



Undergraduate Study Program

School of Medicine

**KNOWLEDGE, ATTITUDES, AND CLINICAL COMPETENCE IN CHEST TUBE
MANAGEMENT AMONG MEDICAL INTERNS AT TERTIARY TEACHING
HOSPITALS IN ADDIS ABABA, ETHIOPIA**

Investigator: Dr. Amanuel Tekle Mekonnen (Medical Intern)

**A Thesis Report Submitted to the School of Public Health, St. Paul's Hospital Millennium
Medical College in Partial Fulfillment of the Requirements for the Degree of Doctor
Medicine**

March 2026

Addis Ababa, Ethiopia

St. Paul's Hospital Millennium Medical College
Undergraduate Study Program
School of Public Medicine

Name of investigator	Amanuel Tekle Mekonnen (Medical Intern)
Full title of the research project	Knowledge, Attitudes, and Clinical Competence in Chest Tube Management Among Medical Interns at Tertiary Teaching Hospitals in Addis Ababa, Ethiopia
Duration of the project	Feb 17, 2025- February 20, 2026
Study area	Tertiary Teaching Hospitals in Addis Ababa
Total cost of the project	8000 ETB
Source of funding	St. Paul's Hospital Millennium Medical College
Address of the investigator	<u>E-mail-amanueltekmek18@gmail.com</u> Cell phone: +251953419774
Name of the advisors and contact address	Mr. TakeleGezahegn (MPH, Assistant Professor of Public Health) Email: <u>takele.gezahegn@sphmmc.edu.et</u> Dr NatanNegash (Emergency and critical care medicine) Email: <u>Natannegash10@gmail.com</u>

March 2026

Addis Ababa, Ethiopia

Acknowledgements

First and foremost, I would like to express my deepest gratitude to the Almighty God for granting me the strength, health, and perseverance to complete this research project.

My heartfelt appreciation also goes to the faculty and staff of School of Public Health at St. Paul's Hospital Millennium Medical College whose academic and administrative assistance greatly facilitated the completion of this research. I extend my gratitude to the staff of SPHMMC involved in this study for their cooperation and for allowing me access to the data necessary for this study. I am sincerely thankful to my advisor, Mr. Takele Gezahegn (MPH, Assistant Professor of Public Health) and Dr Natan Negash (Emergency and Critical Care Medicine) for their invaluable guidance, constructive feedback, and continuous support throughout the course of this study. Their expertise and encouragement have been instrumental in shaping this work.

Special thanks go to my colleagues and classmates for their insightful discussions, motivation, and moral support during the research process. Finally, I am deeply grateful to my family and loved ones for their unwavering encouragement, understanding, and patience throughout this journey.

Table of Contents

Acknowledgements.....	3
List of Tables.....	6
List of Figures	7
Abbreviations	8
Abstract	9
1. Introduction	11
Background of the Study	11
Statement of problems	12
Significance of the Study	14
Literature review.....	15
Overview of Chest Tube Management by Medical Interns	15
Knowledge of Chest Tube Management.....	16
Attitude Towards Chest Tube Management.....	16
Competencies	17
Associated Factors of Practice	17
Summary of Research Gaps.....	18
Objectives of the Study.....	20
General Objective	20
Specific Objectives	20
Methods and Materials.....	21

4.1 Study Area and Period	21
4.2. Study Design.....	21
4.3 Population	22
4.3.1. Source Population	22
4.3.2. Study Population.....	22
4.3.3. Study Unit	22
4.3.4. Sampling Frame	22
4.4. Eligibility Criteria	22
4.4.1. Inclusion Criteria	22
4.4.2. Exclusion Criteria	23
4.5. Sample Size Determination and Sampling Technique	23
4.5.1. Sample Size Determination.....	23
4.5.2. Sampling Technique and procedures	24
4.6. Study Variables	24
4.7. Operational Definitions	25
4.8. Data Collection Tool, Methods and Procedures	26
4.9. Data Quality Control	27
4.10. Data Processing and Analysis	27
4.11. Ethical Considerations	28
4.12. Plan for Dissemination of Results	29
Results.....	30

5. Results.....	30
5.1 Sociodemographic Characteristics.....	30
5.2 Training and Clinical Experience.....	30
5.3 Knowledge, Attitude, and Clinical Competence.....	30
5.4 Factors Associated with Knowledge, Attitude, and Competence	33
6. Discussion.....	35
7. Conclusion and Recommendations.....	38
7.1. Conclusion.....	38
7.2 Recommendations	38
8. References.....	40
Annexes.....	41
Annex 1: Participants Information Sheet.....	41
Annex 2: Questionnaire	43
Declaration.....	49
Advisor Approval	Error! Bookmark not defined.

