COMPARISON OF SHORT-TERM OUTCOME BETWEEN DAY AND NIGHT TIMING OF INTRAMEDULLARY NAILING OF THE DIAPHYSEAL FEMUR FRACTURES IN ADULTS AT MUHIMBILI ORTHOPEDIC INSTITUTE

Christina Marycianne Nyandwi, MD

MMed (Orthopedics and Traumatology) Dissertation
Muhimbili University of Health and Allied Sciences
October 2021

Muhimbili University of Health and Allied Sciences

Department of Orthopedics and Traumatology

COMPARISON OF SHORT-TERM OUTCOME BETWEEN DAY AND NIGHT TIMING OF INTRAMEDULLARY NAILING OF THE DIAPHYSEAL FEMUR FRACTURES IN ADULTS AT MUHIMBILI ORTHOPEDIC INSTITUTE

By

Christina M. Nyandwi, MD

A Dissertation Submitted in (partial) Fulfilment of the Requirements for the Degree Of Master of Medicine (Orthopedics and Traumatology) of

Muhimbili University of Health and Allied Sciences

CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: ***"Comparison of short-term outcome between day and night timing of intramedullary nailing of the diaphyseal femur fractures in adults at Muhimbili Orthopedic Institute"*** submitted in partial fulfillment of the requirement for the degree of Master of medicine in Orthopedics and Trauma surgery of Muhimbili University of Health and Allied Science

_____

Dr. Cuthbert Nathan Mcharo

Supervisor

Date: _____

_____

Dr. Joseph Mwanga

Co-Supervisor

Date: _____

DECLARATION AND COPYRIGHT

I, **Christina M. Nyandwi,** declare that this dissertation is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award

Signature: …….. Date: ……..

ACKNOWLEDGEMENTS

I would like to thank God almighty for the good health, strength, perseverance, and faith has offered me during the whole period of my study.

I wish to express my sincere gratitude to my supervisor Dr. Cuthbert N Mcharo and co-supervisor Dr. Joseph Mwanga, for their advice and intellectual guidance at all stages of this research.

I would like to acknowledge the management of Muhimbili Orthopedics Institute for their cooperation and for allowing me to conduct this study. I like to convey my appreciation to all members of MOI teaching and non-teaching staff for their inputs during development to report writing of this research work. I would also like to acknowledge my fellow residents for their continued friendship and support throughout my residence.

In a special way, I want to thank my family, starting with my dear husband, Alfred, and my parents, together with my children, Daniel, Darius, Delvin, and Dominic for their unwavering support, encouragement, and trust in me without forgetting my siblings and Shani.

DEDICATION

To my dearest father and mother, Prof. N. Nyandwi and Mrs. Roselyne B. Nyandwi, and my entire family.

ABSTRACT

Background

Timing of intramedullary nailing in femoral diaphyseal fracture has been an area of controversy for quite some time. It is being guided by two principles of management whether early total care or Damage control orthopedics. In carefully selected patients early total care is advocated whereby it is recommended to operate these patients within 24 hours of injury and in other settings up to 48hours. This has led to operating these patients even at night time.

Objective

This study aimed at comparing the surgical outcomes of intramedullary nailing carried out during the daytime and those carried out during the night.

Methodology

This was a comparative cohort study with two arms of the operations done during the day and operations were done during the night on adult patients with femoral diaphyseal fractures. A total of 66 patients were enrolled using the consecutive sampling method. Data was collected using an objectively structured questionnaire. Duration of surgery, nail entry point, limb length discrepancy, and degrees of rotation was assessed on those patients depending on the time of operation. Data was coded cleaned and analyzed using SPSS version 20, descriptive statistics and inferential statistics were used in this study. A p-value of < 0.05 was considered statistically significant.

Results

30 patients were operated on during the night. Patients with proximal shaft fractures were more likely to be operated on during the day whereas those with comminuted midshaft fractures were operated on during the night. The median operation time was 124 minutes during the night and 122 minutes during the day. In 2 patients unexpected nail entry points were used based on the fracture pattern at night compared to 1 patient in whom an unexpected nail entry point was used during the day. Limb length discrepancy of 1-2 cm was found in 4 patients who were operated

on during the night and 2 patients who were operated on during the day (p=0.399). 2 patients who were operated on during the night had 11-15 degrees of rotation and 2 patients who were operated on during the day had also 11-15 degrees of rotation (p =0.621). It was found that there was no statistical significance in surgical outcome in terms of limb length discrepancy, degree of rotation when the surgeries were done during the day and night.

Conclusion

Following this study, it was found that the time at which the diaphyseal femur fracture is treated has no significant difference in the surgical outcome and therefore doing this operation at any time maximizes the use of theatre.

TABLE OF CONTENTS **pages**

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AO/OTA	AO Foundation/Orthopedic Trauma Association
ARDS	Acute respiratory distress syndrome
ATLS	Advanced trauma life support
DCO	Damage Control Orthopedics
EMD	Emergency Medicine Department
HDU	High-dependency unit
ICU	Intensive care unit
IRB	Institutional Review Board
KCMC	Kilimanjaro Christian Medical Centre
MOI	Muhimbili Orthopedic Institute
MUHAS	Muhimbili University of Health and Allied Sciences
SIGN	Surgical Implant Generation Network
WHO	World Health Organization

DEFINITION OF TERMS

BLUMENSAAT'S LINE	Blumensaat's line is a line that corresponds to the roof of the intercondylar fossa of the femur as seen on a lateral view radiograph of the knee joint
DAY TIME	in this study is defined as 0700hrs to 1859hrs
DIAPHYSEAL FEMORAL FRACTURE	is the break of a bone on the shaft of the femur which includes the area just below the lesser trochanter extending downward to the area just above the adductor canal tubercle.
EMERGENCY PROCEDURE	is a procedure done within 24 hours of admission at MOI before entering the ward.
LIMB LENGTH DISCREPANCY	This is the difference in the length of the lower limbs measured from the anterior superior iliac spine and the inferior border of the medial malleolus.
MALROTATION	Rotational malalignment or torsional deformity of the femur is expressed as a femoral anteversion difference between the injured and uninjured sides. It can be measured by MRI, CT scan, Ultrasound, Plain radiograph, and physical examination. For the sake of this study, the clinical examination method was used by using a goniometer and tape measure to assess rotation malalignment post-operatively.
NIGHT TIME	in this study is defined as 1900hrs to 0659hrs
SCHEDULED PROCEDURE	is a procedure done on patients after they have been admitted in the ward and listed in the operating theatre list
SURGICAL OUTCOME	For the sake of this study this is the immediate postoperative outcome related to the procedure, observed within the 48-72hours of admission.

CHAPTER ONE: INTRODUCTION

1.1 Background

The timing of femoral intramedullary nailing has been an area of controversy (1). Early intramedullary nailing is favored over delayed intramedullary nailing in carefully selected patients with acute femur fractures because of shorter hospital stay, lower complication rate, minimal blood loss, and high union rate(2) (3)**.** The concept of early femoral intramedullary nailing has led to some centers operating on such patients even at night. Night-time surgeries have been associated with increased morbidity and mortality(4)(5).

In African countries where the burden of trauma is high, health facilities are overwhelmed with a large number of patients(6)**.** In Tanzania, road traffic crash has been increasing and it accounts for tibia fibula and femur fractures in the majority of its casualties(7)**.** Femur fracture occurs as a result of high energy injury(8) and it accounts for the highest disease burden globally with most of its fatalities in low and middle-income resource countries(9).

