INDICATIONS, PROMPTNESS OF INSERTION AND REMOVAL OF CHEST TUBES IN PATIENTS AT KENYATTA NATIONAL HOSPITAL.

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2018

DECLARATION

I declare that this dissertation is the result of my original work and has not been submitted either wholly or in part in any other institution for an academic award.

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SUPERVISORS` APPROVAL

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DEDICATION

This research is dedicated to my family, my father and mother for bringing me up well. My wife, Mercy, and children, Kimberly and Myles; you have been my greatest inspiration and source of motivation.

ACKNOWLEDGEMENT

My gratitude goes to the Almighty God for keeping me healthy to enable me do this research. I also thank my supervisors; Prof. Joseph Oliech and Dr. Mark Awori for their overwhelming support, constant encouragement and guidance. I appreciate my classmates, colleagues, staff of KNH and friends for their input and support throughout this academic journey.

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ABBREVIATIONS/ ACRONYMS

ACS - American College of Surgeons

A/E - Accident and Emergency

ATLS - Advanced Trauma Life Support

BTS - British Thoracic Society

CI - Confidence Interval

ERC - Ethics and Research Committee

KNH - Kenyatta National Hospital

LOS - Length of Hospital Stay

SPSS - Statistical Package for Social Sciences

UON - University of Nairobi

CT - Computed Tomography Scan

SD - Standard Deviation

IQR - Interquartile Range

ICD - International Classification of Diseases

WHO - World Health Organization

OPERATIONAL DEFINITIONS

Chest tube insertion- This is the procedure of putting a thoracostomy tube into the pleural cavity for the purpose of draining air, fluid or a mixture of both.

Chest tube removal- This is the procedure of taking out a thoracostomy tube from the pleural cavity.

Indication- This is a condition that warrants insertion of a chest tube.

Doctors-refers to all surgical residents who will be rotating in cardiothoracic unit (ward 4B), who by being first on call will be responsible for all chest tube insertions in patients that present as emergencies at KNH.

Trauma patients-patients referred or admitted in KNH surgical wards following any form of injury to the chest that results in need for chest tube insertion.

Non trauma patients-patients referred or admitted in KNH for medical conditions other than chest injury that end up developing features of respiratory compromise due to accumulation of pleural fluid or air that necessitates chest tube insertion.

Time to insertion- This is the time from recorded decision by the doctor that a chest drain is indicated to the time that the drain is actually inserted. The approximated time to insertion is 1 hour.

Time to removal- This is the time from recorded decision by doctor that chest drain should be removed to the time that the drain is actually removed. The approximated time to removal is half a day (12 hours).

ABSTRACT

Background: Currently in Kenya there is increased motorization with a rise in road traffic accidents which predispose people to blunt chest injuries or penetrating chest injuries hence an increased likelihood of the need of a tube thoracostomy. Advances in medical practice have resulted in a rise in the diagnosis of malignancies as well as other respiratory medical conditions and infections with complications that may warrant insertion of chest tubes. Findings on the indications for chest tube insertion, time to insertion and removal of chest tubes will therefore aid in auditing the management of patients who require tube thoracostomy.

Objective: To establish the indications**,** promptness of insertion and removal of chest tubes in patients at Kenyatta National Hospital (KNH).

Study design: Prospective descriptive study done at KNH in the Accident and Emergency department, General Surgical, Cardiothoracic and Medical wards from December 2017 to May 2018.

Study Population: All patients above 18 years at Kenyatta National Hospital who had tube thoracostomy and gave consent to participate in the study.

Methodology: Ethical approval was obtained from the KNH/UON Ethics and Research Review Committee. Patients were selected by convenience sampling. Informed and signed consent was obtained from patients. Patient case notes were examined and the following information was entered into a data sheet: patient bio data, indication for chest tube insertion, time to insertion and time to removal, site of insertion, the size of catheter used, duration chest tube stayed in-situ, and the outcomes in terms of hospital stay and death. The data was analyzed using SPSS version 22.

Mean, median and as well as ranges, proportions and ratios were employed in analysis. Categorical data was analyzed using Chi square test and a p value < 0.05 was considered significant. The results were presented in tables, bar charts, pie charts and graphs.

Results: There were 125 patients reviewed after chest tube insertion between December 2017 and May 2018. Out of these, 55.2% of the chest tube insertions were due to non-trauma medical conditions and 44.8% were due to chest trauma. The time to insertion of chest tube after doctors` review was within one hour in majority of the cases. The time to removal of chest tube after the doctors` review was 7-12 hours, accounting for 62.7% of all the patients.

Three-quarters (75.4%) of the patients had the chest tube remain in situ for a period of 1-14 days. The median length of hospital stay was 9 days for trauma patients and 20 days for non-trauma cases. The mortality rate of patients undergoing chest tube insertions due to trauma causes was 5% and 95% survived, while for non-trauma cases it was 22% with 78% of patients surviving.

Conclusion: Non-traumatic conditions constituted the majority of indications for chest tube insertions compared to trauma indications. Time to insertion of chest tube was within one hour after doctors' review which is in keeping with the ATLS guidelines.

Recommendations: Investing in a well-equipped trauma bay at the Accident and Emergency department at KNH will allow proper management of trauma cases and application of ATLS guidelines and protocols to the later.

CHAPTER ONE
INTRODUCTION

1.1 Introduction

As early as the 5th century there has been documentation on the presence of air and fluid within the chest cavity. The presence of air and fluid in the chest cavity is due to the development of a communication between the intrapulmonary air space and pleural space or through the chest wall between the atmosphere and pleural space as a result of trauma to the chest or lung disease [1]. The technique of draining pleural collections has changed over the years since its first description by Hippocrates. The first closed intercostal drainage system was used by Hewitt in 1876 [2].

In the practice of medicine, general surgeons, emergency physicians, intensivists and respiratory physicians may at one time be required to insert chest tubes (tube thoracostomy). Tube thoracostomy is life-saving despite being an invasive procedure with complications. Tube thoracostomy can be performed through two techniques i.e. the blunt dissection technique or trocar technique. Trocar technique so far is associated with the highest number of complications[3]. Currently chest tube drainage is the standard of care for the management of chest trauma[4].

In different clinical settings pleural aspiration (thoracocentesis) and chest drain insertion may be required for a variety of indications. Doctors in different specialties are therefore exposed to patients requiring pleural drainage and need to be aware of safe techniques of chest tube insertion[5]. The ultimate goal of draining the collection of fluid or air in the pleural cavity is to prevent death or complications [2].

In developed and developing countries trauma continues to be an enormous public health problem and is associated with high morbidity and mortality worldwide[6]. Globally it is reported that 10% of all trauma admissions result from chest injuries and 25% of trauma related deaths are attributable to chest injuries[7]. Most chest injuries can be treated with relatively simple methods such as tube thoracostomy, appropriate analgesics management and aggressive chest physiotherapy[8].

CHAPTER TWO
LITERATURE REVIEW

2.1 Literature Review

2.1.1 Indications for Chest Tube Insertion in Patients

In a study conducted over a period of 12 months titled "Chest tube complications: How well are we training our residents", in Canada,76 chest tubes were inserted in 61 patients of which 77% were male and in 99% of these patients the injuries were secondary to blunt trauma. Out of the 61 patients in whom chest tubes were inserted, 47 (62%) patients had pneumothorax, 6 (8%) had hemothorax and 23 (30%) patients had hemopneumothorax[2].

A retrospective study was conducted in a Level I hospital in Turkey over a ten-year period of which the participants were mainly cases of chest trauma associated with blunt and penetrating trauma. Out of 4205 cases, 40% of them had chest tubes inserted[9].

A study conducted over a four-year period at the Pieter-Maritzburg Metropolitan Traum Service (PMTS) in South Africa titled "An audit of the complications of intercostal chest drain insertion in a high volume trauma service in South Africa" the results yielded showed that 1050 chest tubes had been inserted of which 91% were males. Nine hundred and sixty two (962) of these patients had unilateral chest tubes and 44 bilateral chest tubes[10].

Out of 186 patients in a study conducted in the South West region of Cameroon, 134 chest tubes were inserted. The study was titled "Indications and morbidity of tube thoracostomy performed for traumatic and traumatic free pleural effusions. Most of these chest tubes were inserted for non-traumatic conditions; pleural effusion in patients with HIV infection or pulmonary tuberculosis were the most common indication[11].

