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COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING SCIENCES

RESEARCH PROPOSAL SUBMITTED IN PARTIAL FULFILMENT FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN NURSING.

TOPIC: ASSESSING THE METHODS AND OUTCOMES OF MANAGEMENT OF ORTHOPAEDIC TRAUMA PATIENTS IN KENYATTA NATIONAL HOSPITAL (A COMPARATIVE STUDY)

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# TABLE OF CONTENTS

List of Abbreviations ................................................................. iv
Declaration ..................................................................................... v
Approval ....................................................................................... vi
Dedication ..................................................................................... vii
Acknowledgement .......................................................................... viii
Abstract ......................................................................................... ix

## CHAPTER 1.0: INTRODUCTION

1.1 Introduction .................................................................................. 1
1.2 Problem Statement ........................................................................ 11
1.3 Justification .................................................................................. 12
1.4 Research Objectives ..................................................................... 13
1.5 Research Question ......................................................................... 13
1.6 Study Hypothesis .......................................................................... 13
1.7 Study Variables and theoretical framework .................................. 14

## CHAPTER 2.0: LITERATURE REVIEW

2.1 Introduction .................................................................................. 15
2.2 Complications associated with bone healing ............................... 17
2.3 Effectiveness of ORIF (in terms of turnaround time and cost) .... 18
2.4 Use of different ORIF devices ...................................................... 20
References ......................................................................................... 23

## CHAPTER 3.0: METHODOLOGY

3.1 Purpose of the study ..................................................................... 26
3.2 Study Design ................................................................................ 26
LIST OF ABBREVIATIONS

UoN – University of Nairobi.

MoH – Ministry of Health.

KNH – Kenyatta National Hospital.

DASH – Disability of the Arm, Shoulder and Hand.

ORIF – Open Reduction and Internal Fixation.

DALY – Disability Adjusted Life Years.

CSS – Constant Shoulder Scores

ROM – Range Of Motion
DECLARATION

This research proposal is my original work and to the best of my knowledge has not been presented in any institution or university for the purpose of examination.

Signature Date

Mutua M. M.
(Candidate)
APPROVAL
This research has been submitted for examination with the approval of the assigned supervisor

Signed

Date

Mr. S. T. Kimani MSc., BScN. (UoN)
Supervisor
DEDICATION

I dedicate this work to my parents, Comm. George Nzioka and Mrs. Christine Nzioka.
ACKNOWLEDGEMENT

I would like to extend my sincerest appreciation to my supervisor, Mr. S. T. Kimani for all his help and encouragement.
I would also like to appreciate my parents, brothers and sisters for their unwavering support (both moral and material) and belief in me.
Above all, I want to thank the Almighty God for His Divine providence, mercies and guidance.
ABSTRACT

The study, "Assessing the methods and outcomes of management of orthopaedic trauma patients in Kenyatta National Hospital (A comparative study)" is aimed at comparing the different methods of management of orthopaedic trauma injuries and their outcomes not only in clinical terms but also in terms of socio-economic stresses where the time spent in hospital and for recovery is a major factor.

The methods being considered in this study (though not all have been taken to account) are majorly, traction and ORIF (Open Reduction and Internal Fixation)

The traction method has been taken to represent the more conservative methods of management while its counterpart ORIF, the more modern and radical methods of management.

The main objective of the study is to compare the incidences of malunions, non unions, misalignments and other downfalls associated with conservative management of orthopaedic patients. However, I am also looking at the socioeconomic implications of each method.

The study, whose main hypothesis is "The conservative treatment of orthopaedic fractures provides acceptable functional results and is more cost effective" aims at answering a few fundamental questions such as how effective traction is as a method of management of orthopaedic injuries, its demerits and the possibility of tailoring a cost effective ORIF package at the KNH.

It is a comparative retrospective survey of patient files to evaluate the relative proportion of traction procedures that do not take and therefore force the patients to undergo ORIF as a corrective measure.

The study population will comprise of consenting patients, numbering 384, and chosen using a stratified sampling system.

Data collection methods will involve observation of clinical methods, interviews with the relevant medical personnel and checklists.

The study is expected to take at least 24 weeks (This being the minimum amount of time required for a fracture of the lower limb to heal). The budget put in place was carefully calculated and amounting to Ksh.128,935 that will cater for both personnel and material.

The expected benefits of this study include, putting in place a more cost effective method of orthopaedic
trauma management that would reduce both the overall hospital cost, the time spent in the orthopaedic ward for both treatment and recovery (and subsequently reduce bed occupancy rates in the orthopaedic wards) and further allowing a quicker return to normalcy for patients by allowing sooner return to school or economic viability.
CHAPTER 1.0: INTRODUCTION

Musculoskeletal injuries comprise over one third of all trauma. The causes of adult trauma include gunshot wounds, road traffic accidents, stabbings, industrial accidents, sport, recreational and domestic accidents. (Sherry, 1997)

A fracture maybe defined as a disruption in the integrity of a living bone, involving injury to the bone marrow, periosteum, and adjacent soft tissues. Many types of fractures exist, such as pathologic, stress, and greenstick fractures. When a fracture occurs, it is described radiographically and clinically. (Burkley, 2010)

It may be no more than a crack, a crumpling or a splintering of the cortex; more often the break is complete and the bone fragments are displaced. If the overlying skin remains intact it is a closed (or simple) fracture; if the skin or one of the body cavities is breached it is an open (or compound) fracture, liable to contamination and infection. (Solomon et al, 2001)

Causes of fractures
Fractures result from: a single traumatic incident- Most fractures are caused by sudden and excessive force, which may be direct or indirect. With a direct force the bone breaks at the point of impact; the soft tissues also must be damaged. A direct blow usually causes a transverse fracture and damage to the overlying skin; crushing is more likely to cause a comminuted fracture with extensive soft-tissue damage. With an indirect force the bone breaks at a distance from where the force is applied; soft-tissue damage at the fracture site is not inevitable. Although most fractures are due to a combination of forces (twisting, compression, bending, tension), the x-ray pattern may suggest the dominant mechanism.
Secondly, repetitive stress- Cracks can occur in bone, due to repetitive stress. This is most often seen in the tibia, fibula or metatarsals, especially in athletes, dancers and army recruits who go on long route marches. or finally, abnormal weakening of the bone (a 'pathological' fracture). Fractures may occur even with normal stresses if the bone has been weakened by a change in its structure (e.g. in osteoporosis and Paget's disease) or the presence of a lytic lesion (e.g. a bone cyst or a metastasis). (Solomon et al, 2001)

Types of fractures
Fractures are infinitely variable in appearance but for practical reasons they are divided into a few well defined groups.
Complete fractures

The bone is completely broken into two or more fragments. If the fracture is transverse, the fragments usually remain in place after reduction; if it is oblique or spiral, they tend to slip and redisplace even if the bone is splinted. In an impacted fracture the fragments are jammed tightly together and the fracture line is indistinct. A comminuted fracture is one in which there are more than two fragments; because there is poor interlocking of the fracture surfaces, these lesions are often unstable. (Solomon et al, 2001)

Incomplete fractures

Here the bone is incompletely divided and the periosteum remains in continuity. In a greenstick fracture the bone is buckled or bent (like snapping a green twig); this is seen in children, whose bones are more springy than those of adults. Reduction is usually easy and healing is quick. Compression fractures occur when cancellous bone is crumpled. This happens in adults, especially in the vertebral bodies. Unless operated upon, reduction is impossible and some residual deformity is inevitable. (Solomon et al, 2001)

Fracture description

In terms of anatomy, the fracture is described with relation to the bones involved and the location within the bone (diaphysis, metaphysis, epiphysis); In relation to articular surface involvement, the presence of intra-