Health facilities have limited resources to accommodate the high turn up of a large number of patients due to the high burden of injuries. Operating theatres are the same that are used for routine and emergency cases(10)**.** During the daytime there is tight operating theatre use, rendering patients to wait for congestion to clear thus they get to be operated on at night so that they may not interfere with routine schedule and at the same time offer optimal care to the trauma patients(11)**.** On the other hand trauma patients present to the health facilities at any time of the day with variations in the severity of injury whereby they need to be optimized medically and according to the advanced trauma life support protocol before they deem fit for surgical intervention. Careful medical optimization takes time so by the time they are cleared for surgical intervention it may be night warranting nighttime surgery(10)**.**

Normally most surgeons do not have a shift pattern of work so they are involved in daily activities of caring for the patients, either through elective surgeries, attending patients in the clinics and at the end of the day they are the ones also attending emergency patients. So they end up with fatigue (12). Fatigue has been shown to affect surgeons' judgment and

performance(13)**.** Such fatigue has been shown in non-orthopedic disciplines to impair surgical performance and potentially lead to an increase in surgical errors and even a substantially higher mortality rate(14). In an orthopedic practice where mortality is not very high, other measures are used to associate them with the surgeon's fatigue include observing complication rates in such patients(14)**.**

The human body needs to rest at a certain time of the day especially at night (15). The 24 hours around clock pattern of the trauma setting setup has not put much consideration on this aspect. This has led to sleep deprivation on the surgeon which is known to impair cognitive function in a normal person (16). A study that was done in 2006 on errors in fracture diagnosis in the emergency department and characteristics of patients and diurnal variation found that the night effect on surgeons led to misdiagnosis of fractures whereby there were peak errors in fracture diagnosis noted between 8 pm and 2 am (17)**.** Again sleep deprivation was found to be associated with self-reported medical errors, falling asleep during surgical procedures (18)**.**

Complications following intramedullary nailing include malalignment, infection, hardware failure, impaired bony healing, and neurovascular injuries(19) (20). Furthermore, malalignment can be classified into primary and secondary malalignment. Primary malalignment includes those that are under the control of the surgeon and can be avoided intraoperative whereas secondary malalignment is those that lead to disfiguring in fracture reduction and alignment at some point during the post-operative period. This secondary malalignment may be due to loss of fixation in poor bone quality aggravated by inadequate fixation in combination with unstable fracture patterns. Noncompliance with appropriate weight-bearing restrictions may also lead to secondary malalignment (21). Therefore this study aims to compare the surgical outcome in terms of primary malalignment on the procedures that are done at night and those done during the day.

1.2 Problem statement

There is a high burden of patients with diaphyseal femoral fractures being admitted at MOI whereby on average 6 to 10 patients are attended daily at MOI EMD. In early total care which advocates for intramedullary nailing within 24 hours as the optimal time of surgery has led to

patients fitting in this category of treatment to be operated on as they come even at night. This necessitates MOI to operate these patients as they come to reduce congestion which has led to operating these patients even at night. On the other hand, operating theatres are busy during the day, and this necessitates for the patients to wait for available theatre space. Night-time surgeries may lead to surgical complications which may otherwise have been avoided by doing such surgeries during the day. However, the effect of operating at night on the surgical outcome of these patients has not been studied at MOI.

1.3 Conceptual framework

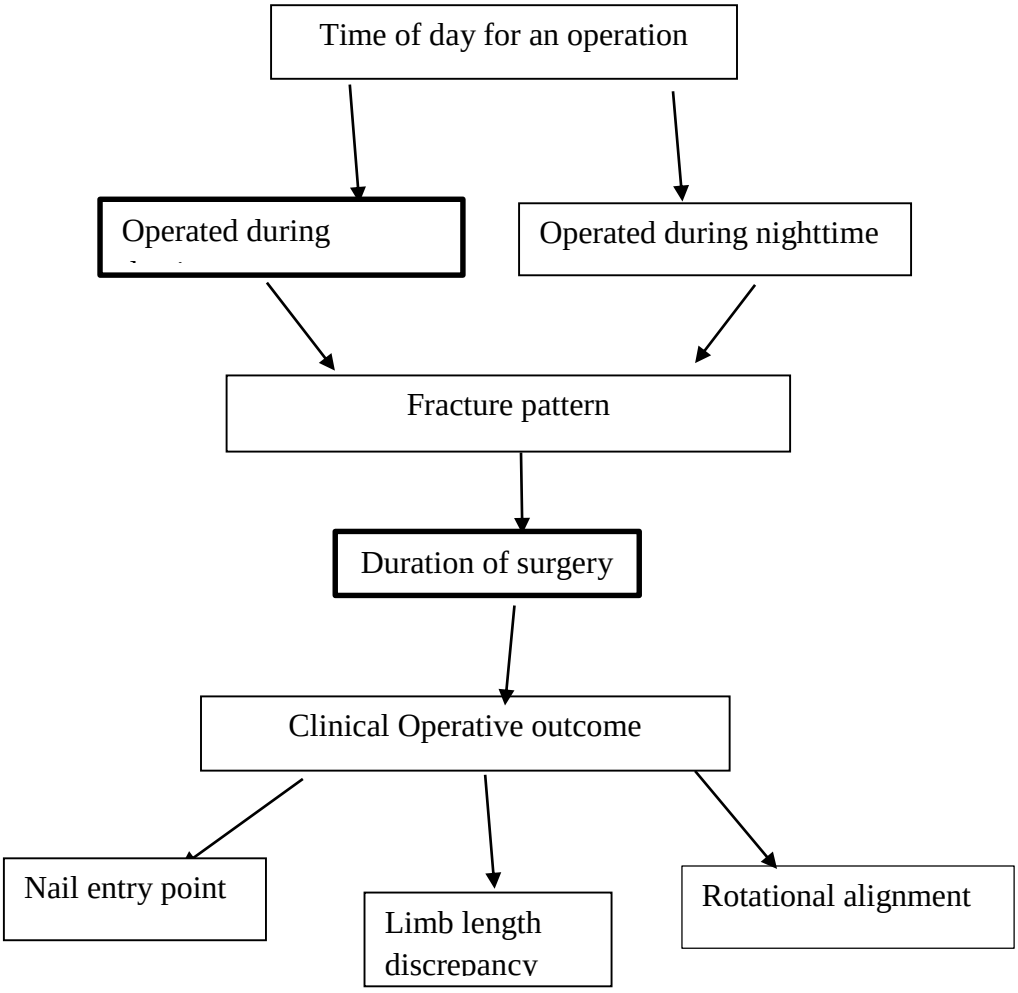

Figure 1. Conceptual framework

1.4 Rationale

This study aims at comparing the effect of nighttime surgery in patients with diaphyseal femoral fractures requiring IMN compared to those operated on during daytime. This will help in the proper planning of primary surgery concerning the time of the day to prevent malalignment. By proper planning, it will help to improve the working environment that is safe for both the patient and surgeon. This study will form the basis of change of practice on the timing of surgical procedures on patients requiring early intramedullary nailing by helping the surgeon to decide on the timing of the procedure to minimize chances of malreduction which affects postoperative limb alignment about the time of the day of operation.

1.4 Research hypothesis

The time at which intramedullary nailing of diaphysis femoral fractures is carried out brings the difference in short-term surgical outcomes.

1.6 Broad objective;

To compare the surgical short-term outcome of intramedullary nailing of diaphyseal femoral fractures in patients operated during day time versus night time.

1.6.1 Specific objectives

1. To determine the fracture pattern in patients with diaphyseal fractures in patients operated during night times versus daytime at MOI from August to December 2020.
2. To compare the length of operation time on patients operated between night time and daytime at MOI from August to December 2020
3. To compare nail entry points in patients with diaphyseal femur fractures that were operated during night time versus daytime at MOI from August to December 2020.
4. To determine rotation alignment in patients with diaphyseal femur fractures that were operated during night time versus daytime at MOI from August to December 2020.