List of Tables

Table 1: Multivariable Analysis of Factors Associated with Knowledge, Attitude, and Clinical Competence (N=297)	34
---	----

List of Figures

Figure 1: Conceptual framework	19
Figure 2: Distribution of Knowledge Levels on Chest Tube Management Among Medical Interns (N = 297).....	31
Figure 3: Distribution of attitude Levels towards Chest Tube Management Among Medical Interns (N = 297)	32
Figure 4: Distribution of Clinical Competence in Chest Tube Management Among Medical Interns (N = 297)	33

Abbreviations

ATLS: Advanced Trauma Life Support

CBME: Competency-Based Medical Education

CI: Confidence Interval

ICS: Intercostal Space

IRB: Institutional Review Board

KAP: Knowledge, Attitude, and Practice

LMIC: Low- and Middle-Income Countries

OR: Odds Ratio

OSCE: Objective Structured Clinical Examination

SD: Standard Deviation

SPHMMC: St. Paul's Hospital Millennium Medical College

SPSS: Statistical Package for the Social Sciences

SBT: Simulation-Based Training

TASH : Tikur Anbessa Specialized Hospital

Abstract

Background: Chest tube insertion is vital in managing thoracic emergencies such as pneumothorax, hemothorax, and pleural effusion. Evidence shows persistent gaps in knowledge, procedural competence, and preparedness among medical trainees in low- and middle-income countries. In Ethiopia, medical interns train in tertiary teaching hospitals, yet their competence in chest tube management has not been systematically assessed. This study addresses that gap, providing critical evidence to strengthen medical education and safeguard patient safety in emergency care.

Objective: To assess the knowledge, attitudes, clinical and competence of medical interns regarding chest tube management in tertiary teaching hospitals in Addis Ababa, Ethiopia.

Methods: A hospital-based cross-sectional study was conducted among 297 medical interns at three tertiary teaching hospitals in Addis Ababa. Participants were selected using multistage sampling. Data was collected through a structured questionnaire assessing knowledge and attitude, and a simulation-based checklist evaluating clinical competence in chest tube management. Data quality was ensured through training, pretesting, and supervision and ethical clearance was obtained for the Collage IRB, and informed consents were secured from all participants. Data was analyzed in SPSS (version 29) using descriptive statistics, bivariate chi-square tests.

Results: A total of 297 medical interns participated in the study. The majority (51.2%) demonstrated poor knowledge of chest tube management, while 48.8% had good knowledge. Attitudes towards chest tube management were predominantly unfavorable, with 75.8% of interns reporting negative perceptions and only 24.2% showing favorable attitudes. Clinical competence was also limited, as 66.7% of interns were classified as incompetent based on self-reported confidence and procedural assessment, whereas only 33.3% were competent. These findings highlight significant gaps in knowledge, attitudes, and practical competence among medical interns in Addis Ababa's tertiary teaching hospitals, underscoring the need for strengthened training, structured supervision, and simulation-based learning to improve patient safety and clinical outcomes.

Conclusion: This study reveals substantial gaps in medical interns' preparedness for chest tube management in Addis Ababa's tertiary teaching hospitals. More than half demonstrate poor knowledge, three-quarters hold unfavorable attitudes, and two-thirds lack competence in performing the procedure. These deficiencies in theoretical training and practical exposure pose risks to patient safety and clinical outcomes. Addressing these gaps requires strengthening the medical curriculum, expanding simulation-based training, and implementing structured mentorship programs. Such measures are essential to ensure that interns acquire the competence and confidence needed to manage thoracic emergencies effectively.

Keywords: Chest tube management; tube thoracostomy; medical interns; knowledge, attitudes, and practice; clinical competence; Ethiopia

1. Introduction

Background of the Study

Chest tube insertion is a fundamental, life-saving procedure used to evacuate air, blood, or other fluids from the pleural space in conditions such as pneumothorax, hemothorax, and pleural effusion. Globally, thoracic trauma accounts for approximately 25% of trauma-related deaths, and chest tube thoracostomy remains the primary initial intervention in many of these cases (1). Effective management requires not only theoretical knowledge but also practical skills and a confident, safety-oriented attitude, especially in emergency settings (2). However, the procedure is not without risks; complications occur in up to 30% of cases, often related to insertion technique, highlighting the need for proper training and supervision (3).

