

https://dspace.org/

Management of patient with head injuries during the first 24 hours in Princess Marina Hospital (Botswana)

Gwaila, Tebogo Synat

2014-03-17
http://hdl.handle.net10539/14173

Downloaded from a DSpace repository. https://dspace.org/

MANAGEMENT OF PATIENTS WITH HEAD INJURIES DURING THE FIRST 24 HOURS IN PRINCESS MARINA HOSPITAL (BOTSWANA)

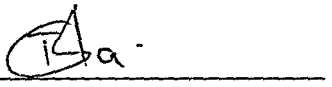
Tebogo Synat Gwaila

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg in partial fulfilment for the requirements for the Degree of Master of Science in Nursing in the field of Intensive Care

Johannesburg, 1999

DECLARATION

I, Tebogo Synat Gwaila 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.



15.9.99

TEBOGO SYNAT GWAILA **DATE**

DEDICATION

To my Patients

To my Parents

Tau and Mokone

To my Brothers and Sisters

Gwaila, Modibedi, Moathodi, Masego and Malebogo

To my Daughter and Son

Tiny Mogogi and Tsholofelo Terrence

To my little Grandson

Kaesi Etsile

To my best friend

Molekodi

Without their support and encouragement this could never be.

ABSTRACT

The purpose fo the study was to investigate and describe the documented management of head injured patients during the first 24 hours as implemented at the Princess Marina Hospital, Gaborone (Botswana). Particular attention was paid to the documented interventions carried out by nurses and medical doctors during the first 24 hours. A survey research design using a chekclist to obtain data was utilized. The method of data collection was by record review. The population for this research comprised all head injured patients admitted to the Princess Marina Hospital over a one year period from 1.1.1997 to 31.12.1997. A preliminary record review indicated that a total of 240 patients have been treated from January 1997 to December 1997. The sample (n = 126) consisted of one hundred and twenty-six records of head injured patients, who were received in the accident and emergency unit and admitted in different wards for management during the first 24 hours. The setting of this research was the Princess Marina Hospital in Gaborone, Botswana. A pilot study was undertaken at the same hospital. Data was analysed by use of a computer. Descriptive statistics were used. The study revealed that documentation of time of injury, arrival time and time of transfer to the wards was inadequate. Motor vehicle accidents are the commonest causes of injury and assault is the second commonest. Though poor documentation is noted at some stages, adequate care appears to have been given to patients in the opinion of the researcher. The prescription and interventions for head injured patients were found to be appropriate. There was poor documentation on cervical spine **control.** Blood gases were not assessed in 98% of patients.

ACKNOWLEDGEMENTS

I wish to acknowledge the following people without whose help, this study could not have materialised.

- I am highly indebted to Mrs JCM Bruce who played a key role as my supervisor in promoting this research.
- The permanent secretary, Ministry of Health for financial assistance towards my research expenses.
- The Hospital Superintendent, Professor G. Anabwani and the research committee, Mr S. Israel and staff at the records department.
- Beverley Noble and Tip Top Secretarial Services for typing my research document.
- Thagiso Pilatwe for support and guidance with statistical information.
- Staff in the Intensive Care Unit.
- The members of staff of the Department of Nursing Education of the University of the Witwatersrand who assisted with this research.
- To all others too many to mention, for their support and encouragement.

TABLE OF CONTENTS

		PAGE
DECLARATION		ii
DEDICATION		iii
ABSTRACT		iv
ACKNOWLEDGEMENTS		v
TABLE OF CONTENTS		vi
LIST OF FIGURES/ILLUSTRATIONS		xi
LIST OF TABLES		xii
ABBREVIATIONS		xiii
CHAPTER 1: BACKGROUND TO THE STUDY		
1.1	INTRODUCTION	1
1.2	PROBLEM STATEMENT	2
1.3	SIGNIFICANCE OF THE STUDY	3
1.4	PURPOSE	4
1.5	OBJECTIVES	4
1.6	OPERATIONAL DEFINITIONS	5
1.7	SUMMARY	5
CHAPTER 2: LITERATURE REVIEW		
2.1	INTRODUCTION	6
2.2	ANATOMY	8
2.3	CATEGORIES OF HEAD INJURIES	13
2.3.1	Primary Injury	13
2.3.2	Secondary Injury	13
2.4	MECHANISMS OF INJURY	13
2.5	PATHOPHYSIOLOGY	14
2.6	SPECIFIC HEAD INJURIES	17
2.6.1	Scalp Lacerations	17
2.6.2	Skull Fracture	18
2.6.3	Stab Wounds	20
2.6.4	Concussion	21
2.6.5	Contusion	21
2.6.6	Intracranial Haematoma	21

		PAGE
2.7	COMPLICATIONS OF HEAD INJURIES	22
2.7.1	Subdural Haematoma	22
2.7.2	Intracerebral Haemorrhage	23
2.7.3	Hyperpyrexia	23
2.7.4	Brain Death	23
2.7.5	Respiratory Arrest	24
2.8	ASSOCIATED INJURIES	24
2.9	MANAGEMENT	25
2.9.1	Respiration	26
2.9.2	Circulation	27
2.9.3	Intracranial Pressure	27
2.9.4	Neurological Status	28
2.9.5	Vital Signs	30
2.9.6	Fluid Balance	31
2.9.7	Blood Transfusion	31
2.9.8	Positioning	32
2.9.9	Investigations	32
2.9.10	Medications	33
2.9.11	Feeding	35
2.10	SUMMARY	36
CHAPTER 3: RESEARCH METHODOLOGY		
3.1	INTRODUCTION	37
3.2	RESEARCH DESIGN	37
3.3	THE SETTING	37
3.4	POPULATION	38
3.5	THE SAMPLE	38
3.6	DATA COLLECTION	39
3.6.1	Research Tool	39
3.6.2	Data Collection Procedure	40
3.7	VALIDITY AND RELIABILITY	40
3.8	PILOT STUDY	40
3.9	ETHICAL CONSIDERATIONS	41
3.10	SUMMARY	42

		PAGE
CHAPTER 4: PRESENTATION OF FINDINGS		
4.1	INTRODUCTION	43
4.2	SECTION I: GENERAL INFORMATION	43
4.2.1	Time of Injury	43
4.2.2	Admissions	43
4.2.3	Time of Arrival at the Hospital After Injury	44
4.2.4	Mechanism of Injury	44
4.2.5	Provisional Diagnoses	45
4.3	SECTION II: INITIAL MANAGEMENT	46
4.3.1	Initial Attendant	47
4.3.2	Airway Maintenance	48
4.3.3	Control of Cervical Spine	48
4.3.4	Breathing	48
4.3.5	Circulation	48
4.3.6	Glasgow Coma Scale	49
4.3.7	Vital Signs	50
4.3.7.1	Temperature	50
4.3.7.2	Pulse	50
4.3.7.3	Respiratory	51
4.3.7.4	Blood Pressure	51
4.3.7.5	Skin Perfusion	51
4.3.7.6	Urinary Output	51
4.3.7.7	Consensual Reflex	51
4.3.7.8	Intracranial Pressure Monitoring	52
4.3.8	Investigations	52
4.3.8.1	Blood Gases	52
4.3.8.2	Haemoglobin	53
4.3.8.3	Blood Grouping and Cross-matching	53
4.3.8.4	Urine Testing	53
4.3.8.5	Electrocardiogram	53
4.3.8.6	Computerised Tomography Scan	54
4.3.8.7	Radiological Examinations	54
4.3.9	Associated Injuries	55
4.3.10	Associated Signs and Symptoms	55

		PAGE
4.3.11	Medications	55
4.3.12	Transfer or Referral	56
4.4	SECTION III: SUBSEQUENT MANAGEMENT	57
4.4.1	Airway	57
4.4.2	Control of Cervical Spine	57
4.4.3	Breathing	57
4.4.3.1	Oxygen with Assistance	57
4.4.3.2	Mechanical Ventilation	58
4.4.4	Glasgow Coma Scale	58
4.4.5	Vital Signs	58
4.4.6	Medications	59
4.4.7	Surgical Procedures	59
4.4.8	Self Care Requisites	59
4.5	SECTION IV: PATIENT'S OUTCOME	60
4.6	SUMMARY	60
CHAPTER 5: DISCUSSION, CONCLUSIONS & RECOMMENDATIONS		
5.1	INTRODUCTION	61
5.2	DISCUSSION OF FINDINGS	61
5.3	CONCLUSIONS	69
5.4	LIMITATIONS	71
5.5	RECOMMENDATIONS	71
5.5.1	Practice	71
5.5.2	Nursing Education	72
5.5.3	Research	72
5.6	SUMMARY	73
REFERENCES		74

PAGE

APPENDICES

Appendix 1:	PRINCESS MARINA HOSPITAL	86
Appendix 2:	CHECKLIST	87
Appendix 3:	LETTER OF APPROVAL FROM COMMITTEE OF HUMAN SUBJECTS	97
Appendix 4:	LETTER OF APPROVAL FROM POST GRADUATE COMMITTEE	98
Appendix 5 & 6:	LETTER TO AND FROM THE MINISTRY OF HEALTH	99
Appendix 7 & 8:	LETTER TO AND FROM THE OFFICE OF THE PRESIDENT	101
Appendix 9,10, 11 & 12	LETTER TO AND FROM THE PRINCESS MARINA HOSPITAL	103

LIST OF FIGURES/ILLUSTRATIONS

		PAGE
Figure 2.1:	Racoon Eyes	19
Figure 2.2:	Battle's Eyes	20
Figure 4.1:	Admission Distribution of the Sample	44
Figure 4.2:	Mechanism of Head Injury	45
Figure 4.3:	Glasgow Coma Scale Reading During the Initial Management	50
Figure 4.4:	Vital Signs Monitoring	50
Figure 4.5:	Investigations Performed on Head Injured Patients	55
Figure 4.6:	Glasgow Coma Scale Reading During the Subsequent Management	58
Figure 4.7:	Head Injury Patient's Outcome After 24 hours	60

LIST OF TABLES

PAGE

Table 2.1:	Glasgow Coma Scale	29
Table 4.1:	Provisional Diagnoses of Head Injured Patients Admitted in A & E Unit	46
Table 4.2:	Initial Attendants of Head Injured Patients in A & E Unit	47
Table 4.3:	Types of Intravenous Fluids Given During the First 24 Hours	49
Table 4.4:	Radiological Examination of Head Injured Patients	55
Table 4.5:	Medications and Treatment Prescribed	56

ABBREVIATIONS

A & E:	Accidents and Emergency
CT Scan:	Computerised Tomography
ECG:	Electrocardiograph
GCS:	Glasgow Coma Scale
ICU:	Intensive Care Unit
RTA:	Road Traffic Accident
ICP:	Intracranial Pressure
mmHG:	Millimetres of Mercury
PaO_2:	Arterial Partial Pressure of Oxygen
$PaCO_2$:	Arterial Partial Pressure of Carbon Dioxide
HCO_3:	Bicarbonate
pH:	Hydrogen ion (H^+) Concentration of Plasma
CSF:	Cerebrospinal Fluid
MVA:	Motor Vehicle Accident
PVA:	Pedestrian Vehicle Accident
Hb:	Haemoglobin
ABG:	Arterial Blood Gases

CHAPTER 1

BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Head injury is a major cause of mortality and morbidity world wide. It is a problem in developing and developed countries. Those often affected are young victims. This poses a major problem not only in terms of frequency, but also because of the fatalities, handicaps and labour losses (Combes, Fauvage, Colonna, Passagia, Chirossel & Jacquot, 1996). South Africa, being a developing country is faced with an increasing incidence of head injuries which account for 30% of all surgical admissions at Chris Hani Baragwanath Hospital (Gopal, 1989; Bruce & Mngoma, 1998). Botswana as a developing country, with a population of 1.3 million (Population Census, 1991) is faced with an escalating rate of road traffic accidents. One thousand five hundred and twenty-five patients who are admitted in the year 1995 in Botswana are due to motor vehicle accidents and of these patients, 48% (727) sustained head injuries. Of these 727 head injured patients, 28% (201) deaths are reported and 20% of these deaths are reported to have occurred during the first week of injury (Botswana Health Statistics, 1995) In Botswana, attempts have been made to mandate the use of seat belts, motor cycle helmets, road blocks and alcohol testing at the road side, however, this had not been a solution to the problem.

Gaborone, which is the capital city, with a population of 133,791 (Botswana Population Census, 1991) has one big government hospital called the Princess Marina Hospital with 483 beds. This hospital admits an average of 20 head injured patients monthly (Princess Marina Hospital Statistics, 1996). There are approximately 131 motor vehicle accidents

which occur in Gaborone in a month (Botswana Road Traffic File Gaborone, 1997) and road traffic accidents are the commonest cause of head injuries. An unknown percentage of victims die or their prognoses are made worse by poor acute management techniques and practices within the first 24 hours following injury (Keenan, 1989). Fifteen percent may die from factors that are potentially reversible by trained personnel. As stated by Treadwell and Mendelow (1994), 40% of patients die later in hospital because of delay in treatment or failure to diagnose intracranial haematoma. It is thus essential during admission to perform a thorough assessment and neurological observation of the head injured patient (Trevou & Allwright, 1997). The final functional outcome of head injuries largely depends on the initial care the victims receive immediately after the injury (Demetriades, 1989), and this can be done by using simple methods, simple equipment and common sense and if patients are assessed in an objective way (Keenan, 1989). Subsequent management is of vital importance in head injuries. However, this requires a sophisticated, well organised approach to minimize secondary damage to the brain. This is supported by Brown, Raine, Robertson and Swann (1994) who state that patients should be managed promptly to avoid later occurrence of complications such as meningitis or haematoma.

1.2 PROBLEM STATEMENT

Head injuries are amongst the leading causes of death and contribute to an increase in inpatient admissions in Botswana (Botswana Health Statistics, 1995). Because of a shortage of skilled manpower, head injured patients are not managed effectively from the accident scene to the hospital. Extrication and removal of head injured patients is done by

policemen, passers-by (public) or relatives who may not have the technical know how in handling head injured patients which may eventually lead to complications. Management of head injured patients at hospital level is performed by nurses and doctors who have the fundamental general knowledge. Guidelines or protocols for management of these patients are not readily available. Literature reveals that management of head injured patients should be carried out by personnel with guided detailed understanding of pathophysiology and therapeutic principles (Naidoo, 1997). This therefore necessitates the use of protocols or guidelines. It is essential that proper assessment and management of these patients are carried out by expert personnel which is often not the case in Botswana because there are few trained personnel for critical care and emergency management. Whilst there are some studies which have been conducted on head injury management, no studies have been conducted in Botswana. Hence there is no data available on head injury research in Botswana. This has prompted the researcher to investigate and describe the documented management of head injury patients during the first 24 hours so as to enrich the quality care of these patients.

1.3 SIGNIFICANCE OF THE STUDY

According to the researcher's experience that head injured patients are often not managed effectively from the accident scene to the hospital through the first 24 hours, which is considered as a crucial time for head injured patients. The Botswana National Development Plan (NDP 7) midterm review (1997) had introduced a programme of upgrading enrolled nurses to general nurses; the emphasis is more on competence in clinical skills. To fulfil this aim the NDP 7 has established a Bachelor of Science in

Nursing and Master Degree. By investigating and describing the documented management of patients with head injuries, the results may make an input in the curriculum content in those cadres. The research findings will be useful to:

* Health personnel (nurses, doctors, physiotherapists etc.) who are working in accident and emergency, surgical wards, intensive care units where these patients are managed. The findings would assist the hospital to formulate and implement a protocol of management, which would guide them on emergency management of head injured patients
* Policemen, members of the public, and relatives who often assist in removal and transportation of head injured patients from the accident scene to the hospital.

1.4 PURPOSE

The purpose of this study was to investigate and describe the documented management of head injured patients during the first 24 hours at the Princess Marina Hospital, Gaborone.

1.5 OBJECTIVES

The objectives of this study were:

* To describe the initial management of head injured patients upon arrival in the accident and emergency unit.
* To describe the subsequent Nursing and Medical management documented during the first 24 hours.
* To identify the outcomes associated with head injuries within the first 24 hours.

1.6 OPERATIONAL DEFINITIONS

The study variables were defined as follows:

* **Head injury:**

Any trauma to the head that results in some degree of impairment in cerebral or body function.

* **Initial Management:**

Treatment and care rendered to the head injured patients by health personnel immediately on arrival in the accident and emergency unit to stabilize the condition.