5. To determine limb length discrepancy in patients with diaphyseal femur fracture that were operated during night time versus daytime at MOI from August to December 2020

1.7 Literature review

The epidemiology of femur fractures varies in occurrences according to age and sex (22)**.** Femur fractures are commonly found in men in their youth compared to females(23). In old age, they are more common in females than men (22)**.** Femur fracture in the youth is more due to high energy injury compared to the elderly population where they occur due to low energy injuries. High energy injuries cause a complex fracture pattern compared to low energy injuries in a healthy femur (24)**.** The high energy injuries include involvement in a motor traffic crash, sports activities amongst many other causes of injuries (6)(7)**.** At the same time a diseased femur fractures due to low energy injuries which may also cause more complex fracture patterns and surgery (24)(25)**.** A study that was done in KCMC on the epidemiology of femur fracture in northern Tanzania revealed that men in their youth of less than 30 years of age were commonly involved in MTC compared to women who mainly sustained femur fracture due to falls. The most common site that fractured on the femur was the mid-shaft and the mode of treatment that was commonly used was skeletal traction (26)**.** In another study done in India found that patients with femur fracture aged 40 and less had a mid-shaft femur fracture and were also involved in MTC compared to those with more than 40 years who had proximal femur fractures (27).

Fracture pattern directly affects surgical outcome in terms of quality of reduction and alignment. The surgical outcome has been observed to be influenced by the time of operation(5). Proximal and distal shaft fractures are more likely to be malaligned compared to mid-shaft fractures (21). These are complex fractures and need even more proper surgical planning in terms of nail entry technique and reduction which may be greatly affected by the time of operation (28)**.** Fracture comminution affects limb alignment postoperatively, with rotation malalignment being more common in fractures with Winquist-Hansen classification class 2 to 4 compared to class 0 -

1(28)(29). A study that was done in Nigeria revealed that femur fracture had diverse fracture patterns and treatment options with the pattern of injury and it stressed strict adherence to principles of management (30)**.** In one study it was revealed that open femur fractures are more likely to be done during the night compared to closed fractures (31)**.** Another study showed no difference in femur fracture patterns in intramedullary nailing that were done during the day compared to those during the night (32)**.**

There is the issue of the length of operation time. A study done by William Ricci et al found that there is a significant two-fold increase in complication rate in surgeries that were done at night compared to daytime surgeries and also night time surgeries have been associated with shorter operation time (32)**.** Shorter operation time has been associated with an increased risk of technical errors (5)**.** In another study, it was revealed that intramedullary nailing for femoral shaft fractures took longer when the procedure was done at night compared to daytime surgery (33). Length of operation time has been associated with fracture pattern whereas proximal shaft fractures take longer time compared to mid-shaft fractures (34). The technique of locking intramedullary nailing with screws sometimes may bring up a challenge, leading to further stress in the fracture and femur. In turn, this may add to the length of operation time (35). Longer operation time has been associated with increased surgical team fatigue(36) and it increases the perioperative risk of cardiopulmonary complications especially in the elderly, medically sick patients with multiple comorbid conditions(20). Also, the patient may be predisposed to an increased risk of infection. At the same time, this increases the risk of increased blood loss by the patient necessitating blood transfusion which also carries the risk on its own. (37) A study carried out in Malawi revealed that femur fractures that were classified as acute fractures warranting primary fracture treatment had a mean length of operation time of 112min(SD 43) and a mean estimated blood loss of 279mls(SD 202) (38)**.** In another study done in Nigeria showed that the meantime for the operation was 1 hour and 57 minutes $\pm$ 37 with 85.7% of patients not requiring blood transfusion (39)**.**

Primary malrotation is determined by fracture reduction and nail entry points (21)**.** Rotational malalignment shows inadequate fracture reduction whereas nail entry point directly affects

fracture reduction (40)**.** The method of introducing a nail into the femoral shaft can be antegrade or retrograde (41)**.** Antegrade is either through the tip of the greater trochanter or through the piriformis fossa. Piriformis entry has been shown to be superior to greater trochanter entry in proximal femoral shaft fractures (42)**.** In the rest of the femoral shaft fractures, there is no difference either using an antegrade or retrograde method in terms of union, outcome, and complication rate. However retrograde nailing is found to be less technically demanding compared to an antegrade method (43)**.** In obese patients antegrade nailing is more technically demanding, therefore depending on the surgeon's comfortability, retrograde nailing is more preferred. Intramedullary nailing aims to restore length and proper limb alignment. In one study it was observed that nighttime surgeries especially at the peak hours were more associated with limb malrotation (31)**.** The nail entry point is one of the most important technical steps in the process of correct intramedullary nailing, but so far no study has been done to compare the nail entry point when the operation was done at night compared to daytime.

Fracture malreduction may be observed more at night whereby the surgeon may overlook some of the steps in the intramedullary nailing fixation which may otherwise not have been overlooked had the surgery been done during the day (44)**.** The quality of reduction may only be seen after the post-operative radiographs are taken whereby the instep, bone to bone contact, the correct entry point of the nail together with correct positioning may be discerned. Also, other factors may be observed like the correct intramedullary nail sizing, correct locking screws placement, and correct nail ending point and compared with those that are done during the day. A study done in the UK revealed that there were more complications relating to surgery done at night compared to daytime surgery (33)**.**

CHAPTER TWO: METHODOLOGY

2.1 Study design

It is a hospital-based cohort comparative study.

2.2 Study population

This study included patients with diaphyseal femoral fracture treated with an intramedullary nail at MOI immediately following admission whereby patients are grouped into those who are operated on at night and those who were operated on during the daytime.

2.2.1 Inclusion criteria

All adult patients from 18 years and above with isolated diaphyseal femur fracture operated at MOI

2.2.2 Exclusion criteria

Patients with Pathological fracture of the femur

Patients with preexisting deformity in the lower limb

Patients with a previous femur fracture

2.3 Study area

The study was conducted at Muhimbili Orthopedic Institute (MOI) in Dar es Salaam. MOI is located in Dar es Salaam in Tanzania and is a governmental health facility providing tertiary services in orthopedics, traumatology, and Neurosurgery. It is a center for the training of residents of MUHAS. MUHAS has an understanding with MOI whereby the residents get an opportunity to be trained by the highly qualified surgeons working at MOI. MOI can well manage patients with trauma through surgical management. It has a bed capacity of 360 with 32 beds in ICU and HDU. It has 9 operating theatres and has 33 surgeons all capable of operating 24 hours a day. Of the 9 theatres, 2 are for emergency cases. MOI uses a SIGN nail system in intramedullary nailing and has a SIGN kit available for 24 hours use.

2.4 Sampling technique

A consecutive sampling technique was used to obtain the required sample

2.5 Sample size estimation

The following formula is was used to estimate the sample size (45).

$$N = \frac{2SD^2 (z_\alpha + z_\beta)^2}{d^2}$$

From an article by William M. Ricci A Prospective Comparative Study (Is After-Hours Orthopedic Surgery Associated with Adverse Outcomes?) the mean length of operation time of night and day femoral intramedullary nailing were 56.5 minutes and 69.8 minutes respectively with a standard deviation of 21.2 minutes(32)

Where;

N = sample size

SD = Standard Deviation

$Z\alpha = 1.96$ (from Z table) at type 1 error of 5%

$Z\beta = Z_{0.20} = 0.84$ (from Z table) at 80% power

d = effect size = difference between the mean values

$$N = \frac{2 \times 21.2^2 (1.96 + 0.842)^2}{(69.8 - 56.5)^2}$$

Therefore final estimated sample size was 40 patients per group.

2.6 Variables

Independent variables are age, sex (male/female), fracture pattern (AO/OTA 32 A-C), time of operation (night/day), surgeon's experience (in years), academic qualification of a surgeon (registrar, resident, specialist) working time (in hours).

Dependent variables are the length of the operation time, implant size, number of locking screws used limb length discrepancy (0 -2, >2 cm), degrees of rotation (0-15, >15 degrees); blood loss during operation (in milliliters) and expected nail entry point (in relation to fracture pattern).

2.7 Measurement of the Variables

The surgeon's qualifications were categorized according to the title of the surgeon whereby the title may be registrar, resident, and specialist whereby the resident is further classified into either resident 1, resident 2, or resident 3.

Working time was calculated from the time of arrival to work up to the time of operation. Arrival to work used was 7:30 am. Length of operation time was calculated from the cutting time to end time which was recorded by the nursing staff. The intraoperative data were recorded in the implant form in the patient's file. They include data on the procedure, surgeon, time the procedure began (cutting time), time the procedure ended, and the time the patient left the room. The nursing staff also records implant size, number of locking screws used.