In a Regional Hospital, Limbe in South-West Cameroon out of the 151 patients that were attended to over a seven-year period, more than 91% of the chest tubes were inserted in non-traumatic conditions. Most of these patients had non-infectious pleural effusion i.e. 93 (51.6%) patients. Fifty nine patients (39%) had tested smear positive for tuberculosis and were under treatment and of these 38 (64%) had an associated HIV infection. Fifty-seven (37.7%) patients

had a chest tube inserted after a previous needle thoracentesis had been performed. Of the 57 patients, 18 (31.6%) had an associated pneumothorax[11].

In a study titled "pre-hospital and in-hospital thoracostomy: indications and complications": out of the 91 chest tubes inserted in a 7 month period, 44(48.4%) were as an indication of management of suspected tension pneumothorax, 14(15.4%) for simple pneumothorax or haemothorax, 3 (3.3%) for reduced air entry on clinical examination and 5(5.5%) for non-functioning existing tubes[12].

In a study conducted at Bugando Medical centre in Northwestern Tanzania titled "Pattern and outcome of chest injuries" 29 (19.3%) patients out of the 150 patients with chest injuries had chest tubes inserted [8].

2.1.2 Time to Insertion of a Chest Tube

In the management of empyema thoracis, prompt chest tube drainage is recommended and is best done at the time of diagnostic sampling as delayed tube thoracostomy has been associated with poorer outcome in retrospective human studies and a prospective experimental animal model[13].

The current Advanced Trauma Life Support (ATLS) guidelines stipulate that the time taken to intervene in cases of thoracic injury is very crucial. One of the most serious complications of chest injury is hypoxia which results from inadequate lung expansion due to air or fluid accumulation in the pleural cavity. An appropriately and promptly placed chest tube has been indicated as one of the strategies of preventing hypoxia[14].

During the "golden hour" of trauma many patients with chest injuries die after reaching the hospital hence management of these patients should be immediate[15].

2.1.3 Time to Removal of Chest Tube

Thoracostomy tube removal is a commonly performed procedure that is conducted almost daily in most hospitals[16].

After lung parenchyma resection it is standard procedure to insert one or two chest tubes to aid in the drainage of air or fluid. Chest tubes however induce morbidity such as pain and increase the risk of infection and immobilization[17-19]. This is uncomfortable for the patient and also it increases the length of hospital stay (LOS) and cost. Chest tubes must therefore be removed as soon as it is safe and if they have no more contribution to recovery. In the earlier chest tube protocols on removal of chest tubes it was stipulated that chest tubes can be removed after the fluid production was less than 150ml[20]. Recently it has been reported in more than one study that the removal of chest tubes is safe at a fluid level of 200ml[19], 300ml[21] and 450ml[20].

In a study conducted in Cameroon chest tubes which had been inserted in trauma and non-trauma patients were left in situ for 6 to 24 days with a mean of 9.3±3.8 days [11].

The majority of thoracic surgeons prefer to leave chest tubes in situ until the air leak has resolved and the output is less than 250mL/day[22]. In a national general thoracic surgeons meeting, approximately 75% stated that they use 250mL/day as their cutoff value for the removal of chest tubes after lung resection. Patient length of hospital stay is therefore influenced by the amount of thoracostomy tube drainage as opposed to air leak[23].

Reports from other studies indicate that chest tubes can be removed early after pulmonary lobectomy on postoperative day 2 or 1 after a wedge resection if the drainage is less than 450ml per day[24].

2.2 Statement of the Problem

In the management of chest injuries the first few minutes are critical in the event that a patient has an accumulation of fluid or air in the pleural cavity. In non- trauma patients who develop pneumothorax and pleural effusion chest tubes need to be inserted before decompensation occurs. This study therefore seeks to determine whether the doctors at KNH follow the current guidelines for tube thoracostomy. The statistics in the health information department at KNH indicate that 360 chest tubes were inserted in the year 2016, and 340 chest tubes in the year 2015. These are indicated in the tables below.

CHEST TUBE INSERTIONS YEAR 2016		
2016		
Disease Code	**Disease**	**Total**
J86.0	Pyothorax with fistula	**13**
J86.9	Pyothorax without fistula	**38**
J90	Pleural effusion, not elsewhere classified	**177**
J93.0	Spontaneous tension pneumothorax	**1**
J93.1	Other spontaneous pneumothorax	**3**
J93.9	Pneumothorax, unspecified	**19**
J94.0	Chylous effusion	**1**
J94.2	Haemothorax	**5**
S27.0	Traumatic pneumothorax	**20**
S27.1	Traumatic haemothorax	**59**
S27.2	Traumatic haemopneumothorax	**17**
S27.3	Other injuries of lung	**1**
S27.8	Injury of other specified intrathoracic organs	**2**
S27.9	Injury of unspecified intrathoracic organ	**4**
	Total	**360**

2015	CHEST TUBE INSERTIONS YEAR 2015	
Disease Code	**Disease**	**Total**
J86.0	Pyothorax with fistula	16
J86.9	Pyothorax without fistula	39
J90	Pleural effusion, not elsewhere classified	184
J93.0	Spontaneous tension pneumothorax	4
J93.1	Other spontaneous pneumothorax	2
J93.9	Pneumothorax, unspecified	12
J94.0	Chylous effusion	1
J94.2	Haemothorax	5
J94.8	Other specified pleural conditions	1
J94.9	Pleural condition, unspecified	1
S27.0	Traumatic pneumothorax	18
S27.1	Traumatic haemothorax	37
S27.2	Traumatic haemopneumothorax	12
S27.3	Other injuries of lung	1
S27.8	Injury of other specified intrathoracic organs	2
S27.9	Injury of unspecified intrathoracic organ	5
	Total	**340**
Source: Health Information Department		
Statistics Unit		
20/03/2017		

Legend: The disease code refers to the WHO International Classification of Diseases (ICD)

2.3 Study Justification

Most studies that have been undertaken look at the indications for chest tube insertion, the technique of chest tube insertion, and the amount of pleural effluent that determine removal of chest tube. None of these studies are on the time to insertion and removal of a chest tube.The last time a study was conducted on chest tube insertion at KNH was in 2005 and it was titled “The management of traumatic haemothorax and haemopneumothorax by closed tube thoracostomy”. In the study 60 (62.5%) of the patients had their chest tube removed within one week and 6 (6.3%) patients had their chest tube maintained for 15 days or more[25]. There is therefore paucity of research on time to insertion and removal of a chest tube not only in Kenya but worldwide.

Cerfolio and Bryant (2007) indicated that there has been a paucity of literature concerning the optimal time to remove a chest tube after pulmonary resection on the basis of the amount of pleural drainage[23].

The findings of this study will therefore serve as a baseline for future studies; contribute to the body of knowledge on tube thoracostomy and will help in the formulation of policies on chest tube insertion.

2.4 Research Objectives

2.4.1 Broad Objective

To establish indications, promptness of insertion and removal of chest tubes in patients at Kenyatta National Hospital.

2.4.2 Specific Objectives

1. To determine the indications for chest tube insertion in patients at Kenyatta National Hospital.
2. To determine the time to insertion of a chest tube in patients at Kenyatta National Hospital.
3. To determine the time to removal of a chest tube in patients at Kenyatta National Hospital.
4. To determine outcomes of chest tube insertion in patients at Kenyatta National Hospital.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Study Design

This was a prospective descriptive study that was conducted over a six-month period from the month of December 2017 to May 2018, where patients who had chest tubes inserted were included. Data was collected from the patients file during the current admission and where it was practically possible data was collected as soon as the procedure was done in the A/E department.

3.2 Study Area

The study was conducted at Kenyatta National Hospital (KNH) Accident and Emergency (A/E) department, General Surgical wards 5A,5B and 5D; Cardiothoracic ward 4B and Medical wards 7A,7B,7C,7D,8A,8B 8C and 8D. Trauma patients needing chest tube insertion had the chest tube inserted either in the A/E department or the mentioned surgical wards and non-trauma patients had the chest tubes inserted in the medical wards.

3.3 Study Population

All patients who had chest tubes inserted in the hospital and who had consented to participate were included in the study.

3.4 Sampling Technique

Convenience sampling technique was used. This technique was used because every possible participant who agreed to participate in the study was included.

3.4.1 Inclusion Criteria

- All patients in the hospital above 18 years of age and who had consented to participate in the study.

3.4.2 Exclusion Criteria

- All patients who had chest tubes inserted elsewhere (i.e. other than at KNH).
- All patients who had a chest tube reinserted, blocked or dislodged.

