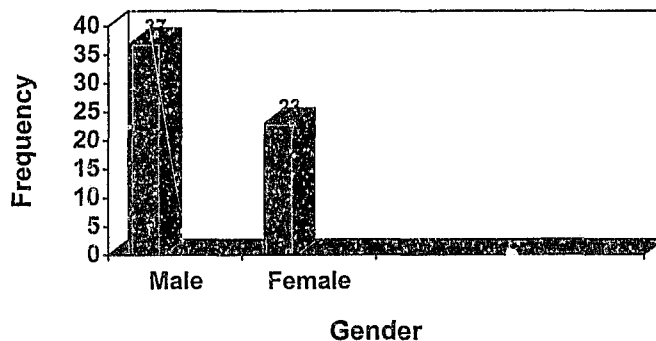


Figure 4.2: Sex Distribution of the Sample (n = 60)

4.2 INITIAL ASSESSMENT

4.2.1 Time of Injury

The time the patient was injured was recorded in only 15% (9) of the records. This made it difficult to determine the time lapse between injury and arrival at the accident/emergency department (i.e. pre-hospital evacuation time).

4.2.2 Time of Arrival in the A & E Department

The time of arrival at the A & E department was recorded 75% of the records. The records where time of arrival was not indicated (25%) were those patients who did not require resuscitation on arrival at the A & E department.

4.2.3 Time Spent in the A & E Department

Thirty-eight percent (38%) of the patients spent 0-2 hours in the A & E department before admission to the Trauma ICU or ward. Twenty percent (20%) of the patients spent 3-4 hours while 15% spent more than 4 hours. In 27% of the patients the time spent could not be easily determined since the time of arrival or leaving the A & E department was not recorded (see Table 4.1).

Table 4.1: Time Spent in the A & E Department (n = 60)

Time Spent	f	%
0 - 1	6	10
1 - 2	17	28
2 - 3	6	10
3 - 4	6	10
> 4	9	15
Not determined	16	27
TOTAL	60	100

Those patients who were critically ill spent a relatively shorter time in the A & E department than those who were less severely ill. There was non significant increase in the development of complications in relation to the length of time spent in the A & E department ($p = 0.487$) since these patients were already receiving treatment.

4.2.4 Mechanism of Injury

Motor vehicle accidents were the commonest cause of blunt chest injuries accounting for 57%. Pedestrian vehicle accidents comprised 23%, falls 8%, crush injuries 2%, assault 5% and other causes such as train accidents and stormed by a bull accounted for 5% of the trauma.

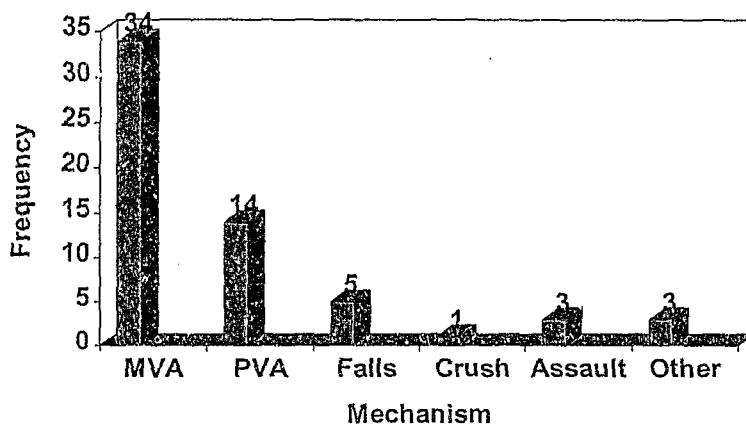


Figure 4.3: Mechanisms of Injury (n = 60)

4.2.5 Wearing Seat Belt

Of the thirty-five (35) patients who were involved in motor vehicle accidents, only 14% (5) were wearing seat belts.