Despite its critical importance, several international studies have shown that medical graduates often lack adequate training and competence in chest tube management. A study in the United Kingdom revealed that a significant number of junior doctors felt unconfident performing the procedure independently, with an audit finding that 45% would have placed a chest drain outside the recommended “safe triangle” (4,5). In the United States, simulation-based assessments indicated significant variability in competence even among residents, though the use of mastery learning modules has shown promise in increasing both performance and confidence (1,6). A recent study in Saudi Arabia further confirmed these global trends, revealing significant knowledge deficits among medical students and interns and underscoring the necessity for targeted education to enhance procedural competency (7).

In Africa, similar concerns have been documented. A study in Nigeria reported that over 60% of final-year medical students had poor knowledge and limited exposure to chest tube procedures (8,9). Another study in South Africa found that while most interns understood the theoretical aspects, only 45% had ever inserted a chest tube, and confidence levels were low (10). These findings reflect broader systemic challenges across the continent, including limited access to simulation labs, high patient loads, and inconsistent supervision, which collectively hinder the development of essential procedural skills (11).

In Ethiopia, trauma and respiratory illnesses remain major causes of hospital admissions, particularly in urban centers like Addis Ababa. However, there is limited published data on the

preparedness of medical interns in chest tube management. A recent national study assessing general clinical competence among graduating medical students found that while overall competence was fair, there were deficiencies in specific procedural skills and variable practical exposure, though chest tube insertion was not specifically detailed (12). More concerning, a retrospective study at a major teaching hospital in Addis Ababa on malpositioned chest tubes found that many were inserted for incorrect indications and were frequently misplaced, sometimes causing injury to intrathoracic or intra-abdominal organs (13). This suggests potential gaps in diagnostic skills, procedural technique, and clinical supervision. Informal reports from clinical educators and supervisors further indicate variability in interns' ability to perform or even assist in chest tube procedures across teaching hospitals (14).

Given the increasing burden of thoracic emergencies and the central role of chest tube insertion in their management, it is essential to assess the current level of knowledge, attitudes, and clinical competence among Ethiopian medical interns (14). This study focuses on tertiary teaching hospitals in Addis Ababa, aiming to generate data that can inform targeted educational reforms and improve clinical outcomes (14).

Statement of problems

Chest tube insertion, or tube thoracostomy, is a fundamental emergency procedure that plays a critical role in managing life-threatening thoracic conditions such as pneumothorax, hemothorax, pleural effusion, and empyema (1). Historically, this procedure has been recognized globally as a primary intervention in trauma and respiratory emergencies, where thoracic injuries contribute to approximately 25% of trauma-related deaths (2). Over time, advancements in clinical education and surgical training have emphasized the importance of theoretical knowledge combined with practical skills to ensure safe and effective chest tube management. Despite these advances, the procedural competence of junior doctors and medical interns remains a significant concern worldwide (3). Studies in high-income countries have revealed that many medical trainees feel inadequately prepared to perform chest tube insertions independently, with a recent UK national survey finding that higher specialty trainees are often neither confident nor perceived as competent by their trainers for out-of-hours procedures (4).

The consequences of inadequate knowledge and poor clinical competence in chest tube management are severe, ranging from procedural complications like organ injury and infection to

delayed recovery and increased mortality. Globally, the overall complication rate associated with tube thoracostomy is reported to be as high as 30% among all operators (5). A systematic review found a median complication rate of 19%, with positional complications—specifically tube malposition—accounting for over 53% of these errors (6). Inexperienced or poorly supervised interns performing chest tube insertions may inadvertently cause iatrogenic lung injury, liver lacerations, or retroperitoneal damage, all of which prolong hospital stays and increase healthcare costs (7,8). Furthermore, negative attitudes or a lack of confidence in performing the procedure can lead to delays in intervention or unnecessary referrals, adversely affecting patient outcomes in emergency settings (4).