* **Subsequent Management:**

Treatment and care rendered to head injured patients by health personnel after stabilizing their condition during the first 24 hours.

* **Health personnel:**

Nurses and doctors rendering care to head injured patients on arrival in the accident and emergency unit for 24 hours.

1.7 SUMMARY

The reduction in mortality and achievement of good quality of life are the two main goals during the first 24 hours after a head injury. Hence it is expected that early diagnosis, new monitoring techniques and effective treatment rendered by health personnel will reduce secondary damage to the brain. The chapter addressed the problem of head injury in developed countries and Southern Africa, the significance of the study, the purpose and the objectives of the study. The study variables have been defined.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter focuses on the literature reviewed in relation to the management of head injury during the first 24 hours. It includes anatomy and pathophysiology of head injuries, causes, types, complications, initial and subsequent management.

Head injury has become the commonest form of trauma world wide. It is a major health problem not only in terms of frequency, but also because of the fatalities, handicaps and labour losses (Combes *et al.*, 1996). It is therefore important to decrease the mortality and morbidity rates. All head injured patients received at the accident and emergency ward requires provision of primary care, acute care and subsequent care.

The difficulty of stabilizing the patient at the site of the accident before transfer to the Accident and Emergency Unit is increasingly being recognised.

Unless paramedical personnel with advanced training are available, it has been found that the patient's prognosis is improved if he can be transferred to a hospital as soon as possible. This has arisen from the fact that many paramedical staff have been unable to intubate the patient.

Fluid overdose is common and this has contributed to the Acute Respiratory Distress Syndrome (ARDS) occurring.

It is therefore important to note that all personnel handling the victims should be aware of the Golden Hour. The Golden Hour is the first hour after injury whereby the airway, breathing and circulation is maintained. Prompt intervention within the first hour can make a dramatic difference to a positive patient outcome (Guin, 1995). According to Thelan, Davie, Urden and Lough (1994) head injury accounts for 25% of all trauma deaths in United States of America, and 50 to 60% of all deaths are as a result of motor vehicle trauma. Early diagnosis and effective treatment rendered can reduce the morbidity (Lloyd, Carty, Patterson, Butcher & Roe, 1997).

For the management of head injury to be carried out promptly the advanced trauma life support (ATLS) in the United States of America provided a systematic management approach which is practised world-wide (Cudmore, 1996). This focuses on two steps: First the primary step by step approach which focuses on the initial assessment of patients as they enter the emergency room. This comprises the Airway maintenance with cervical spine control, Breathing, Circulation with haemorrhage control. Drugs and ECG rhythm (ABCDE).

A secondary approach focuses on a complete head to toe examination of the patient so that all injuries can be identified. Driscoll (1992) introduced a horizontal framework whereby a team of people is involved in working on the initial assessment and each member of the

team is in charge of a particular part of assessment and therefore the work can be completed simultaneously thus reducing the overall assessment time.

2.2 ANATOMY

Head injury affects the cranial cavity hence the importance to understand the anatomy of the cranial cavity.

The cranium is a rigid compartment filled to capacity with incompressible substances, the brain, the cerebrospinal fluid and the blood (Abelson, 1997). The brain is protected from injury by the hair, skin and bones that surround it. Without this protection, the delicate brain which makes us what we are, would be susceptible to injury and destruction (Price, 1992).

Some injuries are caused by direct trauma, many others are secondary to the injury. It is these effects that the medical team manages to prevent and to detect early in order to avoid the sequence of events that leads to mental and physical deficit and even death. Just above the skull lies the galea aponeurotica, a freely movable, dense, fibrous tissue which aids in absorbing the force from external trauma. Between the galea and the skin is a fatty layer and a deep membranous layer which contains large vessels. Awareness of this fact is important, because when severed, these vessels constrict poorly and may cause significant blood loss in a patient with scalp laceration. Care must be taken on suturing because there can be partial denervated scalp with resulting numbness or paresthesia (De Groot & Chusid, 1990). Directly beneath the galea is the subaponeurotic space, in which are found

the emissary and diploic veins. These vessels may carry infection from the scalp to deep within the skull, which underscores the extreme importance of thorough cleansing and debridement of the scalp whenever the galea has been torn.

The calvaria which is the bony vault of the cranium consists of the frontal bone, parietal bones and occipital bones. The calvaria as the scalp, has nerves and vessels supplying it.

The brain is enclosed within the cranial cavity of the skull and divided into the cerebrum, cerebellum and the brain stem and it is covered by protective membranes, the meninges. When a fracture of the skull involves tearing one of the meningeal arteries, the resultant arterial bleeding which accumulates in the epidural space, may lead to fatal outcome unless it is detected and treated immediately. This calls for an immediate neurosurgical intervention (Oh, 1990).

Injury to the motor centres in the frontal lobe which is a component of the cerebrum may cause convulsive seizures. Injury to the parietal lobe may cause Aphasia. Trauma to the occipital lobe may cause contralateral homonymous in the visual fields. The temporal lobe is inferior to the lateral cerebral fissure and extends to the level of the parieto-occipital fissure. Injury to this lobe may experience word blindness (patient may hear the spoken word or see the written word but cannot comprehend its meaning).

The white substance (white matter) contains neuroglia and medullated (myelinated) nerve fibres. The basal ganglia are masses of grey matter situated deep within the cerebral hemisphere. The corpus stratum includes the caudate and le: rm nuclei and a band of fibres separating them, the internal capsule. Trauma to the basal ganglia and the caudate nucleus may cause involuntary movements such as athetosis and chorea.

The caudae nucleus is adjacent to the lower border of the anterior horn of the lateral ventricle. The lentiform nucleus (lenticular) is situated between the insula and the caudate nucleus and thalamus and is divided into the putamen and globus pallidus. Haemorrhage of the lenticulastriate artery may cause spastic hemiplegia of the contralateral side.

The Diencephalon encloses the third ventricle and includes the thalamus, epithalamus and hypothalamus. The thalamus rather than the sensory cortex is the crucial structure for perception of some types of sensation especially pain. The epithalamus contains the pineal gland which plays a role in physical growth.

The hypothalamus is located below the thalamus, and other landmarks around the hypothalamus are the pituitary gland, optic chiasma and sella turcica. The hypothalamus functions to regulate and maintain internal body environment and interacting with the limbic system to generate actual physical responses to emotions such as blushing when embarrassed. Trauma to this centre may cause somnolence, loss of libido, loss of temperature, diabetes insipidus, visual defects (bitemporal hemianopia frequently resulting from involvement of the nearby optic chiasm).

The brain stem is the portion of the brain connecting the cerebral hemisphere with the spinal cord and containing the Midbrain, Pons and Medulla Oblongata. The grey matter in the brain stem is scattered in numerous small masses called nuclei, many of which are motor or sensory nuclei of the cranial nerves. The midbrain forms the junction between the pons and diencephalon. Cranial nerves III and IV originates in this region, the third and fourth ventricle is in the midbrain.

The major function of the midbrain is to relay stimuli involved in voluntary motor movement of the body. Also arising from the midbrain are the tectospinal and rubrospinal tracts of the extrapyramidal (involuntary) motor functions. The tectospinal tracts control reflex motor movements in response to visual and auditory stimuli and rubrospinal tract controls tone of flexor muscles. Trauma to the midbrain may lead to inability to constrict the pupils, change shape of lens, and allow co-ordinated extraocular movements of the eyes.

The pons is located above the Medulla. It relays information to and from the brain to the spinal cord. Located in the pons are two respiratory control centres. They both communicate with the respiratory centre. The apneustic centre controls the length of inspiration and expiration, and pneumotaxic centre controls the rate. Cranial nerves V (Trigeminal), VI (Abducens), VII (Facial), and VIII (Acoustic) are in the pons. Portions of the reticular formation are also in the pons. Trauma to the pons may cause abducence paralysis, tinnitus which may lead to progressive deafness, vertigo, ipsilateral ataxia and contralateral hemiplegia.

The medulla oblongata contains groups of neurons or centres that control involuntary functions as swallowing, vomiting, coughing, vasconstriction and respirations. The medullary respirations work hand in hand with that of the pons. Also located in the medulla are the origins of the cranial nerves 1X (glossopharengeal), X (vagus), XI (spinal accessory), and XII (hypoglossal). The reticular formation begins in the medulla, then it is a diffuse set of neurons, and composed of motor and sensory tracts. It is closely tied to functions of the basal ganglia, thalamus, cerebellum and cerebral cortex. It has some excitatory and inhibitory capabilities, thus it functions in providing a balance between the excitatory and inhibitory stimuli to maintain normal muscle tone which supports the body against gravity.

The cerebellum is composed of two lateral hemispheres. It influences muscle tone associated with equilibrium, orientation in space, locomotion and posture. Input is received from the sensory pathways of the spinal cord, the brain stem and the cerebrum. Whilst output is through the descending motor pathways such as the corticospinal, vestibulospinal and reticulospinal tracts.

2.3 CATEGORIES OF HEAD INJURIES

Head injury categories as outlined by Naidoo (1997) are as follows:

2.3.1 Primary Injury

Primary Injury occurs at the moment of impact and blunt head trauma takes the form of brain contusion and lacerations, extra axial haemorrhages, diffuse cerebral haemorrhages, diffuse cerebral injury and damage to the cranial nerve and pituitary stalk.

Injury to the scalp and cranium may be included in this category, as well as parenchymal damage inflicted by stab and missile wounds of the head. At present there is no treatment for the brain parenchyma and what can be done is to provide the optimal milieu for the injured brain to take whatever recovery it can.

2.3.2 Secondary Injury

Secondary insults are defined as pathological processes that occur after the time of injury and adversely affect the ability of the brain to recover from the primary insult.. Hypoxia, ischaemia, hypotension and anaemia are important sources of secondary damage. Infection and seizures contribute as well. Of the various secondary insults that can occur in the early hours after head injury the most significant are hypovolaemic shock and hypoxia.

2.4 MECHANISM OF INJURY

Mechanisms of injury include penetrating and blunt trauma to the head. Penetrating trauma can result from the penetration of a foreign object (e.g. bullet) that causes direct damage to cerebral tissue. Blunt trauma occurs as a result of the brain being crushed

against the skull. Deceleration injuries are when the brain crushes against the skull after been hit by an object (e.g. dash board of a car). There may be loss of consciousness, vertigo, depending on the impact, also there may be headache. The patient can return to normal without treatment. Acceleration injuries occur when the skull is hit by a force that causes the brain to move forward to the point of impact and then as the brain reverses direction and hits the other side of the skull (Collins, Van Gilder, Venes, Wagner & D'Angelo, 1994).

2.5 PATHOPHYSIOLOGY

The calvaria is the most important aspect of the body because it encloses the brain which consists of various parts which are responsible for life. Injury to the head may be fatal depending on the impact and organs involved (Parsley. Fletcher & Mabrook, 1997). Head injury affects the scalp, skull and brain. This may further affect the normal physiologic mechanism of the body which may be visible during the first 24 hours. Hence the need to follow the ABCDE as outlined by ATLS (Mcabe, 1996). According to Adedeji and Driscol (1996), death after head injury is trimodal. Studies reveal that half of all deaths occur in the first peak or shortly after the accident which can be due to unsalvageable, major neurological or vascular injury. Thirty percent of deaths occur some hours after injury when resuscitation and stabilisation are critical. Therefore it is important to resuscitate during the immediate or early post injury period.

According to different studies on head injuries, the pathophysiology is summarised into Primary (that which occurs on impact) and Secondary (that which occurs as a result of the

original trauma). For the purpose of this research the pathophysiology will be discussed basing on the scalp, skull and brain. Following the moment of impact on the head, the scalp as the outer most covering may sustain a laceration, because of its richness in the nerve and blood supply, large amounts of blood may be lost if not attended to early, leading to hypovolemic shock (Fitzpatrick & Seex, 1996). Trauma to the loose connective tissue especially due to blunt injury may lead to subgaleal haematoma.

Trauma to the skull especially on the face around the orbit may lead to loss of vision because of the pressure exerted. Trauma to the frontal bone may lead to tearing of the dura mater and the arachnoid over the cribriform plate of the ethmoid bone leading to cerebrospinal fluid rhinorrhea. Therefore it is important to avoid an erect posture or straining and coughing which can cause an increase in the amount of fluid flow. Also early use of prophylactic antibiotics is advisable to prevent infection and meningitis (Waner 1997).

There may be trauma to the middle cranial fossa leading to middle meningeal artery haemorrhage. This may lead to transient loss of consciousness followed by apparent recovery. The patient then later starts to develop signs of increasing intracranial pressure due to accumulation of blood in the extradural space. This can lead to death in a few hours if left untreated. This calls for the need for immediate skull x-ray and CT scan (Cranshaw, Hughes & Clancy, 1996)

Trauma to the posterior cranial fossa may lead to leakage of cerebrospinal fluid from the

ear. Thorough examination should be performed because the posterior cranial foss contains the cerebellum, pons, and medulla oblongata which are vital areas of the brain.

Trauma to the dura mater may lead to bleeding resulting in increased intracranial pressure. The clinical manifestations of increased intracranial pressure are varied and subtle in their appearance. Alteration in the patient's level of consciousness (LOC) is the most sensitive indicator. The classic triad of symptoms is headache due to stretching of the dura blood vessels, papilloedema due to pressure on and swelling of the optic nerve, and vomiting which is frequently projectile. The presence of widened pulse pressure and decreased pulse and respiratory rates signals brain decompensation and impending death. A massive subdural haematoma requires surgical treatment. Monitoring of the Glasgow Coma Scale would contrbute to early diagnosis of the possible haematoma and thus, early surgical intervention. Trauma to the brain, especially the frontal lobe may lead to seizures which begins as contralateral focal twitching. Aphasia and Agraphia (inability to write words) may result.

Trauma to the arachnoid membrane may lead to bleeding into the subarachnoid space leading to severe headache, often with impairment or loss of conscious , painful neck stiffness (Kerning's sign) and presence of fresh blood in the cerebrospinal fluid on lumbar puncture. Surgery is often feasible if bleeding is excessive.

Trauma to the parietal lobe may lead to the inability to localise the intensity of pain due to irritation of the post central gyrus. This is why it is important to assess pain stimuli in head

injured patients. There may be visual hallucinations due to irritation of the occipital cortex, destructive lesions of the occipital cortex may cause contralateral homonymous hemianopia. There may be loss of temperature control, visual defects such as bitemporal hemionopia due to trauma to the hypothalamus. This is why it is important to examine the eyes for pupillary reaction to light and monitor vital signs depending on the severity of the condition. Cerebral oedema is mainly due to increase in intracranial pressure, hypoxia, fluid and electrolyte imbalances, cerebral ischaemia, hypotension and injury. Hypotension can be due to extreme blood loss which is overt or in terminal stages when medullary failure supervenes (Naidoo, 1997). This can be minimized by proper initial care (Gopal & Lipschitz, 1988).

It is of great importance for both nursing and medical personnel to know the pathophysiology of head injury and all methods of assessing and monitoring the brain's response to injury. It is thus important for health personnel to exercise rapid assessment, resuscitation and definitive care for head injury patients so as to prevent secondary insults (Thela *et al.*, 1994).

2.6 SPECIFIC HEAD INJURIES

2.6.1 Scalp Lacerations

Scalp lacerations are common in head injuries. This is because of the arrangement it maintains on the calvaria. The face and scalp possess an unusually rich blood supply and significant amounts may be lost from them very quickly (Heckman, Farrington, McDermott, Rockwood, Rosenthal & McFee, 1981). The best clinical feature is bleeding

at the site of injury.

The emergency medical care is local control of the bleeding by a sterile dressing over the wound and a soft, self-adhering, circumferential roller bandage for compression. Delay in definitive management can result in increased morbidity and poor outcome (Fitzpatrick & Seex, 1996).

2.6.2 Skull Fractures

Much too much emphasis has been placed on the presence of skull fractures in predicting brain damage. In Bristol, 7% of head injury patients present for treatment of skull fractures (Cranshaw *et al.* 1996). If a skull fracture has occurred, it is an indication that the mechanical force exerted on the head was great, but the fracture alone offers no proof that the brain has been damaged Skull fractures are usually detected at the hospital by X-ray examination. If the scalp has been lacerated there may be a visible crack. Skull fractures are either open or closed (Van Rensburg 1990). They are classified as:

* Linear - is a thin line crack in the skull.
* Comminuted - in comminuted fracture, multiple cracks radiate from the centre of impact. The pattern is similar to that of a cracked egg.
* Depressed - in depressed fractures, a fragment or fragments of bone have been pushed inward against the brain. Such fractures are common in penetrating injuries. Bullets notoriously thrust fragments of the skull deep into the brain. These fragments may come to lie on the brain or lacerate it causing extensive damage (Figure 2.2). Visualization of the skull beneath the scalp injury should be done only under sterile conditions (McHugh, 1997). Debridement may be done

with cranioplasty.