4.2.6 Glasgow Coma Scale

More than half (67%) of the blunt chest injury victims had a Glasgow Coma Scale of 13-14 on admission and were therefore alert. Three percent (3%) had reduced consciousness with a Glasgow Coma Scale of 9-12 while 27% were unconscious with a Glasgow Coma Scale of less than eight. In another 3% the Glasgow Coma Scale readings were not recorded on admission.

4.2.7 Airway

Fifty-eight percent (58%) of the patients could maintain their own airway on admission while 42% required assistance to maintain their airway.

4.2.8 Breathing

The actual assistance given to maintain respiratory functions on admission included oxygen by face mask (35%), endotracheal intubation with mechanical ventilation (45%) and cardiopulmonary resuscitation (7%). Thirteen percent (13%) did not require any assistance with respiration.

4.2.9 Specific Chest Injuries that Occurred

The specific chest injuries that were sustained included haemothorax (32%), pneumothorax (37%), myocardial contusion (3%), perforated oesophagus (2%), pulmonary contusion (10%), ruptured diaphragm (3%), fractured ribs (68%), flail chest (8%), fractured clavicle (18%), sternal injury (8%) and aspiration (3%).

Table 4.2: Specific Chest Injuries (n = 60)

Type of Injury	f	%
Haemothorax	19	32
Pneumothorax	22	37
Myocardial contusion	2	3
Perforated oesophagus	1	2
Pulmonary contusion	6	10
Ruptured diaphragm	2	3
Fractured ribs	41	68
Flail chest	5	8
Fractured clavicle	11	18
Sternal injury	5	8
Aspiration	2	3

It was noted that some patients had more than one injury i.e. polytrauma. The commonest injuries that occurred were fractured ribs, pneumothorax and haemothorax. Perforated oesophagus and aspiration were rare.

4.2.10 Pre-existing Health Conditions

Various pre-existing health conditions were identified in these sample subjects. These were: smoking (10%), COPD (2%), ischaemic heart disease (5%), diabetes (3%), taking prescribed medications (2%), and other (27%). Previous health history was not available from 31% of the records while 28% had no pre-existing health condition prior to injury. Six percent of patients had more than one pre-existing health problem.

4.2.11 Associated injuries

Seventy percent (70%) of the blunt chest injury patients had polytrauma while 30% did not have any accompanying injuries. Other injuries that were sustained included head

injuries (37%), abdominal injuries (10%), skeletal injuries (48%), urogenital injuries (3%) and soft tissue injuries (7%).

4.2.12 Treatments that were Prescribed

A variety of treatments were prescribed according to the diagnosis. These were intercostal drain (67%), antibiotics (55%), inotropic support (8%), analgesic (93%), tetanus toxoid (20%), oxygen by face mask (15%), laparotomy (10%), cardioversion (2%) and repair of urethra (2%) and cardiopulmonary resuscitation (7%).

4.3 SUBSEQUENT ASSESSMENT AND CARE IN TRAUMA ICU/WARD

4.3.1 Glasgow Coma Scale

Though there was some change in the GCS readings during admission to ICU/ward, more than half of the patients (57%) had readings of 13-14. Three percent (3%) had readings of 9-12, 30% had readings of less than eight while the GCS was not recorded in 10% of the patients. According to the McNamar's test, there was no significant difference between the Glasgow Coma Scale on arrival at the A & E department and the time of admission to the Trauma ICU/ward (Kappa value = 0.00).

4.3.2 Pain Severity Rating

The severity of pain was rated in only 10% (6) of the patients' records. However, the assessment of pain was not done on a pain severity scoring scale to ensure uniformity.

4.3.3 Analgesia

Analysis of the records indicates that 91% of the patients received adequate analgesia i.e. the patient reported pain relief or analgesia was given as necessary to achieve pain relief. Five percent (5%) did not receive any analgesics while in 4% there was no record of analgesic treatment.

4.3.4 Ventilation Support

After admission to the Trauma ICU/ward, patients with blunt chest trauma required ventilation support as follows: twenty-seven percent (27%) could maintain their own airway and did not need any ventilation support. Twenty-five percent (25%) required oxygen supplement by face mask, 3% needed continuous positive airway pressure (CPAP) support and 45% required mechanical ventilation.