3.5 Sample Size

The sample size was determined using the Cochran's formula[26] as follows:

$$n = \frac{z^2 pq}{d^2}$$

Where,

n= the desired sample size if the target population is more than 10,000

z=the standard normal deviation at the required Confidence Interval (C.I.). In this study it was 95% with a 5% margin of error.

p= the proportion in the target population estimated to have characteristics being measured. If there is no estimate available for the proportion in the target population assumed to have the characteristics of interest, 50% should be used [27].

q= 1-p

d= the level of statistical significance set <0.05

For this study, the proportion of the target population was not known hence 50% was used i.e. p=0.5, z=1.96, and a level of statistical significance of 0.05 was desired. The sample size was then calculated as follows:

$$n = \frac{(1.96)^2 (0.5)(0.5)}{/0.05^2}$$

n= 385

Since the target population was less than 10,000, the required sample size is smaller. A final sample estimate (nf) was calculated using the Fisher et al, formula[27]:

$$n_f = \frac{n}{1 + (n-1)/N}$$

Where:

nf= the desired sample size (when the population is less than 10,000)

n= the desired sample size (when the population is more than 10,000) N= the estimate of the population size.

The target population (estimate of the population size) was 360 patients in a period of one year. The current study will take 6 months hence the target population will be 180 patients. This can therefore be substituted as follows:

$$n_f = \frac{385}{1 + (385-1)/180}$$

38nf= 122.879 hence 123 patients

Therefore, the sample size was 123 patients.

3.6 Recruitment Procedure and Investigations

The researcher recruited trauma patients and non-trauma patients who met the inclusion criteria and agreed to participant in the study by signing the informed consent. Recruited patients were followed up and reviewed while in the surgical and medical wards All patients both trauma and non-trauma had a chest radiograph done at the bare minimum for the purpose of diagnosis.

Additional tests like total blood count, ESR (erythrocyte sedimentation rate), pleural fluid analysis for microscopy, cough sputum analysis were done as adjuncts of diagnosis. These tests were not at an added cost to the patient.

3.7 Chest Tube Size

Chest tubes are made in a range of sizes measured by external diameter from 6Fr to 40Fr. The French size abbreviated as Fr is commonly used to measure size of a catheter. French size is 3 times the diameter in millimeters, for example 20Fr is 6.7mm and size 40Fr is 13.3mm. In adults Fr size 28-32 are commonly used to drain haemothorax or pyothorax while size 20-26Fr are used for pneumothorax.

3.8 Chest Tube Insertion Procedure

Chest tubes are inserted under aseptic technique at the triangle of safety whose boundaries are anteriorly; the anterior axillary line, posteriorly; the mid axillary line and inferiorly; the superior border of the 5^{th} rib. Skin is prepared with an antiseptic solution, iodine mixed with alcohol.

Skin, subcutaneous tissues, muscles and pleural membrane are anaesthetized using local anaesthetic agent, 10-20 mls of 1% lignocaine. A 1cm incision is made on the skin and deeper tissues at the centre of selected intercostal space within the triangle of safety. Blunt dissection is done using a haemostat until the pleural cavity is entered. The haemostat is withdrawn and the pleural space is explored with a finger to clear adhesions and clots.

The distal end of the chest tube is grasped with the tip of the hemostat and inserted into the pleural cavity. Chest tube is connected to the underwater seal system and confirmed to be

functional by bubbling of air or drainage of fluid (blood or pus). The chest tube is secured in place by anchoring using a purse string stitch using 2/0 nylon. The incision site of the wound is dressed and patient given analgesics. Post chest tube insertion check chest radiograph is obtained to confirm its position.

3.9 Chest Tube Removal Procedure

The chest tube is removed as soon as its function is accomplished. Check chest radiograph is done routinely to check for adequate expansion of the lung. The patient is asked to practice breathing in and out several times then take a deep breath and hold in. The chest tube removal is done by two clinicians. While the patient is holding their breath in; the 1st clinician pulls the tube out while the 2nd clinician ties the purse string stitch to obliterate the tract created by the chest tube. Occlusive dressing of the wound is done.

3.10 Research Instruments

A structured data sheet was used to collect data, (Appendix IV).

3.11 Data Collection Methods

The researcher used the structured data sheet to collect data from the patients file. The data collected included: demographic data of the participants, indication for chest tube insertion, time to insertion of the chest tube, time to removal of the chest tube and patient outcome post chest tube insertion. The datasheets were coded according to the file number so as to help in tracking the study participant's file. To accurately capture time to insertion and time to removal of chest tube the researcher requested the doctors to ensure they documented the review time. To achieve this the researcher put up reminders on notice boards in A/E department, medical wards and surgical wards. In the event that the review time was not documented, the investigator relied on the nursing kardex.

3.12 Variables

Independent variables included: demographic data of the participants (age and gender), and indication for chest tube insertion. The dependent variables were: time taken to insert chest tube and time taken to remove chest tube. The outcome variables were duration of chest tube in situ, length of hospital stay and death.

3.13 Data Management and Analysis

Data was entered into a computer base using Statistical Package of Social Sciences (SPSS) version 22. Regular file back-up was done to avoid any loss or tampering. The quantitative data was analyzed using SPPS version 22. Measures such as mean, median and ranges were used to describe the data. Descriptive data was presented in form of tables, pie charts and graphs. Categorical data was analyzed using Chi square to determine the relationship between the independent variables, dependent variables and outcome variables.

3.14 Ethical Consideration

Clearance was sought and obtained from the Ethics and Research Committee Kenyatta National Hospital/University of Nairobi. Permission to carry out the research was sought from the Kenyatta National Hospital Research and programs department, the deputy director clinical services. An informed consent form was developed and is shown in appendix (III). No names were included in the datasheets and information gathered was for research purposes only. There were no risks involved in this study. Ethical principles of autonomy, justice, beneficence and confidentiality were applied.

CHAPTER FOUR

RESUTS

4.1 Results

Participants' characteristics

The study recruited a total of 125 patients undergoing chest tube insertion in KNH. The mean age was 41.9 years (SD 17.7) and the median age was 38 years (interquartile range of 28-53) with an age range from 14 to 90 years. Table 1 shows the demographic characteristics of participants. The most common age groups were: 30-39 years 33 (27%) and 20-29 years 30 (23.8%). Males accounted for 75 (59.5%) of the participants and the male-to-female ratio of patients undergoing chest tube insertion was 3:2.

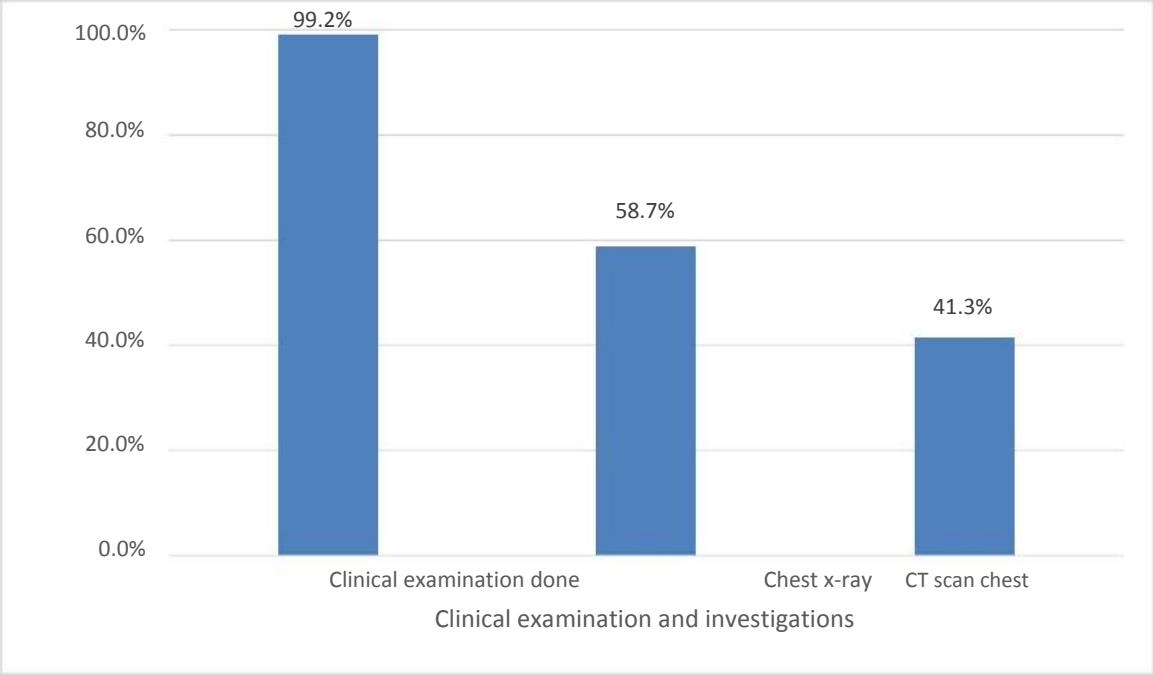
Table 1: Characteristics of patients undergoing chest tube insertion in KNH

	Frequency (n)	Percent (%)
Age		
14-20	5	4
20-29	30	23.8
30-39	33	27
40-49	23	18.3
50-59	11	8.7
60-69	11	8.7
70 and above	12	9.5
Sex		
Male	74	59.5
Female	51	40.5

Clinical examinations and investigations

Out of the 125 participants, 124 (99.2%) had clinical examination conducted and documented prior to chest tube insertion (figure 1). In addition, investigations were conducted using chest radiograph and CT scans in 73 (58.7%) and 52 (41.3%) patients, respectively (figure 1).