With respect to displacement, degree or percentage of the fracture displacement is taken into account; When considering the angulation, the angular deformity is defined in degrees in terms of the distal fragment in relation to the proximal fragment or with respect to the proximal apex of the distal fragment; For rotation, the rotational deformity is described both clinically and radiographically; In terms of shortening, the extent to which shortening of the involved bone has occurred; In assessing fragmentation, the Muller AO (Arbeitsgemeinschaft für Osteosynthesefragen [Association for Osteosynthesis]) is put in use where, a multifragmentary fracture is one that has several breaks in the bone, creating more than 2 fragments. Wedge fractures are either spiral (low energy) or bending (high energy) and allow the proximal and distal fracture fragments to contact each other. The complex multifragmentary fracture is a segmental fracture or one in which there is no contact between the proximal and distal fragments without the bone shortening. Simple fractures are spiral, oblique, or transverse. Management of multifragmentary fractures may be more complicated than that for simple fractures. (Burkley, 2010)
Open fractures communicate with the skin and should be handled with extreme care as contamination and soft tissue disruption may result in disaster. The basic steps to the management of open fractures are to: debride the soft tissues and bone, stabilize and reconstruct the same. This formal management, including thorough debridement with irrigation (normal saline), preferably pulsed should be performed within eight hours of injury. Otherwise serious infection may result. (Sherry, 1997)

Fracture healing
Fracture healing is unique in that there is reconstruction of the original tissue rather than healing with scar formation as in other tissues. (McKibbin, 1978) Fractures heal by restoration of bone continuity. The rate of healing varies with age and is quicker in children. Also, cancellous bone heals more quickly than cortical bone. Some movement at fractures site is required for healing to occur and an uninterrupted blood supply is required. (Forward & Morgan 2002)
The process of fracture repair varies according to the type of bone involved and the amount of movement at the fracture site. In a tubular bone, and in the absence of rigid fixation, healing proceeds in five stages:

Tissue destruction and haematoma formation- Vessels are torn and a haematoma forms around and within the fracture. Bone at the fracture surfaces, deprived of a blood supply, dies back for a millimetre or two.

Inflammation and cellular proliferation- Within 8 hours of the fracture there is an acute inflammatory reaction with proliferation of cells under the periosteum and within the breached medullary canal. The fragment ends are surrounded by cellular tissue, which bridges the fracture site. The clotted haematoma is slowly absorbed and fine new capillaries grow into the area.

Callus formation- The proliferating cells are potentially chondrogenic and osteogenic; given the right conditions, they will start forming bone and, in some cases, also cartilage. The cell population now also includes osteoclasts (probably derived from the new blood vessels) which begin to mop up dead bone. The thick cellular mass, with its islands of immature bone and cartilage, forms the callus or splint on the periosteal and endosteal surfaces. As the immature fibre bone (or 'woven' bone) becomes more densely mineralized, movement at the fracture site decreases progressively and ceases when the fracture 'unites'. The entire process is driven by inductive proteins, which include fibroblast growth factors, transforming growth factor-beta and bone morphogenic proteins.

Consolidation- With continuing osteoclastic and osteoblastic activity the woven bone is transformed into lamellar bone. The system is now rigid enough to allow osteoclasts to burrow through the debris at the
fracture line, and close behind them osteoblasts fill in the remaining gaps between the fragments with new bone. This is a slow process and it may be several months before the bone is strong enough to carry normal loads.

Remodelling The fracture has been bridged by a cuff of solid bone. Over a period of months, or even years, this crude 'weld' is reshaped by a continuous process of alternating bone resorption and formation. Thicker lamellae are laid down where the stresses are high; unwanted buttresses are carved away; the medullary cavity is reformed. Eventually, and especially in children, the bone reassumes something like its normal shape. (Solomon et al, 2001)

Fracture management
Treatment of the fracture consists of manipulation to improve the position of the fragments, followed by splintage to hold them together until they unite; meanwhile, joint movement and function must be preserved. Fracture healing is promoted by physiological loading of the bone, so muscle activity and early weight-bearing are encouraged. These objectives are covered by three simple injunctions: reduce, hold, exercise. The problem is how to hold a fracture adequately and yet use the limb sufficiently: this is a conflict (hold versus move) which the surgeon seeks to resolve as rapidly as possible (e.g. by internal fixation); but he or she also wants to avoid unnecessary risks - here is a second conflict (speed versus safety). This dual conflict epitomizes the four factors that dominate fracture management (the term 'fracture quartet' was coined by Alan Apley). (Solomon et al, 2001)

Reduction should aim for adequate apposition and normal alignment of the bone fragments. The greater the contact surface area between fragments the more likely is healing to occur. However, there are some situations in which reduction is unnecessary. (1) when there is little or no displacement; (2) when displacement does not matter (e.g. in fractures of the clavicle); and (3) when reduction is unlikely to succeed (e.g. with compression fractures of the vertebrae). There are two methods of reduction: closed and open (Solomon et al, 2001)

Closed reduction
In general, closed reduction is used for all minimally displaced fractures, for most fractures in children and for fractures that are not unstable after reduction and can be held in some form of splint or cast. Unstable fractures also can be reduced 'closed', prior to external or internal fixation. (Solomon et al, 2001)
Open reduction
Operative reduction of the fracture under direct vision is indicated: when closed reduction fails, either because of difficulty in controlling the fragments or because soft tissues are interposed between them; when there is a large articular fragment that needs accurate positioning; or for traction fractures in which the fragments are held apart. As a rule, however, open reduction is merely the first step to internal fixation. (Solomon et al, 2001)

HOLD REDUCTION
The word 'immobilization' has been deliberately avoided because the objective is seldom complete immobility; usually it is the prevention of displacement. Nevertheless, some restriction of movement is needed to promote soft-tissue healing and to allow free movement of the unaffected parts. The available methods of holding reduction are:

(1) continuous traction;

Traction is applied to the limb distal to the fracture, so as to exert a continuous pull in the long axis of the bone with a counterforce in the opposite direction (to prevent the patient being merely dragged along the bed). This is particularly useful for spiral fractures of the shaft which are easily displaced by muscle contraction. Traction cannot hold a fracture still; it can pull a long bone straight and hold it out to length but to maintain accurate reduction is sometimes difficult. And meanwhile the patient can move his or her joints and exercise his or her muscles. Traction is safe enough, provided it is not excessive and care is taken when inserting the traction pin. The problem is speed: not because the fracture unites slowly (it does not) but because lower limb traction keeps the patient in hospital. Traction may take the form of either skin or skeletal. Whether by skin or skeletal traction, the fracture is reduced and held in one of three ways: fixed traction, balanced traction or a combination of the two.

Fixed traction The pull is exerted against a fixed point. The usual method is to tie the traction cords to the distal end of a Thomas' splint and pull the leg down until the proximal, padded ring of the splint abuts firmly against the pelvis.

Balanced traction Here the traction cords are guided over pulleys at the foot of the bed and loaded with weights; counter-traction is provided by the weight of the body when the foot of the bed is raised. (Solomon et al, 2001)
Complications of traction

Circulatory embarrassment - In children especially, traction tapes and circular bandages may constrict the circulation; for this reason 'gallows traction', in which the baby's legs are suspended from an overhead beam, should never be used for children over 12kg in weight.

Nerve injury - In older people, leg traction may predispose to peroneal nerve injury and a resultant drop-foot; the limb should be checked repeatedly to see that it does not roll into external rotation during traction.