4.3.5 Blood Gases

In 22% of the patients, the oxygen demands increased in the first 12 hours but the oxygen demands had returned to normal at 48 hours. Twenty-eight percent (28%) did not need oxygen. Blood gas readings were incomplete in 50% of the records and therefore the pattern of oxygen demands could not be determined.

4.3.6 Temperature

Slightly more than half (53%) of the patients experienced pyrexia which may have been due to increased metabolic rate or infective process. Two percent (2%) had hypothermia and 45% had a normal body temperature.

4.3.7 Full Blood Count

Fifty-five percent (55%) of patients had a normal white cell count. The white cell count was raised in 30% of patients. The white cell count was not recorded in nine (15%) of the files. Analysis of the haemoglobin results showed that 38% of patients had normal haemoglobin levels. Forty-seven percent (47%) had varying degrees of anaemia and 40% needed blood transfusions.

4.4 NURSING CARE IN ICU/WARD

4.4.1 Patient Assessment

Analysis of nursing records indicated that patient assessment was systematically performed most of the time (83%). However, need prioritization was documented in only 7% of the records and there was no evidence of written nursing care plans in 98% of the records in the ICU/Ward.

4.4.2 Oxygen/Respiratory Needs

The respiratory needs of the patients were generally well met by administering oxygen, suctioning or ventilation. However, deep breathing exercises were recorded in only 7% of cases, auscultating for air entry (47%) and chest exercises (48%) of the files in the ICU/Ward.

4.4.3 Haemodynamic Functions

The haemodynamic functions of the patients were regularly monitored most of the time (93%) by constant observation of blood pressure, temperature, perfusion, heart rate and rhythm. Positioning of the patients was rarely documented except when

prescribed by the doctor. Administration of medications was well documented all the time while checking of the mediastinum was recorded in only 3% of patients.

4.4.4 Elimination Needs

Elimination needs seem to have been fairly met since they were recorded in more than $\frac{2}{3}$ of the files. Documentation of output was done 83% of the time and correction of fluid balance 80%. Catheter care was recorded in 25% of the files and assessment of gastrointestinal needs 7%.

4.4.5 Psychosocial Needs

The psychological needs of the patients were least met. Talking to the patient was documented in 63% of the records, reassuring the patient 2% and reassuring the relatives was not recorded in any of the files.

4.4.6 Patient Education

Patient education was recorded in only 3% of the files which may have been due to the seriousness of the patient's condition in the first 48 hours. The effectiveness of patient education depends on the patient's readiness to learn when the condition has improved.

4.5 PATIENT OUTCOMES

4.5.1 Complications that Occurred

Analysis of the records identified various complications that occurred following blunt chest injuries. These included pain (12%), atelectasis (3%), infection (5%), pneumonia

* (10%), pleural effusion (2%), respiratory failure (7%), arrhythmia (2%), cardiac arrest (8%), hypotension (8%), persistent pneumothorax (5%), pulmonary oedema (2%), and acute respiratory distress syndrome (ARDS) (2%). Of the 42% of patients who developed complications, 17% had more than one complication. Fifty-eight percent of patients did not develop any complications.

Table 4.3: Complications From Blunt Chest Injuries (n = 60)

Complication	f	%
Pain	12	12
Atelectasis	2	3
Infection	3	5
Pneumonia	6	10
Pleural effusion	1	2
Respiratory failure	4	7
Arrhythmia	1	2
Cardiac arrest	5	8
Hypotension	5	8
Persistent pneumothorax	3	5
Pulmonary oedema	1	2
ARDS	1	2
None	35	58

Pulmonary contusion and flail chest were found to cause more complications than other blunt chest injuries ($p = 0.01850$, $p = 0.00433$). It was also observed that infection was alluded to when there was significant rise in temperature and white cell count. Ten patients (17%) experienced more than one complication.

4.5.2 Final Outcomes at 48 Hours

At the end of 48 hours 67% of the patients were still in the unit of initial admission, 12% had been transferred to a specialized unit and 3% were transferred to a general ward. Eight percent (8%) of the patients had died, 42% experienced complications while 58% did not. Ten percent (10%) had been discharged home (see Table 4.4).