Figure 1: Clinical examination and investigation conducted prior to insertion of chest tubes



Indications for chest tube insertion in patients

There were 56(44.8%) patients who had chest tubes inserted following trauma and 69 (55.2%) who had underlying infective conditions, table 2. Among the cases of trauma there were 40 of penetrating trauma and 16 of blunt trauma. In the non-trauma patients, the underlying conditions comprised cases of malignancy (25.6%), tuberculosis (28.8%) and pneumonia (0.8%).

Table 2: Trauma and underlying conditions in patients undergoing chest tube insertion

	Frequency (n)	**Percent (%)**
Blunt trauma (n = 16)		
Road traffic accident	12	9.6
Non-road traffic accident	4	3.2
Penetrating trauma (n = 40)		
Knife	32	25.6
Gunshot	7	5.6
Others	1	0.8
Underlying condition (n = 69)		
Pneumonia	1	0.8
Tuberculosis	35	28.8
Malignant condition	33	25.6

Except for malignancy there was no evidence of a significant association between patient age and trauma or underlying condition, table 3. Most malignancy occurred after 30 years of age: 14 (42.4%) between 30 and 59 and 17 (51.5%) after 60 years ($p < 0.001$). The remaining trauma or underlying conditions were not associated with age ($p > 0.05$).

Table 3: Participants age and the occurrence of trauma and underlying conditions

	Age in years			
	14-29	30-59	60 +	p-value
Blunt trauma				
Road traffic accident	6(54.5)	4(36.4)	2(9.1)	0.092
Non-road traffic accident	0(0.0)	4(100.0)	0(0.0)	0.092
Penetrating trauma				
Knife	18(58.1)	14(41.9)	0(0.0)	0.298
Gunshot	3(42.9)	4(57.1)	0(0.0)	0.52
Others	0(0.0)	1(100.0)	0(0.0)	0.274
Underlying condition				
Pneumonia	0(0.0)	1(100.0)	0(0.0)	0.842
Tuberculosis	7(16.1)	24(71.0)	5(12.9)	0.38
Malignancy	2(6.1)	14(42.4)	17(51.5)	<0.001

There was a significant association between penetrating trauma and type of investigation conducted prior to chest tube insertion, table 4. Stabbings were mostly investigated using chest x-rays (93.5%, $p = 0.002$) and gunshots using CT scan (57.9%, $p = 0.001$).

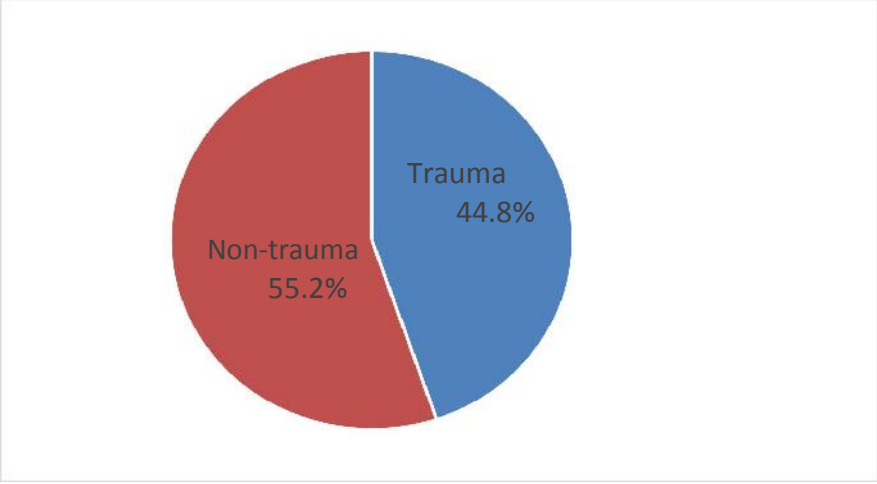
Malignant underlying causes of chest tube insertion were also associated with CT scan investigation prior to insertion (66.7%), $p = 0.001$, table 4.

Table 4: Type of trauma, underlying condition and investigations

	Investigation		
	Chest x-ray	**CT scan Chest**	**p-value**
Blunt trauma			
Road traffic accident	5(45.5)	7(54.5)	0.475
Non-road traffic accident	1(25.0)	3(75.0)	0.475
Penetrating trauma			
Knife	29(93.5)	3(6.5)	0.002
Gunshot	3(42.9)	4(57.1)	0.001
Others	1(100.0)	0(0.0)	0.666
Underlying cause			
Pneumonia	0(0.0)	1(100.0)	0.23
Tuberculosis	21(61.3)	15(38.7)	0.37
Malignancy	11(33.3)	22(66.7)	0.001

The distribution of indications for chest tube insertion were trauma in 44.8% and non-trauma in the remaining cases accounting for 55.2%, figure 2.

Figure 2: Indications for chest tube insertion in KNH



The specific trauma and non-trauma indications for chest tube insertion are presented in table 5. Haemopneumothorax occurred in 34 (27%) of patients undergoing chest tube insertion followed by haemothorax in 11 (8.7%), table 5. For the non-trauma indications for chest tube insertion pleural effusion secondary to infection occurred in 36 (28.6%) and pleural effusion secondary to malignancy in 22 (17.5%).

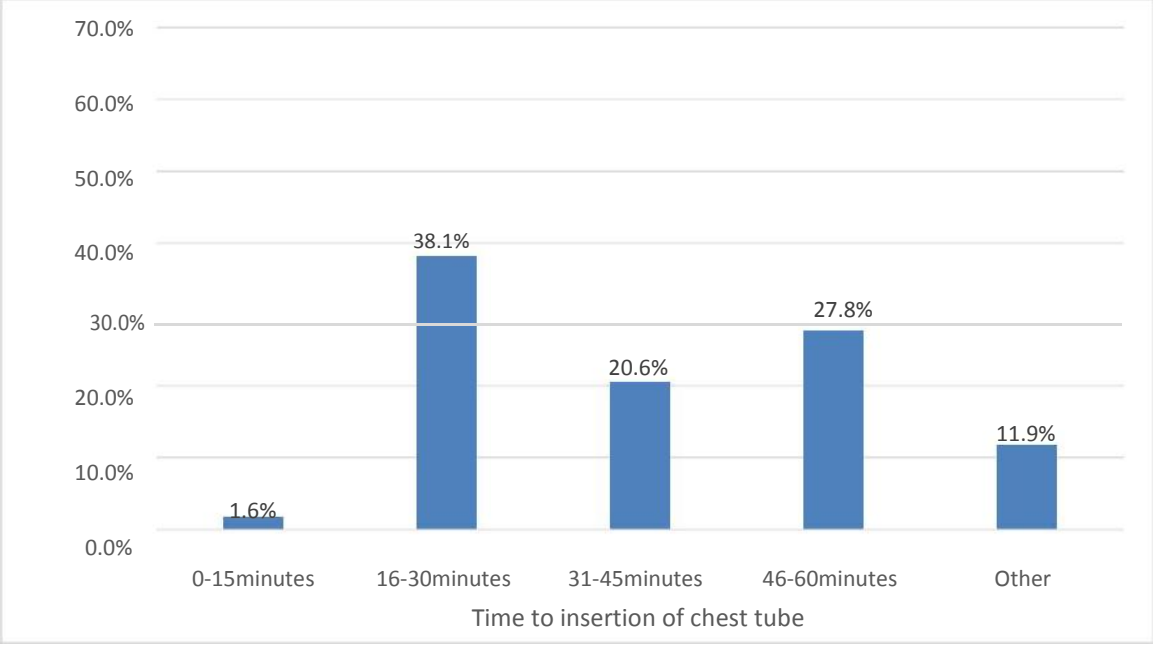
Table 5: Specific trauma and non-trauma indications for chest tube insertion in patients in KNH