* Basal - basal skull fractures cannot be seen even with excellent x-rays. They can present with severe clinical problems especially if there is an obvious cerebrospinal fluid leak. Haemorrhage from the ear in the absence of a good local cause is also a strong indication that a basal skull fracture exits. CT scanning should be an early investigation (Cranshaw *et al.*, 1996). Much controversy exists concerning the use of antibiotics prophylactically in patients with cerebrospinal fluid leakage. However, various studies suggest that, the use of antibiotics can reduce the incidence of infections like meningitis (Jennett & Tedale, 1992).



Figure 2.1 Racoon eyes as shown by du Trevou & Allwright (1997)



Figure 2.2 Battle Sign as shown by du Trevou & Allwright (1997)

* Compound fracture. Any skull fracture in association with a scalp laceration such as that the fracture is open is compound.

2.6.3 Stab Wounds

The patient who gives a history of having been stabbed in the skull must be evaluated carefully as much as the patient whose scalp or facial injury has the appearance of a stab wound.

A slot fracture of a knife wound of the skull may not be visible on X-ray nor a transorbital stab wound. No attempt should be made to remove the foreign object from the head.
All patients with suspected stab wounds of the skull undergo CT scan followed by cerebral angiography, if a haematoma needs surgical evacuation (Gopal & Lipschitz, 1988).

2.6.4 Concussion

When a person has been struck on the head or hit in the face, a brain concussion results. There is a temporary loss of some or all of the ability of the brain to function. The brain may rebound within the skull as it is bounced. According to the study conducted by Landy (1998), 70% of patients admitted in the accident and emergency unit in Australia present with concussion. The patient with concussion may become totally unconscious and unable to breath for a short period of time, or may be confused and staggering. The concussive stage is of short duration and the patient recovers fully without treatment. Most patients who have sustained a concussion have some loss of memory for the events surrounding the accident (amnesia). If the patient cannot remember the events prior to the injury (retrograde amnesia), a more severe concussion is evident.

2.6.5 Contusion

The brain may sustain a contusion or bruise when any object hits the skull with force. Contusion implies that bleeding from the injured blood vessels has occurred. The individual may lose consciousness, paralysis on one side of the body, dilatation of one pupil and alteration in vital signs. Very severe contusion can produce unconsciousness for prolonged periods of time, and paralysis of all limbs. Patients must receive adequate ventilation, supplementary oxygen and all cardiopulmonary resuscitation (McQuillan, Pilkington, Allan, Faylor, Short, Morgan, Nielson, Barret & Smith, 1998).

2.6.6 Intracranial Haematoma

Any severe injury within the skull may cause a collection of blood called intracranial

haematoma. The haematomas are classified as follows:

* Epidural: outside the dura and under the skull.

* Subdural: beneath the dura and outside the brain.

* Intracerebral: within the brain.

The signs are related to the development of pressure on the brain where it is compressed by an expanding mass of the blood clot within the skull. These haemorrhages usually require an operation to remove the clot. If it is not removed the patient may die. The nursing care of these patients includes assessment of the neurological status and noting changes, bandaging any obvious scalp wound and vital signs monitoring (Swann & McCarter, 1998).

2.7 COMPLICATIONS OF HEAD INJURIES

2.7.1 Subdural Haematoma

Bleeding may come from a bridging vein or surface artery but more commonly it is an extension of an intracerebral haematoma through brain laceration. The mortality rate is 90% (Mieny & Menen, 1990). The second type of subdural haematoma occurs with little or no brain damage. The bleeding occurs from subarachnoid artery, often one in which a lateral hole has been torn by the avulsion of a side branch which bridges the subdural space, or by tearing of bridging veins during movements of the brain within the skull. This type of haematoma is common following non-ventricular trauma such as assaults and domestic accidents. Recovery is greater than the first. Many subdural haematomas are either not treated or detected in the acute stage and present later as expanding intracranial lesions. Burr holes are drilled in the skull to attain access to the haematoma.

2.7.2 Intracerebral Haemorrhage

Scattered haemorrhages through the brain substance. They are considered as basal ganglia haematomas due to angular acceleration or deceleration forces causing the shearing of blood vessels. They may be single or multiple, superficial or deep. The mechanism producing these haematomas is probably mass movement with shearing stresses causing disruption of blood vessels. This may demand speedy evacuation by a burr hole by a means of brain needle, but it is best to leave the damaged brain undisturbed. The prognosis is very poor because the haemorrhages are minute in size and very difficult to remove surgically (Mieny & Mennen, 1990). From these facts it is obvious that the continuing neurological evaluation is an important aspect of the care of the patient with head injury.

2.7.3 Hyperpyrexia

The temperature of a patient with severe brain stem injury may soar to 40^{0}C or more as a result of injury to the heat regulating centre. Treatment is by tepid sponging, reduction of ambient temperature, fan therapy, cooling inhaled gases and cooling blankets (Segatore, 1992).

2.7.4 Brain Death

This is due to trauma and haemorrhage. The patient's brain is completely and irreversibly destroyed. According to Mieny and Mennen (1990) the diagnosis of brain death depends on:

i) No spontaneous respiration when the patient is detached from the respirator in the absence of depressant drugs or hypothermia.

ii) Pupils are fixed and there are no reflexes present above spinal level.

If this situation persists over an observation period of 12 hours, death may be certified. The decision to stop mechanical ventilation rests on the above factors. The possibility of the patient becoming an organ donor for transp'antation should be considered. This should be discussed fully and sympathetically with available relatives so that their informed consent is obtained for the removal of organs either before, or immediately after mechanical ventilation is finally stopped.

2.7.5 Respiratory Arrest

It is evident that the majority of patients die of asphyxia before reaching the hospital and unfortunately also sometimes thereafter (Treadwell & Mendelow, 1994). Approximately 40% of unconscious patients develop pulmonary complications within 12 hours, and respiratory failure is in deed often present on admission to hospital, particularly when there is evidence of thoracic and abdominal injuries. The clinical manifestations are decrease in respiratory and pulse rate, hiccoughing and then Chyne strokes respirations. The treatment is by giving oxygen by mechanical ventilatory support.

2.8 ASSOCIATED INJURIES

It is important to exclude, recognise and treat extracranial injuries. So a thorough assessment in the A & E unit should be performed to locate and avoid misdiagnoses. Fractures particularly of the facial skeleton and upper limbs will present a higher percentage of patients. According to Bouckaert (1997) in South Africa about 5% of head

injured patients have facial fractures, 40% of patients have nasal fractures and fractures of the zygomatic arch account for 30% of head injuries. Injuries of the thorax are very common and account for 25% of all trauma deaths (Moore, Jones & Zoltie, 1997).

Rupture of the abdominal organs such as the spleen, liver, kidneys should also be kept in mind. Injuries to the bladder and urethra must be excluded. An indwelling catheter will yield a sample of urine analysis and will serve to monitor urinary output (Naidoo, 1997).

2.9 MANAGEMENT

The first hour following traumatic injury is referred to as the "golden hour". Medical intervention within the first hour can make a dramatic difference to a patient's positive outcome (Cudmore, 1996). The widely used management of care is the Advanced Trauma Life Support. It is comprises the ABCDE (Airway, Breathing, Circulation, Drugs and Electrocardiograph Rhythm).

Seriously ill patients may be identified by the clinical signs of life threatening dysfunction of the airway, breathing or circulation but these may be missed, misinterpreted or mismanaged by clinicians of all grades. (McQuillan, Pikington, Allan, Taylor, Short, Morgan, Nielsen, Barret & Smith, 1998). It is thus important that the team should consist of individuals with predefined and practised roles so that the tasks and responsibilities can be achieved quickly and simultaneously (Eyre, 1993). Hence it is essential to perform immediate resuscitation and diagnose promptly in order to produce a substantial better outcome (Vrankovic, Splarski Hecimovic, Glavina, Mursic & Blagus, 1998).

It is of paramount importance to take a history from the person accompanying the head injured patient. This will help the nurse or medical doctor to make prompt diagnosis and hence provide quality care. Important things to note are: At what velocity did the skull hit the object? was there any protective head gear worn? Was there any loss of consciousness and if so for how long? Was there any underlying medical disorder or any history of alcohol or drug ingestion (Sacks & Katz, 1989). As suggested by Bouckaert, Kelly, Ramundo, Thurman and Zink (1997), the initial priorities of management are: respiration, circulation, intracranial pressure monitoring, neurological status, Glasgow Coma Scale vital signs, fluid and electrolyte balance, investigations, treatment, feeding and physiotherapy.

2.9.1 Respiration

The airway must be open and respiration must be adequate. This is the first and great commandment, therefore as a health personnel be sure the patient is breathing well, otherwise an airway must be established immediately. Establish an airway by a jaw lift or jaw thrust manoeuvre, guarding the neck because of the possibility of a cervical spine injury which must thereafter be excluded as soon as possible by means of a neck X-ray. Adequate cerebral oxygenation is essential for preservation of brain function. Hence give 100% supplementary oxygen i.e. 10-12 litres per minute. Intubation is recommended to maintain the airway and facilitate ventilation in all patients with a decreased level of consciousness (Marik, 1996). However this is usually performed after radiological investigations. In cases of facial fractures or injury to the cervical spine, it may be necessary to perform an early tracheostomy if the introduction of the endotracheal tube is

found difficult. Suctioning or removing of any foreign debris is done initially in order to establish an airway. However it should be done with care because it can create more harm than good. Literature reveals that suctioning can increase intra-cranial pressure for severely head injured patients (Wainwright & Gould, 1996 & Wood, 1998). If a cervical spine injury has not yet been ruoled out, care must be taken during intubation to avoid flexion or extension of the neck (Naidoo, 1997).

2.9.2 Circulation

Hypovolaemia is a common finding which may be caused by a scalp laceration which may have bled profusely. Determine if circulation and perfusion are normal. Assess the degree of shock and transfuse as appropriate for age/weight. The question of what to give is debatable, but most researchers recommend the use of hypertonic saline which is believed to lower the intracranial pressure but increase the cerebral perfusion pressure and the patient will hence require significantly fewer interventions. Ringers lactate also can be given because it is cheap, does not transmit infectious diseases, does not cause allergic reactions and does not interfere with subsequent blood cross matching (Demetriades, 1989 & Naidoo, 1997).

2.9.3 Intracranial Pressure

Increased intracranial pressure may be accompanied by bradycardia, abnormal breathing pattern with tachypnoea and hyperventilation. Increased intracranial pressure may suggest impending brain herniation. This can be monitored by intracranial pressure equipment. If no equipment the nurse can use her skills (Abelson, 1997) by assessing blood pressure,

pulse and respiration, cerebrospinal fluid leakages, seizures, maintenance of fluid balance, positioning the patient, maintenance of a quiet environment and administering pentobarbital with a loading dose of 2-5mg/kg intravenously slowly, followed by a maintenance dose of 1-3mg/kg/hour. Therapy is moderated to maintain ICP between 15mmHg - 20mmHg. If the blood brain barrier is intact, osmotic diuretics such as mannitol and urea will lower the ICP. Mannitol is given at a dose of 0.3 - 1.0g/kg. The subsequent dose of mannitol is 0.25 - 0.5g/kg every 6 hours. Treatment with mannitol is continued for only 24-48 hours.

2.9.4 Neurological Status

The Glasgow Coma Scale is advocated for all head injuries together with other clinical and laboratory findings. It is useful for comparing treatment regimes from different centres, but is not a complete neurological assessment (Thelan *et al.*, 1994). A score of 15 over 15 reveals that everything is normal whilst a score of less than 3 predicts a poor outcome and mortality rate of 20-25% even with contemporary, rapid intervention. Outcome depends on other factors such as age and concurrent trauma.

Table 2.1 Glasgow Coma Scale as Outlined by Boffard (1998)

	SCORE
EYES	
Open eyes spontaneously	4
Open to speech	3
Open to pain	2
No response	1
MOTOR (BEST MOTOR RESPONSE)	
Obeys commands	6
Localises pain	5
Flexioin withdrawal	4
Decerebrate flexion	3
Decerebrate extension	2
No response	1
VERBAL (BEST VERBAL RESPONSE)	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No response/silent	1

The Glasgow Coma Scale is a commonly used tool. The total score is rated out of fifteen

(15). It is based on three categories; eye opening, verbal response and best motore reposne (Thelan *et al.*, 1994). Categories can be simplieid as normal 15, mild 13-14, moderate 9-12 and severe 3-8 (Hutchinson *et al.*, 1996) (refer to Table 2.1). Pupils are checked for size and reactivity. Fixed dilated pupils reflect potentially ominous development such as severe brain stem damage. A single fixed pupil suggests injury to the ipsilateral side of the brain and warns of possible herniation. Assess the patient's other reflexes to determine the extent of possible neurological damage.

2.9.5 Vital Signs

Vital signs are extremely important indices of brain stem function (Sacks & Katz, 1989) changes in vital signs can indicate deterioration in neurological status.

- **Temperature**

Pyrexia may occur immediately after injury as a result of acute phase response to injury. It may also reflect dysfunction of thermoregulatory system in the hypothalamus (Segatore, 1992). Fever must therefore be treated to avoid the risk of compromising already impaired brain function. Treatment is by instituting measures of cooling such as tepid sponging, fan therapy, cooling blankets etc. (Segator, 1992). Literature reveals that cooling patients to mild hypothermia (34-35^{0}C) combined with convential therapies, is effective in reducing ICP and may improve survival rates (Marion, Obrist, Carlier & Penrod, 1993).

- **Pulse rate**

Bradycardia pulse rate is associated with increased intracranial pressure. A progressive bradycardia associated with a progressive hypertension is suggestive of an expanding lesion hence the need for surgical intervention.

- **Respiratory pattern**

Respiratory rate and character are important because a decreased respiratory rate may signify increased intracranial pressure. Spinal injuries and paralysis of the respiratory muscles may limit the patient's ability to breath. Evaluation of the respiratory pattern also must include evaluation of the effectiveness of gas exchange in maintaining adequate oxygen and carbon dioxide levels.

- **Blood pressure**

Blood pressure is significant in that if there is a rise it shows increased intracranial pressure especially when the systolic pressure is increased. Hypotension is associated with neurogenic shock, or hypovolemic shock. This can then help the nurse to pay more attention to signs of shock. This is not common in head injured patients.

2.9.6 Fluid Balance

Fluid balance is maintained by administering hypertonic saline and ringers lactate and monitoring intake and output. The patient should be kept envolemic; dehydration does not reduce brain oedema. Insertion of a Foley's catheter to record fluid output and prevent distension of the bladder. Later a condom catheter is usually preferred in males.

2.9.7 Blood Transfusion

Blood transfusion must be initiated if the hypotension does not respond to the initial treatment and if the haematocrit level is <30%. Diagnosis and treatment of the cause of hypotension should be rapid and efficient. Peritoneal lavage or Computerised Tomography (CT) scan of the abdomen should be performed (Naidoo, 1997) to ascertain whether the

patient shows signs of haemorrhaging internally.

2.9.8 Positioning

Literature reveals that it is associated with an increase in intracranial pressure. The head can be elevated at a 30 degrees angle . This is effective at reducing intracranial pressure (Hall 1997, Simma et al, Naidoo 1997, Swearingen & Keenan, 1995).

2.9.9 Investigations

- **Blood gases**

Blood gases are important because they can signify hypoxia or hypercapnia and hence the need for oxygen administration. Blood investigations may also show or indicate low levels of potassium, calcium etcetera. and hence need for replacement.

Regular monitoring of electrolytes, urea, creatinine and blood sugar are important.

- **Haemoglobin**

Haemoglobin level can be evaluated before a decision on oxygenation status can be made. In the same way it is significant to identify if there is overt bleeding, it is also important in evaluating the oxygen and carbon dioxide saturation in head injured patients.

- **Blood grouping and crossmatching**

It is evident that head injury management needs aggressive intervention during the first 24 hours, because it is associated with multiple structural involvement of body parts. The calvaria like any structural body part has blood vessels. Trauma to the head may cause severe blood loss if left untreated or unnoticed. Hence the need for blood samples for grouping and cross-matching, should a transfusion be needed.