Table 4.4: Final Outcomes at 48 Hours (n = 60)

Outcome	f	%
Still in initial unit	40	67
Transferred to specialized unit	7	12
Transferred to general ward	2	3
Death	5	8
Discharged home	6	10
TOTAL	60	100

It was noted that the five deaths were caused by pedestrian vehicle accidents ($p = 0.0016$).

4.6 SUMMARY

In this chapter the findings of this research have been presented. Narrative and descriptive statistics were used to present the results and where appropriate figures and tables were utilized to enhance data presentation.

Analysis of data indicated that young people are mostly affected by trauma. The time the patients were injured and arrived at the A & E department was infrequently

documented. Motor vehicle accidents were the commonest cause of injury with PVA causing all the fatalities that occurred due to the magnitude of force that was involved. Most patients often had polytrauma.

Nursing care contributed significantly to patient recovery. However, documentation was least done in the trauma ward than ICU. In general less than half (42%) of patients experienced complications.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

5.1 DISCUSSION OF FINDINGS

Blunt chest injuries have long been recognized as a cause of significant mortality and morbidity in which young people are mostly affected. This study revealed that the majority of those who were injured (63%) were aged between 18 to 47 years. Males were more affected (62%) than the females (38%). These findings are consistent with other studies found in the literature (Linton, 1990; Robertson & Redmond, 1994; Watters, 1996). This finding implies that males are more likely to be involved in high risk behaviour which predisposes them to injury.

Motor vehicle accidents were the commonest cause of injury accounting for 57% of all trauma. Pedestrian vehicle accidents accounted for 23% of injuries. No single mechanism of injury was found to be associated with more complications than the other mechanisms ($p = 0.6009$).

The wearing of seatbelts is compulsory according to the Road Traffic Act/Regulation Act 29 of 1989. This study however found that seatbelts were irregularly worn. Of the 58% of patients who were injured in motor vehicle accidents only 5 (14%) were wearing seatbelts. The correct use of seatbelts can reduce the occurrence of blunt chest injuries and associated injuries as well as ejection during accidents.

It is generally recognized that time is a crucial factor in trauma care. The quicker the victim receives treatment after injury the better the recovery outcomes. It was observed from this research that the time the patient was injured was recorded in only 15% of the files. It was therefore difficult to determine the pre-hospital evacuation time. Documentation of the time when the patient was injured and when treatment was received is important in maintaining standards and the conduct of research activity. As stated by McCabe (1996) and Mirvis and Young (1992), survival after the initial trauma is related to severity and duration in which treatment is given. Survival is highest if treatment is given within one hour after injury.

Slightly more than a third of patients (35%) spent over 2 hours in the A & E department before admission to the ICU/ward while in another 27% the time spent in A & E could not be determined. The cause of the delay is multifactorial. It could be relative to the severity of injury, availability of beds in the trauma ward/ICU, time spent for CT scan or unstable patients who needed longer time to stabilize before transfer. It was however observed that patients, who were critically injured and required operative intervention or intensive therapy, spent a relatively shorter time (< 2hrs) in the A & E department before admission to the Ward/ICU or transfer to theatre than those who were less severely injured. This finding is consistent with the recommended time in the literature (McCabe, 1996; Mirvis & Young, 1992).

All the mechanisms of injury were found to cause similar specific chest injuries. Injuries to the rib cage and pleurae were commonest. Myocardial contusion, oesophageal and diaphragmatic injuries were uncommon. Flail chest and pulmonary

contusion were found to be associated with significant morbidity due to complications ($p = 0.018$, $p = 0.004$). These findings are similar to those found in the literature (Schwartz, 1992; Walt & Wilson, 1996).