	Frequency (n)	Percent (%)
Trauma		
Haemothorax	13	10.4
Simple pneumothorax	5	4
Tension pneumothorax	1	0.8
Haemopneumothorax	36	28.8
Tension and haemopneumothorax	1	0.8
Non-trauma		
Pleural effusion secondary to infection	36	28.8
Pleural effusion secondary to malignancy	30	24
Empyema thoracis	1	0.8
Pleural effusion	2	1.6

Time to insertion of a chest tube in patients

Chest tube insertion after recorded doctors' orders occurred most commonly (38.1%) between 16 and 30 minutes following clinical decision, figure 2. Approximately one-quarter (27.9%) of insertion were conducted between 46-60 minutes after decision was made and one in every four insertions (20.6%) were done in 31-45 minutes.

Figure 3: Time to insertion of chest tubes in patients in KNH



There was a significant association between time to insertion of chest tube after the initial 15

There was a significant association between time to insertion of chest tube after the initial 15 minutes and indication for insertion, table 6. Chest tube insertions following trauma were commonly done 16-30 minutes after clinical decision was made (82.7%) while those for non-traumatic indications were commonly inserted after 30 minutes.

Table 6: Time to insertion according to indication for chest tube insertion

	Indication			
	Trauma	Non-trauma	Chi square	p-value
Time to insertion				
0-15minutes	1(1.9)	1(1.6)	0	0.882
16-30minutes	45(82.7)	5(6.3)	69.6	<0.001
31-45minutes	5(7.7)	19(28.1)	7.8	0.005
46-60minutes	5(7.7)	28(40.6)	16.2	<0.001
Other	0(0.0)	16(23.4)	14	<0.001

There was no association between the specific type of trauma indication for chest tube insertion and the time to insertion of chest tubes, table 7 (p values > 0.05). Similarly, most of the specific non-trauma indications for chest tube insertion did not show a significant association with time to chest tube insertion (p values > 0.05).

Table 7: Time to insertion of chest tube according to indication in patients with trauma

	Time to insertion (in mins)					
	0-15	16-30	31-45	46-60	Other	p-value
Trauma						
Haemothorax	0(0.0)	10(81.8)	0(0.0)	3(18.2)	-	0.342
Simple pneumothorax	0(0.0)	4(80.0)	0(0.0)	1(20.0)	-	0.653
Tension pneumothorax	0(0.0)	1(100.0)	0(0.0)	0(0.0)	-	0.975
Haemopneumothorax	1(2.9)	29(82.4)	5(11.8)	1(2.9)	-	0.137
Tension and haemopneumothorax	0(0.0)	1(100.0)	0(0.0)	0(0.0)	-	0.975
Non-trauma						
Pleural effusion secondary to infection	0(0.0)	1(2.8)	8(22.2)	19(52.8)	8(22.2)	0.139
Pleural effusion secondary to malignancy	0(0.0)	5(16.6)	7(23.3)	7(23.3)	11(36.7)	0.372
Empyema thoracis	1(25.0)	0(0.0)	3(75.0)	0(0.0)	0(0.0)	0.975
Pleural effusion	0(0.0)	0(0.0)	0(0.0)	0(0.0)	2(100.0)	0.15

There was an association between type of trauma and chest tube insertion, table 9. All chest tube insertions following road traffic accidents were done between 16 and 30 minutes after decision was made to insert a tube ($p = 0.012$) and half of non-traffic accidents delayed to 46-60 minutes ($p = 0.012$). Insertion with malignant underlying cause were also commonly (42.4%) done between 46 and 60 minutes after clinical decision, ($p = 0.002$).

Table 8: Time to insertion of chest tube and other characteristics of patients undergoing insertion

	Time to insertion (in minutes)					
	0-15	16-30	31-45	46-60	Other	p-value
Age in years						
14-29	1(2.9)	21(60.0)	6(17.1)	5(14.3)	2(5.7)	0.02
30-59	1(1.5)	24(35.3)	13(19.1)	20(30.9)	9(13.2)	0.876
60 and above	0(0.0)	3(13.0)	7(30.4)	9(39.1)	4(17.4)	0.078
Type of trauma						
Road traffic accident	0(0.0)	12(100.0)	0(0.0)	0(0.0)	-	0.012
Non-road traffic accident	0(0.0)	2(50.0)	0(0.0)	2(50.0)	-	0.012
Knife	0(0.0)	24(77.4)	4(12.5)	4(12.5)	-	0.175
Gunshot	1(14.3)	5(71.4)	0(0.0)	1(14.3)	-	0.132
Others	0(0.0)	1(100.0)	0(0.0)	0(0.0)	-	0.959
Underlying cause						
Pneumonia	0(0.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0.806
Tuberculosis	1(3.2)	0(0.0)	11(31.3)	15(42.9)	8(22.8)	0.13
Malignancy	0(0.0)	3(9.1)	10(30.3)	14(42.4)	6(18.2)	0.002

Table 9 shows that 124 (99.2%) insertions were in the triangle of safety, two-thirds (84, 66.7%) used catheter size 24-28F and 65 (51.6%) of inserted tubes remained in situ for between 7 and 14 days.

Table 9: Details of chest tube insertion in patients in KNH

	Frequency (n)	**Percent (%)**
Site of insertion		
Triangle of safety	124	99.2
Others	1	0.8
Size of catheter		
20-24F	37	30.2
24-28F	84	66.7
>28F	4	3.2
Duration chest tube in-situ		
<7days	30	23.8
7-14days	65	51.6
>14days	30	23.8

Time to removal of a chest tube in patients

Of the 125 chest tubes, 79 (62.7%) were removed 7-12 hours from the time the doctor made the decision to remove the chest drain, table 10. There were 123 (97.6%) chest x-rays conducted prior to removal of tubes and 31 (24.6%) repeat chest x-rays post removal of the tube.

Table 10: Removal of chest tube in patients in KNH

	Frequency (n)	Percent (%)
Time to removal		
<6hours	32	25.4
7-12hours	79	62.7
13-24hours	14	11.9
>24hours	0	0
Chest x-ray pre-removal		
Yes	123	97.6
No	2	2.4
Chest x-ray post removal		
Yes	31	24.8
No	94	75.2

Duration of Chest Tube in Situ

There was also a significant association between duration chest tube remained in situ and trauma or non-trauma cause for chest tube insertion. The non-trauma cases had a significantly longer duration with the tube in situ compared to trauma cases.

Table 11: Duration of chest tube in situ

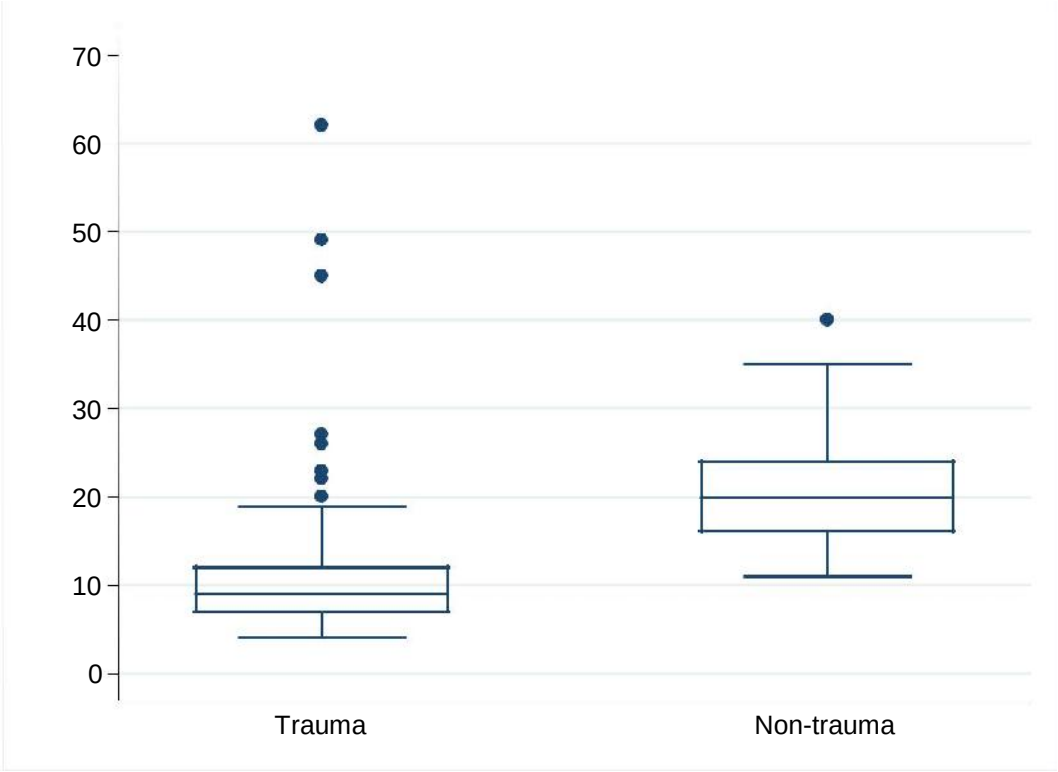
	Indication			
	Trauma	Non-trauma	Chi square	p-value
Duration chest tube in situ				
<7days	30(53.6)	0	0	<0.001
7-14days	23(39.2)	42(59.7)	69.6	0.043
>14days	4(7.3)	26(40.3)	7.8	<0.001