In sub-Saharan Africa, and Ethiopia specifically, high rates of chest trauma, tuberculosis-related pleural disease, and other respiratory infections increase the demand for chest tube procedures. However, this demand is met with significant systemic challenges, including limited clinical exposure during training, inadequate supervision by experienced clinicians, and a lack of standardized simulation training (9). In Nigeria, studies have documented that medical students have poor exposure to procedures and low confidence in performing basic life-saving skills after graduation (10). In Ethiopia, tertiary teaching hospitals in Addis Ababa serve as principal sites for clinical education where medical interns frequently encounter emergencies requiring chest tube management. Yet, there is limited empirical evidence assessing their preparedness. A retrospective study at a major teaching hospital in Addis Ababa highlighted that malpositioned chest tubes are a frequent complication, often resulting from insertion for incorrect indications or poor technique, with tubes found in the lung, liver, or spleen (11).

Despite the recognized importance of chest tube management, there is a clear gap between the ideal level of intern competence and the reality observed in clinical practice within Ethiopian teaching hospitals. While previous research has explored emergency preparedness in general or the epidemiology of thoracic injuries, none have comprehensively assessed the triad of knowledge, attitudes, and clinical competence specifically in chest tube management among medical interns (12). The lack of systematic evaluation of these critical competencies poses a risk to patient safety and impedes the development of targeted educational interventions. This research aims to fill this gap by providing robust, evidence-based data to inform educational strategies, improve supervision, and ultimately enhance patient safety and care quality in Addis Ababa's tertiary hospitals (12).

Significance of the Study

The rationale for undertaking this study in the Ethiopian context is grounded in the essential role medical interns play as frontline providers of emergency and surgical care in tertiary teaching hospitals. In these settings, thoracic emergencies such as pneumothorax, hemothorax, and pleural effusion are frequently encountered and require prompt and proficient chest tube insertion and management. Despite the clinical importance of these procedures, both global and local evidence highlight significant gaps in knowledge, attitudes, and procedural competence among medical trainees, including interns. These deficiencies often contribute to preventable complications, poor patient outcomes, and increased healthcare burdens. By examining these gaps within Ethiopia's specific healthcare and educational context, the study aims to uncover underlying causes and contextual challenges that hinder skill acquisition and clinical preparedness among medical interns.

The significance of this study lies in its potential to inform and influence a wide array of stakeholders—medical educators, hospital administrators, curriculum developers, and policymakers—by providing evidence-based insights into the clinical competence of interns. The findings can support the development of targeted educational reforms, structured clinical training programs, and standardized competency benchmarks tailored to resource-limited settings. Moreover, the research will contribute to academic discourse by refining existing frameworks of clinical competence assessment and proposing practical methodologies suited for low-resource environments. Ultimately, the study seeks to improve patient safety, enhance the quality of clinical training, and ensure that medical interns in Ethiopia are better equipped to deliver high-quality, life-saving care in critical scenarios.

Literature review

Overview of Chest Tube Management by Medical Interns

Chest tube management, also known as tube thoracostomy, is a vital clinical procedure used to manage a range of intrathoracic conditions characterized by abnormal accumulation of air, blood, pus, or other fluids in the pleural cavity. These include pneumothorax, hemothorax, pleural effusion, and empyema—all of which, if not promptly and effectively treated, can lead to compromised lung expansion, hypoxia, and life-threatening respiratory distress (1). The technique involves the placement of a flexible thoracic catheter through the chest wall into the pleural space, enabling continuous drainage and allowing for lung re-expansion, stabilization of respiratory function, and reduction of intrathoracic pressure (2). Due to its life-saving nature, the procedure is considered a core competency for all physicians working in emergency, surgical, and pulmonary settings (3).

The development of clinical competence in chest tube management requires more than procedural familiarity. It is a multi-dimensional construct composed of theoretical knowledge, technical proficiency, and a strong professional attitude. Theoretical knowledge encompasses an understanding of pleural anatomy, the pathophysiology of pleural conditions, proper indications and contraindications for the procedure, and the ability to anticipate and manage complications (4). Technical skill involves accurate site selection, use of sterile technique, tube placement within the “safe triangle,” secure fixation, appropriate connection to the drainage system, and monitoring for tube function and complications (5). Meanwhile, professional attitude includes clinical judgment, patient-centered decision-making, situational confidence, and adherence to safety protocols (6). While many institutions agree on the importance of chest tube insertion as a critical emergency skill, significant variability exists in how and when students and trainees are taught and assessed, often influenced by institutional priorities, available resources, and clinical caseload (7).