- **Electrocardiogram**

Electrocardiography is used to detect and monitor the cardiac function, especially where there are associated injuries of the chest, abdomen or even dehydration.

- **Radiological investigations**

Computerised Tomography (CT) imaging is used to rule out brain lesion. It gives the extent and precise location of injury thus helping to formulate the most appropriate treatment plan (du Trevou & Allwright, 1997).

X-rays of skull, spine, chest, abdomen, pelvis, upper and lower extremities to rule out fractures. Radiographic investigations should be carried out in head injury patients but of special importance are those of the chest, cervical spine and pelvis to rule out fractures.

- **Ventriculography**

It is the introduction of light into the ventricles to visualize valve function and ventricular deformation. It provides information on the degree of midline shift and allows measurement of the intracranial pressure.

2.9.10 Medications

- **Barbiturates**

Barbiturates reduce the intracranial pressure in the group of patients with ICP that are resistant to standard treatment (Price, 1992). They reduce the cerebral metabolic rate of oxygen, increase the intracellular pH, decrease the cerebral blood flow and lower the ICP.

A loading dose of thiopentone 20mg/kg over 1 hour should be followed by maintenance infusions of 2-12mg/kg/hour.

- **Vasopressors**

These are sympathomimetic agents that mediate peripheral vasoconstriction through stimulation of alpha receptors, thus they maintain adequate mean arterial pressure (MAP). They may be occasionally used to maintain organ perfusion in shock states. Epinephrine (Adrenaline) may be given at doses of 1-2mg/minutes (Thelan *et al.*, 1994).

- **Analgesics and sedatives**

The use of the above have been condemned on the premise that they will mask changes in the state of consciousness and neurological signs. However analgesics and sedatives may be given after a CT Scan has been done. Restlessness is a source of discomfort such as a full bladder or a developing intracranial haematoma, which must be excluded. Diazepam (valium) has a long half-life and substantially drops the blood pressure. It is useful for sedating patients and if pain appears to be responsible for the restlessness, a cocktail of pethidine, chlorpromazine and promethazine, 12.5 to 25mg of each, intramuscularly, is effective (van Rensburg, 1990). The tendency is to use midazolam (Dormicum) if weaning the patient from benzodiazepines. In other cases, clothiapine (Etomine) is recommended.

- **Anticonvulsants**

Because of the risk of secondary ischemic insult associated with seizures, anticonvulsants are prescribed. Seizures may cause metabolic requirements to increase which results in elevation of cerebral blood flow, cerebral blood volume and ICP even in paralysed patients. The usual anticonvulsant regime includes phenytoin or phenabarbital or both at therapeutic doses. Loading dose for phenytoin is 15-18mg/kg and phenobarbital 4-8mg/kg. Maintenance doses of phenytoin are administered to achieve therapeetic blood level of 10-20mg/ml. Maintenance doses of phenobarbital are administered to keep blood level at 2-

4mg% (Thelan *et al.*, 1994).

- **Diuretics**

Diuretics should be used to treat intracranial pressure and maintain systemic and cerebral perfusion. *Frusemide (Lasix) is a loop diuretic, it is not effective when used alone* therefore should be used in combination with Mannitol (Cudmore, 1996). The dose is 1mg/kg at a maximum rate of 4mg/min. Frusemide (Lasix) is not compatible with 5% dextrose, therefore should be diluted in normal saline if necessary (Evans & Nathan, 1998).

- **Antibiotics**

Antibiotics are used if there is evidence of increased temperature or cerebrospinal fluid leakage. Literature states that antibiotics should not be given prophylactically (Claasen 1995). But where there is leakage of cerebrospinal fluid from the ear and nose, antibiotics can be prescribed (Waner, 1997).

- **Propofol**

Propofol as an anaesthetic agent is recommended in head injuries (Hall, 1997). It reduces systemic vascular resistance, causing a decrease in cerebral metabolic rate and cerebral blood flow. An infusion of 1mg/kg/h should be given (Oh, 1990).

2.9.11 Feeding

Because of the nature of the head injury and many nutrition related consequences, the nutritional status should be continuously monitored. Severe head injuries demonstrate markedly increased energy requirements, a negative nitrogen balance, weight loss and hypoalbuminaemia due to effects of some medications given, and the injury.

Both enteral and parenteral feeding are recommended by most researchers (Haynes, 1992 & Marik, 1996).

2.10 SUMMARY

Relevant literature regarding head injuries has been discussed. Though literature has highlighted useful information, very little research on this subject has been found in African countries. Therefore it is the responsibility of health professionals in these African countries to establish a protocol or guidelines of management in order to provide quality care to the head injured patients. The management during the first 24 hours can determine the outcome.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter describes the methodology undertaken by the researcher. The research setting, instrument used, the population, sample and sampling techniques, data collection and procedures are discussed.

3.2 RESEARCH DESIGN

A descriptive survey was used, where data was obtained from patients' records using a checklist. According to Brink (1996), a survey searches for accurate information about the characteristics of particular subjects, groups, opinions, attitudes and behaviours as they currently exist in a population. Therefore the researcher chose a descriptive survey because it is most suited to describe the actions of health personnel in relation to their management of head injured patients.

3.3 THE SETTING

The research setting was a large urban academic government hospital called the Princess Marina Hospital in Gaborone (Botswana) (Appendix I). It is a 483 bedded hospital. It is a referral hospital from health facilities in the nearby villages.

It has an accident and emergency unit and a critical care unit which admits eight patients. Most head injured patients are managed in surgical wards.

Attached to the accident and emergency unit lies the records department which consists of an office with two computers, two filing offices and a store room.

3.4 POPULATION

The population for this research comprised all head injured patients admitted to the Princess Marina Hospital over a one year period from 1.1.1997 to 31.12.1997. A preliminary record review indicated that a total number of 240 patients have been treated from January 1997 to December 1997. All 240 charts were identified from the filing room.

3.5 THE SAMPLE

After the population was identified from the computer and the record registers in the records department (n = 240), 126 patients' records were considered eligible for inclusion in the sample. The following criteria were applied to obtain the sample (n = 126).

Exclusion criteria:

* Patients below the age of 18 years
* Those who had minor scalp lacerations and had been discharged immediately after treatment.
* Those certified dead on arrival.

The associated injuries, signs and symptoms and documented interventions were checked. All documentation included in the patients record files was examined. Particular attention was paid to the interventions carried out by nurses and medical doctors during the first 24 hours. Data that were collected related to approximate time of injury, mechanism of injury, initial management, subsequent management and patient outcome during the first

24 hours after injury.

3.6 DATA COLLECTION

A retrospective record review of all head injured patients who were admitted during the period 1.1.97 to 31.12.1997, was used. The focus of the record review was to examine the initial management on admission as well as the subsequent management during the first 24 hours.

3.6.1 Research Tool

A checklist was formulated by the researcher to guide the recording of data obtained from the records (Appendix 2). Various forms of nursing and medical management were defined as clearly as possible so as to reduce ambiguity of meaning.

Measures relevant to this investigation are described below in order in which they appear in the checklist.

- Section I consisted of five items which address General Information. This is composed of the time of injury, arrival time at the hospital, mechanism of injury and the provisional diagnosis.
- Section II documents the initial management. It is assumed that it was performed during arrival of the head injured patient in the accident and emergency unit. This section covers who the attendees were, what was done to the patient, what were the associated signs and symptoms and injuries, any medications prescribed and whether the patient was transferred to the ward or referred to a different hospital.
- Section III, covers the subsequent management and has eight items. It covers the

respiration, how they were maintained, any assistance given to aid breathing and how. the Glasgow Coma Scale, vital signs monitoring, feeding and medications prescribed. Any surgical procedures performed and whether the self-care requisites were met.

- Section IV covers the patient's outcome. It has one item which addresses whether the patient developed complications or not.

3.6.2 Data Collection Procedure

The data was collected by the researcher from the 16.11.998 to 31.12.98. All information was collected from the patient's hospital records. Documentation was examined through patients' record files to meet the study objectives. Particular attention was paid in relation to the interventions carried out by nurses and medical doctors during the first 24 hours.

3.7 VALIDITY AND RELIABILITY

The items in the check list were derived from a thorough and recent literature review. Content validity was checked by two intensive care doctors and four intensive care nurses. All were in agreement that the items in the checklist would elicit the data needed to address the study objectives. Reliability and validity were assessed by pilot testing the checklist. The researcher was the only person for data collection hence consistency was assured.

3.8 PILOT STUDY

The researcher acknowledged the limitations of the record review, as such the checklist

was pre-tested on five records and 95% of the questions addressed in the checklist were obtainable from the records. Hence records were taken as a reliable source for data collection for the head injured patients. Records used in the pilot study were not included in the main research study.

Modifications were effected where they considered to be necessary. These were:

Question 3. "not recorded" was added where time of arrival was not recorded in patients' notes.

Question 6, 7, 8, 12, 13, 17, 20, 22 and 24 "not recorded" deleted

Question 17: "self" was added under maintenance and "not recorded" was deleted.

Question 19: "not recorded" was shifted to follow below "severe: in a vertical line.

3.9 ETHICAL CONSIDERATIONS

Permission to conduct the research was obtained as follows:

- The Committee for Research on Human Subjects (Medical) of the University of the Witwatersrand gave permission on 28.07.1998, protocol no. M980554 (Appendix 3).
- Post graduate committee gave permission on 10.11.1998 (Appendix 4).
- Ministry of Health of Botswana gave permission on 20.10.1998 (Appendix 5 and 6).
- Office of the President of Botswana gave permission on 02.11.1998 (Appendix 7 & 8).

- The Superintendent of the Princess Marina Hospital of Botswana, who advised the researcher to request from the interim research committee within the hospital (Appendix 9, 10 & 11).

Informed consent.

Patients' informed consent was not needed since only records were consulted.

Anonymity.

To ensure anonymity, the checklist was coded. Patients' names and health personnel members involved in their care were not recorded.

Confidentiality.

Data collection was only performed in the records department. No records were taken outside the data collection room until after the data was collected. The identity of the patents or the health care team were not divulged in the report to ensure confidentiality.

3.10 SUMMARY

This chapter addressed the research methodology which focused on the design, the setting, the sample, the data collection tool and procedures and the professional ethical considerations. Information was given on how validity and reliability were ensured. Changes as a result of the pilot study were described.

CHAPTER 4

PRESENTATIONS OF FINDINGS

4.1 INTRODUCTION

The findings of the study are presented in four sections as per checklist (Appendix 2). Section I consists of the general information, Section II the initial management, Section III subsequent management and Section IV, the patients' outcome. Data were coded and analysed by a computer. Descriptive statistics such as frequency distribution, percentages, mode, mean and use of graphs were used to present interpretation of data.

4.2 SECTION 1: GENERAL INFORMATION

This section consists of time of injury, date of admission, arrival time after injury, mechanism of injury and provisional diagnosis.

4.2.1 Time of Injury

Based on the records in the accident and emergency unit, the time the patient was injured was documented in only one record (0.8%). This made it difficult to determine the time of injury and the arrival time in the accident and emergency department.

4.1.2 Admissions

The highest number of admissions for the year 1997 was 23 (18%) patients with head injuries in November and 17 (13.5%) patients with head injuries in January.

Figure 4.1 presents data on the number of admissions in a year.

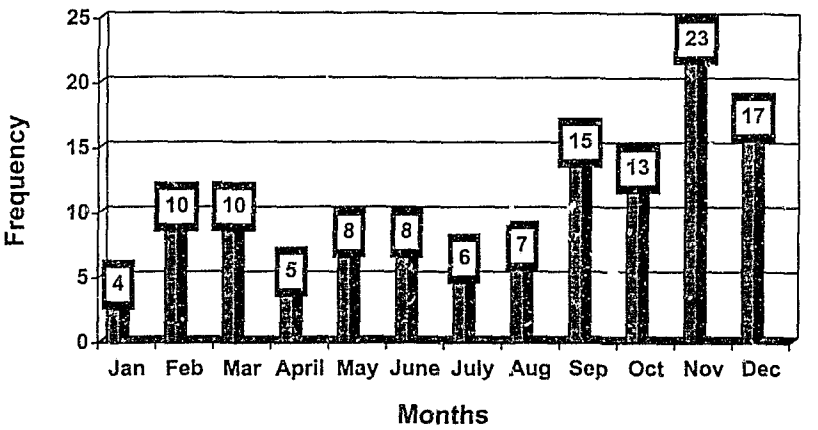


Figure 4.1 Admission distribution of the sample (n = 126)

4.2.3 Time of Arrival at the Hospital After Injury.

The times of arrival at the accident and emergency unit were not documented in 121 (96%) records.

4.2.4 Mechanism of Injury

Motor vehicle accidents were the commonest cause of head injuries accounting for 70 (56%) of patients with head injuries, whilst stab wounds were the least frequent, accounting for 2 (1.6%) of patients with head injuries. Other mechanisms of injury were assaults, which accounted for 44 (35%) and falls, 2 (1.6%). Figure 4.2 shows the frequency of the mechanisms of head injuries.

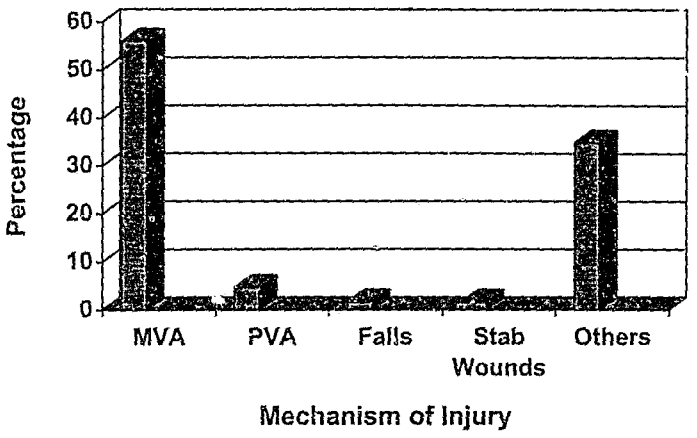


Figure 4.2: Mechanisms of head injury (n = 126)

4.2.5 Provisional Diagnosis

One hundred and fifteen (91.%) patients with head injuries had no provisional diagnosis documented during the first 24 hours. Skull fractures accounted for five (4%) of diagnoses. Concussion, diffuse subdural haemorrhage, head injury with post trauma epilepsy and aphasia and head injury with scalp lacerations all accounted for one (0.8%) each. Subdural haematoma with hemiplegia accounted for two (1.6%) of provisional diagnoses. Table 4.1 shows the provisional diagnoses in percentages.

Table 4.1 shows a table of provisional diagnosis in percentages.

Table 4.1: **Provisional diagnosis of head injury patients admitted in A & E unit from January to December 1997**

PROVISIONAL DATA	FREQUENCY	%
Depressed skull fracture	3	2.4
Concussion	1	0.8
Depressed fractured occipital bone	1	0.8
Diffuse subdural haemorrhage	1	0.8
Fractured skull base	1	0.8
Head injury with post-trauma epilepsy and aphasia	1	0.8
Head injury with scalp laceration	1	0.8
Subdural haematoma with hemiplegia	2	1.6
Not documented	115	91
TOTAL	**126**	**100%**

4.3 SECTION II: INITIAL MANAGEMENT

The initial management included the treatment and care rendered to the head injury patients immediately on arrival in the Accident and Emergency Unit until the condition was stabilized. The initial management focused on who the attendees were, the airway, Breathing, Circulation, Drugs, Electrocardiogram (ECG) Rhythm, Glasgow Coma Scale, vital signs, skin perfusion, urinary output, radiological investigations, associated signs and symptoms, associated injuries and medications prescribed.

4.3.1 Initial Attendant

Seventy-eight (61.9%) patients with head injuries were attended to by both registered nurses and doctors on admission at the Accident and Emergency Unit. In 15 (11.9%) patients with head injuries, doctors only were in attendance, whilst registered nurses together with enrolled nurses attended to three (2.4%) patients and one (0.8%) patient was attended by an enrolled nurse only (Table 4.2).

Table 4.2: Initial attendants of head injured patients at the accident and emergency unit

ATTENDANT	FREQUENCY	%
Doctor and Registered Nurse	78	61.9
Doctor	15	11.9
Doctor and Enrolled Nurse	2	1.6
Doctor, Registered Nurse and Enrolled Nurse	3	2.4
Enrolled Nurse	1	0.8
Registered Nurse	6	4.8
Registered Nurse with Enrolled Nurse	6	4.8
Not documented	15	11.9
TOTAL	**126**	**100%**

4.3.2 Airway Maintenance

After admission in the accident and emergency unit, ten (7.9%) patients with head injuries required suctioning and five (4%) required endotracheal intubation. The majority, 108 (85.7%) patients with head injuries could maintain their own airway. There was no documentation on airway maintenance in three records (2.4%).