Outcomes of chest tube insertion

Length of stay

There was a significant difference in the length of stay among patients undergoing chest tube insertion due to trauma and non-trauma causes ($p < 0.001$). The median length of stay in all patients was 15 days (IQR 9-21). In the patients with trauma the median stay was 9 days (IQR 7-12) compared to 20 days (IQR 16-24) for non-trauma cases (figure 3).

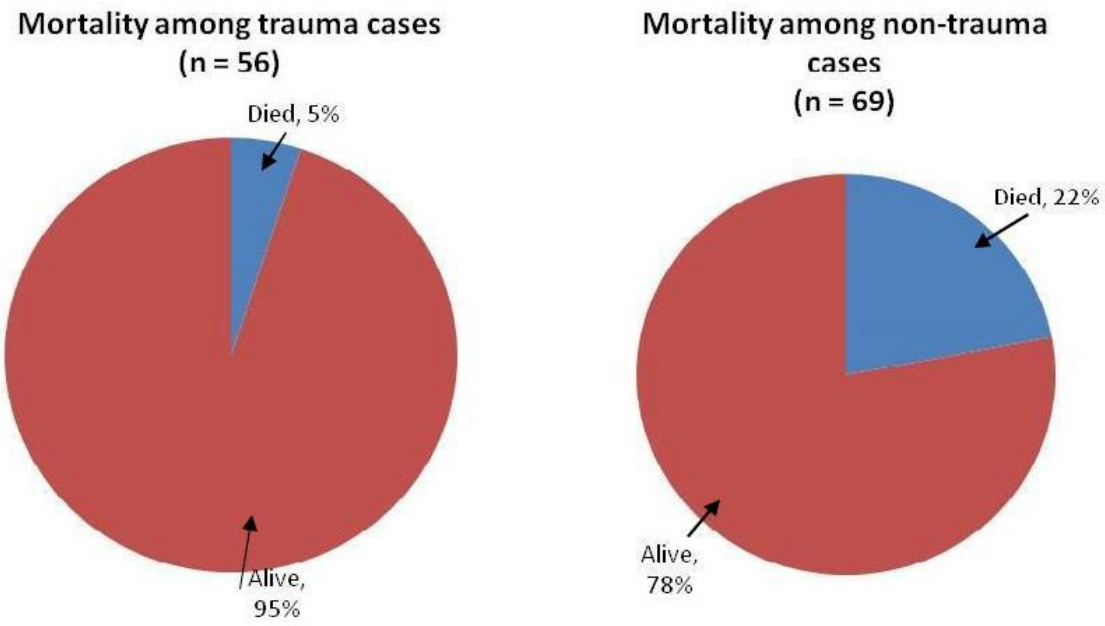
Figure 4: Length of hospital stay among patients undergoing chest tube insertion according to trauma or non-trauma diagnosis



Mortality

Figure 5 shows that the mortality rate among patients undergoing chest tube insertion in KNH was 5% among the trauma patients who had chest tube inserted and 22% for the non-trauma cases.

Figure 5: Mortality among patients undergoing chest tube insertion in KNH



CHAPTER FIVE
DISCUSSION

5.1 Discussion

Chest tube insertion remains a basic surgical procedure that is lifesaving.[2.] One of the main indications for tube thoracostomy is chest trauma resulting in life threatening conditions like haemothorax, pneumothorax or pneumohaemothorax[4].

In this study of 125 patients in KNH, non-traumatic medical conditions accounted for the majority of chest tube insertions making up 69 patients (55.2%) compared to 56 patients who had trauma (44.8%). This is comparable to a study in West Africa, where out of 151 patients seen in a seven year period 91 % of the chest tubes were inserted in non-traumatic conditions[11].Of the trauma patients 40(71%) had penetrating injuries compared to 16(28%) who had blunt injuries. These results compare to Omar Mukhtar findings of 61% having penetrating injuries and 38% had blunt injuries[25]. Among the penetrating injury patients, stab wounds accounted for 80% of cases followed by gunshots at 17.5%. Omar's study showed stab wounds accounted for 50% of cases followed by gunshots [25]. Of the underlying medical conditions in the current study, tuberculosis accounted for 28.8%, malignancy 25.6% and pneumonia 0.8%.

There was no significant association between the age of the patient and trauma or underlying condition. It was however noted that majority of the malignancies occurred in seventeen patients aged above 60 years representing 51.5% of all patients with malignancies who had chest tube inserted. Trauma cases were also common in the younger age group with penetrating knife stab wounds occurring in eighteen patients aged between 14-29 years, representing 58.1% of all trauma cases. Therefore, trauma represents a significant burden of non-communicable disease in young adults in their productive years resulting in loss of economic productivity due to hospitalisation.

There was a significant association between the penetrating trauma and type of investigations done before chest tube insertion. Chest stab wounds were mostly investigated with chest radiographs (93.5% p=0.002) and gunshot wounds were investigated using Computed

Tomography (CT) scans (57.9% p=0.001). Malignant conditions resulting in pleural effusion were also associated with CT scan investigations prior to tube insertion (66.7% p=0.001).

Time to insertion of chest tube after recorded doctors' review occurred commonly within one hour of review. About a quarter of tube insertions were done between 46-60 minutes after decision was made and one in every four tube insertions were done between 31-45 minutes. Chest tube insertion following trauma were done 16-30 minutes after the decision was made (82.7% of cases) while for non-traumatic indications were commonly inserted after 30-60 minutes (68.7%).This is critical because interventions within the golden one hour of trauma is vital for the patients survival and is keeping to the ATLS guidelines[14,15].There was an association between the type of trauma and the time to insertion; road traffic accident cases had chest tube insertion within 16-30 minutes compared to blunt trauma at 30-45 minutes. However, 15 patients (23.4%) with non-traumatic indications for chest tube insertions had the tube inserted more than 1 hour later, with 3 patients having the chest tube inserted 6 hours later and 2 patients more than 24 hours later. This was due to delays in procuring the chest tube insertion sets in medical wards compared to the surgical units and accident and emergency departments. Kenyatta National Hospital being a Level I Trauma Centre is expected to follow guidelines hence chest tubes should be inserted within the shortest time possible after a diagnosis is made.

According to the committee on trauma by American College of Surgeons a Level I Trauma Centre should have 24-hour coverage by general surgeons with prompt availability of all other specialists that is; orthopedic surgeons, neurosurgeons, critical care specialists, anesthesiologists, radiologists and other cadres. There should also be a trauma bay in the general Accident and Emergency department where there is enhanced communication between the pre-hospital team and the in-hospital team and there is proper triage and management of injured patients. In the designated trauma bay the team leader is a general surgeon, trauma surgeon or a senior resident in one of these two specialties covering the unit.

It is paramount that the staff in the trauma centre undergo continuous professional development and are involved in research so as to keep at per with current guidelines. Availability of resources also ensures that the set guidelines are followed to the core [28].