Pin-site infection - Pin sites must be kept clean and should be checked daily. (Solomon et al, 2001)

(2) Cast splintage
Plaster of Paris is still widely used as a splint, especially for distal limb fractures and for most children's fractures. It is safe enough, so long as one is alert to the danger of a tight cast and provided pressure sores are prevented. The speed of union is neither greater nor less than with traction, but the patient can go home sooner. However, joints encased in plaster cannot move and are liable to stiffen; Stiffness can be minimized by: (1) delayed splintage - that is, by using traction until movement has been regained, and only then applying plaster; or (2) starting with a conventional cast but, after a few days, when the limb can be handled without too much discomfort, replacing the cast by a functional brace which permits joint movement. (Solomon et al, 2001)

Complications.

Tight cast - The cast may be put on too tightly, or it may become tight if the limb swells. The patient complains of diffuse pain; only later - sometimes much later - do the signs of vascular compression appear. The limb should be elevated, but if the pain persists the only safe course is to split the cast and ease it open throughout its length and through all the padding down to skin. Whenever swelling is anticipated the cast should be applied over thick padding and the plaster should be split before it sets, so as to provide a firm but not absolutely rigid splint.

Pressure sores - Even a well-fitting cast may press upon the skin over a bony prominence (the patella, the heel, the elbow or the head of the ulna). The patient complains of localized pain precisely over the pressure spot. Such localized pain demands immediate inspection through a window in the cast.

Skin abrasion or laceration - This is really a complication of removing plasters, especially if an electric saw is used. Complaints of nipping or pinching during plaster removal should never be ignored.

Loose cast - Once the swelling has subsided, the cast may no longer hold the fracture securely. If it is loose, the cast should be replaced. (Solomon et al, 2001)
(3) Functional bracing

Functional bracing, using either plaster of Paris or one of the lighter materials, is one way of preventing joint stiffness while still permitting fracture splintage and loading. Segments of a cast are applied only over the shafts of the bones, leaving the joints free; the cast segments are connected by metal or plastic hinges which allow movements in one plane. The splints are 'functional' in that joint movements are much less restricted than with conventional casts. Functional bracing is used most widely for fractures of the femur or tibia, but, since the brace is not very rigid, it is usually applied only when the fracture is beginning to unite, that is after 3-6 weeks of traction or conventional plaster. (Solomon et al, 2001)

(4) Internal fixation

Bone fragments may be fixed with screws, transfixing pins or nails, a metal plate held by screws, a long intramedullary nail (with or without locking screws), circumferential bands or a combination of these methods. Properly applied, internal fixation holds a fracture securely so that movements can begin at once; with early movement the 'fracture disease' (stiffness and oedema) is abolished. As far as speed is concerned, the patient can leave hospital as soon as the wound is healed. The greatest danger, however, is sepsis; if infection supervenes, all the manifest advantages of internal fixation (precise reduction, immediate stability and early movement) may be lost. The risk of infection depends upon: (1) the patient - devitalized tissues, a dirty wound and an unfit patient are all dangerous; (2) the surgeon - thorough training, a high degree of surgical dexterity and adequate assistance are all essential; and (3) the facilities - a guaranteed aseptic routine and a full range of implants. (Solomon et al, 2001)

Indications for internal fixation

Internal fixation is often the most desirable form of treatment. The chief indications are:

1. Fractures that cannot be reduced except by operation.
2. Fractures that are inherently unstable and prone to redisplacement after reduction (e.g. mid-shaft fractures of the forearm and displaced ankle fractures); also, those liable to be pulled apart by muscle action (e.g. transverse fracture of the patella or olecranon).
3. Fractures that unite poorly and slowly, principally fractures of the femoral neck.
4. Pathological fractures, in which bone disease may prevent healing.
5. Multiple fractures, in which early fixation (by either internal or external fixation) reduces the risk of general complications and late multisystem organ failure (Phillips and Contreras, 1990).

6. Fractures in patients who present nursing difficulties (paraplegics, those with multiple injuries and the very elderly). (Solomon et al, 2001)

Types of internal fixation

**Interfragmentary screws** Screws which are only partially threaded (a similar effect is achieved by over-drilling the 'near' cortex of bone) exert a compression or 'lag' effect when inserted across two fragments.

**Wires** (transfixing, cerclage and tension-band) Transfixing wires, often passed percutaneously, can hold major fracture fragments together. They are used in situations in which fracture healing is predictably quick (e.g. in children or for distal radius fractures), and some form of external splintage (usually a cast) is applied as supplementary support. Cerclage and tension-band wires are essentially loops of wire passed around two bone fragments and then tightened to compress the fragments together.

**Plates and screws** This form of fixation is useful for treating metaphyseal fractures of long bones and diaphyseal fractures of the radius and ulna. Plates have five different functions:

1. Neutralization - when used to bridge a fracture and supplement the effect of interfragmentary lag screws; the plate is to resist torque and shortening.
2. Compression - often used in metaphyseal fractures in which healing across the cancellous fracture gap may occur directly, without periosteal callus. This technique is less appropriate for diaphyseal fractures.
3. Buttressing - here the plate props up the 'overhang' of the expanded metaphyses of long bones (e.g. in treating fractures of the proximal tibial plateau).
4. Tension-band - using a plate in this manner, again on the tensile surface of the bone, allows compression to be applied to the biomechanically more advantageous side of the fracture.
5. Anti-glide - by fixing a plate over the apex of an angulated fracture and then using the plate as a reduction aid, the anatomy is restored with minimal stripping of soft tissues. The position of the plate acts to prevent shortening and recurrent displacement of the fragments.

**Intramedullary nails** These are suitable for long bones. A nail (or long rod) is inserted into the medullary canal to splint the fracture; rotational forces are resisted by introducing transverse interlocking screws which transfix the bone cortices and the nail proximal and distal to the fracture. Nails are used with or without prior reaming of the medullary canal; reamed nails achieve an interference fit in addition to the added stability.
from interlocking screws, but at the expense of temporary loss of the intramedullary blood supply. (Solomon et al, 2001)

Complications of internal fixation
Most of the complications of internal fixation are due to poor technique, poor equipment or poor operating conditions.

Infection iatrogenic infection is now the most common cause of chronic osteomyelitis; the metal does not predispose to infection but the operation and the quality of the patient's tissues do.

Non-union - If the bones have been fixed rigidly with a gap between the ends, the fracture may fail to unite

Implant failure- Metal is subject to fatigue, and until some union of the fracture has occurred metal implants are precarious. Stress must therefore be avoided and a patient with a plated tibia should walk with crutches and minimal weight-bearing for the first 3 months. Pain at the fracture site is a danger signal and must be investigated.

Refracture- It is important not to remove metal implants too soon, or the bone may refracture. A year is the minimum and 18 or 24 months safer; for several weeks after removal the bone is weak, and care or protection is needed. (Solomon et al, 2001)

(5) External fixation
A fracture may be held by transfixing screws or tensioned wires which pass through the bone above and below the fracture and are attached to an external frame. This is especially applicable to the tibia and the pelvis, but the method is also used for fractures of the femur, the humerus, the lower radius and even the bones of the hand. (Solomon et al, 2001)

Indications
External fixation is particularly useful for:
1. Fractures associated with severe soft-tissue damage for which the wound can be left open for inspection, dressing or skin grafting.
2. Fractures associated with nerve or vessel damage.
3. Severely comminuted and unstable fractures, which can be held out to length until healing commences.
4. Ununited fractures, which can be excised and compressed; sometimes this is combined with elongation.
5. Fractures of the pelvis, which often cannot be controlled by any other method.
6. Infected fractures, for which internal fixation might not be suitable.
7. Severe multiple injuries, in which early stabilization reduces the risk of serious complications (Phillips and Contreras, 1990). (Solomon et al, 2001)

**Complications**

**Damage to soft-tissue structures**- Transfixing pins or wires may injure nerves or vessels, or may tether ligaments and inhibit joint movement.