Intraoperative blood loss is the blood lost during operation which is calculated following summation of sucked blood in the suction machine, soaked gauze, and spilled blood on the operating table and floor. This is estimated by the operating nurse, surgeon and the assistance, and the anesthetic team.

Limb length discrepancy was measured within 48 hours postoperatively before the patient had been discharged home, a tape measure was used to measure the lengths of the lower limb from the anterior superior iliac spine to the inferior pole of the medial malleolus on both the injured limb and uninjured limb, and the difference between the two lengths is noted.

In assessing the degree of rotation within 48 hours postoperatively, a physical examination method was used whereby in comparison with the uninjured limb post-operative rotational alignment was assessed when the patient was placed supine, relaxed with the hip and knee extended. The amount of deviation of degrees was measured using a goniometer from the neutral axis that is 0 degrees whereby the angle between an imaginary line along the medial border of

the foot and vertical axis was measured. This was done on both lower limbs starting with a normal limb, followed by an affected limb and then, angles obtained were compared. If both angles were the same it means no limb rotation deformity present, if the affected limb rotation angle was larger than the normal limb rotation angle it means angle difference is the degree of external rotation deformity. If the affected side rotation angle is less than the normal limb rotation angle it means the angle difference is the degree of internal rotation deformity. Normal value averages between 8 and 14 degrees in adults.

2.8 Data collection process

Patients were sorted from the Emergency Department at MOI whereby carefully selected patients who met inclusion criteria were included in the study. Informed consent was obtained from the patient and it was stated clearly to the patient that his refusal to be involved in the study will not by any means affect his method of treatment. Patient's information on socio and demographic data, mechanism of injury were sought. Fracture pattern through radiograph using RADIANT software was determined and classified according to AO/OTA classification and anatomical classification.

Patients with diaphyseal femur fracture are treated with reamed intramedullary nailing, which can be antegrade through piriformis entry or trochanteric entry, or retrograde intramedullary nailing. The fracture reduction may be done by an open or closed method. Intraoperative findings like time of operation which may be night or daytime, duration of operation which was calculated from the cutting time to end time, implant size used number of screws, and blood loss during the operation was obtained. Postoperative complications were identified like pulmonary complications, ICU/HDU admission, abnormal bleeding per incision site.

The radiological outcome was observed in terms of the nail entry point. The correct entry point was determined in relation to the fracture pattern. In antegrade nailing, the entry point can be trochanteric or piriformis, whereby proximal shaft fractures require piriformis entry and distal shaft fractures require a retrograde entry. In retrograde nailing, the correct entry point is anterior to an extension of Blumensaat's line on the lateral view and in the center (or slightly medial to center) of the intercondylar notch on the AP view.

Within 48 hours of the intramedullary nailing and before the patient was discharged from the ward lower limb length discrepancy using a tape measure was obtained. Using a goniometer degree of rotation was also obtained whereby normal value averages between 8 and 14 degrees in adults

2.9 Validity and reliability

In this study, the validity of the tool was achieved by reviewing all questions with the help of research experts and providing an opinion on the coverage of the items of the research objectives.

Reliability is the degree to which an instrument measures the same way each time, it is used under the same conditions with the same subjects. Therefore, the pre-test was conducted to ensure the instrument's ability and accuracy. Eight patients which are ten percent (10%) of the eighty patients were used to pretest the tool before engaging in an actual study but were not be included in an overall sample of the study. The findings obtained from the pilot study were used to make necessary adjustments for the improvement of the tool. Moreover, the same tool was administered to all participants and the only principal investigator was involved in data collection to ensure reliability.

2.10 Data analysis

Data collected were entered into a computer and analyzed using Statistical Package for Social Scientists (SPSS) from IBM SPSS statistical version 20 computer programs. The categorical variables like sex, mechanism of injury, the pattern of injury, were analyzed using a chi-square test or Fischer test. Continuous data like age, duration of surgery, blood loss was summarized using Standard Deviation and mean and their association by using a t-test. The continuous variable that did not follow the normal distribution pattern was tested using the Shapiro Wilk test to check for normality and a nonparametric test Mann Whitney test was used to check the difference in means. The difference was considered statistically significant if the P-value will be ≤ 0.05.

2.11 Ethical consideration and consent

Ethical clearance was sought from the IRB of MUHAS. Permission was sought from the MOI administration to access patients' files and data needed for the study. Ethical clearance was obtained from the ethical clearance committee of MUHAS. Consent was obtained from the patient after the patient has been managed and resuscitated, is free of pain, has been prepared and counseled for operation, and has signed consent for surgery by the surgical team. That is when the principal investigator sought consent from the patient to be enrolled in the study. The patient was assured that he was going for surgery whether he participates or not and care was not be affected by his choice of being involved in the study or not. The participants were allowed to ask questions about the study. During and after the study period, the patient's confidentiality was maintained. The obtained information was used for research purposes only. The participants in this study signed the consent after agreeing to participate. The participants were allowed to withdraw from the study at any point during the study.

CHAPTER THREE

RESULTS

A total of 66 patients with femoral shaft fractures met the inclusion criteria and were operated on within 24 hours of admission during the night and day. Of the 66 patients, 87.9% (58) were male. These patients had a mean age of 28.3 years ranging from 18 to 55 years.

Table 1: Demographic data on patients with diaphyseal femoral fractures

Variable	Night	Day	Total
	Frequency (%)	Frequency (%)	
Sex	N=30	(N=36)	
Male	26(44.83)	32(55.17)	58
Female	4(50.00)	4(50.00)	8
Age Group			
18-30	18(39.13)	28(60.37)	46
31-40	6(46.15)	7(53.85)	13
41-50	5(83.33)	1(16.67)	6
>50	1(100.00)	0(100.00)	1

Fracture classification

Of the 66 patients, 30 patients were operated on during the night. 55 patients had closed fractures. Of the 11 patients with open fractures, 5 (45.45%) were operated on during the night. Of the 55 patients with closed fracture, 25 (45.45%) were operated on during the night. 13 patients had proximal shaft fracture 39 midshaft fracture, and 14 distal shaft fractures. Patients with proximal shaft fractures were more likely to be operated on during day 10 (76.92%). whereas those with midshaft fractures were more likely to be operated on during night 21 (53.85%). Patients with comminuted femur shaft fracture were operated on during night 16

(59.26%) whereby patients with transverse femur shaft fracture were operated on during day 19 (76%).

Table 2: Fracture pattern according to AO/OTA and anatomical classification on patients with diaphyseal femoral fractures

Categories	Night Frequency (%)	Day Frequency (%)	Total N	P-Value
OTA classification				
32A	13(39.39)	20(60.61)	33	0.190*
32B	11(55)	9(45)	20	
32C	6(46.15)	7(53.85)	13	
Open or closed				
Open fracture	5(45.45)	6(54.55)	11	1
Closed fracture	25(45.45)	30(54.55)	55	
Proximal Mid or Distal				
Proximal shaft	3(23.08)	10(76.92)	13	0.153*
Midshaft	21(53.85)	18(46.15)	39	
Distal shaft	6(42.86)	8(57.14)	14	
Fracture pattern				
Transverse	6(24.00)	19(76.00)	25	0.041*
Oblique	5(71.43)	2(28.57)	7	
Comminuted	16(59.26)	11(40.74)	27	
Wedged	1(33.33)	2(66.67)	3	
Segmental	2(50.00)	2(50.00)	4	

Operation time

30 patients were operated on during the night with a median time of 124 minutes whereby 36 patients were operated on during the day with a median time of 122 minutes. Patients with segmental fractures took longer time in both night and daytime surgeries and also patients with transverse fractures took shorter time in both daytime and nighttime surgeries.