4.3.3 Control of Cervical Spine

Cervical spine control was maintained in five (4%) patients with head injuries, whilst 121 (96%) of the records show no documentation.

4.3.4 Breathing

The actual assistance given to maintain respiratory functions on admission included oxygen by face mask for two (1.6%) patients with head injuries, ambubag three (2.4%), nasal cannula five (4%), tracheostomy six (5%). Patients who did not need assistance with breathing were 111 (88%).

4.3.5 Circulation

The most commonly used intravenous fluids were Ringers Lactate with a combination of Normal saline which accounted for 77 (61%). The least commonly used were a combination of blood transfusion, Normal saline, Mannitol and Maintylyte. Most patients, 126 (67.5%), with head injuries were given more than one type of intravenous fluid to restore their circulatory volume (Table 4.3).

Table 4.3: **Intravenous fluids given during the first 24 hours (n = 126)**

TYPE OF INTRAVENOUS FLUID	FREQUENCY	%
Ringers Lactate and Normal saline	77	61.1
Normal saline	23	18.3
Ringers lactate, normal saline and mannitol	2	1.6
Mannitol	3	2.4
Ringers lactate	11	8.7
Ringers lactate normal saline and dextrose 10%	4	3.2
Blood transfusion and normal saline	1	0.8
Normal saline, Mannitol and Maintylyte	1	0.8
No circulatory assistance	4	3.2

4.3.6 Glasgow Coma Scale

The Glasgow Coma Sacle is a neurological assessment tool to evaluate the level of consciousness. It is evaluated according to normal (15/15), mild (13-14/14), moderatel (9-12/15), and severe (3-8/15) (Refer to Table 2.1). The records of 55 (43.7%) patients with head injuries revealed a Glasgow Coma Scale reading of 13-14/15 (mild). Seventeen (13.5%) patients with head injuries had reduced consciousness with a score of 9-12/15 (moderate), while eleven (8.7%) patients with head injries were unconscious with a Glasgow Coma Scale reading of 3-8/15 (severe). In seven (5.6%) records the GCS reading was 15/15 (normal), whilst 36 (28.6%) of the records the GCS readings were not recorded.

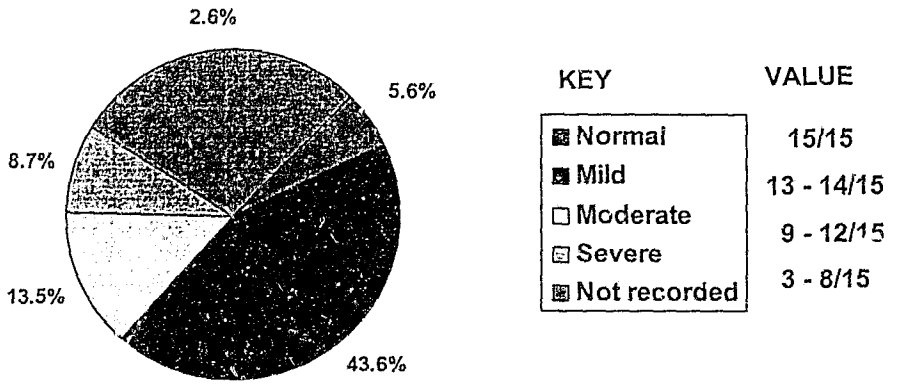


Figure 4.3 Glasgow Coma Scale readings during the initial management (n=126)

4.3.7 Vital Signs

4.3.7.1 Temperature

Fifteen (11.9%) patients with head injuries experienced pyrexia. One (0.8%) had hypothermia, 108 (85.7%) had normal temperature, whilst in 2 (1.6%) of the records was not recorded.

4.3.7.2 Pulse

Six (4.8%) of head injury records show tachycardia, one (0.8%) bradycardia and 119 (94%) had normal pulse rates.

4.3.7.3 Respiratory

The normal respiratory rate is 12-20 breaths per minute. One hundred and twenty-six (100%) of patients' records show that the respiration was monitored, whilst 25 (20%) of the patients' records revealed an altered respiratory function, that is one (5%) were above the 30b/minute whilst the remaining24 (15%) were below 12b/minute.

4.3.7.4 Blood pressure

Six (5%) patients with head injuries reflected a slight elevation of blood pressure. Of these, one patient was commenced on treatment. One hundred and twenty (95%) patients with head injuries had normal blood pressure readings.

4.3.7.5 Skin perfusion

In 97 (77%) patients with head injuries their skin perfusion was not assessed , in 23 (18%) patients with head injuries the skin perfusion were assessed and recorded as normal, and the remaining six (5%) were recorded to be cold and clammy.

4.3.7.6 Urinary output

Forty-seven (37%) patients with head injuries had urinary output measured and recorded, 9 (7%) were measured and tested and 70 (56%) of the records showed that the urinary output was not measured and tested.

4.3.7.7 Concensual reflex

This is an assessment of the eyes, whereby when you shine a light on the pupil and observe

pupillary constriction on the other eye. Forty-three (34%) of the records showed that the reflex was checked, and 84 (66%) not recorded.

4.3.7.8 Intracranial pressure monitoring

One hundred and twenty (99%) of records show that the intracranial pressure monitoring was not done by use of any continuous monitoring system, but measures were taken through the use of clinical skills, for example, vital signs assessment, inspection of cerebrospinal fluid leakages and maintenance of fluid balance.

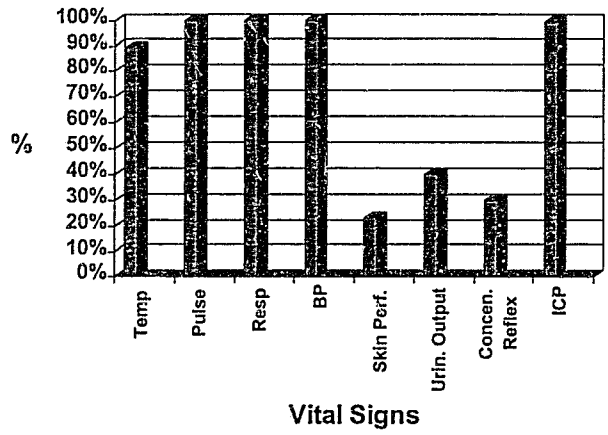


Figure 4.4 Vital signs monitoring

4.3.8 Investigations

4.3.8.1 Blood gases

The normal blood gas levels as outlined by Thelan et al (1992) are partial pressure of oxygen (PaO_2) 80-100mmHG, partial pressure of carbon dioxide (PCO_2) is 35-45mmHg,

hydrogen ion concentration of plasma (PH) 7.35 - 7.45, bicarbonate (HCO_3) 22-26mEq/L and oxygen saturation (SaO_2) 95%. In 124 (98.4%) of records, blood gases were not documented, two (1.6%) records were documented, one (0.8%) out of two (1.6%) no readings were recorded and the remaining one (0.8%) the readings were normal.

4.3.8.2 Haemoglobin

The normal haemoglobin levels ranges from 14-18 grams per decilitre (g/dl) in males and from 12-16g/dl in females (Thelan *et al.* 1994). Nineteen (15%) records reflect that the haemoglobin levels were below 12g/dl and one (0.8%) of these patients were transfused. Sixty-six (52%) patients with head injuries had normal haemoglobin levels, and 42 (32%) patients with head injuries had the haemoglobin levels not assessed.

4.3.8.3 Blood grouping and x-matching

The data shows that 85% of patients' blood was tested for grouping and cross-matching, and the remaining 15% were not documented.

4.3.8.4 Urine testing

Forty-six (44%) patients with head injuries had a variety of urine tests done e.g. dipstick for blood, protein, glucose, culture and sensitivity. The remaining 70 (56%) patients' urine was not tested.

4.3.8.4 Electrocardiography

Though literature reveals that the ECG is not the emergency management for head injuries

unless whereby there are associated injuries (Thelan *et al.* 1994), seven (6%) of patients had ECG's done whilst 119 (94%) were not assessed by ECG.

4.3.8.5 Computerised Tomography (CT) scan

The CT scan results indicate that 13 (10%) patients with head injuries underwent CT scanning during the first 24 hours and all findings were documented.

4.3.8.6 Radiological examinations

It was noted that 121 (96%) patients with head injuries were radiologically examined and some patients had more than one radiological examination. Analysis of data revealed that 105 (85%) patients with head injuries had skull x-rays, 55 (44%) spine x-rays, 5 (42%) chest, 12 (10%) abdomen, 35 (29%) pelvis, 30 (24%) upper extremities, and 23 (18%) lower extremities. Table 4.4 shows the X-ray examination of patients with head injuries. Figure 4.5 shows the total of all investigations performed on patients with head injuries.

Table 4.4: Radiological examination of head injured patients (n = 126)

ANATOMICAL PARTS	FREQUENCY	%
Skull	107	85
Spine	55	44
Chest	53	42
Abdomen	12	10
Pelvis	35	29
Upper extremities	30	24
Lower extremities	23	18

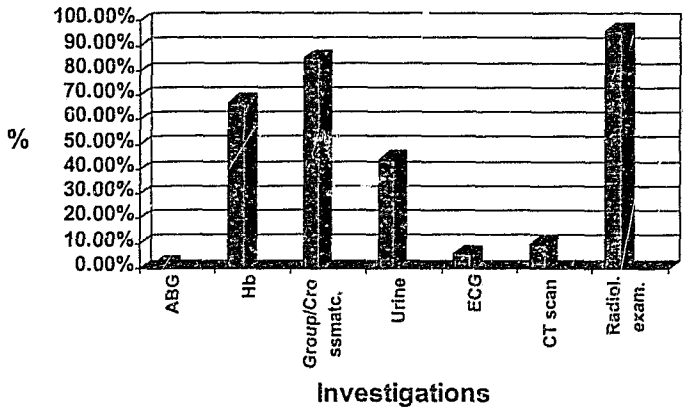


Figure 4.5 Investigations performed on head injured patients

4.3.9 Associated Injuries

The findings reveal that the commonly associated injuries were found to be facial lacerations 56 (44%), associated injuries of the spine, chest and abdomen two (1.6%), fractured ulna and radius, dislocated hip, dislocated knees, fractured femurs accounted for 68 (54.4%) of all associated injuries..

4.3.10 Associated Signs and Symptoms

Nineteen (15%) head injury patients' records reveal haemorrhage as one of the associated symptoms, raised intracranial pressure one (0.8%), hyperthemia 14 (11%), restlessness 19 (15%) and 73 (58%) not recorded.

4.3.11 Medications and Treatment Prescribed

A variety of treatment and medications were prescribed and given according to the

diagnosis. A combination of treatment was given to some patients. A high frequency, 91 (71%) head injury patients received analgesia. Tetanus toxoid (0.8%) was the least recorded medication only one patient having received this.

Table 4.5: Medications and treatment prescribed (n = 126)

MEDICATIONS AND TREATMENT PRESCRIBED	FREQUENCY	%
Analgesics	90	71
Antibiotics	79	63
Anticonvulsants	5	4
Sedatives	39	31
Diuretics	8	6.3
Others	27	21
Tetanus toxoid	1	0.8

It was found that a combination of treatment was prescribed. Other medications prescribed were vitamin B. complex, folic acid, hydrocortisone, metronidazole, nifidipine, isoniazid (INH), rifampicin, amytryptyllin, captopril, dexamethasone, slow K, vitamin C, cimitidine, ferrous sulphate, dopamine and dulcolax.

4.3.12 Transfer to Ward and Referral Hospital

One hundred and twenty-three (98%) patients with head injuries were transferred to the ward in 24 hours, whilst three (2%) were transferred to private hospitals on request. In only one (0.8%) record, the time frame of transfer between accident and emergency unit

and the wards was documented as one hour.

4.4 SECTION III: SUBSEQUENT MANAGEMENT

This section describes the care rendered after stablisation of the condition in the Accident and Emergency Unit. It entails the ABCDE, Glasgow Coma Scale, vital signs, feeding, medications, surgical procedures performed and the self care requisites.

4.4.1 Airway

One hundred and four (83%) patients with head injuries could maintain their airway on admission in the wards. Seventeen (12%) patients needed suctioning, three (2.4%) endotracheal intubation, and one patient (0.8%) needed both endotracheal intubation and suctioning. In one record there was no documentation of airway maintenance.

4.4.2 Control of Cervical Spine

Eight (6%) of the records showed that the cervical spine control was maintained. In 118 (94%) of the records there was no documentation of cervical spine control.

4.4.3 Breathing

4.4.3.1 Oxygen with assistance

After admission in the wards, some patients, four (3%) needed oxygen with assistance by face masks, nasal cannula five (4%), tracheostomy eleven (8.7%), and 106 (84%) did not require assistance in breathing.

4.4.3.2 Mechanical ventilation

One hundred and nine (87%) patients did not require any mechanical assistance whilst 17 (13%) needed mechanical assistance by Synchronised Intermittent Mechanical Ventilation (SIMV) mode.

4.4.4 Glasgow Coma Scale

Patients with head injuries who were recorded to be having a mild Glasgow Coma Scale reading were 56 (44.4%), 16 (12.9%) moderate, 5 (4%) severe, one (0.8%) normal and those that were not documented 43 (30.6%) patients.

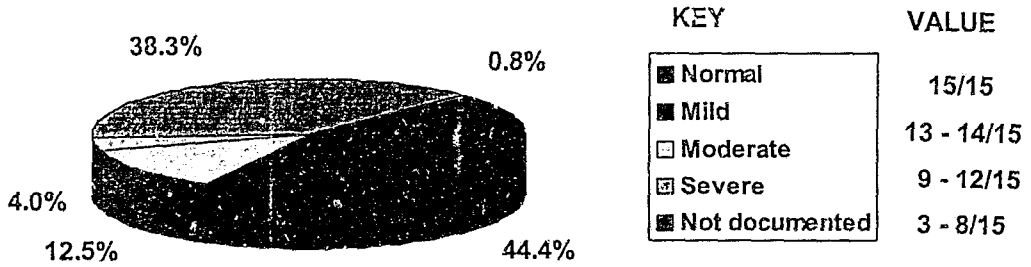


Figure 4.6 Glasgow Coma Scale reading during the subsequent management (n = 126)

4.4.5 Vital Signs

The haemodynamic functions were monitored on 112 (89.2%) patients, this was monitred

by constant check of temperature, pulse, respiration, blood pressure, and skin perfusion. Actions were applied where necessary e.g. giving of antipyretics, and diazepam for reducing blood pressure. The concensual reflex was documented in 14 patients' charts (11%).

4.4.6 Medication or Treatment Prescribed

Analysis of the records indicates that medications prescribed at the Accident and Emergency Unit were continued in the wards during the first 24 hours except for the stat dose medications e.g. tetanus toxoid.

4.4.7 Surgical Procedures Performed

The records show that burr holes were performed on two patients (1.6%), evacuation of a haematoma on one patient (0.8%). One (0.8%) who had a depressed parietal fracture was elevated, and in 126 (96.8%) patients with head injuries no surgical procedures were performed.

4.4.8 Self Care Requisites

Bronchial care was recorded as having been performed on two (2%) patients, whilst urological care, mouth care, skin care, eye care and position changing all accounted for 0.8% each. In 124 (94%) of the records, there was no documentation of self care.

4.4 SECTION IV: PATIENTS' OUTCOME

Analysis of the records indicated that 107 (85%) patients with head injuries remained in the ward. Seven (6%) were transferred to private hospitals for various reasons. Six (5%) patients with head injuries developed complications. Of the 5% patients with head injuries who developed complications, two (3%) developed cardiac arrhythmias, whilst one (0.8%) had cerebral oedema and one (1.8%) of patients developed anaemia. Five (4%) of the patients had died.

Figure 4.7 reflects the patient outcomes after 24 hours.