**Overdistraction**- If there is no contact between the fragments, union is unlikely.

**Pin-track infection**- This is less likely with good operative technique. Nevertheless, meticulous pin-site care is essential, and antibiotics should be administered immediately if infection occurs (Solomon et al, 2001)
1.2 PROBLEM STATEMENT

Trauma causes more than 140,000 deaths per year in the United States, is the leading cause of death and disability for those aged 1-34 years, and causes more years of lost productivity before age 65 years than coronary artery disease, cancer, and stroke combined. Fracture incidence is multifactorial and often complicated by such factors as the patient's age, sex, co morbidities, lifestyle, and occupation. In the United States, 5.6 million fractures occur each year, corresponding to a 2% incidence. Almost 6000 fractures were treated in an orthopaedic trauma unit in Edinburgh, Scotland, in one year. The overall fracture incidence in the Scottish case series was 1.13% in men and 1.16% in women. Interestingly, there was a bimodal distribution of fractures in males, with a high incidence in young men and a second rise in men starting at the age of 60 years. In women, there was a unimodal distribution of fractures, with a rise around the time of menopause (Burkley, 2010).

In a previous study, it was found that, injuries cause profound morbidity and are one of top 10 causes of death and disability in both developing and developed economies. Kenya, like other developing countries, lacks organised efforts to reduce the burden of injuries. In the same article, a high young male preponderancy potential for high Disability Adjusted Life Years (DALYs) losses for this group as a feature describing the injury situation in other cities in developing countries (Saidi, 2003).

In Kenyatta National Hospital, the use of skeletal and/or skin traction as a primary method of management in orthopaedic practise is proving to be continually disappointing. Despite being put on constant traction, several patients end up going for ORIF due to malunion or some other form of misalignment associated complication. This type of treatment is costly, in terms of time, money and causes congestion in the wards forcing some patients to be allocated floor space instead of bed space.
1.3 JUSTIFICATION

Though Open Reduction and Internal Fixation (ORIF) is considerably more costly than its counterpart conservative methods, it is in the long run more cost effective as it allows for weight bearing much sooner and thereby allowing the patients to be economically active.

Massive cases of injuries have overwhelmed the orthopaedic ward, making it the busiest section at the hospital with bed occupancy of 140 per cent. This means that the bed capacity in the wards is not enough to handle the patients streaming into the hospital, forcing the nurses to put some of them on the floor. (Okwemba, 2009)

The use of conservative methods of management is associated with complications such as: Burns; Constrictive oedema also known as Compartment Syndrome where there is disruption of venous drainage with resulting fluid accumulation in the soft tissue and swelling distal to the point of constriction distal to the point of circulatory restriction; Formation of decubitus ulcer or Pressure sore which is an area of pressure necrosis caused by lying in the same position resulting from continuous or uneven pressure applied from continued immobilisation (Also associated with traction); Drop foot-paralysis of the perineal nerve resulting from pressure over the fibula head with inability to dorsiflex the ankle; Pin Tract infection, a direct bacterial contamination of the area where pins have been used for external traction or skeletal fixation: could potentially lead to osteomyelitis; Superior Mesenteric Artery Syndrome sometimes referred to as Cast Syndrome-Disruption of circulation to the bowel commonly occurring following application of the body cast resulting in pain and diarrhoea.(Carlos, 2008).

Literature shows that indications for internal fixation are such as, Intra-articular fractures - to stabilise anatomical reduction, repair of blood vessels and nerves - to protect vascular and nerve repair, multiple injuries, elderly patients - to allow early mobilisation, long bone fractures - tibia, femur and humerus, failure of conservative management, pathological fractures and unstable fractures.(Forward and Morgan, 2002)

Patients from Nigeria, Kenya, Uganda and Tanzania are now relying upon Indian doctors for less cost orthopedic surgery and with excellent results. This enviable track record becomes even more significant considering the fact that the treatment costs one-tenth as compared to the west. (Bojwani, 2009)
1.4 RESEARCH OBJECTIVES

1.4.1 Broad Objectives

To assess the methods and outcomes of management of orthopaedic trauma patients in KNH

1.4.2 Specific Objectives

1. To identify methods of management of orthopaedic trauma patients in KNH
2. To identify the commonly used Internal Fixation Devices
3. To assess the clinical success rates of the identified methods
4. To assess the cost of the identified methods

1.5 RESEARCH QUESTIONS

This study aims at answering the following questions:

1. What methods are orthopaedic trauma patients managed with?
2. How effective are the identified methods of management of orthopaedic injuries?
3. What are the demerits of each as a method of management?
4. Is it possible to tailor an ORIF package to cater to the rising number of orthopaedic trauma injuries?
5. How cost effective would the ORIF package be?

1.6 HYPOTHESIS

The conservative treatment of orthopaedic trauma patients at KNH provides acceptable functional results and is more cost effective.
1.7 VARIABLES AND THEORETICAL FRAMEWORK

- Age
- Nutrition status - calcium and vitamin D
- Medication (aspirin retards bone healing)
- Nicotine
- Weight bearing - mobilization and isometric exercises
- Blood supply
- Physiological status
- Initial displacement of fracture
- Site of fracture
- Infection

### Independent variables
- Weight bearing
- Nutrition
- Age
- Blood supply
- Physiological status

### Dependent variables
- Initial displacement of fracture
- Site of fracture

### Confounding variables
- Nicotine
- Infection
- Medication

![Diagram showing relationships between independent, dependent, and confounding variables](image-url)
Chapter 2.0: Literature Review

2.1 Introduction

Open Reduction Internal Fixation (ORIF) refers to open surgery to set bones, as is necessary for some fractures. Internal fixation refers to fixation of screws and/or plates to enable or facilitate healing. An internal fixator may be made of stainless steel or titanium. Types of internal fixators include bone screws and metal plates, pins, rods, Kirschner wires and intramedullary devices such as the Kuntscher nail and interlocking nail. Rigid fixation prevents micro motion across lines of fracture to enable healing and prevent infection, which happens when implants such as plates (e.g. Dynamic Compression Plate) are used (McKenzie, 2006)

Traction is used to manage fractures in an effort to realign broken bones; it is most often used as a temporary measure when operative fixation is not available for a period of time. It can either be applied through the skin (skin traction) or through pins inserted into bones (skeletal traction) (McKenzie, 2006)

Skin traction is generally less desirable due to the fact that skin can be injured when pressure is applied for extend periods of time. Skin traction called Buck's traction is commonly used in patients who have a hip fracture. It includes weight traction, which uses lighter weights or counterweights to apply force to fractures or dislocated joints. It also refers to specialized practices, such as Dunlop's traction, used on children when a fractured arm must maintain a flexed position to avoid circulatory and neurological problems. Buck's skin traction stabilizes the knee, and reduces muscle spasm for knee injuries not involving fractures. In addition, splints, surgical collars, and corsets also may be used. (McKenzie, 2006)

Weight traction may be employed short-term, (e.g., at the scene of an accident) or on a temporary basis (e.g., when weights are connected to a pulley located above the patient's bed). The weights, typically weighing five to seven pounds, attach to the skin using tape, straps, or boots. They bring together the fractured bone or dislocated joint so that it may heal correctly. (McKenzie, 2006)

Skeletal traction requires an invasive procedure in which pins, screws, or wires are surgically installed for use in longer term traction requiring heavier weights. This is the case when the force exerted is more than skin traction can bear, or when skin traction is not appropriate for the body part needing treatment. Weights used in skeletal traction generally range from 25–40 lbs (11–18 kg). It is important to place the pins correctly because they may stay in place for several months, and are the hardware to which weights and pulleys are attached. The pins must be clean to avoid infection. Damage may result if the alignment and weights are not carefully calibrated. Skeletal traction does have the disadvantage of complications associated with pin
insertion, and infections can come from the sites of pin insertion. (McKenzie, 2006)