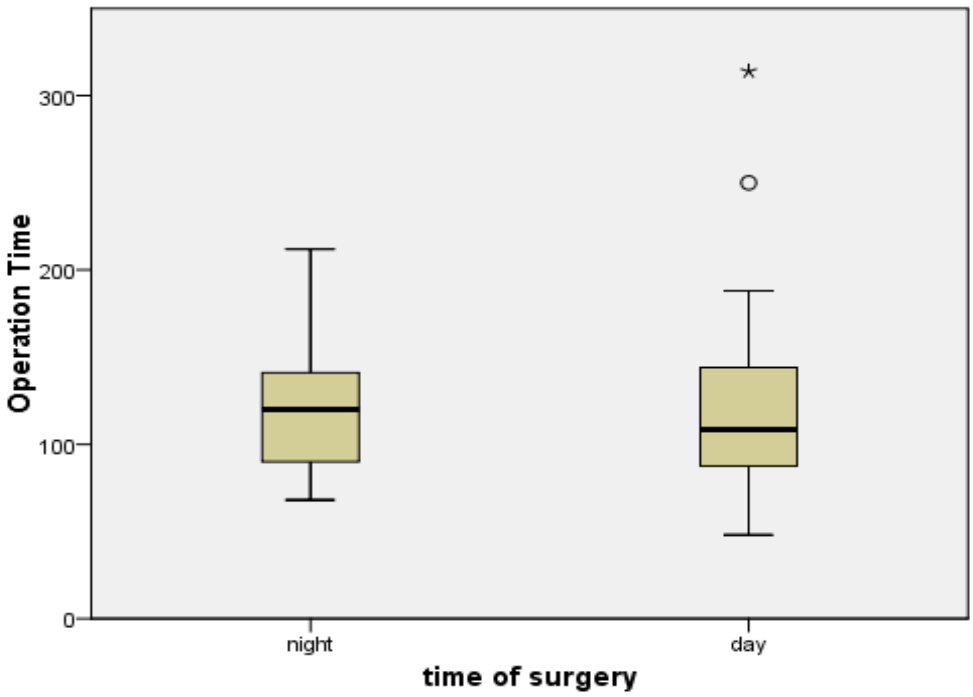

Figure 2: Whiskeys presentation of length operation time and time of surgery

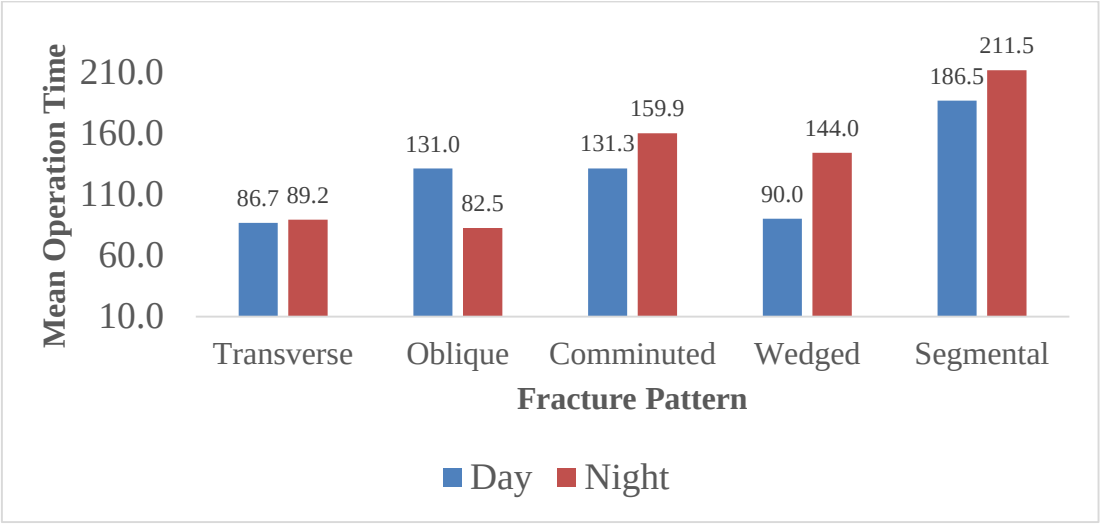

Figure 3: Bar chart showing fracture pattern of patients operated on day and night time surgery and their mean operation time.

Nail entry point

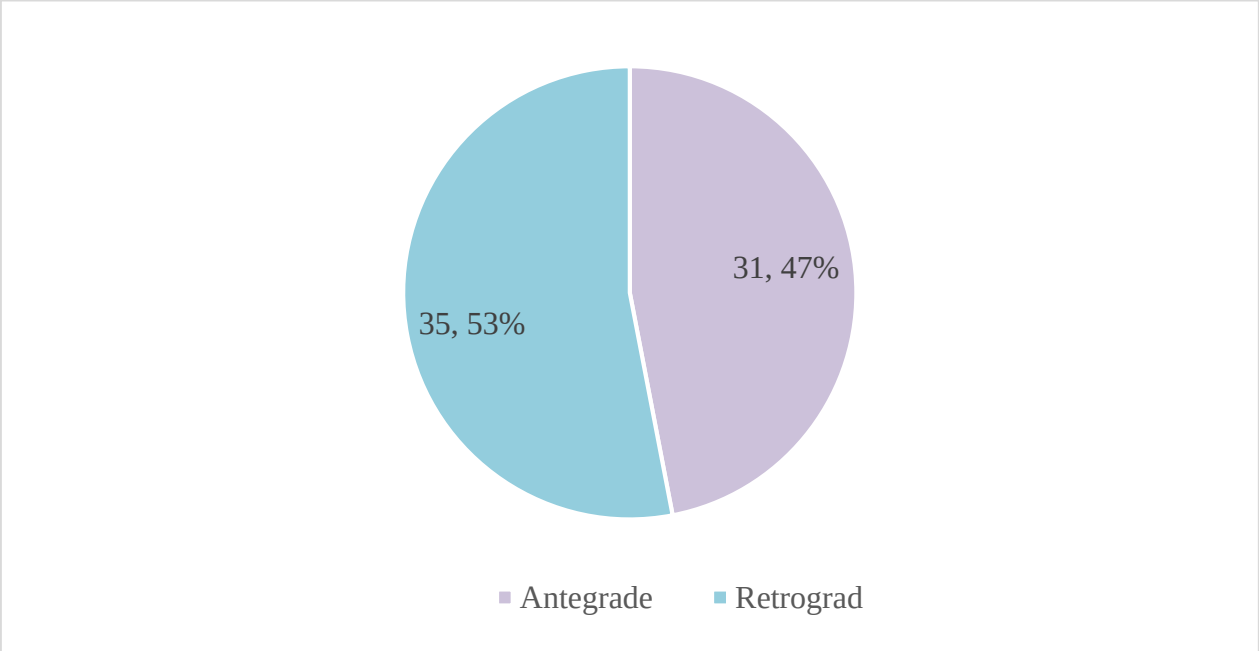

Figure 4: Pie chart showing Antegrade and retrograde method of intramedullary nailing

In this study, the retrograde method of introducing nails was used more compared to antegrade. There were 2 (66.67%) patients of whom trochanteric nail entry point was used which were not expected to be used based on the fracture pattern during the night compared to 1 (33.33%) patient of whom trochanteric nail entry point was not expected to be used basing on the fracture pattern during the daytime surgeries. However, this was found to be not statistically significant.

Table 3: Antegrade and Retrograde nail entry in night and day surgeries

Variable	Night Frequency (%)	Day Frequency (%)	Total	P-Value
Ante grade entry point				
Trochanteric entry expected	8(61.54)	5(38.46)	13	0.372*
Trochanteric entry not expected	2(66.67)	1(33.33)	3	
Piriformis entry expected	5(33.33)	10(66.67)	15	
Retrograde entry point				
Adequate entry point	15(44.44)	19(55.56)	34	1*
Inadequate entry point	0(0.00)	1(100.00)	1	

Of the 35 patients with retrograde nail entry points, 34 had adequate nail entry points anterior to an extension of the Blumensaat's line. Also of the 35 patients with retrograde nail entry points, 2 patients who were operated on during the night had nail endpoint above the isthmus but distal to the lesser trochanter compared to 3 patients who were operated on during the day. However, it was not statistically significant (p =0.661)

Limb Length Discrepancy and Rotational alignment

This study revealed that the limb length discrepancy was observed more during night 4 (66.67%) compared to during day 2 (33.33%) at a range of 1-2cm. On the other hand, 2 (6.67%) patients who were operated on during the night had a degree of rotation of $11 – 15^0$ degrees compared to 2 (5.56%) patients who were operated on during the day. This was not statistically significant.