The mortality and morbidity from blunt chest injuries may be influenced by pre-existing health conditions and associated injuries. It was found that other pre-existing health conditions such as pregnancy, hypertension, TB, HIV, hypothyroidism and drug abuse (27%) could raise morbidity significantly ($p = 0.032$). Blunt chest injury patients often have polytrauma. Associated injuries to the head may cause considerable morbidity ($p = 0.0052$) and mortality ($p = 0.014$). All five patients who died had associated head injuries. Associated skeletal injuries may also cause significant morbidity and prolonged duration of hospitalization ($p = 0.023$).

Most of the blunt chest injury patients (91%) received adequate analgesia i.e. the patient reported pain relief or analgesia was administered as necessary. The drugs of choice were omnopon 10-20mg, morphine 2-5mg and intercostal nerve block. A non-steroidal anti-inflammatory, indocid, was prescribed on one occasion. Rib fractures and the intercostal drainage tube were associated with most pain experiences. However, it was noted that there was no standard (i.e. Pain Scoring Scale) way in which pain was assessed. The Pain Scoring Scale should always be utilized to ensure that pain was similarly assessed and most effectively managed in all patients.

Various treatments were prescribed for the blunt chest injury victims. Forty patients (67%) had intercostal drains inserted due to hemothorax or pneumothorax. Nine

patients received antibiotic therapy due to infection or pneumonia while another twenty-four received antibiotics as prophylaxis. However, prophylactic use of antibiotics in blunt chest injuries is controversial (Wilson & Walt, 1996). Almost all the patients (91%) received analgesics. Adequate analgesia has been found to relieve pain and improve respiratory functions (Oh, 1990). Six patients (10%) who had associated abdominal injury required urgent laparotomy which revealed injury to the diaphragm, liver and spleen. Twenty-nine patients (48%) had associated skeletal injury mostly to the long bones of the limbs and pelvis. These patients were treated either by open reduction, closed reduction or traction. It must be noted that each patient required specific treatment depending on the injuries that were sustained. The treatments that were prescribed are similar to those recommended in the literature (Wilson & Walt, 1996; Johnson, 1995; Roux & Fisher, 1992; Schwartz *et al*, 1992; Robertson & Redmond, 1994).

Less than half of the patients (45%) required mechanical ventilation. The choice of mechanical ventilation depended on their ability to maintain their own airway, severity of injuries, clinical assessments and blood gases. In some of the patients the oxygen demands rose in the first 12-24 hours, but the oxygen demands had returned to normal by the end of 48 hours.

Almost half of the patients (47%) experienced varying degrees of anaemia. The anaemia could be associated with the actual blood loss from haemorrhage (Robertson & Redmond, 1994). It can also be speculated that trauma itself may be a cause of haemolysis which may occur in the reticulo-endothelial cells of the lungs. This

assumption has also been attributed in one case study (Buzzio, Pigella, Memore & Olivero, 1997). Further research on all the possible causes of anaemia in trauma patients could resolve this issue since there is lack of literature on the subject.

Patient assessment by nurses was well documented especially in the Trauma ICU. Documentation of nursing care was least done in the Trauma Ward and evidence of written care plans was lacking. The provision for the nursing process on the reverse of the ICU chart was not being utilized. Since there was less documentation of nursing care in the Trauma Ward than the Trauma ICU, it can be concluded that the patients in the Trauma ICU and Ward are likely to receive different levels of care though the injuries may be similar. The administration of medications, infusions and transfusions were documented all the time.

Assessment of gastrointestinal needs of the patients was infrequently documented. The possible reasons to explain this could be that nurses do not see the prescribing for nutritional needs as part of their responsibility or lack of ability to do adequate nutritional needs assessment. GIT needs were often documented in nursing notes only when they were prescribed in the medical notes.

Psychosocial needs of the patients received the least attention from the healthcare team. Since their mortality and morbidity is not obvious, the psychosocial needs tend to be given low priority. If the patients are to receive holistic care, then psychosocial and spiritual needs of the patients and families must not be overlooked. McCabe (1996) states that information to relatives is an issue that is often neglected.