Proper care is important for patients in traction. Prolonged immobility should be avoided because it may cause bedsores and possible respiratory, urinary, or circulatory problems. Mobile patients may use a trapeze bar, giving them the option of controlling their movements. An exercise program instituted by caregivers will maintain the patient's muscle and joint mobility. Traction equipment should be checked regularly to ensure proper position and exertion of force. With skeletal traction, it is important to check for inflammation of the bone, a sign of foreign matter introduction (potential source of infection at the screw or pin site). (McKenzie, 2006)
2.2 Complications associated with fracture healing

The role of the clinician is to promote functional fracture healing. Inadequate response to the fracture injury sometimes occurs, resulting in delayed union or nonunion. Most fractures, if left completely alone, would probably heal but with such malunion that function might be lost. In normal fractures, a certain amount of time is required before bone healing can be expected to occur. This normal time may vary according to age, species, breed, bone involved, level of the fracture, and associated soft tissue injury. Delayed union, by definition, is present when an adequate period of time has elapsed since the initial injury without achieving bone union, taking into account the above variable.

Nonunion is defined as the cessation of all reparative processes of healing without bony union. Since all of the factors discussed under delayed union usually occur to a more severe degree in nonunion, the differentiation between delayed and nonunion is often based on radiographic criteria and time. In humans, failure to show any progressive change in the radiographic appearance for at least 3 months after the period of time during which normal fracture union would be thought to have occurred, is evidence of nonunion.

Malunion is defined as a healing of the bones in an abnormal position; Malunions can be classified as functional or nonfunctional. Functional malunions are usually those that have small deviations from normal axes that do not incapacitate the patient. Malunions can occur with both axial deviations and rotational deformities. Most malalignments should be detected before healing occurs. In these cases adequate treatment is under taken by resolving the axis or rotational deformity that exists, thereby allowing normal union to take place. It is usually better to interrupt the fracture healing at an early stage to correct the deformity than to wait until osteotomy is needed. Proper follow-up of cases after internal fixation or splinting should make the occurrence of malunion very infrequent. (Nunamaker & Newton, 1985)
2.3 Effectiveness of ORIF (in terms of turnaround time and cost)

Since 1996, surgeons in the USA have implemented the use of elastic nails (Flexible titanium pins approximately 15 to 20 inches in length and about the width of a radio antenna) in the management of fractures especially of the femur. According to Jack Flynn M.D, (The Children's Hospital of Philadelphia) treatment with elastic nails allows children more rapid mobility and the ability to resume normal daily activities in half the time of the traditional cast and traction treatment. The children treated with the nails were able to get out of bed two days after surgery and were discharged from hospital approximately four days after surgery. Within just a few days they were walking with crutches and missed about half the amount of school as those treated in casts. (Flynn et al, 2004)

In a previous study conducted, thirty five patients aged 6-14 years with diaphyseal femoral fractures were stabilised with two titanium nails. The overall results were excellent in 25, satisfactory in 8 and poor in 2. Hospital time averaged 12.3 days and all fractures healed with an average time to union of 9.6 weeks. Return to school was within an average of 7.8 weeks. There was no delayed union, infection or refractures. Singh and his team are of the belief that with proper operative technique and aftercare, TEN'S may prove to be an ideal for paediatric femoral fracture fixation. (Singh et al, 2006)

Other findings show that fixing adults' mid-shaft clavicle fracture with open reduction internal fixation may be more cost-effective than nonoperative treatment if the treatment effect is long-lasting, according to findings from a multi-centered study. "We found as utility and duration of benefit of open reduction internal fixation (ORIF) increases, ORIF becomes more cost-effective," Robert V. Cantu, MD, an investigator, said in describing results of his group's analysis of how long-term variables affected costs and outcomes. The study Cantu and colleagues conducted showed cost-effectiveness of ORIF treatment greatly depended on whether surgery led to improved function and fewer complications, as well as when and if union occurred. Their abstract said ORIF is a reasonable option as ORIF-treated patients in that study had significantly better DASH and Constant scores at 1 year and all other time points, Cantu said. (Rapp, 2009)

Results from a randomized trial in Chicago comparing ORIF against closed reduction for distal fractures has found short and long term advantages in grip strength and range of motion for the open procedure but no differences of the Disabilities of the Arm, Shoulder and Hand (DASH) scores between the two approaches in one year. Patients ranged from 18-65 years. Abramo reported that at 7 weeks post op the ORIF group had higher mean grip strength, mean ROM in flexion and extension and forearm rotation. There were a lot
more complications with the external fixation group with a number of patients having to be re operated due to malunion. (Beadling, 2008)

In a recent study by Christopher S. Ahmad, percutaneous pinning and ORIF of four fragment fractures of the shoulder were found to have good results. The method has an advantage of causing less soft tissue damage, less disruption of vascularity, minimized blood loss, better cosmesis and decreased hospitalisation. It also showed remarkable results in the elderly. (Ahmad, 2008)

Yet still, operative fixation yielded better outcomes than conventional sling treatment for completely displaced clavicle shaft fractures in a new Canadian study. The operation offered more rapid union and earlier return to function, the researchers said. Jeremy A. Hall, cited modern literature showing a non-union rate of more than 15% for displaced clavicle shaft fractures, especially when associated with displacement, female gender and age. Open reduction and internal fixation cut the non-union risk by 86%, he said. The surgical group had bony union at an average 16 weeks. The non-surgical group had union at an average 29 weeks. Researchers recorded Constant Shoulder Scores (CSS), Disability of the Arm, Shoulder and Hand (DASH) scores and there was a significant improvement in the operative group compared to the non-operative group. Complications among the non-operative group included one case of reflex sympathetic dystrophy, three symptomatic malunions, seven non-unions, one secondary compound fracture requiring ORIF and one open fracture. The operative group’s complications included four complaints of local plate irritation, three cases of late-wound dehiscence infection and one wound failure requiring revision fixation. The conclusions were that early operative fixation of completely displaced midshaft clavicle fractures results in improved patient-oriented and surgeon-based outcomes, an earlier return to function and a decreased non-union rate. This study supports early operative plate fixation of completely displaced midshaft clavicle fractures in young and active individuals. (Boyle, 2005)

Over the past two decades, the advantages of fixation and rapid mobilisation have been recognized. Healthcare cost containment and a desire for early discharge from the hospital have become important factors in the treatment of femoral shaft fractures. As a result, newer methods are preferred. Moreover, conservative treatment results in prolonged hospitalization causing more burden on the hospital and financial losses on the parents attending their children in the hospital. It was also concluded that the most associated complications of the procedure were in fact features of inexact technique and can be eliminated by strictly adhering to the basic principles and technical aspects. (Singh, 2006)
2.4 Use of different ORIF devices

Intramedullary K wires

A Kirschner wire, also known as K-wire, is a smooth stainless steel pin with a drill tip. The wire is available in different diameters with various tips. It is used mainly in orthopedics and plastic surgery and is especially useful for hand surgery. Its main functions are fixation of fractures and skeletal traction. (Franssen, 2010)