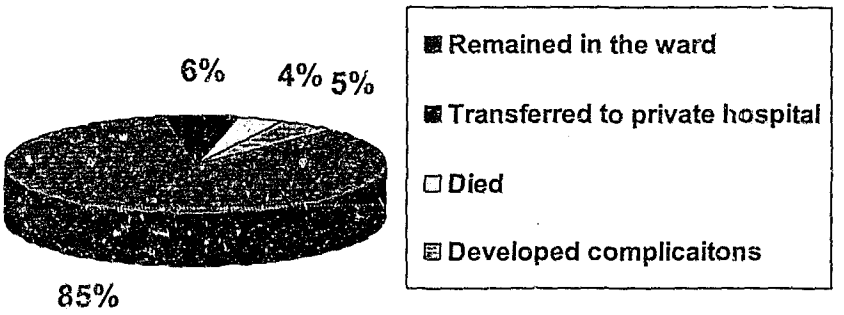


Figure 4.7 Head injured patients' outcome after 24 hours (n = 126)

4.5 SUMMARY

In this chapter data have been analysed. Descriptive statistics were used to present the findings. Where appropriate graphs, tables and figures were utilized to enhance data presentation.

CHAPTER 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

5.1 INTRODUCTION

In this chapter the results will be discussed to answer the study question. "What is the documented nursing and medical management of head injury patients during the first 24 hours"? Conclusions of the study in relation to the findings, problem statement and objectives as well as limitations of the research and recommendations are discussed.

5.2 DISCUSSION OF FINDINGS

Head injury has long been recognised as a cause of mortality and morbidity in developed and developing countries (Thelan et al., 1994). Literature emphasises the prompt management of head injuries during the "Golden Hour" for better outcomes (Guin, 1995). However the findings of this study revealed that there is poor recording of the time of injury, time of arrival of the patient at the Accident and Emergency Unit before transfer to surgical wards and Intensive Care Unit . Most vehicle accidents were the commonest causes of injuries accounting for 70 (56%) of all head injuries, two (1.6%) stab wounds, two (1.6%) falls, six (4.7%) PVA and "others" were assaults only, accounting for 46 (37%) patients. The highest frequency of motor vehicle accidents was in the months of November and December, whilst that of assaults were high in September. Although there is no written predictor on the frequency of the occurrence of head injuries, September in

Botswana has a public holiday and this is possibly why most (37%) of the occurrence of the assaults are reflected. (Coombes et al, 1996; Swann et al, 1998 and Thelan et al, 1994).

The highest frequency of motor vehicle accidents in November and December might be due to the fact that the majority of the public service and private sector people take their annual leave towards the end of the year, hence they travel from their areas of work to their home villages. Other studies in literature also reflect that motor vehicle accidents are the commonest causes of head injuries (Coombes *et al.*, 1996, Swann & McCarter, 1998 & Thelan *et al.*, 1994). The writings of Bouckaert (1997); Bruce and Mngoma (1998); and Gopal and Lipschitz, (1989) show that interpersonal violence cannot be ruled out as the cause of head injury.

Over the past few decades major advances have been made in the management of patients with head injuries and significant improvements have been made in their care in both the Accident and Emergency Units including Intensive Care Unit. These patients require a co-ordinated multidisciplinary approach by an experienced team with access to diagnostic and therapeutic modalities necessary for optimum management during the first 24 hours. The documentation of the provisional diagnosis is important during the first 24 hours because the outcome can be predicted. As stated by Grant and Shrouder (1997); Mac Namara, Brazil and Evans (1998); Rodrigues, Wang and Pearl (1997), diagnosis is important particularly for patients who still had to be managed both in the hospital or even transferred for further management.

Causes of non-documentation could be due to the fact that those attending to the patient are not utilizing the secondary approach to the head injured patient hence forgetting to document their interventions. Airway maintenance was well documented and managed effectively on both the initial and subsequent care.

Literature advocates control of the cervical spine until the cervical spine fracture clearance has been assured on clinical grounds or on a comprehensive series of radiographs (Bouckaert, 1997; Naidoo, 1997; Swann & McCarter, 1998).

Cervical spine stabilization is important because injury to the cervical spine from C1 to C6 vertebrae can cause varying degrees of diaphragm dysfunction, reduced inspiratory ability, paradoxic breathing pattern and diminished chest mobility. The cervical spine of 121 (96%) patients with head injuries was not maintained, whilst the cervical spine of five (4%) patients with head injuries was maintained. It is important to control the spine because complications can arise if flexion and extension of the neck has not been avoided.

Breathing

A higher percentage of patients in the Accident and Emergency Unit 100 (83%) could maintain their own airway. Those who needed assistance were assisted by administering oxygen by face mask, nasal cannula and tracheostomy. Assistance by the above devices was similar to those recommended in the literature (Keenan 1986; Mc Cabe, 1996).

Thirteen percent of patients during subsequent care were assisted by mechanical ventilation through the synchronous intermittent mandatory ventilation mode.

Circulation

The majority of patients 121 (96%) with head injuries were infused with various intravenous infusion. Most patients were given a combination of more than one type of intravenous fluid to restore their circulatory volume. The commonly used fluids were Ringers lactate and Normal saline 71 (61%).

This finding is similar to the literature (Simma et al., 1998; Thelan et al., 1997, Waner, 1997) whereby these can be given in combination with Mannitol if there is increased intracranial pressure in order to reduce the intracranial pressure, maintain fluid volume, correct hyponatraemia, and increase cerebral perfusion pressure.

Glasgow Coma Scale

The Glasgow Coma Scale is a neurological assessment tool to evaluate the level of consciousness, pupillary reaction and motor activity. By determining the level of consciousness you would be evaluating the reticular activating system function of the brain stem and thalamus. The reticular activating system acts as a relay for stimuli transmission to the cerebral cortex, influencing the cortical awareness system. It mediates responses such as eye opening to painful stimuli as well as corneal reflexes, pupillary reaction and occular motility. The state of consciousness can be altered when the effects of the insults impinge on the reticular activating system. The research findings reveal that 44% of patients with head injuries arrived in both the Accident and

Emergency Unit and wards with a Glasgow Coma reading of 13-14/15 (mild) whilst those with moderate were 13.5% and 12.5% respectively. Those who were recorded severe were 5.6% and 4%. The GCS readings which were not documented during the initial management were attended to by nurses. Reasons given in patient records for not monitoring the Glasgow Coma Scale during subsequent care were as follows: patient resting, patient awaiting to be examined by medical officer, patient under heavy sedation. Literature advocates evaluation of the GCS because this will help in early intervention measures and hence avoiding some complications (du Trevour & Allwright, 1997; Kelly, 1997 & Thelan *et al.,* 1994).

Intracranial Monitoring

Intracranial pressure monitoring is recommended in all head injury patients (Thelan t al, 1994, Kelly et al 1997, Vrankovoic et al, 1998). Though the study findings reveals that intracranial monitoring was not done by use of a continuous monitoring system, 125 (99%) of the records reveals that measures were taken through use of clinical skills e.g. asses BP, pulse, respiration, temperature, monitor intake and output etc. The clinical skills used were similar to those recommended in the literature of Abelson (1997).

Blood Gases

Blood gases are of paramount importance on head injured patients because they assess the adequacy of ventilation (Swann & McCarter, 1998). The findings reveals that in 98.4% of the records blood gases were not assessed. It is important to monitor the blood gases especially in head injury patients because blood gases can act as an index to aid the

health worker for the need to support the patient with ventilation. In cases of concealed injuries of the chest, respiratory failure can be detected through blood gases.
The haemoglobin levels of below 12g/dl were reflected in 19 (15%) patients with head injuries, 66 (52%) had normal haemoglobin levels, 41 (33%) were not assessed.

One hundred and seven (85%) of patient's blood was tested for grouping and cross-matching. The importance of assessing the haemoglobin level, grouping and cross-matching is advocated by Swann and McCarter (1998). Haemoglobin transports and releases oxygen to the tissues of the body. Therefore by assessing the haemoglobin level you will be assessing both the oxygen level and the haematologic disorder: anaemia. So if there is a decreased haemoglobin level and haematocrit level, this can cause further complications in patients with head injuries e.g. increase cardiac workload, cardiac dilation and eventually result in cardiac failure.

The use of electrocardiographic monitoring is advocated to Head injury patients by Swann, McCarter and Waner (1997). However findings reveal that 119 (94%) of the patients with head injuries were not assessed by ECG. This also can reflect lack of interpretation skills, no ECG machine available in the Accident and Emergency Unit or wards, ECG machine not functioning or staff not appreciating the importance of ECG monitoring particularly for head injury patients. Head injury can be associated with chest injuries so by assessing the cardiac function you will be providing a basis on which other definitive diagnostic test can be initiated e.g. Sinus bradycardia in head injury patients can be an indication of increased intracranial pressure.

CT Scan

The research findings reveals that 13 (10%) of patients with head injuries underwent CT scan during the first 24 hours and 6 (5%) of the results were found as subdural haematoma and epidural haemorrhage. This correlates quite well with the literature which states that subdural haematoma and epidural haematoma can be due to blunt trauma e.g., assaults. (Thelan et al 1994). The findings of this study reveal assaults as the second highest mechanism of injury.

Though literature advocates CT scan for all head injuries this will differ from one hospital to another depending on their guidelines of management (Johnstone, Zuberi & Scobie, 1996; Mac Namara, 1998; Swann & McCarter, 1998). So the CT scan might have been performed after 24 hours.

Radiological examination is important in head injuries, because head injuries can be associated with other injuries. A high percentage, 117 (85%) patients with head injuries had skull X-rays and 25% of patients with head injury records revealed fractured skull of base, occipital bone, compound, frontal bone, depressed temporal, transverse and hairline fractures. Abdominal X-ray was taken in 10% of patients, one (0.8%) patient revealed bladder rupture. Chest X-ray was performed on 53 (42%) patients out of the 42% of chest X-rays taken 12 (23%) revealed fractured ribs and lung contusions. Twenty-three percent revealed fractured femur, tibia and fibular and were taken to theatre for open reduction and plaster of Paris application. Nine (17%) of the records revealed fractured ulna and radius and plaster of Paris was applied; 19 (36%) patients had dislocated

shoulders and were reduced; one (0.8%) record revealed fractured pelvis and this was immobilised. It should be noted that some patients had more than one radiological examination. The assessment is consistent with other studies found in the literature (Hutchinson et al., 1998 & Johnstone et al., 1996) which advocate radiological test or not only the skull but other anatomical parts.

Associated injuries cannot be ruled out in head injuries. The study revealed that the motor vehicle accidents were the main cause of injury in 70 (56%) patients and assaults were responsible for 44 (35%). These injuries occur in the months of September, November and December. The commonly associated injuries are those of the face (15%). this correlates with the findings whereby assaults (37%) are the second commonest cause of head injuries in the princess Marina Hospital. Also the CT scan results revealed intracerebral haematoma and epidural haemorrhage which is mostly caused by blunt injury due to assault.

Other associated injuries of the spine, chest, abdomen, upper and lower extremities cannot be ruled out because of the mechanism of injury of MBA as the number one cause. The study findings revealed that the associated signs and symptoms were that of haemorrhage from facial lacerations which accounted for 15%, raised ICP 0.8%, hyperthermia 11%, restlessness 15% for which diazepam was given. Where restlessness was due to pain, analgesics were prescribed.

Medications

Analgesics, anticonvulsants and diuretics should be administered as prescribed (Abelson, 1997). Antibiotics can be given where there is risk of infection (Wanter, 1997) and tetanus toxoid given prophylactically (Mc Cabe, 1996). The study revealed that 84 (71%) of patients with head injuries received analgesics; the drugs of choice were pethidine, ibuprofen, indomethacin and paracodeine. Only in one (0.8%) of the records, a combination of morphine and DF 118 was given (DF 118 is a narcotic analgesic). Antibiotics were given to 99 (79%) of patients and the commonly used antibiotics were ampicillin and cloxacillin. Tetanus toxoid one (0.8%) was least documented. The treatment given to the patients depended on the associated signs and symptoms, injuries they sustained and the underlying conditions before the injury.

Feeding

There was poor documentation on the assessment of gastrointestinal needs. The gastrointestinal needs were often documented in the nursing notes only when prescribed in medical notes. Reasons behind this could be lack of assessment skills on nutritional status, nurses feeling that is it not their responsibility, or lack of knowledge on the nutritional requirements of the head injured patients.

5.3 CONCLUSION

The following conclusions can be made from the findings:

There was poor documentation on some interventions carried out on the head injury patients. But literature advocates the importance of documentation of all the events and

treatment so as to be able to form a baseline for management (Mc Cabe, 1996). For better outcome, head injury victims should be given prompt care during the first hour (Golden Hour) (Guin, 1995). However, it was very difficult to ascertain whether care was given during this hour because of poor documentation of the times the patient was attended. It is of paramount importance to control the cervical spine until the cervical spine fracture has been ruled out (Bouckaert, 1998; Naidoo, 1998; Swann & McCarter, 1998). However, the findings revealed that the cervical spine control was least attended to.

As stated by Bouckaert (1997), Kelly, Ramundo, Thurman and Zink (1997) the initial priorities of management are: respiration, circulation, intracranial pressure monitoring, assessment of neurological status, Glasgow Coma Scale, monitoring vital signs, fluid and electrolyte balance, giving treatment as ordered and feeding. According to the study findings, the Glasgow Coma Scale readings were not recorded in some charts and some did not correspond with the patient's condition. The GCS is an important index in head injuries because it evaluates the level of consciousness which is the main aspect for determining deterioration of the condition. Blood gases are of paramount importance because they assess the adequacy of ventilation (Swann & Mc Carter, 1998). The findings reveal that blood gases were not assessed in 98,4% of records.

5.4 LIMITATIONS

The chi-square test could not be used as many cells had expected value counts of less than 5, therefore no statements of statistical significance could be made.

The sample size was small even though this was a referral hospital in the capital city. Due to this fact, generalisation of findings are therefore limited to the hospital and Gaborone region. The results arising from this survey may be used by applying the concept of transferability to similar groups.

5.5 RECOMMENDATIONS

5.5.1 For Practice

The following recommendations can be made for patient care:

- Accurate documentation on the time including time of injury, arrival time, time on all procedures performed on the patients to ensure good quality care.
- A head injury chart or record system should be developed.
- A treatment protocol with clear treatment algorithms should be developed. This should show a step-by-step treatment or management to the procedures and investigations to be done in every head injury patient. The algorithms will be based on individual care and treatment.
- To ensure that the protocols and treatment algorithms are efficiently applied, clear organisational plans should be compiled. Each team member should have clear guidelines to maximise their individual contribution to the team effort.

- Nurses should be trained in the critical care management of head injury patients.
- Periodic auditing by the audit team.

5.5.2 For Nursing Education

- Educate nurses on head injury with more emphasis on management, Glasgow Coma Scale assessment, arterial blood gases and interpretation, ECG taking and interpretation.
- Emphasize the importance of nursing procedures like self care requisites. This can be done through in-service education.

5.5.3 For Research

- The findings of the current study warrant that further investigation be done to establish whether the findings can be replicated with a larger, more representative sample size in which randomisation is possible.
- Similar research, but an observational study, is needed to establish the care given at the accident scene, so as to establish appropriate standards of care.

5.6 SUMMARY

In summary, the study was undertaken to:

- Describe the documented initial management of head injury patients upon arrival in the Accident and Emergency Unit.
- To describe the subsequent nursing and medical management documented during the first 24 hours.
- To identify the outcomes associated with head injuries within the first 24 hours.

It was recognised that head injury management needs a well organised team approach during the first few hours of injury of better outcome.

REFERENCES

Abelson M.N. The pathophysiology of raised intracranial pressure. *Professional Nursing Today.* July/August 1997; 1: 4: pp 10-11.

Adedeji O.A. & Driscol P.A. The trauma team - a system of initial trauma care. *Postgraduate Medical Journal.* 1996; 72: pp 587-593.

Boffard K.D. Scoring systems in trauma. *Trauma Year Book.* University of the Witwatersrand: Johannesburg. 1998. pp 10-14.

Botswana Health Statistics. Ministry of Health [N. Pub] 1995. Government Printers. Gaborone 1995.

Botswana National Development Plan 7. Government Printers. Gaborone 1995.

Botswana Population Census. Government Printers. Gaborone 1995.

Botswana Road Traffic Accident File. Gaborone 1997.

Bouckaert M.M.M.R. Maxillofacial Trauma. *Trauma & Emergency Medicine.* April/May 1997, pp 13-21.

Brink H.I. Fundamentals of Research Methodology for Health Care Professionals. Creda Press: Cape Town. 1996.

Brown S.R., Raine C., Robertson C.E. & Swann I.J. Management of minor head injuries in the accident and emergency department: the effect of an observation ward. *Journal of Accident & Emergency Medicine.* 1994; 11: pp 144-148.