The pattern of complications that occurred in the first 48 hours is similar to that found in the literature (Oh, 1990; Schwartz *et al*, 1992; Moore *et al*, 1988; Heyman & Culling, 1995). Pain and pneumonia were the commonest complications while pulmonary contusion and flail chest were associated with the highest incidence of complications.

The use of antibiotics, physiotherapy, adequate analgesics and nursing care all played a big role in preventing and treating the complications.

The final outcomes of blunt chest injuries at 48 hours were positive. Less than half (42%) of the patients experienced complications while 6 patients (10%) had been discharged home within 48 hours. However, it was an unexpected finding that all five deaths (8%) that occurred were due to pedestrian vehicle accidents. Pedestrian vehicle accidents can therefore cause a high fatality rate due to the severity of the injuries that are caused.

In summary this study was undertaken with the main aim of describing the profile of care given to blunt chest injury patients within the first 48 hours. The objectives of the research were:

- To determine the incidence of blunt chest injuries.
- To describe the initial assessment of blunt chest injuries.
- To determine the specific chest injuries.
- To identify patient outcomes within 48 hours of admission.
- To describe the medical and nursing care that was given.

Patients with blunt chest injuries received a thorough initial assessment and adequate care. No missed injuries were identified on subsequent assessments. With prompt medical and nursing interventions, complications could be anticipated and prevented to improve patient outcomes.

5.2 RECOMMENDATIONS

5.2.1 For Practice

The following recommendations can be made for trauma patient care:

- Accurate documentation of time be done including time of injury, arrival and leaving the A & E department to facilitate quality control and research activity by the Trauma Unit.
- Explore the possibility of initiating a trauma prevention program to be coordinated by the Trauma Unit.
- To give adequate attention to psychosocial and spiritual care for patients and families.

5.2.2 For Nursing

- To encourage the use of written nursing care plans as a means of prescribing and documenting nursing care that is given to patients and families.
- To increase the emphasis on psychosocial nursing care in professional nursing education.
- Explore the possibility of utilizing computer assisted careplans.

- To identify areas of weakness such as nutrition and address them via continuing nursing education.

3.2.3 For Research

- A comparative study should be done to determine the levels of care that patients with similar blunt chest injuries are receiving in the Trauma ICU and ward.
- Since psychosocial nursing received minimal attention, research needs to be done to identify if relatives are receiving adequate information/communication.
- A similar research is needed to establish the present pre-hospital evacuation time in relation to distance and suggest appropriate standards of care.

5.3 CONCLUSIONS

The following conclusion can be made from the findings of this research:

- The blunt chest injury patients received a thorough initial assessment. No missed or concealed injuries were identified in the sample on the subsequent assessment.
- Despite the complications that some of the patients experienced, adequate care seems to have been given.
- Although more than half of the patients spent more than 2 hours in the A & E department, there was no relative increase in the development of complications.
- The prescription and documentation of the nursing care that was given to blunt chest injury patients was found to be inadequate.

- The majority of the blunt chest injury victims were the young and economically active.
- The findings of this research are consistent with the literature and other studies elsewhere.

5.4 SUMMARY

In this chapter the findings of this research have been discussed and conclusions and recommendations have been made.

The sample in this research represented a select group. Although the sample of 60 is small, the information gained formed a specific trend similar to other studies on blunt chest injuries. It is generally recognized that the care which trauma patients receive immediately after injury determines the recovery outcomes.

The purpose of this study was to describe the care given to blunt chest injury victims within the first 48 hours following injury and to discuss the implications for nursing practice. The literature reviewed various aspects of blunt chest trauma such as the mechanism of injury, specific chest injuries, presentation, nursing care, complications and possible outcomes of care. It was recognized that trauma care needs a disciplined team approach since time lost by lack of coordination can be disastrous to the patient.

In general, patients with blunt chest injuries were found to receive a thorough assessment and adequate medical and nursing care. This answers the main research question of this study.