Intramedullary K-wire fixation of forearm fractures in children is inexpensive and provides satisfactory clinical results with minimal complication even in older children. Angulation in radial bone has greater effect on forearm rotation. Changes on the ulnar variance can be expected even if early period clinical outcomes are satisfactory. A retrospective study evaluated the results of intramedullary Kirschner wire fixation in pediatric forearm fractures and the effects on the wrist. Open reduction was used through a limited open approach centered over the fracture site in all fractures. All fractures had union at an average 7.8 weeks (range, 5-16 weeks) postoperatively. No infection occurred in any of the open fractures. Hardware was removed at an average 9.4 months (range, 6-27 months). No irritation was reported of K-wires that were inserted distally into the medullary canal of the ulna and no neurovascular injuries were reported in this series. The use of intramedullary K-wire for fixation of forearm fractures in children has been shown to be successful with fewer complications and with the added advantage of providing reasonable stability on the frontal and sagittal plane. (Bombaci et al, 2007)

Reamed intramedullary nailing is now commonly used in the management of tibial shaft fractures and is considered by some to be the treatment of choice in closed displaced fractures. Published evidence on the use of interlocking intramedullary nails for tibial fractures is extensive with well-documented high rates of union associated with a low incidence of complications. In particular, the rate of malunion has been much lower than with other forms of treatment for tibial fractures. These encouraging results have led to widespread use of these devices for treatment of tibial diaphyseal fractures. (Robertson et al, 2000)

Prior to the widespread use of interlocking nailing, closed treatment of tibial shaft fractures was the most common method of treatment. The relatively high incidence of loss of reduction and the need to prevent malunion necessitated frequent radiographic follow-up. The literature on reamed nailing appears to indicate that patients are subjected to radiographs at similar intervals to those treated nonoperatively. This approach
may lead to the unnecessary use of radiographs with implications both in terms of cost and radiation exposure. (Robertson et al, 2000)

Open reduction for late-presenting unreduced elbows, followed by a supervised physiotherapy can restore elbows to a functional, stable and painless state, irrespective of the time since injury (up to 6 months), the age of the patient, or the preoperative range of movement (Mehta et al, 2007)

**Plates**

A bone plate is a metal bar with perforations for the insertion of screws, used to immobilize fractured segments and maintain the ends in apposition. The most commonly used type of orthopaedic plate is the decompression plate which is lag screws to provide dynamic compression on the tension side of the bone. These plates have special oval screw holes with a beveled floor and an inclined surface to approximate the ends of the bone as the screws tighten. (McGraw-Hill, 2002)

Locked-plate fracture-fixation techniques and designs continue to evolve. Polyaxial locking plates that allow screw angulation and end-point locking have become available. The variable-axis locking plates performed well, with a high rate of fracture union and no evidence of varus collapse due to failure of the polyaxial screw fixation, in a series of complex fractures about the knee. Complication rates were similar to those for historical controls treated with fixed-trajectory locking plates. Polyaxial locking plates offer more fixation versatility without an apparent increase in mechanical complications or loss of reduction. (Haidukewych et al, 2007)

Plate constructs are superior in showing less displacement at fixed loads and greater loads at fixed displacements over a broad range of loads and displacements with cyclic four-point bending. The clinical relevance is that plate fixation may provide a stronger construct for early rehabilitation protocols that focus on repetitive movements in the early pre-operative period. (Golish et al, 2008)

Double overlapping plate configuration for the treatment of low energy, extensile, diaphyseal and metaphyseal fractures of the distal tibia is a reliable fixation method. The current protocol for distal tibial intraarticular fracture treatment favors using open reduction and internal fixation versus prolonged use of external fixators. Our spiral extension distal tibial intraarticular fracture fixation method with a double-
overlapping plate is advantageous because it combines the thin and flexible cloverleaf plate used with 3.5-mm screws with the appropriate length long bone decompression plate with 4.5-mm screws. The use of small fragment implants (cloverleaf plates, one-third tubular plates) helps to obtain stability and avoid compromising soft-tissue blood supply. This model could be used in other difficult fixation conditions, such as extension to diaphysis of intraarticular distal radial metaphyseal fractures, intraarticular distal femoral condylar, or, intraarticular distal humeral condylar, but always by first assessing the soft tissue. Skin coverage and good soft tissue are a prerequisite. Although no skin slough was observed, caution is advised, especially if the periarticular plating sets are not available (Christodoulou, 2007)

Conclusion
In all countries, the priority for reducing road traffic injuries should be prevention. Nonetheless, there are low-cost ways to strengthen the care of injured persons that will help to lower the toll from road traffic. For both prehospital and hospital based care, studies revealed several critical weak points to address in: (1) human resources (staffing and training); (2) physical resources (equipment, supplies, and infrastructure); and (3) administration and organization. The 'essential services' approach, which has contributed to progress in a variety of fields of international health, needs to be developed for the care of the injured. This would define the trauma treatment services that could realistically be made available to virtually every injured person. It would then address the inputs of human resources, physical resources, and administration necessary to assure these services optimally in the different geographic and socioeconomic environments worldwide. Finally, it would identify and target deficiencies in these inputs that need to be strengthened.
(Mock et al, 2003)
REFERENCES


London: Oxford University Press.


Rapp, S., 2009. The most effective ORIF clavicle Fracture treatments are also the most economical (Online) [Updated June 19th 2009] Available at [http://www.orthosupersite.com/trauma](http://www.orthosupersite.com/trauma) [accessed 16 Mar 2010]

CHAPTER 3.0: METHODOLOGY

3.1 PURPOSE OF THE STUDY
The study will be used to describe the clinical and socioeconomic benefits of the methods of management of orthopaedic patients and injuries.

3.2 STUDY DESIGN
Retrospective survey of medical files for past patients (fitting the inclusion criteria) up to 5 years back and interview of medical staff. A checklist will be used to collect data relating to clinical methods. Also observation of clinical methods while on traction and post operatively after ORIF (of patients fitting the inclusion criteria) will be used to give additional information on the apparent downfalls of the methods. The study will assume that the clinical methods in use at the time of observation (of current patients) are the same ones that were in place for previous patients. Approval will be sought from the relevant authorities (UoN, MoH and KNH).

3.3 STUDY AREA
The study will be carried out in KNH (level 6). KNH is a national referral hospital in Nairobi, Kenya. KNH has 1800 bed capacity and is a public hospital that has been in existence since 1901. It became a state cooperation in 1987. It receives patients referred from other hospitals or institutions within or outside Kenya for specialized health care which include orthopaedics, paediatrics and general surgery. It provides facilities for medical education for the University of Nairobi and research either directly or through other co-operating institutions. The hospital also provides facilities for education and training in nursing and allied professions. (KNH strategic plan, 2008-2012). The hospital is located along hospital road (off Ngong Road), 4 km from the central business district of Nairobi city. Patient population of the ward 6C comes to a total of 101 Patients (as at May 2010).

3.4 STUDY POPULATION
The wards have patients from all over the country and are a representative cross section of all the 42 ethnic groups in Kenya with over 40 different languages spoken. Not to mention patients from neighbouring countries such as Rwanda, Somalia, DRC etc.
Even with such diversity, English and Swahili remain the most commonly spoken languages. There is an almost 50-50 distribution factor of the sexes admitted to the wards with a vast age distribution range.

3.4.1 Inclusion Criteria
Any patients admitted to the ward and will consent to the study.
Any patients within the age bracket 20-60yrs (this is the optimal age for physiologic repair of tissue and also takes into consideration early geriatrics)
Medical personnel directly related to the practice of orthopaedics including radiologists

3.4.2 Exclusion Criteria
Any patient who had already been on traction for 1 week by the time the study begins
Any patients falling outside the age bracket
Patients with pathological fractures
All non-consenting patients
Medical personnel not directly related to the patient or orthopaedic practice

3.5 SAMPLE DESIGN AND SAMPLE AREA
A stratified sampling method will be used to get the desired sample size.
This formula is used to calculate population samples less than 10, 000.