Table 4: Limb length discrepancy and difference in the degree of rotation in the nighttime and daytime surgeries

Variable	Night	Day	Total	P-Value
	Frequency (%)	Frequency (%)		
LLD				
0-1cm	26(43.33)	34(56.67)	60	0.399*
1-2cm	4(66.67)	2(33.33)	6	
Difference Degree of rotation				
0 – 10 degrees	28(45.16)	34(54.84)	62	0.621*
11 -15degrees	2(50.00)	2(50.00)	4	

CHAPTER FOUR

DISCUSSION

In this study findings, the majority of the patients were male in their mid-twenties. This study finding is similar to a study done by Hollis et al in KCMC and a study done by Ibeanusi et al in South Nigeria that found that men in their youth tend to get femur fractures more compared to their female counterparts (26)(30). This can be due to the fact that men are the breadwinner in the family and tend to be in trafficking in search of their daily income (46) and also the use of motorcycles as means of transport in this region (6)(7).

This study found that majority of the patients had simple fracture patterns according to AO/OTA classification 32A and were mainly operated on during the day. This coincides with a study done by Patel who had similar findings whereby many of his patients had 32A and were operated on during the day (31). A slight variation was found in a study by Ricci who found that the patients with the complex pattern were more likely to be operated on during the night time (32) whereas in our study finding the complex fractures were operated equally during the day and the night. Also in this study, it was found that open fractures were equally operated during the day and night which contradicts a study finding done by Patel who found that open fractures were more likely to be operated on during the night. This is because the operating team attends also all patients that come on their day of admission not necessarily with femur fractures only and have to operate case to case base approach on those patients who require emergent and immediate operations so they follow a list of operations they have on that day.

The median operation time was found to be 124 at night time and 122 minutes during the day. This range coincides with a study done in Qatar which found the meantime for patients who underwent open reduction with intramedullary nailing of femur shaft to be 132 min(47) and another study done in Nigeria which had a mean time of 112min (38). These study findings contradict with a study done in London which found that night time significantly took longer time 261 minutes compared to daytime surgery 219 minutes (33), however, this study used a closed mode of reduction compared to our study which used the open reduction method. In another study done in Halifax Canada found that nighttime surgeries took shorter time

56.5minutes compared to day time surgeries 70 minutes which was associated with increased frequency to technical errors in Afterhours surgeries (defined as those surgeries done beyond 04:00 pm) and this was associated with shorter operation time and non - ideal conditions.

In this study technical outcome was measured in terms of postoperative limb alignment by measuring limb length discrepancy and degrees of rotation in comparison with uninjured limb and it was found not statistically significant. This coincides with a study done by Patel in New York which concluded there is no statistical difference in the difference in femoral length and femoral neck shaft angle ante version when the surgeries are done at night or during the day. However, the study done in New York used CT scan to measure post-operative limb alignment whereas this study used clinical method to measure the postoperative limb alignment. Previous studies have shown that there is a wide variation in the femoral neck shaft angle anteversion from one person to another, and in other people, the femoral rotation range of $0\text{-}15^0$ may still be considered normal (48). On the other hand, rotational malalignment following intramedullary nailing is very hard to detect both radiographically and clinically (49) (50) and it ranges from 2 – 28%, and most studies used closed mode of reduction using image intensifier (50). In this study the open reduction technique was used for intramedullary nailing which allows fracture reduction under direct visualization thus allowing near anatomical reduction to be achieved on the fractured fragments, therefore, improving rotational stability (47)(51). This was observed in this study whereby no patient was observed having a degree of rotation more than 15^0 thus coinciding with other studies which found that rotational malalignment to be rarer after open reduction (47).

Another aspect of technical outcome that was observed in our study is the nail entry point which is a critical step in femoral nailing. The retrograde was used more compared to antegrade nailing. This may be due to the fact that retrograde intramedullary nailing is not as demanding as the antegrade method in antegrade nailing piriformis entry was used as well as the trochanteric entry. With the proximal shaft fractures, piriformis entry is more advocated. And 5 proximal shaft fractures used trochanteric entry of which 2 were done at night. However, the optimal entry

point for antegrade femoral nailing has many controversies with others preferring to the tip of the greater trochanter and others to the piriformis fossa.

CONCLUSION

This study found that there is no difference in duration of operation time when the surgery is done at night or day. It has also shown that there is no difference in surgical outcomes in terms of limb length discrepancy or rotational alignment in patients with femoral shaft fractures who are operated on during the night and those operated during the day within 24 hours of admission. It at also found that there is no significant difference in nail entry point when the surgery is done at night or in the daytime. Therefore time at which the intramedullary nailing is carried out does not bring a difference in short-term surgical outcomes on patients with diaphyseal femur fractures.

STUDY LIMITATION AND MITIGATION

The study was done for a short duration of time.

The study is done at a single center thus it cannot be used to generalize on a larger population.

RECOMMENDATION

With this study finding it is recommended to operate patients with femur fracture as they come in a center where there are 24 hours operating theatre, enough human resources, and available implants. It is also recommended to do a larger study for a longer duration of time involving more than a single center.

REFERENCE

1. Harvin JA, Harvin WH, Camp E, Caga-Anan Z, Burgess AR, Wade CE et al. Early femur fracture fixation is associated with a reduction in pulmonary complications and hospital charges: A decade of experience with 1,376 diaphyseal femur fractures. J Trauma Acute Care Surg. 2012;73:1442–8.
2. Seibel R, Laduca J, Hassett J, Babikan G, Mills B BD et al. Blunt Multiple Trauma (ISS 36), Femur Traction, and the Pulmonary Failure-Septic State. Ann Surg. 1985;202(3):283–95.
3. Nahm NJ, Como JJ, Wilber JH, Vallier HA. Early appropriate care: Definitive stabilization of femoral fractures within 24 hours of injury is safe in most patients with multiple injuries. J Trauma - Inj Infect Crit Care. 2011;71(1):175–85.
4. Gallaher JR, Varela C, Purcell LN, Maine R, Charles A. Diurnal variation in trauma mortality in sub-Saharan Africa : A proxy for health care system maturity. Injury. 2020;51(1):97–102.
5. Kelz RR, Freeman KM, Hosokawa PW, Asch DA, Spitz FR, Moskowitz M, et al. Time of day is associated with postoperative morbidity an analysis of the national surgical quality improvement program data. Ann Surg. 2008;247(3):544–52.
6. Mcharo B. Motorcycle Crash : Injuries Pattern and Associated Factors Among Patients Treated At Muhimbili Orthopaedic Institute. Vol. 19, East & Central African Journal of Surgery. 2012.
7. Boniface R, Museru L, Kiloloma O, Munthali V. Factors associated with road traffic injuries in Tanzania. Pan Afr Med J. 2016;23(46):1937–8688.
8. Ugezu AI, Nze IN, Ihegihu CC, Chukwuka NC, Ndukwu CU OR. Management of Femoral Shaft Fractures in a Tertiary Centre , South Est Nigeria. Afrimedic J. 2018;6(1):27–34.
9. Agarwal-Harding KJ, Meara JG, Greenberg SLM, Hagander LE, Zurakowski D, Dyer GSM. Estimating the Global Incidence of Femoral Fracture from Road Traffic Collisions. J bone Jt Surg incorperated. 2015;31:1–10.
10. Yeatman M, Cameron-Smith A, Kingsmill Moore JM. Nocturnal orthopaedic operating:

Can we let sleeping orthopaedic surgeons lie? Ann R Coll Surg Engl. 1994;76(2):90–4.
11. Gulamhussein MA, Chaudhry S, Noor S, Chaudhry T, Guha A, Knebel R. Safety in out-of-hours operating in trauma and orthopaedics at a district general hospital. Ann R Coll Surg Engl. 2017;99(5):347–50.
12. Gawande AA, Zinner MJ, Studdert DM. Analysis of errors reported by surgeons at three teaching hospitals. Surgery. 2001;614–21.
13. Halvachizadeh S, Teuber H, Cinelli P, Allemann F, Pape HC, Neuhaus V. Does the time of day in orthopedic trauma surgery affect mortality and complication rates? Patient Saf Surg. 2019;13(1):1–8.
14. Adams O, Cruz S, Balach T, Dirschl D, Shi L LM. Do 30-Day Reoperation Rates Adequately Measure Quality in Orthopedic Surgery ? Jt Comm J Qual Patient Saf. 2020;46(2):72–80.
15. Amirian I, Danielsen A RJ. The Impact of Sleep Deprivation on Surgeons' Performance During Night Shifts. Bull R Coll Surg Engl. 2013;95(7):1–5.
16. O'Brien M, O'Toole R, Newell M, Lydecker A, Nascone J SM et al. Does Sleep Deprivation Impair Orthopaedic Surgeons' Cognitive and Psychomotor Performance? J Bone Jt Surgery. 2012;94(21):1975–81.
17. Hallas P ET. Errors in fracture diagnoses in the emergency department – characteristics of patients and diurnal variation. BMC Emerg Med. 2006;6(1).
18. Banfi, T., Coletto, E., d' Ascanio, P., Dario, P., Menciassi, A., Faraguna, U., & Ciuti G. Effects of Sleep Deprivation on Surgeons Dexterity. Front Neurol. 2019;10.
19. Yoon R, Liporace F. Impact of Intramedullary Nailing in the Treatment of Femur Fractures An Evolutionary Perspective. Bull Hosp Jt Dis. 2013;76(13):9.
20. Fantry A, Elia G, Vopat B DA. Distal femoral complications following antegrade intramedullary nail placement. Orthop Rev (Pavia). 2015;7(1).
21. Berkes MB, Little MTM, Lorich DG. Complications of Intramedullary Nailing. In: Rommens P & Hessmann M., editor. Springer-Verlag London. Springer - Verlog london; 2015. p. 85–94.
22. Court-Brown CM. The Epidemiology of Fractures and Dislocations. In: Bucholz,

Heckman & PT, editor. Rockwood and Green's fractures in adults (Vol 1). 8th ed. Baltimore: Wolters Kluwer Health; 2015. p. 59–102.

23. Inaba K, Recinos G, Teixeira PGR, Barmparas G, June M. Complications and Death at the Start of the New Academic Year : Is There a July Phenomenon ? J Trauma. 2010;68(1):1–4.
24. Gozna ER. Biomechanics of long bone injuries. Biomechani. Gozna ER HI, editor. Biomechanics of musculoskeletal injury. Baltimore: Williams and Wilkins,; 1982. 1–24 p.
25. Salminen S, Pihlajamaki H, Avikainen V, Kyro A B, O. Specific features associated with femoral shaft fractures caused by low-energy trauma. J Trauma. 1997;43:117–22.
26. Hollis A, Ebbs S MF. The epidemiology and treatment of femur fractures at a northern tanzanian referral centre. Pan Afr Med J. 2015;22.
27. Adnan RM, Zia MI, Amin J et al. Frequency of femoral fractures; comparison in patients less than and more than 40 years of age. Prof Med J. 2012;19(11).
28. Carsen S, Park SSH, Simon DA, Feibel RJ. Treatment With the SIGN Nail in Closed Diaphyseal Femur Fractures Results in Acceptable Radiographic Alignment. Clin Orthop Relat Res. 2015;473(7):2394–401.
29. Billy T. Haonga, Felix S. Mrita, Edmundo E. Ndalama JEM. Short-term outcome of patients with closed comminuted femoral shaft fracture treated with locking intramedullary sign nail at Muhimbili Orthopaedic Institute in Tanzania. Tanzan J Health Res. 2015;17(3).
30. Ibeanusi S, J C. Pattern and Outcome of Femoral Fractures Treated in a Regional Trauma Centre in South South, Nigeria. Int Arch Orthop Surg. 2019;2(1):1–9.
31. Patel NM, Yoon RS, Koerner JD, Donegan DJ, Liporace FA. Timing of diaphyseal femur fracture nailing : Is the difference night and day ? Injury. 2014;546–9.
32. Ricci BWM, Gallagher B, Brandt A, Schwappach J, Tucker M, Leighton R. Is After-Hours Orthopaedic Surgery Associated A Prospective Comparative Study. JBJS. 2009;91(805):2067–72.
33. Bhattacharyya, T., Vrahas, M. S., Morrison, S. M., Kim, E., Wiklund, R. A., Smith, R.

M., & Rubash HE. The Value of the Dedicated Orthopaedic Trauma Operating Room. J Trauma Inj Infect Crit Care. 2006;60(6):1336–1341.

34. Narayana L, Reddy GV, Kiran NR, Naresh G. Interlocking Nailing In Adult Femoral Shaft Fractures. IOSR J Dent Med Sci. 2016;15(09):58–60.
35. Bhandari M, Tornetta P III, Sprague S, Najibi S, Petrisor B GL et al. Predictors of reoperation following operative management of fractures of the tibial shaft. J Orthop Trauma. 2003;17(5):353–61.
36. Cheng, H., Clymer, J. W., Po-Han Chen, B., Sadeghirad, B., Ferko, N. C., Cameron, C. G., & Hinoul P. Prolonged operative duration is associated with complications: a systematic review and meta-analysis. J Surg Res. 2018;229:134–144.
37. I Kajja, GS Bimenya, B Eindhoven, H Jan ten Duis and CS. Blood loss and contributing factors in femoral fracture surgery. African Heal Sci. 2010;10(1):18–25.
38. Young S, Banza L, Hallan G, Beniyasi F, Manda K MB et al. Complications after intramedullary nailing of femoral fractures in a low-income country. Acta Orthop. 2013;84(5):460–7.
39. Ibeanusi SE. Locked Intramedullary Nailing of Fractures. Experience from a Trauma Centre in Nigeria: A Prospective Observational Study. Asian J Orthop Res. 2018;1(1):1–10.
40. Jaarsma RL, Pakvis DFM, Verdonschot N, Biert J, Kampen A Van. Rotational Malalignment After Intramedullary Nailing of Femoral Fractures. 2004;18(7):403–9.
41. Trompeter A, Newman K. Femoral shaft fractures in adults. Orthop Trauma. 2013;27(5):322–31.
42. Mohamed Mustafa Diaba, Hao-Hua Wua, Edmund Eliezerc BH SMD. The impact of antegrade intramedullary nailing start site using the SIGN nail in proximal femoral fractures: A prospective cohort study. Injury. 2017;49(2):323–7.
43. Bitta KA. Antegrade versus retrograde reamed interlocking femoral nailing. A comperative prospective study at Muhimbili Orthopaedic Institute(MOI). Med Thesis Diss. 2010;
44. Lewis G. Zirkle MD. Technique Manual of SIGN IM Nail & Interlocking Screw

System Insertion & Extraction Guide. 2011.

45. Charan J, Biswas T. Review Article How to Calculate Sample Size for Different Study Designs in Medical Research ? Indian J Psychol Med. 2013;35(2).
46. Lise Haug, Margaret Wazakili SY& GV den B. Longstanding pain and social strain: patients' and health care providers' experiences with fracture management by skeletal traction; a qualitative study from Malawi. Disabil Rehabil. 2017;37(17):Pages 1714-1721.
47. Ghouri SI, Alhammoud A, Alkhayarin MM. Does Open Reduction in Intramedullary Nailing of Femur Shaft Fractures Adversely Affect the Outcome? A Retrospective Study. Adv Orthop. 2020;2020.
48. Reikerås O, Høiseth A RA, E F. Femoral neck angles: A specimen study with special regard to bilateral differences. Acta Orthop Scand. 1982;53(5):775–7.
49. Langer JS, Gardner MJ RW. The cortical step sign as a tool for assessing and correcting rotational deformity in femoral shaft fractures. J Orthop Trauma. 2010;24(2):82–8.
50. Lindsey JD, Krieg JC. Femoral mal rotation following intramedullary nail fixation. J Am Acad Orthop Surg. 2011;19(1):17–26.
51. Anisi C, Abang I AJ. Early outcome of open locked intramedullary nailing of femoral diaphyseal fractures in a resource – poor setting. Niger J Med. 2019;28(1):22.