Bruce J. & Mngoma L. Head injuries: the Chris Hani Baragwanath experience. *Professional Nursing Today.* Jan-March 1998; 2: 4: pp 20-23.

Claasen A.J. Trauma & Cerebrospinal Fluid Leakage. *Trauma & Emergency Medicine.* December 1995, 12: pp 214-217.

Collins W.F., Van Gilder J.C., Venes J.L., Wagner F.C. & D'Angelo C.M. Brain and cranial nerves. *Brief Textbook of Surgery.* WB Saunders: London. 1976.

Combes P., Fauvage B., Colonna M., Passagia J.G., Chirossel J.P. & Jacqout C. Severe head injuries: an outcome prediction and survival analysis. *Intensive Care Medicine.* 1996, 22: pp 1391-1395.

Cudmore J.E. Trauma nursing: the team approach. *British Journal of Nursing.* 1996; 5: 12: pp 736-753.

Brink H.I. Fundamentals of Research Methodology for Health Care Professionals. Creda Press: Cape Town. 1996.

Brown S.R., Raine C., Robertson C.E. & Swann I.J. Management of minor head injuries in the accident and emergency department: the effect of an observation ward. *Journal of Accident & Emergency Medicine.* 1994; 11: pp 144-148.

Bruce J. & Mngoma L. Head injuries: the Chris Hani Baragwanath experience. *Professional Nursing Today.* Jan-March 1998; 2: 4: pp 20-23.

Claasen A.J. Trauma & Cerebrospinal Fluid Leakage. *Trauma & Emergency Medicine.* December 1995, 12: pp 214-217.

Collins W.F., Van Gilder J.C., Venes J.L., Wagner F.C. & D'Angelo C.M. Brain and cranial nerves. *Brief Textbook of Surgery.* WB Saunders: London. 1976.

Combes P., Fauvage B., Colonna M., Passagia J.G., Chirossel J.P. & Jacqout C. Severe head injuries: an outcome prediction and survival analysis. *Intensive Care Medicine.* 1996, 22: pp 1391-1395.

Cudmore J.E. Trauma nursing: the team approach. *British Journal of Nursing.* 1996; 5: 12: pp 736-753.

Cranshaw J., Hughes G. & Clancy M. Computerised tomography and acute traumatic head injury: time for change? *Journal of Accident & Emergency Medicine.* 1996; 13: pp 80-85.

DeGroot J. & Chusid J. The scalp, the skull and the cerebral meninges. *Correlative Neuroanatomy & Functional Neurology.* 19th ed. Lange. 1985.

Demetriades D. Initial assessment and resuscitation of a trauma patient. *Trauma Journal of Accident & Emergency Medicine.* Mar/April 1989, pp 9-13.

Demeatriades D. *A Guide to Management of Trauma.* University of the Witwatersrand: Johannesburg. 1993.

Driscoll P.A. Trauma: Today's problems, tomorrow's answers. *Injury.* 1992; 23: pp 151-158.

du Trevou M.D. & Allwright P.H. The management of skull base fractures. *Trauma & Emergency Medicine.* April/May 1997, pp 9-12.

Evans P.A., Brazil E. & MacNamara A.F. Computed tomography of the head by the accident and emergency department - why 24 hour access is vital. *Journal of Accident & Emergency Medicine.* April 1998; 15: pp 294-297.

Evans F. & Nathan B. The treatment of head injury during the renaissance. *Journal of Accident & Emergency Medicine.* August 1998; 15: pp 119-120.

Eyre G. Shock treatment. *Nursing Times.* 1993; 89: 343: pp 30-34.

Fitzpatrick M.O. & Seex K. Scalp lacerations demand careful attention before interhospital transfer of head injured patients. *Journal of Accident & Emergency Medicine.* 1996; 13: pp 207-208.

Frye B. Head injury issues in the Netherlands and the United States. *Rehabilitation Nursing.* Jan/Feb 1994; 19: 1: pp 45-46.

Gopal R. & Lipschitz R. Head Injury. *Modern Surgery in Africa - The Baragwanath Experience.* D. Pantanowitz. Southern Book Publishers: Johannesburg. 1988.

Gopal R. Can outcome from head injury be improved? *Trauma & Emergency Medicine.* July/Aug 1991; 8: 4: pp 373.

Gopal R. The management of head injuries. *Journal of Accident & Emergency.* March/April 1989, pp 6-8.

Grant P.T. & Shrouder S. Initial assessment of head injured patients transferred to a regional neurosurgical service: what do we miss? *Journal of Accident & Emergency.*

1997; 14: pp 10-12.

Guin S.E. Central nervous system practice in neurosurgery: is there a central nervous system in the house? *Clinical Nurse Specialist.* 1995; 9: pp 3-7.

Hall C.A. Patient management in head injury care: a nursing perspective. *Intensive & Critical Care Nursing.* Dec 1997; 13: 6: pp 329-337.

Haynes M.K.M. Nutrition in the severely head-injured patient. *Clinical Rehabilitation.* 1992; 6: pp 153-158.

Heinz C.E. Living with head injury: a guide for families. *Rehabilitation Nursing.* 1994; 19: pp 1.

Hutchinson P.J.A., Kirkpatrick P.J., Addison J., Jackson S. & Pickard J.D. The management of minor traumatic brain injury. *Journal of Accident & emergency.* 1998; 15: pp 84-88.

Jennet B. Assessment of outcome after severe brain damage. *Lancet* 1975; 1: pp 480-484.

Johnstone A.J., Zuberi S.H. & Scobie W.G. Skull fractures in children: a population study. *Journal of Accident & Emergency.* 1996; 13: p 386-389.

Keenan J.P. Mining supplement to trauma Head injuries. No compromising. *Journal of Accident & Emergency.* September 1986, pp 18-21.

Kelly P., Ramundo M., Thurman D.J. & Zink B.J. Improving outcome after brain trauma. *Patient Care.* August 1997, pp 36-59.

Landy P.J.B. Neurological sequelae of minor head and neck injuries. *Injury: International Journal of the Care of the Injured.* 1998; 29: 3: pp 199-205.

Lloyd D.A., Carty H., Patterson M., Butcher C. & Roe D. Predictive value of skull radiography for intracranial injury in children with blunt head injury. *Lancet.* March 1997; pp 349.

Mac Namara A.F., Brazil E. & Evans P.A. Computed tomography of the head by accident and emergency department. Why 24 hour access is vital. *Journal of Accident & Emergency.* 1998; 15: pp 294-297.

Magenis P., Shepherd J., Hutchison I. & Brown A. Trends in facial injury: increasing violence more than compensates for decreasing road trauma. *British Medical Journal.* Jan 1998; 316: pp 325-326.

Mahalapye Hospital Statistics on Head Injuries. [N. Pub] 1997.

Marik P.E. *The Intensive Care Unit Therapeutic Handbook.* 1st ed. United States of America. Mosby. 1996.

Marion D.W. Complications of head injury and their therapy. *Journal of Clinical Neurology.* 1991; 2: pp 411-424.

Marion D., Obrist W., Carlier P., Penrod L. & Darby J. The use of moderate therapeutic hypothermia for patients with severe head injuries. A preliminary report. *Journal of Neurosurgery.* 1993; 79: pp 354-362.

McCabe M. Broadsheet on the management of major trauma. *Journal of Accident & Emergency Medicine.* 1996; 13: pp 200-201.

McHugh K. & Moore F. Guidelines for imaging children with head injuries in A & E departments. *Journal of Accident & Emergency Medicine.* 1997; 14: pp 58-60.

McQuillan P., Pilkington S., Allan A., Taylor B., Short A., Morgan G., Nielsen M., Barett D. & Smith G. Confidential inquiry into quality of care before admission to intensive care. *British Medical Journal.* 1998; 316: pp 1853-1858.

Meiny C.J. & Mennen V. *Principles of Surgical Patient Care.* Pretoria. Academica. 1990.

Moreea S., Jones S. & Zoltie N. Radiography for head trauma in children: what guidelines should we use? *Journal of Accident & Emergency Medicine.* 1997; 14: pp 13-15.

Naidoo K. Closed head injury - the second insult. *Trauma & Emergency Medicine.* June/July 1997, pp 26-27.

Oh T.E. *Manual of Intensive Care.* Sydney: Butterworths. 1990.

O'Driscoll K, Jones A. & Luke L.C. Head injuries and observation ward. *Journal of Accident & Emergency Medicine.* 1995; 12: pp 160-164.

Olfunso A.A. & Driscoll P.A. The trauma team - a system of initial trauma care. *Journal of Postgraduate Medicine.* 1996; 72: pp 587-593.

Parsley J. Fletcher L. & Mabrook A.F. Head injury instructions: a time to unify. *Journal of Accident & Emergency Medicine.* 19979; 14: pp 238-239.

Polit D.F. & Hungler B.P. Essentials of basic research. United states of America: UJ.P. Lippincott. 1993.

Price C.I. The intensive care of head injured patients. Tinker J. Zapol N. (eds) *Care of the Critically Ill.* 2nd ed. Springer-Verlag: New York. 1992.

Princess Marina Hospital Records. Gaborone: Botswana. 1997.

Rodriquez R.M. Wang N.E. & Ronald G.P. Prediction outcome of intensive care patients admitted from the emergency department. *Critical Care Medicine.* 1997; 25: 11: pp 1801-1805.

Sacks R. & Katz L. Pre-hospital management of head-injured patients. *Trauma - The Journal of Accident & Emergency Medicine.* March/April 1989, pp 4-5.

Segatore M. Fever after traumatic brain injury. *Journal of Neuroscience Nursing.* 1992; 24: 2: pp 104-109.

Simma B., Burger R., Falk M., Sacher P. & Fanconi S. A prospective, randomized, and controlled study of fluid management in children with sever head injury: lactated Ringers solution versus hypertonic saline. *Critical Care Medicine.* 1998; 26: 7: pp 1365-1270.

Swann I.J. & McCarter D.H.A. Investigation of the head injured patient. *Journal of Accident & Emergency Medicine.* 1998; 15: pp 337-348.

Swann I.J. & McCarter D.H.A. Later investigation of head injury. *Journal of Accident & Emergency.* 1998, pp 344-347.

Teasdele G. & Jennette B. Assessment of coma and impaired consciousness: a practical scale. *Lancet.* 1974; 2: pp 81-84.

Thelan L.A., Davie J.K., Urden L.D. & Lough M.E. *Critical Care Nursing. Diagnosis and Management.* 2nd ed. Mosby: United States of America. 1994.

Treadwell L. & Mendelow D and the Head Injury Audit Team. Audit of head injury management in the northern region. *British Journal of Nursing.* 1994; 3: 3: pp 136-140.

Van Rensburg M.J.. Head injuries. Principles of surgical patient care. Academica: Pretoria. 1990; pp 491-507.

Vrankovic D.J. Splavski B., Hecimovic I., Glavina K., Mursic B. & Blagus G. Self-inflicted gunshot wounds to the head during war and post-war period. *Journal of Care of the Injured.* 1998; 29: 5: pp 369-373.

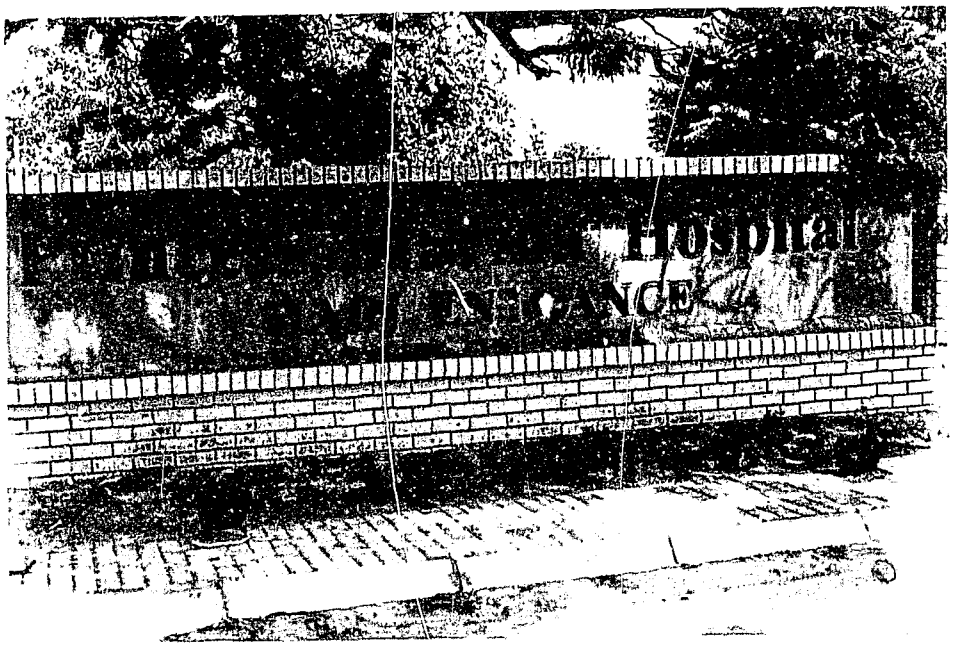
Wainwright S.P. & Gould D. Endotracheal suctioning in adults with severe head injury: literature review. *Intensive & Critical Care Nursing.* 1996; 12: pp 303-308.

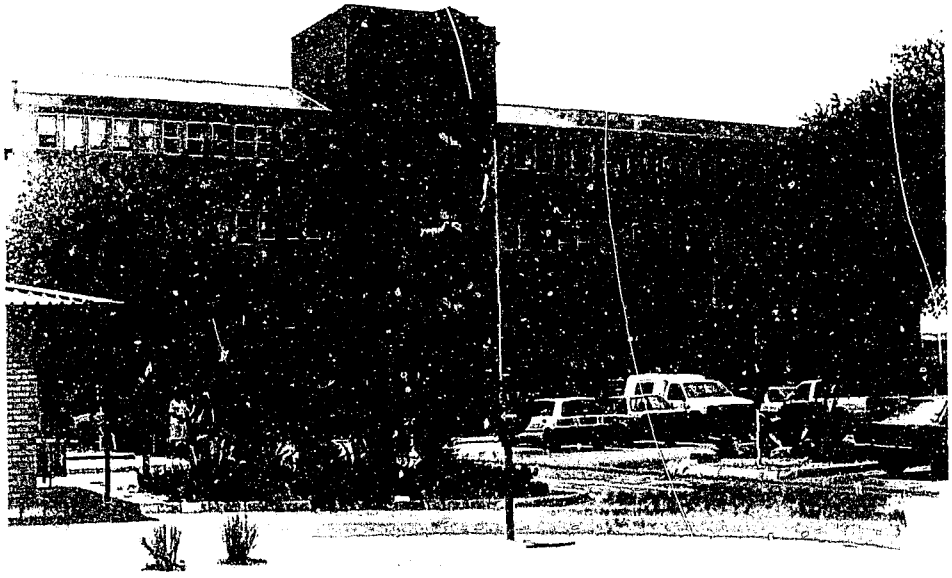
Waner S. Preventive treatment for trauma of the head. *Trauma & Emergency Medicine.* October/November 1997; 14: 5; pp 18-20.

Wood C.J. Endotracheal suctioning: a literature review. *Intensive & Critical Care Nursing.* 1998; 14: pp 124-136.

APPENDECES

APPENDIX 1





CHECKLIST APPENDIX 2

SECTION I

Number: .....