The general formula

\[ Z = \frac{\alpha^2 p(1-p)}{d^2} \]

Where:-
- \( Z \) – Sample Size
- \( \alpha \) – 1.96 (standard deviation value at 95% confidence interval)
- \( p \) – Estimated number of fractures (this is usually 50% on average)
- \( d \) – Error on both sides i.e. 5%
Therefore

\[ Z = \frac{1.96^2 \times 0.5 \times 0.5}{0.05 \times 0.05} \]

\[ = 384.16 \]

\[ = 384 \text{ patients} \]

**Sampling Method**

A sample of 384 will make the target frame for the study.

The Principle researcher will then randomly select the first patient file. The \( n^{th} \) file will then be selected where in the sampling interval until the sample size is reached.

Since the files are not numbered in an organized form, the sampling method below will be applied to determine subsequent files till the \( n^{th} \) file.

Sample interval (n) \[ = \frac{\text{Total study population}}{\text{Sample Size}} \]

Therefore the S.I \[ = \frac{\text{Total number of patients seen in the last 5 years}}{\text{Sample Size}} \]

\[ = \frac{6000}{384} \]

\[ = 15.62 \]

\[ = 15 \]

Therefore every 15\(^{th}\) file will be included in the study once the 1\(^{st}\) file has been determined.
3.5.1 RESEARCH ASSUMPTIONS AND STUDY LIMITATIONS

The main assumption is that the clinical methods in place during the study are the same ones that were in use five years back and that the medical practitioners are familiar with the procedures. Moreover, it is assumed that not only are the facilities adequate and aseptic, but that any failures are due to patient related factors.

The limitations expected to be encountered include:

a. False, inaccurate, incomplete or misleading information from the respondents
b. Refusal to give consent to participate in the study.

3.6 DATA COLLECTION TOOL AND PROCEDURE

The principal investigator will work collaboratively with the staff of Kenyatta National Hospital Orthopaedic Ward 6C. Serving to develop uniform recruitment and data collection procedures that would ensure reliable access to the patients on traction and on post operative ORIF care without interfering with the patient's medical care.

3.6.1 Quantitative Data

Quantitative data will be collected using checklists administered in three sections: for the nurses, for the primary doctor and for other technical staff such as the plaster technicians and traction engineers.

3.6.2 Qualitative Data

Interviews will be conducted on the medical staff to ascertain their satisfaction with both the initial and subsequent evaluation of the patients injuries, the methods used for management and the progress. The interviewer will use clear English to enhance reproducibility and reduce miscommunication.

3.6.3 Appointment and Training of research assistants

Three health assistants will be hired, preferably with orthopedic background like a nurse. This will be the basis of precision in taking measurement and tabulation of causes and factors. They will undergo an intensive 2-week training to help in making them know the study well, familiarize with tools, pre-test the tool and improve rapport and interview skills so as to minimize errors in the study. They will take observe clinical methods, interview the medical practitioners and fill the checklists.
3.6.4 Study tool pre-test
The checklist will be administered on 20 past cases from the records at Kenyatta National Hospital to maintain quality and further allow the principal investigator to modify the study tool if necessary.

3.7 Ethical considerations and aspects
Approval will be sought from the ethics committee at KNH, informed consent will be obtained from the respondents. Participants will be briefed on the objectives and procedures of the study and have the right to withdraw from it at any given time.

3.8 Data management
The checklists will be hand delivered to the respondents by the research assistants.

The data will then undergo the following steps:

3.8.1 Sorting data
Items will be numbered and arranged in order

3.8.2 Quality checks
The data will be screened for completeness and consistency, this will also include verification of how data has been coded and entered into the computer. Spoilt items will be discarded and those not complete will not be used in the final report.

3.8.3 Coding
Codes will be put on the items themselves and the research assistant will work closely with the statisticians throughout.

3.8.4 Data analysis
This will be done using the statistical package for social sciences SPSS. It will involve data entry, verification, validation, and output in the form of frequency distribution tables, pie charts and narrative to the language of understanding by the intended audience.
Quantitative Data
To ensure completeness of the data collected, all items in the checklist will be coded.
A data entry clerk will be used to do data entry and analysis into the SPSS.
Chi-square will be used to determine association between the dependent and independent variables.

Qualitative Data
This will be grouped based on themes and sub-themes and then the data entered and analyzed using SPSS.

3.9 Report writing
A report will be written and given to my supervisor in the School of Nursing Sciences- University Of Nairobi as part of an examination in the partial fulfilment of a degree in Nursing. The start and finish dates of the planned activities will be demonstrated using the Gantt chart.

3.10 Dissemination
The report will be forwarded for consideration in relevant scientific peer review journals.
CHAPTER 4.0: WORK PLAN AND BUDGET

4.1 Time frame (Gantt Chart)

The start and finish dates of the planned activities as demonstrated using the Gantt chart.

<table>
<thead>
<tr>
<th>ACTIVITY CODE</th>
<th>ACTIVITY</th>
<th>WEEKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Proposal development</td>
<td>8</td>
</tr>
<tr>
<td>02</td>
<td>Literature review</td>
<td>8</td>
</tr>
<tr>
<td>03</td>
<td>Checklist and Questionnaire develop</td>
<td>6</td>
</tr>
<tr>
<td>04</td>
<td>Training of research assistants</td>
<td>2</td>
</tr>
<tr>
<td>05</td>
<td>Pretesting of the study tools</td>
<td>2</td>
</tr>
<tr>
<td>06</td>
<td>Review of data collection tools</td>
<td>2</td>
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<tr>
<td>07</td>
<td>Data collection</td>
<td>24</td>
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<tr>
<td>08</td>
<td>Analysis of data and report writing</td>
<td>4</td>
</tr>
<tr>
<td>09</td>
<td>Presentation of the results</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Feedback to the community</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Defending the proposal</td>
<td>4</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>NOV</td>
<td>DEC</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
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<tr>
<td>Proposal Development</td>
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<td>Literature Review</td>
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<td>Checklist and questionnaire development</td>
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<td>Feedback to the community</td>
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<td>Defending the proposal</td>
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## 4.2 Budget

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<thead>
<tr>
<th>ITEM</th>
<th>TOTAL COST (KSh.)</th>
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</thead>
<tbody>
<tr>
<td><strong>1. Personnel cost</strong></td>
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<tr>
<td>Training of three research assistants</td>
<td>24,000 (8000X3)</td>
</tr>
<tr>
<td>1 principal researcher</td>
<td>25,000</td>
</tr>
<tr>
<td>Data analysis statistician</td>
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<tr>
<td><strong>2. Materials and supplies</strong></td>
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</tr>
<tr>
<td>Calculator</td>
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<tr>
<td>Foolscaps (3 reams)</td>
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<tr>
<td>Folders</td>
<td>1,400</td>
</tr>
<tr>
<td>Stapler and staples</td>
<td>700</td>
</tr>
<tr>
<td>Pens</td>
<td>500</td>
</tr>
<tr>
<td>USB mass storage discs</td>
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<tr>
<td>Erasers</td>
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<td>Lab coats</td>
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<td>Photocopy paper</td>
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<td><strong>3. Services</strong></td>
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<td>Typing</td>
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<tr>
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<tr>
<td>Photocopy</td>
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</tr>
<tr>
<td>Binding</td>
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<td><strong>4. Transport</strong></td>
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<tr>
<td><strong>5. Pre-test</strong></td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>118,850</td>
</tr>
<tr>
<td><strong>6. Contingency (10% of the total)</strong></td>
<td>19,085</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td>128,935</td>
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APPENDIX 1
INTERVIEW QUESTIONNAIRE

"Assessing the methods and outcomes of management of orthopaedic trauma patients at Kenyatta
National Hospital."