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Appendix A

DATA COLLECTION CHECKLIST

1. BIOGRAPHIC DATA

1.1 Hospital Number

1.2 Age 18-27years ☐

28-37 yrs ☐

38-47 yrs ☐

48-57 yrs ☐

58-67 yrs ☐

> 68 yrs ☐

NR ☐

1.3 Sex: Male ☐ Female ☐

1.4 Date of admission

1.5 Reason for admission

2. INITIAL ASSESSMENT - Accident and Emergency Department (A&E)

2.1 Date of injury

2.2 Time of injury Not recorded ☐

2.3 Time of arrival in A&E Not recorded ☐

2.4 Time spent in A&E

0-1 hour ☐

1-2 hours ☐

2-3 hours ☐

3-4 hours ☐

>4 hours ☐

2.5 Mechanism of injury

MVA ☐ Driver ☐ Passenger ☐

PVA ☐

Motor cycle ☐

Fall from height ☐

Crush injury ☐

Assault ☐

Sports injury ☐

Other ☐

2.6 Was wearing seatbelt Yes ☐ No ☐ NR ☐

2.7 Glasgow Coma Scale

13-14	
9-12	
3-8	
< 3	
NR	

2.8 Resuscitation required on admission

Maintains own airway	Yes	No
Requires assistance with airway	Yes	No

2.9 Actual assistance required

Correct positioning	
Oral/Nasal airway	
Oxygen	
Endotracheal intubation	
Artificial ventilation	
CPR	

2.10 Specific chest injuries

Hemothorax	☐	Systemic air embolism	☐
Pneumothorax	☐	Perforated oesophagus	☐
Aortic injury	☐	Pulmonary contusion	☐
Great vessel injury	☐	Ruptured diaphragm	☐
Tracheobronchial tear	☐	Fractured ribs	☐
Myocardial contusion	☐	Flail chest	☐
Myocardial infarct	☐		

Other (state) _____

3 ASSOCIATED INJURIES

Head injury	☐
Abdominal injury	☐
Skeletal injury	☐
Urological injury	☐
None	☐

Other (state) _____

4 PRE-EXISTING HEALTH CONDITIONS

Smoking	☐
COPD	☐
Ischemic heart disease	☐
Diabetes	☐
Medication	☐
Other	☐
Not recorded	☐
None	☐

5 MEDICAL DIAGNOSIS (List)

6 TREATMENTS PRESCRIBED

Intercostal drain	☐
Thoracotomy	☐
Antibiotics	☐
Inotropes	☐
Analgesia	☐
Tetanus toxoid	☐
Oxygen	☐

Other (state) _____

7 PATIENT MANAGEMENT IN ICU/WARD

7.1 Time arrived in the Unit/Ward NR ☐

7.2 Glasgow coma score

13-14 ☐

9-12 ☐

3-8 ☐

< 3 ☐

7.3 Pain severity rated Yes ☐ No ☐ NR ☐

7.4 Analgesia prescribed Yes ☐ No ☐ NR ☐

7.5 Ventilation support required

	0-12 hrs	13-24 hrs	25-48 hrs
No support required			
Oxygen by face mask			
CPAP			
Artificial ventilation			

7.6 Blood gases

	0 - 12 hrs	13-24 hrs	25-48 hrs
PCO ₂			
PO ₂			
FiO ₂			

Remarks _____

7.7 Vital signs

	0-12 hrs	13-24 hrs	25-48 hrs
BP			
Temperature			
Pulse			
Respiration			

7.8 Full blood count

	0-12 hrs	13-24 hrs	25-48 hrs
WBC			
Hb			

Remarks _____

8 NURSING CARE

8.1 Patient Assessment

	0-12 hrs	13-24 hrs	25-48 hrs
Physical assessment			
Need prioritization			
Written care plan			
NR			

8.2 Oxygen/Respiratory Needs

	0-12 hrs	13-24 hrs	25-48 hrs
Oxygen therapy maintained			
Maintenance of clear airways			
Deep breathing exercises			
Auscultating air entry			
Chest exercises			
NR			

8.3 Hemodynamic function

	0-12 hrs	13-24 hrs	25-48 hrs
Frequency of monitoring			
Positioning			
Administration of medications			
Checked mediastinum			