APPENDICES

Appendix I: Informed Consent Form

Consent to participate in the study titled "Timing of intramedullary nailing of diaphyseal femoral fracture in adults: is there any difference in surgical outcome between night and day time surgeries**?"**

I am Dr. Christina M. Nyandwi, a postgraduate student researching the Timing of intramedullary nailing of diaphyseal femoral fracture in adults: is there any difference in surgical outcome between night and day time surgeries**?"**

Purpose of the Study: This study aims at comparing the surgical outcome of intramedullary nailing carried out during the daytime and those carried out during the night

What participation involves: If you agree to participate in this study, you will be asked questions and examined before and after the operation.

Confidentiality: All information collected will be entered into a computer with only an identification number; no name included.

Cost: You will not be required to pay any amount for your participation in this study

Risk: We expect no harm to happen to you during this study.

Rights to withdraw: Taking part in this study is completely voluntary and refusal to participate or withdrawal will not involve penalty or loss of any benefits to which you are entitled. You will be treated and followed up as per the usual treatment protocol of the Institute for all patients with a diaphyseal femur fracture.

Benefits: If you agree to participate in this study, you will be assessed on the progress of your condition by the investigating doctor. We hope that the obtained information from this study will benefit others.

Who to contact: If you have any other questions regarding this study, feel free to contact me, the investigator, **Dr. Christina M. Nyandwi**, MUHAS, P.O. Box 65001, Tel no.0655 982997 Dar es Salaam.

If you have any questions concerning your rights as a participant, you may contact the Chairman of the university research and publication committee, P.O. Box 65001, Dar es Salaam. Telephone: 2150302/6.

Signature

Do you agree to participate. .....

Participant does not agree…….

I, ……..have read the consent form and my questions have been answered and I agree to participate in this study.

Signature of Participant……..

Signature of Investigator…….

Date of signed consent…….

Appendix II: Fomu ya ridhaa kwa kiswahili

Ridhaa ya kushiriki katika utafiti wa kuangalia matokeo ya upasuaji baada ya mvunjiko wa fupaja kama upasuaji huo utafanyika usiku au mchana.

Mimi ni Dr. Christina M. Nyandwi, ni mwanafunzi wa masomo ya uzamili katika kitengo cha mifupa ndani ya chuo kikuu cha afya cha Muhimbili. Ninafanya utafiti wa kuangalia matokeo ya upasuaji baada ya mvunjiko wa fupaja kama upasuaji huo utafanyika usiku au mchana. Tafadhali naomba ushiriki wako. Utaulizwa maswali machache na utafanyiwa utafiti wa matokeo ya upasuaji wako

Lengo la utafiti huu: Ni kulinganisha matokeo ya upasuaji baada ya mvunjiko wa fupaja kama upasuaji huo utafanyika usiku au kama utafanyika mchana.

Namna ya kushiriki: Kama utakubali kushiriki utaulizwa maswali machache na utafanyiwa uchunguzi baada ya upasuaji huo

Usiri: Taarifa zitakazopatikana hapa zitatunzwa kwa usiri wa hali ya juu na zitatumika kwa ajili ya utafiti huu tu na kwa ajili ya kuboresha hali ya huduma ya wagonjwa waliovunjika fupaja

Gharama: Hautahitajika kulipia gharama kwa ushiriki wako katika utafiti huu

Madhara ya kushiriki utafiti: Hatutarajii madhara yoyote yatakayompata mshiriki kwa ushiriki wake ndani ya utafiti huu.

Hiyari ya kujitoa katika utafiti huu: Ushiriki katika utafiti huu ni wa hiyari na pia una haki ya kujitoa katika utafiti huu muda wowote unapohisi kufanya hivyo. Na hakuna madhara yotote yakayokupata ikiwa utajitoa katika ushiriki wa utafiti huu.

Manufaa ya kushiriki utafiti huu: utakuwa na faida kwako na taarifa za utafiti utawasaidia wengine watakaokuja wakiwa na shida kama ya kwako

.

Mawasiliano na wahusika: Kama utakuwa na swali lolote kuhusiana na utafiti huu wasiliana na mimi, **Dr. Christina M. Nyandwi**, MUHAS, P.O. Box 65001, Tel no 0713 478783 Dar es Salaam.

Kama utakuwa na swali lolote kuhusiana na haki zako kama mshiriki wa utafiti huu unaweza asiliana na mkuu wa kamati ya utafiti wa Chuo kikuu cha Muhimbili S.L.P 65001, Dar es salaam.

Sahihi:

Unakubali kushiriki. .....

Haukubali kushiriki…….

Natoa idhini mwenyewe bila ya kushurutishwa au kulazimishwa kushiriki kwenye utafiti uliotajwa. Nafanya hivi baada ya kuwa nimeongea na Dr.Christina Nyandwi na pia amenijibu na kunielewesha maswali yote niliyomuuliza.

Sahihi ya Mshiriki……..

Sahihi ya Shahidi…….

Tarehe …….

Appendix III: Questionnaire English version

Data collection tool for study determinants of reoperation among patients with femur fracture treated as they come definitively at MOI

Study Number: …… I.P No...……

A) DEMOGRAPHICS.

Age: …….

Sex: 1.Male ☐ Female ☐

1. Any co morbid condition
   Hypertension ……
   DM……
   Other……

Days of injury ……hrs/days

Limb involvement

1. Left femur ☒ 2.Right femur ☐

B) FEMORAL SHAFT FRACTURE CLASSIFICATION

Using OTA classification ……..

Using anatomical classification…….

C) TIME OF SURGERY

Night……..Day……

Surgeon's qualification registrar……. Resident ……. Specialist……

Working time ……. hours.

The number of emergency operations done in a day……..

D) INTRAOPERATIVELY

1. Operation time: cutting time …… End time……. am……..pm……

2. Antibiotic used…… Yes/No If yes 1. Cephalosporin…….2. Aminoglycoside ……..3. In combination of 1 and 2 …….

3. Closed reduction …….Open Reduction…….

4. Reamed antegrade…….…. Reamed retrograde…….

Unreamed antegrade…… Unreamed retrograde……..

5. Implant used IMN: Standard SIGN nail/Fin nail…….....……

6. Size of implant: length……

Diameter….……

7. The number of screws: Proximal locking screws……..Distal locking screws……..

8. The post-operative radiograph entry point in relation to fracture pattern

Antegrade……Trochanteric entry…….Expected…….

Not expected……..

Piriformis entry……Expected……

Not expected……..

Retrograde (anterior to an extension of Blumensaat's line on the lateral view and the center)….Yes/No.

Nail endpoint in relation to the narrowest diameter of the femur (Isthmus):

i. Above isthmus proximal to lesser trochanter…….
ii. Above isthmus but distal to lesser trochanter……..
iii. In the isthmus……..
iv. Distal to Isthmus…….

9. Blood loss……..

Blood transfusion ……Yes/No……No. of units……

F) POSTOPERATIVE

Limb length discrepancy…0-1cm…..……

1-2 cm……

>2cm…….

Degree of rotation……0-10^0……

10-15^0……

>15^0……..

Length of hospital stays 0-2 days……

3-5 days……

>5 days…..

Postoperative complications.

i. Pulmonary complication…….
ii. Need for mechanical ventilation……..
iii. Thromboembolic event……
iv. Acute Respiratory Distress syndrome……
v. Abnormal bleeding per incision site……..