Participants are guaranteed in advance that the information received during this interview will be treated in
TOTAL CONFIDENCE, and are requested to participate with sincerity when giving this important
information.
Thank You.

BIOGRAPHIC DATA
Age.................................
Sex.................................

QUALIFICATION AND EXPERIENCE
1. Which one correctly describes you?
   a. Orthopaedic Trauma surgeon (qualified and experienced. [Where experience refers to at least
      3 years working in a high stress environment such as Casualty]
   b. Orthopaedic trauma resident
   c. Orthopaedic nurse
   d. Registered nurse undergoing specialized orthopaedic care training
   e. Registered nurse with basic training
   f. Qualified and experienced Plaster technician
   g. Plaster technician in training
   h. Qualified and experienced Traction engineer
   i. Traction engineer in training
   j. Other.......................................................... Specify

2. Which one correctly describes your clinical experiences and proficiency?
   a. No experience (Instruction only, no hands on experience)
   b. Minimal experience (Have experience but has performed procedures infrequently.
Minimal assistance needed)
c. Experienced (Competent to perform the procedure, task or skill independently)
d. Proficient (Able to demonstrate, perform the task or skill proficiently without any assistance. Able to teach or instruct)

**INITIAL ASSESSMENT AND ONGOING MANAGEMENT**

Answer *questions 3 and 4 only* if your response to *question 1* is a, b, c, d, or e.

3. Can you perform an effective initial assessment on an orthopaedic trauma patient?
   a. Yes
   b. No
   c. Maybe with assistance from a more qualified colleague

If yes, answer the questions that follow:

4. Can you perform an effective ongoing assessment on an orthopaedic trauma patient? (Including checking of peripheral pulses, Starting I.V lines and admission of blood and blood products)
   a. Yes
   b. No
   c. Maybe with a more assistance from a qualified colleague

Answer *question 5 ONLY* if your response to *question 1* was a or b.

5. In your opinion what sort of management would have benefited the patient most in terms of functional acceptability and cost effectiveness
   a. ORIF
   b. Traction
   c. ORIF then traction
   d. Casting and splintage
   e. Functional bracing
   f. External fixation

If your response to *question 5* is a or c then:
Which device would be most suitable for stabilization?
   a. TENS (Titanium elastic nails)
   b. K–wire
c. Decompression plates  

d. IM nails  

If your response is b or c then:  

Which sort of traction would be most suitable?  

a. Skeletal traction  

b. Skin traction  

If your response is d, e or f, give a reason.  

........................................................................................................................................

........................................................................................................................................

6. What is the typical initial timing of the surgical debridement in your institution?  

a. Within 6 hours of hospital admittance  

b. More than 6 hours after admittance  

c. More than 12 hours after admittance  

d. More than 24 hours after admittance  

7. Wound closure period at the facility is:  

a. Immediate (that is at the time of initial surgical intervention)  

b. Early (that is within a 24-72hr period)  

c. Delayed (beyond 3 days)  

d. Other. Specify  

8. Whether on traction or ORIF, is bony union occurring as anticipated?  

a. Yes  

b. No  

9. Are there any adjunctive therapies that are hindering or reducing the rate at which bony union is occurring?  

a. Yes  

b. No  

Answer question 10 ONLY if your response to question 1 was c, d or e  

10. Can you aseptically change dressings and drains?  

a. Yes  

b. No
If **yes**, which one(s) can you perform?

a. A wet sterile dressing  
b. A dry sterile dressing  
c. Both a dry and wet sterile dressing  
d. Wound irrigation  
e. Assist with cast slab  
f. Cast care  
g. Stump wrapping

11. As pertain to care of the immobile patient, how often do decubitus ulcers occur in your unit?

a. Very often  
b. Often  
c. Fairly often  
d. Rarely  
e. Not at all

If your response is a, b or c then:

Are there any measures put in place to prevent them?

a. Yes  
b. No

If **yes**, how effective are they?

a. Very effective  
b. Effective  
c. Somewhat effective  
d. Not effective

If your response is no, then how do you care for these sores?

Answer **question 12 ONLY** if your response to question 1 was f, g, h or i

12. Which one(s) of the following are most commonly used in KNH?

a. Casts  
b. Splints
13. How many patients with cast develop plaster sores?
   a. None
   b. A few
   c. A good number
   d. Majority

Questionnaire administered by: ____________________________
Date: ________________________________________________
Signed: _____________________________________________
APPENDIX 2
CHECKLIST

Instructions:
- You are requested to be as honest as possible when answering the following questions.
- You don't need to write your name or contact on this paper.
- Tick only one answer unless otherwise stated.

<table>
<thead>
<tr>
<th></th>
<th>Very Effective</th>
<th>Effective</th>
<th>Somewhat Effective</th>
<th>Not Effective</th>
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<tr>
<td>Initial assessment</td>
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<tr>
<td>Ongoing assessment</td>
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<tr>
<td>Wound debridement</td>
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<td>Method of management in use</td>
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<td>Antibiotic cover</td>
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<td>Aseptic technique in wound handling</td>
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<td>Fracture reconstruction and stabilisation</td>
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<td>Fasciotomy release</td>
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<td>Correction of mal union or non union</td>
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<td>Instruction on crutch walking</td>
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APPENDIX 3

CONSENT FORM

I hereby volunteer to participate in the research study entitled "Assessing the methods and outcomes of management of orthopaedic trauma patients at Kenyatta National Hospital." To be carried out by Mutua M.M. of the University of Nairobi. The implications of my participation, the nature, duration, method and purpose of the research study have been explained to me fully by the researcher.

I have been given opportunity to ask questions concerning this study and any such questions have been answered to my full satisfaction. I have been assured that for any information I give in this study, confidentiality shall be maintained. I also understand that I may at anytime revoke my consent during the course of this study and withdraw from the study without any benefit, penalty or victimization.

Respondent's Signature.................................................................
Date.................................................................................................

Respondent's Witness.................................................................
Date.................................................................................................

Researcher's Signature...............................................................
Date.................................................................................................
TO THE CHAIRMAN,
KENYATTA NATIONAL HOSPITAL,
RESEARCH AND ETHICAL COMMITTEE,
P.O BOX
NAIROBI, KENYA

Dear Sir/Madam,

RE: PERMISSION TO CONDUCT A RESEARCH IN KENYATTA NATIONAL HOSPITAL

I am a fourth year student at the University of Nairobi, pursuing a degree for the award of Bachelor of Science in Nursing. For the partial fulfilment of my degree, I am required to conduct a research which I would like to carry out in Kenyatta National Hospital, Nairobi. The topic is "Assessing the methods and outcomes of management of orthopaedic trauma patients at Kenyatta National Hospital, Nairobi". Your assistance will be highly appreciated.
Yours sincerely,

MUKAMI MUTUA
Dear Sir/Madam,

RE: PERMISSION TO CONDUCT A RESEARCH ON ASSESSING THE METHODS AND OUTCOMES OF MANAGEMENT OF ORTHOPAEDIC TRAUMA PATIENTS AT KENYATTA NATIONAL HOSPITAL, NAIROBI.

I am a fourth year student at the University of Nairobi, pursuing a degree for the award of Bachelor of Science in Nursing. For the partial fulfilment of my degree, I am required to conduct a research which I would like to carry out in Kenyatta National Hospital, Nairobi. The study topic is “Assessing the clinical and socioeconomic effects of conservative management of orthopaedic patients at Kenyatta National Hospital, Nairobi”

I kindly request your permission and assistance to carry out this study.

Your support will be highly appreciated.

Attached are copies of my research proposal and my Student Identification card.

Thank you in advance.

Yours sincerely,

MUKAMI MUTUA