Of the 125 chest tubes inserted, 79 (62.7%) were removed within 7-12 hours of the doctors' decision to remove the tube. This was after a review to ascertain if the tube was inactive (in case of pneumothorax bubbling should have seized) or had a drainage of <150mls per day (in case of haemothorax or pleural effusion[20, 28]. Chest radiographs were performed in 123 patients (97.6%) prior to removal of chest tube removal. It is important to have radiological evidence of adequate expansion of the lung before chest tube removal[29].

The majority of the patients 65 (51.6%) had the chest tube remain in place for 7-14 days. Three quarters of the patients (75.4%) had the chest tube in situ for 1-14 days with mean of 7±2.5 days. This compares well to a study in Cameroon where chest tubes for both trauma and non-trauma remained in situ for 6-24 days with mean of 9.3±3.8 days.

In Omar Mukhtar's study, 60% of patients had tubes removed within one week with only 6% of patients having their tubes removed after more than 2 weeks; the duration of tube remaining in situ ranged from 3-36 days with a mean of 6 days in the same study[25].

A significant difference was noted in the length of hospital stay among patients undergoing tube thoracostomy due to trauma and non-trauma indications. Among all patients the median length of stay was 15 days. In patients with trauma the median length of stay was 9 days as compared to 20 days for non-trauma cases. Younes et al demonstrated that removal of chest tube based on amount of drainage alone was associated with a significantly longer hospital stay[19].

For the non-trauma cases, the underlying medical conditions warranted the patients to be admitted for longer periods for further evaluation, investigations and management. The same was observed for polytrauma cases involving more than the chest region, especially if there were abdominal injuries, head injuries as well as fractures of the long bones.

The mortality of patients undergoing chest tube insertion due to trauma was 5% and 22% for non-trauma indications. Mortality was highest in the medical wards where the underlying

conditions were serious or critical and in severely injured polytrauma patients. Of the trauma cases 95% of patients who had chest tube inserted survived while in non-trauma cases 78% were discharged home alive.

CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Chest tube insertion remains a basic life-saving surgical procedure for both trauma and non-trauma cases.

The majority of the indications for chest tube insertions are non-traumatic medical conditions. Of the trauma indications for chest tube insertions, penetrating chest injuries due to stab wounds account for the majority of cases.

The time to insertion of chest tube in our facility, KNH, is within one hour after the doctor's review.

The majority of patients undergo clinical examination and investigations before the chest tube is inserted.

Three quarters of the patients have their chest tubes in situ for up to 2 weeks. This is a relatively long period that may predispose to complications like empyema thoracis.

The median length of hospital stay was 15 days and this could be explained by the duration of chest tube being in situ.

6.2 Recommendations

Investing in a well-equipped trauma bay in the Accident and Emergency department where for the traumatic indications for chest tube insertion like tension pneumothorax, chest tube insertion is done promptly prior to investigations being done like chest radiograph. Currently the KNH Accident and Emergency department handles both trauma and other medical cases concurrently resulting in unnecessary delays for the management of emergency trauma cases. A dedicated and functional trauma bay will allow proper practice of ATLS guidelines and protocols.

Chest tube insertion sets should be readily available in medical wards to shorten time to insertion for the non-trauma cases. Each medical ward should stock at least one chest tube insertion set which should be replaced promptly once it has been utilized.

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APPENDICES

Appendix I: Work plan

	May 2017	June 2017	July 2017	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2017	Feb 2018	Mar 2018	Apr 2018	May 2018	June 2018
Proposal development														
Ethical Clearance														
Data Collection														
Data Processing and analysis														
Report Writing														

Appendix II: Budget

Budget Item	**Total Cost (Khs)**
Research fee for KNH/UoN- ERC	2, 000
Stationery • Printing • Photocopying • Binding • Pens	 20,000 10,000 10,000 1,000
Statistician fee	30,000
Contingency fee	10,000
GRAND TOTAL	**83,000**

Appendix III: Consent Form

The title of the study is "**Indications, Promptness of Insertion and Removal of Chest Tubes in Patients at Kenyatta National Hospital".**

Researcher's statement

Hello, My name is Dr. David Maina Mungai, a post graduate student at the University of Nairobi's School of Medicine undertaking a Masters degree in General Surgery. I am carrying out a study to determine the **"Indications, Promptness of Insertion and Removal of Chest Tubes in Patients at Kenyatta National Hospital"** as part of my course requirement.

The purpose of this study is to establish the indications**,** promptness of insertion and removal of chest tubes in patients at Kenyatta National Hospital.

The purpose of this consent form is to provide you with information you need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what I will ask you to do, the possible risks and benefits, your rights as a volunteer and anything else about the research or this form that is not clear. When I have answered all your questions, you can decide if you want to participate in the study or not. You may refuse to participate and you are free to withdraw from this study at any time without penalty or loss of benefits to which you are otherwise entitled to.

Your participation in the study is on voluntary basis and will not result in any physical or psychological harm. There will be no penalty if you decide to withdraw from the study. In case you decide to participate in the study, your file will be used to collect information on the reason why the chest tube was inserted, time to chest tube insertion and time to chest tube removal. You are free to ask any questions about the study at any time. There are no monetary benefits for you as an individual participant but the information collected will help in the improvement of medical care of patients requiring chest tube insertion. The information will also aid the management of the institution to better understand issues concerning chest tube insertion and management and empower the staff on evidence based practice.

You will not be required to write any of your personal particulars on the questionnaire and the information you provide will be kept confidential and anonymous. The questionnaires will be kept under lock and key and only the researcher and the supervisors will access them. Your participation will be highly appreciated.

Information dissemination plan

The results of this study will be presented to the management of the Accident and Emergency department, General surgical wards, cardiothoracic ward and Medical wards, KNH. The results will also be presented to the management of Kenyatta National Hospital and the Kenyatta National Hospital Research Department to aid in development of policies in chest tube insertion which will help in the improvement of patient care and the relevant stakeholders for examination purposes, publication and abstract presentation for scientific use. The means of disseminating the results will be group briefings which will be held in all the relevant departments from the institution and any conferences organized by Kenyatta National Hospital or University of Nairobi.

Moreover, the participants' particulars will not be included or identified as the results will be in form of raw data.

Please contact the following people if you have questions or concerns about the content of this study; Researcher: **Dr. David Maina Mungai** of the **University of Nairobi- telephone number: 0720820108** or email at mungaimd81@gmail.com, as well as the Chairperson, KNH/UoN-ERC, Professor M.L. Chindia; **2726300 Ext: 44102**, Fax: **0725272**; Email: uonknh_erc@uonbi.ac.ke.

Participant's Statement

I have read the foregoing information, and I have had the opportunity to ask questions about it and any questions I have asked have been answered clearly and to my satisfaction. I do therefore agree voluntarily to participate in this study and understand that I have the right to withdraw from the study at any time without in any way attracting any penalties.

Signature of participant: _____ Date: _____

Name of the researcher: Dr. David Maina Mungai

Signature of researcher _____ Date: _____

If non-literate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Thumb print of participant.

Signature of Participant _____

Date _____

Kiambatisho I: Fomu ya kibali

Kichwa cha utafiti ni “Indications,Promptness of Insertion and Removal of Chest Tubes in Patients at Kenyatta national hospital”.

Taarifa Ya Mtafiti

Jina langu ni Dkt. David Maina Mungai, mwanafunzi anayesomea Chuo Kikuu cha Nairobi cha Matibabu akifanya shahada ya Masters kwa upasuaji wa jumla. Ninafanya utafiti kwa anwani ya "Indications,Promptness of Insertion and Removal of Chest Tubes in Patients at Kenyatta National Hospital" kama sehemu ya mahitaji yangu ya kozi.

Kusudi la utafiti huu ni kujua sababu,muda kabla ya kuweka au kutoa mrija kwa wagonjwa walioumia kifua au walio na ugonjwa wa kuwafanya wawe na maji au hewa kifuani. Madhumuni ya fomu hii ya idhini ni kukupa maelezo unayohitaji ili kukusaidia kuamua kuwa katika utafiti au la. Tafadhali soma fomu kwa makini. Unaweza kuuliza maswali kuhusu madhumuni ya utafiti, nini nitakuomba kufanya, hatari na manufaa iwezekanavyo, haki zako kwa kujitolea kushiriki na kitu kingine chochote kuhusu utafiti au fomu hii ambayo haukuelewa. Ninapojibu maswali yako yote, unaweza kuamua kama unataka kushiriki katika utafiti au la. Unaweza kukataa kushiriki na una uhuru wa kujiondoa kwenye utafiti huu wakati wowote bila adhabu au upotevu wa faida ambazo wewe ungezipata.