1. **Approximate time of injury: .....**
2. **Date of admission: .....**
3. **Time of arrival at hospital after incident:**

< 1 hour	☐
1 - 2 hours	☐
2 - 3 hours	☐
3 - 4 hours	☐
4 - 5 hours	☐
> 5 hours	☐
Recorded	☐

Remarks: _____

4. **Mechanism of injury:**

Blunt:	
Motor vehicle accident	☐
Motor cycle accident	☐
Pedestrian vehicle accident	☐
Fall	☐
Sports	☐
Penetrating:	
Gunshot wound	☐
Stab wound	☐
Other	☐

Remarks: _____

4. **Provisional diagnosis:** _____

SECTION II

Initial Management

6. Initial attendant:

Doctor	
Registered Nurse	
Enrolled Nurse	
Other	

Remarks: _____

	Yes	No
7. Airway maintained self:		
Suctioning		
Endotracheal intubation		
7.1 Control of cervical spine		

Remarks: _____

8. Breathing:

	Yes	No
Oxygen		
* Face mask		
* Nasal cannula		
* Ambu bag		
Surgical airway		
* Tracheostomy		
* Cricothyroidotomy		
No assistance required		
Others		

Remarks: _____

9. Circulation:

	Yes	No
Intravenous infusions:		
* Ringers lactate		
* 0.9% normal saline		
* Mannitol		
* Haemacel		
* Dextrans		
* Blood transfusion		
Line:		
* Central venous line		
Other		

Remarks: _____

10. Glasgow Coma Scale:

Normal	
Mild 13 - 14/15	
Moderate 9 - 12/15	
Severe 8/15 and below	
Not recorded	

Remarks: _____

11. Vital Signs Checked	Yes	No	Results	Action taken
Temperature				
Pulse				
Respiration				
Blood pressure				
Skin perfusion				
Urinary output				
Pupils checked				
Concensual reflex				
Intracranial pressure monitored				

Other: _____

Remarks: _____

12. Investigations:	Yes	No	Results	Action taken
Blood gases				
Haemoglobin				
Blood grouping and X-matching				
Urine				
Electrocardiogram				
CT scan				
X-ray: Skull				
Spine				
Chest				
Abdomen				
Pelvis				
Upper extremities				
Lower extremities				

Remarks: _____

13. Associated Injuries:	Yes	No	Action taken
Head			
Face			
Neck			
Thorax			
Abdomen and Spine			
Upper extremity			
Lower extremity			
External			

Remarks: _____

14. Associated Signs and Symptoms	Yes	No	Action taken
Cerebrospinal fluid leakage			
Haemorrhage			
Increased intracranial pressure			
Cushings response			
Hyperthermia			
Racoons eyes			
Battle's sign			
Restlessness			
Other			

Remarks: _____

15. **Medication and Treatment/Prescribed:** Yes ☐ No ☐

	Yes	No	Name
Anticonvulsants			
Antibiotics			
Analgesics			
Sedatives			
Diuretics			
Tetanus toxoid			
Others			

If other explain: _____

Remarks: _____

		Yes	No	Time frame
16.	**Transfer to ward**			
	Referral hospital			

SECTION III

Subsequent Management

		Yes	No
17.			
	Airway maintained Self		
	Cleared		
	Suctioning		
	Endotracheal intubation		
17.1	Control of cervical spine		

Remarks: _____

18. Breathing:

	Yes	No
1. Oxygen		
a. Face mask		
b. Nasal cannula		
c. Tracheal intubation		
Tracheostomy		
Cricothyroidotomy		
Others		

Remarks:_____

2. Mechanical Ventilation	Yes	No
Mode		
Synchronised Intermittent		
Mandatory Ventilation (SIMV)		
Continuos Positive Airway		
Pressure (CPAP)		
Positive Pressure Support		
Ventilation (PPSV)		
Others		
No assistance required		

Remarks:_____

19. Glasgow Coma Scale:

	Yes	No
Normal		
Mild 13-14/15		
Moderate 9/15		
Severe 8/15 below		
Not recorded		

Remarks:_____

20. **Vital Signs:** Checked Yes ☐ No ☐

	Yes	No	Action taken
Temperature			
Pulse			
Respiration			
Blood pressure			
Skin perfusion			
Urinary output			
Pupils checked			
Consensual reflex			
Intracranial pressure monitored			

Remarks: _____

21. **Feeding:**

	Yes	No
Nil per mouth		
Oral		
Nasogastric tube		
Orogastric tube		
Parenteral		
Intravenous therapy		
Other		
Not recorded		

Remarks: _____

22. **Medications or Treatment Prescribed:** Yes ☐ No ☐

	Yes	No	Name
Anticonvulsants			
Antibiotics			
Analgesics			
Sedatives			
Tetanus toxoid			
Other			

Remarks: _____

23	**Surgical Procedures Performed**	Yes	No
	Burrhole		
	Craniotomy		
	Frontal lobectomy		
	Subdural tear repair		
	Others		

Remarks:_____

24	**Self-Care Requisites**	Yes	No
	Mouth care		
	Bronchial care		
	Urological care		
	Skin care (pressure areas)		
	Eye care		
	Hygiene		
	Position changing		
	Sensory stimulation		
	Nutrition		
	Rehabilitation		
	Other		

Remarks:_____

SECTION IV

25. Patient Outcome:

	Yes	No	Action
* Developed complications			
Anaemia (haemorrhage)			
Cerebral oedema			
Seizure			
Cardiac dysrhythmia			
Intracranial infection			
Other			

	Yes	No
* Did not develop complications		
* Patient in the ward		
* Transferred		
* Deceased		
* Other		

Remarks:_____

APPENDIX 3

Faculty of Health Sciences

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

7 York Road, Parktown, 2193 South Africa • Telegrams 'Witsmed' • Telephone (011) 647-1111 • Fax: (011) 643-4318

10 November 1998

Ms T S Gwaila
P O Box 299
Mahalapye
BOTSWANA

Dear Ms Gwaila,

APPROVAL OF PROTOCOL ENTITLED "MANAGEMENT OF PATIENTS WITH HEAD INJURIES DURING THE FIRST 24 HOURS IN PRINCESS MARINA HOSPITAL"

I should like to advise you that the protocol that you have submitted for the degree of MSc(Nursing) has been approved by the Postgraduate Committee for continuation of candidature. It is noted that ethics clearance has been obtained.

Mrs J Bruce of the Department of Nursing Education has been appointed as your supervisor. You are asked to maintain regular contact with your supervisor who must be kept advised of your progress.

Please note that all candidates for higher degrees must make reference in their research reports to the clearance number of the relevant ethics committee, where applicable. The final title, when submitting the research, should comply with the above approved title, and a signed declaration, noting that the work has been your own and not submitted to any other University, must also be included.

Please also note that Postgraduate students are required to register with the Faculty Office every year until they graduate from the University.

Yours sincerely

MRS G GABRIEL
FACULTY OFFICER (POSTGRADUATE)
FACULTY OF HEALTH SCIENCES

cc: Ms P McInerney
Mrs J Bruce

The University seeks to serve South Africa by furthering access to equal opportunity while striving for excellence in teaching, learning and research

APPENDIX 4

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

COMMITTEE FOR RESEARCH ON HUMAN SUBJECTS (MEDICAL)
Ref: R14/49 Gwaila

CLEARANCE CERTIFICATE PROTOCOL NUMBER M980554

PROJECT Management Of Patients With Head Injuries During The First 24 Hours In Princess Marina Hospital Botswana

INVESTIGATORS Miss TS Gwaila

DEPARTMENT Dept of Nursing Education, Ministry of Health Botswana

DATE CONSIDERED 980529

DECISION OF THE COMMITTEE *

Approved unconditionally

DATE 980728 CHAIRMAN ..... (Professor P E Cleaton-Jones)

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

c c Supervisor: Mrs JCR Bruce
Dept of Dept of Nursing Education, Wits Medical School

Works2\lain0015\HumEth97.wdb\M 980554

==========

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 28.07.98 SIGNATURE .....

PROTOCOL NO.: M 980554

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX 5

University of the Witwatersrand
Parktown Village 1
House H6
Johannesburg
2050
South Africa

15 May 1998

The Permanent Secretary
Ministry of Health
Private Bag 0038
GABORONE
Botswana

PERMISSION TO CONDUCT A RESEARCH

Dear Sir,

I am a MSc (Nursing) critical care student in the University of the Witwatersrand. For the purpose of obtaining my MSc I have to do a research project. I would like to undertake research on the management of patients with head injuries during the first 24 hours in the Princess Marina Hospital. Data will be obtained by review of records of all head injury patients admitted from 1st January 1997 to 31st December 1997 at the Princess Marina Hospital during the December vacation. I also would like to conduct a pilot study in July 1998.

I therefore request permission to undertake this study at the abovementioned setting.

Enclosed please find a copy of my research proposal. Your assistance and permission would be highly appreciated.

If you have any questions, please contact me at:
0027114802156 (H) ; Cell: 0027829533494 ;
e-mail: 011TSG@Chiron Wits.ac.za

Yours sincerely

TEBOGO SYNAT GWAILA (Miss)
BEd (Nursing) UB, RN, RM, Diploma Family Nurse Practice
(I.H.S. Gaborone)

cc: Superintendent PMH (Botswana)

APPENDIX 6

TELEPHONE: 305169
FAX: 314697
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BD
REFERENCE: MII 13/18/1

REPUBLIC OF BOTSWANA

MINISTRY OF HEALTH,
PRIVATE BAG 0038,
GABORONE.

20 October, 1998

Mrs T.S. Gwaila
Univeristy of Witwatersrand
Department of Nursing Education
Johannesburg

Dear T. S. Gwaila

Grant of a Research Permit: T.S. Gwaila

Your application for a research permit refers.

I am pleased to inform you that you have been granted permission to conduct research on **"Management of patients with Head Injuries during the first 24 hours in Princess Marina Hospital in Botswana"**

The permit does not give authority to enter any premises, private establishment or protected area without permission of concerned parties. Such permission should be negotiated with those concerned. You may also need to request permission from other relevant authorities, i.e. Ministry of Local Government Lands and Housing, (PHC), Local District Health Team, etc.

You are also requested to submit at least one copy of the findings of your study to the Ministry of Health, Health Research Unit.

Yours sincerely

Pilate Khulumani.
For Permanent Secretary.

APPENDIX 7

University of the Witwatersrand
Parktown Village 1
House H6
Johannesburg
2050
Republic of South Africa

14 October 1998

The Secretary
Office of the President
Private Bag 001
GABORONE

Attention: Mr J. Sethibe

Dear Sir

RE: PERMISSION TO CONDUCT RESEARCH

I am registered for a MSc (Nursing) degree in Critical Care in the University of the Witwatersrand and request for permission to undertake research in Botswana Princess Marina Hospital in November 1998.

The study is management of patients with head injuries during the first 24 hours. Data will be collected by a retrospective record review.

Enclosed please find copies of my proposal, Curriculum Vitae, certified copies of my passport, National Identity Card and a Research Application form.

Yours sincerely

TEBOGO S. GWAILA

APPENDIX 8

TELEGRAMS: PULA

TELEPHONE: 350800
TELEX 2655 BD

REPUBLIC OF BOTSWANA

OFFICE OF THE PRESIDENT

PRIVATE BAG 001

GABORONE

OP 46/1 LXX (115)

2 November 1998

Mrs. T.S. Gwaila
University of Wits
Department of Nursing Education
Johannesburg
R.S.A.

Dear Madam

RE: GRANT OF A RESEARCH PERMIT

Your application dated 14th October, 1998 refers.

We are pleased to inform you that you have been granted permission to conduct research on "Management of Patients with Head Injuries During the First 24 Hours in Princess Marina Hospital in Botswana. The permit is valid for a period not exceeding one (1) year, effective November 1, 1998.

The permit is granted subject to the following conditions:

1. Copies of any papers written as a result of the study are directly deposited with the Office of the President, National Archives (2 copies each), National Institute for Research, National Library Service, University of Botswana Library, and Health.

2 The study is conducted according to particulars furnished in the application.

3. The research team comprises only Mrs. T. Gwaila.

4. The permit does not give authority to enter any premises, private establishment or protected area. Permission for such entry should be negotiated with those concerned.

Yours Faithfully



J. Sethibe
for/PERMANENT SECRETARY TO THE PRESIDENT

cc. Permanent Secretary
Ministry of Health
Director, National Institute for Research
Director, Botswana National Library Services
Government Archivist
Librarian, University of Botswana Library
District Commissioner, Gaborone
City Clerk, Gaborone

JS/ck

APPENDIX 9

University of the Witwatersrand
Parktown Village 1
House H6
Johannesburg
2050
South Africa

15 May 1998

The Permanent Secretary
Ministry of Health
Private Bag 0038
GABORONE
Botswana

PERMISSION TO CONDUCT A RESEARCH

Dear Sir,

I am a MSc (Nursing) critical care student in the University of the Witwatersrand. For the purpose of obtaining my MSc I have to do a research project. I would like to undertake research on the management of patients with head injuries during the first 24 hours in the Princess Marina Hospital. Data will be obtained by review of records of all head injury patients admitted from 1st January 1997 to 31st December 1997 at the Princess Marina Hospital during the December vacation. I also would like to conduct a pilot study in July 1998.

I therefore request permission to undertake this study at the abovementioned setting.

Enclosed please find a copy of my research proposal. Your assistance and permission would be highly appreciated.

If you have any questions, please contact me at:
0027114802156 (H) ; Cell: 0027829533494 ;
e-mail: 011TSG@Chiron Wits.ac.za

Yours sincerely

TEBOGO SYNAT GWAILA (Miss)
BEd (Nursing) UB, RN, RM, Diploma Family Nurse Practice
(I.H S. Gaborone)

cc: Superintendent PMH (Botswana)

APPENDIX 10

TELEPHONE: 353221
TELEGRAMS: NGAKA
REFERENCE:

REPUBLIC OF BOTSWANA

PRINCESS MARINA HOSPITAL
P.O. Box 258
GABORONE
BOTSWANA

Ref: PMH 2/11A

12 July 1998

Ms Tebogo Synat Gwaila
Wits University
Parktown Village 1
House H6
Johannesburg
2050
South Africa

Dear Ms Gwaila,

Re: Research on Management of Head Injuries

Thank you for your letter of 25 June 1998 in which you request permission to conduct a pilot study by record review of five patients admitted with head injuries.

As indicated verbally I am happy to authorise you to review the charts of 5 head injury charts and through this letter I would request that the Medical Records Officer gives you whatever assistance you need.

In terms of your definitive study which I understand you plan to conduct at the end of the year on the management of patients with head injuries during the first 24 hours I would request that you submit your research protocol to our hospital research and ethics committee for its evaluation and approval.

The address is as follows:

Professor G. Anabwani
Secretary,
Princess Marina Hospital Research and Ethics Committee
P O Box 258
Gaborone,
Botswana

With best wishes.

Yours sincerely,

H.J. Moffat
Acting Hospital Superintendent

APPENDIX 11

University of the Witwatersrand
Parktown Village 1
House H6
Johannesburg
2050
South Africa

14 October 1998

The Secretary
Princess Marina Hospital Research & Ethics Committee
P.O. Box 258
GABORONE
Botswana

Attention: Professor G. Anabwani

Dear Sir,

RE: PERMISSION TO CONDUCT RESEARCH

I am registered for a MSc (Nursing) degree in Critical Care in the University of the Witwatersrand and request permission to undertake research on all records of head injury patients admitted from 1st January 1996 to December 1996 in the Princess Marina Hospital from 16th November 1998.

The study is management of patients with head injuries during the first 24 hours. The study findings will be useful to the hospital because it will help the hospital to formulate a protocol of management during the first 24 hours. This protocol of management can extend to other hospitals in Botswana.

The protocol underwent three committees in South Africa. At the moment I am awaiting results of the last Committee which will sit on 4th November 1998. Application for conducting research in Botswana has been forwarded to the Ministry of Health and Office of the President of Botswana.

Enclosed please find a Curriculum Vitae and Proposal.

Yours sincerely

TEBOGO S. GWAILA

APPENDIX 12

TELEPHONE: 353221
TELEGRAMS: NGAKA
REFERENCE:

REPUBLIC OF BOTSWANA

PRINCESS MARINA HOSPITAL
P.O. BOX 258
GABORONE
BOTSWANA

16 November 1998

Tebogo Synat Gwaila
University of Witwatersrand
Faculty of Health Sciences
Johannesburg
RSA

Dear Ms Gwaila

Re: Retrospective Investigation of the Management of Patients with Head Injuries at the Princess Marina Hospital

Having consulted with the Committee Chairperson I am happy, on behalf of the Research and Ethics Committee, to give provisional Ethics approval for you to proceed with the above named research. We note that this will be a purely retrospective study based on perusal of hospital records and that direct patient interventions will not be involved.

In giving you this provisional approval, I wish to inform you that it is the mandate of this Committee to maintain a Research Inventory on behalf of the hospital. Consequently, you will be obliged to provide the Committee with one copy of your study report, including all the key research findings, at the end of the study.

On behalf of the Committee, I wish you success in this endeavour.

Yours sincerely,

Prof. Gabriel M. Anabwani
Secretary, Research and Ethics Committee

Cc: Chairman, Research and Ethics Committee

Author Gwaila T S
Name of thesis Management Of Patients With Head Injuries During The First 24 Hours In Princess Marina Hospital (Botswana) Gwaila T S 1999

PUBLISHER:
University of the Witwatersrand, Johannesburg
©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.