8.4 Elimination needs

	0-12 hrs	13-24 hrs	25-48 hrs
Charting output			
Catheter care			
Prevention of constipation			
Correcting fluid/electrolyte balance			

8.5 Psychological

	0-12 hrs	13-24 hrs	25-48 hrs
Talking to patient			
Patient education			
Reassuring patient			
Reassuring relative			

9 SPECIFIC CHEST AND OTHER COMPLICATIONS

	0-12 hrs	13-24 hrs	25-48 hrs
Pain			
Atelectasis			
Lung abscess			
Pulmonary haematoma			
Chest tube malposition			
Infection			
Pneumonia			
Pleural effusion			
Respiratory failure			
Bleeding			
Arrhythmia			
Cardiac arrest			

Continued:

Aortic rupture / dissection

Pulmonary edema

Cardiac failure

0-12 hrs	13-24 hrs	25-48 hrs

Other (state) _____

Remarks _____

10 PATIENT OUTCOMES AT 48 HOURS:

Still in Unit of initial admission. ☐

Transferred to specialized unit. ☐

Transferred to general ward. ☐

Death. ☐

Developed complications. ☐

Did not develop complications. ☐

Discharged home ☐

Appendix B

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

COMMITTEE FOR RESEARCH ON HUMAN SUBJECTS (MEDICAL)

Ref: R14/49 Nyangena

CLEARANCE CERTIFICATE

PROTOCOL NUMBER M980119

PROJECT

Profile of Care Given to Patients with Blunt
Chest Injury Within the First 48 hours

INVESTIGATORS

Mr E Nyangena

DEPARTMENT

Nursing Dept, Wits University

DATE CONSIDERED

980130

DECISION OF THE COMMITTEE *

Approved unconditionally

DATE 980220

CHAIRMAN



(Professor P E Cleaton-Jones)

* Guidelines for written "informed consent" attached where applicable.

c c Supervisor: Mrs J Bruce

Dept of Nursing Education, Wits University

Works2Win0015HumEth07.vjblm 080119 *

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10001, 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.

DATE 23.02.98 SIGNATURE 

PROTOCOL NO.: M 980119

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix C

Department of Nursing
University of the Witwatersrand
7 York Road, Parktown
2193
20-02-1998

Dr
Chief Medical Superintendent
Hospital

Approved

Superintendent
20/2/98.

Dear Dr

Re: UNDERTAKING RESEARCH IN THE JOHANNESBURG HOSPITAL

I am a student registered for a MSc Nursing (Intensive Care) at the University of the Witwatersrand. The scope of my research and thesis is "Profile of care given to patients with blunt chest injury within the first 48 hours."

I would like to conduct the research because I believe that better understanding of immediate outcomes following blunt thoracic trauma will provide a basis to modify patient care to enhance recovery.

I want to assure you that the name of the institution and the personnel and patients involved will not be divulged in the report. A copy of the report will be made available to you if so requested.

I hereby apply for permission to undertake research at the Johannesburg hospital once my proposed study has been approved by the University of the Witwatersrand Postgraduate Committee.

Yours sincerely



Lilijah Wangena, BSN (Baraton)(Kenya)

RN, Ret

Approved


4.3.98

Appendix D

Department of Nursing
University of the Witwatersrand
7 York Road
Parktown
2193

PATIENT INFORMATION SHEET

Dear _____

I am a Masters student (Nursing) at the University of the Witwatersrand. As part of my study I will be conducting research on "Blunt Chest Injuries" in the hospital. Your hospital records will be used for the study.

I assure you that your name will not be recorded in the checklist and it will not be divulged in the report. All information in the records will be treated confidentially.

There are no monetary or other immediate benefits from this research. However, the knowledge to be gained will be used to improve patient care in future.

Your willingness that your hospital file be included in the study is taken as a sign of informed consent.

Thank you for your co-operation.

Yours sincerely

ELIJAH NYANGENA

Author Nyangena E

Name of thesis Profile Of Care Given To Patients With Blunt Chest Injury Within The First 48 Hours Nyangena E 1998

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