Ushirika wako katika utafiti huu ni kwa hiari na hauwezi kusababisha madhara yoyote ya kimwili au ya kisaikolojia. Hakutakuwa na adhabu ikiwa unapoamua kujiondoa kwenye utafiti. Ikiwa unaamua kushiriki katika utafiti huu,faili yako itatumika kukusanya taarifa ili kujua sababu ya mrija kuingizwa kifuani, muda uliotumika kuingiza na muda uliotumika kuondoa.Una uhuru wa kuuliza maswali yoyote kuhusu utafiti huu wakati wowote.

Hakuna faida ya fedha kwako kama mshiriki binafsi lakini habari zilizokusanywa zitasaidia katika kuboresha matibabu ya wagonjwa wanaohitaji mrija kwenye kifua. Taarifa pia itasaidia usimamizi wa taasisi kuelewa vizuri maswala kuhusu magonjwa ya kifua na kuwawezesha wafanyikazi juu ya mazoezi ya msingi.

Hautastahili kuandika maelezo yoyote ya kibinafsi kwenye fomu ya maswali na taarifa utakazotoa zitahifadhiwa kwa siri na hazitajulikana. Habari zitakazotokana na utafiti huu zitawekwa siri na zitajulikana tu na mtafiti pamoja na wasaidizi wake pekee. Ushiriki wako utathaminiwa sana.

Mpango wa usambazaji wa habari

Matokeo ya utafiti huu yatawasilishwa kwa usimamizi wa Idara za Dharura, Kata za Upasuaji, kata za upasuaji wa kifua na wadi za matibabu ya kijumla, KNH. Matokeo yatatolewa pia kwa usimamizi wa Hospitali ya Taifa ya Kenyatta na Idara ya Utafiti wa Hospitali ya Taifa ya Kenyatta ili kusaidia katika maendeleo ya sera na kuboresha huduma za wagonjwa na wadau husika kwa ajili ya uchunguzi, uchapishaji na uwasilishaji kwa matumizi ya kisayansi. Njia za kusambaza matokeo zitakuwa kikao cha makundi ambacho kitafanyika katika idara zote husika kutoka kwa taasisi na mikutano yoyote iliyoandaliwa na Hospitali ya Taifa ya Kenyatta au Chuo Kikuu cha Nairobi. Aidha, maelezo ya washiriki hayajajumuishwa au kutambuliwa kama matokeo yatakuwa katika fomu ya data ghafi.

Tafadhali wasiliana na watu wanaofuata ikiwa una maswali au wasiwasi juu ya maudhui ya utafiti huu; Mtafiti: **Dkt. David Maina Mungai** wa **Chuo Kikuu Cha Nairobi- Numbari Ya Simu 0720820108** au parua pepe mungaimd81@gmail.com, ama pia Mwenyekiti, KNH/UoN-ERC, Professa M.L. Chindia; **2726300 Ext: 44102**, Fax: **0725272**; Email: uonknh_erc@uonbi.ac.ke.

Taarifa ya Mshiriki

Nimesoma taarifa iliyotangulia, na nimekuwa na fursa ya kuuliza maswali kuhusu hilo na maswali yoyote niliyoyauliza yamejibiwa kwa uwazi na nimeridhika. Kwa hivyo mimi nakubali kushiriki katika utafiti huu na kuelewa kuwa nina haki ya kujiondoa kwenye utafiti huu wakati wowote bila kuvutia adhabu yoyote.

Sahihi ya mshiriki:

_____Tarehe:_____

Jina la Mtafiti: Dkt David Maina Mungai

Sahihi ya Mtafiti _____ Tarehe: _____

Taarifa Kutoka Kwa Mtafiti

Nimemsomea mhusika muhtasari wa utafiti na nikajizatiti kuhakikisha kuwa anaelewa ya kwamba yafuatayo yatatendeka:

a) Ujumbe wowote utakaopatikana utatendewa usiri.
b) Matokeo ya utafiti huu yanaweza yakachapishwa ili kusaidia katika matibabu ya wagonjwa walioumia kifua na kuhitaji mrija au wagonjwa walio na magonjwa yakuwalizimisha kuwekewa mrija.

Mhusika amepata nafasi ya kuuliza maswali kuhusu utafiti, na maswali yake yote yamejibiwa kwa ukamilifu jinsi niwezavyo. Mhusika hajalazimishwa kutoa ruhusa kuhusika katika utafiti huu,na ametoa ruhusa kwa hiari yake mwenyewe. Jina la mtafiti _____

Sahihi ya mtafiti _____

Tarehe _____

(Siku/Mwezi/Mwaka)

Appendix IV: Data Sheet

INDICATIONS, PROMPTNESS OF INSERTION AND REMOVAL OF CHEST TUBES IN PATIENTS AT KENYATTA NATIONAL HOSPITAL

Checklist number: _____

Section A. Demographic Data

1. Age in years_____
2. Gender
   a) Male []
   b) Female []

Section B: Clinical examination

Done

1. Yes []
2. No []

Section C: Investigations

1. Chest X-ray []
2. CT scan chest []
3. Other tests: Specify _____

Section D: Type of Trauma

1. Blunt
   a) Road Traffic accident []
   b) Non Road Traffic accident []
2. Penetrating
   a) Knife []
   b) Gunshot []
   c) Others (specify)_____

Section E: Underlying condition

1. Infective
    a) Pneumonia []
    b) Tuberculosis []
2. Malignancy []
3. Other (specify)_____

Section F: Indication for chest tube insertion

1. Trauma
    a) Haemothorax []
    b) Simple Pneumothorax []
    c) Tension Pneumothorax []
    d) Haemopneumothorax []
2. Non- Trauma
    a) Pleural effusion secondary to infection []
    b) Pleural effusion secondary to malignancy []
    c) EmpyemaThoracis []

Section G: Time to insertion of chest tube after the recorded doctor's decision to insert a chest drain

a) 0-15 minutes []
b) 16-30 minutes []
c) 31-45 minutes []
d) 46-60 minutes []
e) Other (Specify) _____

Section H: Site of insertion

1. Triangle of safety []
2. Others specify_____

Section I: Size of Catheter

a) <20 F []
b) 20-24F []
c) 24-28F []
d) >28F []

Section J: Duration chest tube in situ

a) < 7 days []
b) 7-14 days []
c) > 14 days []

Section K: Time to removal of chest drain i.e. from the time doctor makes decision to remove chest drain to the time the chest drain is actually removed

a) <6 hours
b) 7-12 hours
c) 13-24 hours
d) > 24 hours

Section L: Post insertion investigation

1. Chest X-ray before removal
   a) Yes []
   b) No []
2. If no for 1 above why? _____
3. Chest X-ray post removal
   a) Yes []
   b) No []

Section M: Patient outcome

1. Time patient is admitted in the ward (number of days)
   a) Trauma patient _____
   b) Non- trauma patient _____

2. Patient alive
    a) Yes /Alive []
    b) No /Died []

Appendix IV: Approval Letter from KNH/UoN Ethics and Research Committee

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
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Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/380

22nd December, 2017

KENYATTA NATIONAL HOSPITAL APPROVED 22 DEC 2017 KNH/UoN-ERC P.O. Box 20723-00202 NRB.

Dr. David Maina Mungai
Reg. No. H58/69205/2013
Department of Surgery
School of Medicine
College of Health Sciences
University of Nairobi

Dear Dr. Mungai,

REVISED RESEARCH PROPOSAL – INDICATIONS, PROMPTNESS OF INSERTION AND REMOVAL OF CHEST TUBES IN PATIENTS AT KENYATTA NATIONAL HOSPITAL (P435/08/2017)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and approved your above proposal. The approval period is from 22nd December 2017- 21st December 2018.

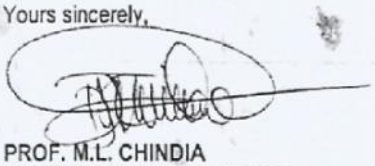
This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
d) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover

For more details consult the KNH- UoN ERC website **http://www.erc.uonbi.ac.ke**

Yours sincerely,



PROF. M.L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Assistant Director, Health Information, KNH
The Chairperson, KNH-UoN ERC
The Dean, School of Medicine, UoN
The Chair, Dept. of Surgery, UoN
Supervisors: Prof. Joseph Samuel Oliech (Dept. of Surgery, UoN),
Dr. Mark Nelson Awori (Dept. of Surgery, UoN)