Knowledge of Chest Tube Management

Knowledge of chest tube management is the foundation of safe and effective clinical practice. Globally, studies have shown that while medical graduates understand the basic indications for the procedure, there is a significant deficit in anatomical knowledge and the management of complications. A study in Saudi Arabia (2025) revealed that medical students and interns often lack an adequate understanding of relevant anatomy, which directly contributes to unsafe procedural practices (8). Similarly, a UK national survey (2024) found that higher specialty trainees often lack the knowledge required to independently perform chest drain insertion, particularly in out-of-hours settings (4).

In Africa, these knowledge gaps are even more pronounced. A study in Nigeria reported that over 60% of final-year medical students had poor knowledge of the procedural steps and indications for chest tube insertion (9). Another study in South Africa found that while most interns understood the theoretical aspects, their knowledge did not always translate into clinical confidence (10). In Ethiopia, a recent national study (2024) on general clinical competence among graduating medical students found a mean competence score of 72%, but specific knowledge on emergency procedures like chest tube management was not detailed, indicating a gap in local literature regarding this specific skill (11).

Attitude Towards Chest Tube Management

The interplay of knowledge and technical skill is essential in defining clinical competence, but it is the professional attitude that often determines whether a procedure is performed safely and effectively. Attitude encompasses confidence, initiative, and a sense of clinical responsibility. Globally, there is a shift in attitude among trainees, with many perceiving chest tube insertion as a specialist-only procedure, leading to reduced motivation to acquire the skill (4). In the United States, simulation-based assessments have shown that anxiety and a lack of confidence are major barriers to performing the procedure independently, though mastery learning modules have been shown to improve both performance and attitude (2).

In sub-Saharan Africa, interns often report low confidence levels despite understanding the theoretical importance of the procedure. In South Africa, only 45% of interns felt confident in

performing a chest tube insertion, suggesting that negative attitudes or anxiety stem from a lack of hands-on experience (10). In Ethiopia, informal reports from clinical educators indicate variability in interns' willingness to perform the procedure, with many deferring to senior residents due to a fear of complications and a lack of situational confidence (12).

Competencies

Clinical competence is the integrated application of knowledge and attitude through repeated, supervised practice. Globally, complication rates for tube thoracostomy are high, reported to be as high as 30% among all operators (5). A systematic review found a median complication rate of 19%, with positional complications—specifically tube malposition—accounting for over 53% of these errors (6). These findings underscore the need for structured training and competency-based evaluation frameworks.

In Africa, deficits in training translate into real clinical consequences. A retrospective study in Cameroon reported a complication rate of 19.35%, with tube dislocation and pneumothorax being the most common issues observed (13). In Ethiopia, a retrospective study at a major teaching hospital in Addis Ababa (2023) found a high prevalence of malpositioned chest tubes, with tubes frequently found in the lung, liver, or spleen (14). This highlights significant deficiencies in procedural practice and a lack of adequate supervision during the procedure.

Associated Factors of Practice

Several factors influence the development of competence in chest tube management. Training and supervision are the most critical factors identified globally and locally. A lack of standardized simulation training and inconsistent supervision by experienced clinicians are major barriers to acquiring procedural skills (15). In resource-constrained environments like Ethiopia, these challenges are amplified by high patient volumes, limited access to up-to-date training tools, and variable institutional protocols (16).

Individual factors also play a role. In Ethiopia, a higher cumulative grade point average (CGPA) and a positive appraisal of the clinical learning environment (CLE) have been associated with better competence scores among graduating medical students (11). Furthermore, the frequency of

performing or assisting in clinical procedures is a strong predictor of competence, highlighting the importance of hands-on exposure during internship (11).

Summary of Research Gaps

Despite the recognized importance of chest tube management, several research gaps exist in the current literature:

1. **Lack of Specificity:** Most Ethiopian studies focus on general clinical competence or specific complications (like malposition) rather than the integrated triad of knowledge, attitude, and practice specifically for chest tube management.
2. **Trainee Focus:** There is a lack of comprehensive data specifically targeting medical interns, who are the primary frontline providers in emergency settings in Ethiopia.
3. **Methodological Gaps:** Few studies use a structured approach to assess the associated factors (individual, institutional, and educational) that influence chest tube management competence in the Ethiopian context.
4. **Global to Local Flow:** While global trends are well-documented, there is a need for more localized data that can inform targeted educational reforms in Addis Ababa's tertiary hospitals.

This research aims to fill these gaps by providing robust, evidence-based data to inform educational strategies, improve supervision, and ultimately enhance patient safety and care quality in Ethiopia.

Conceptual framework

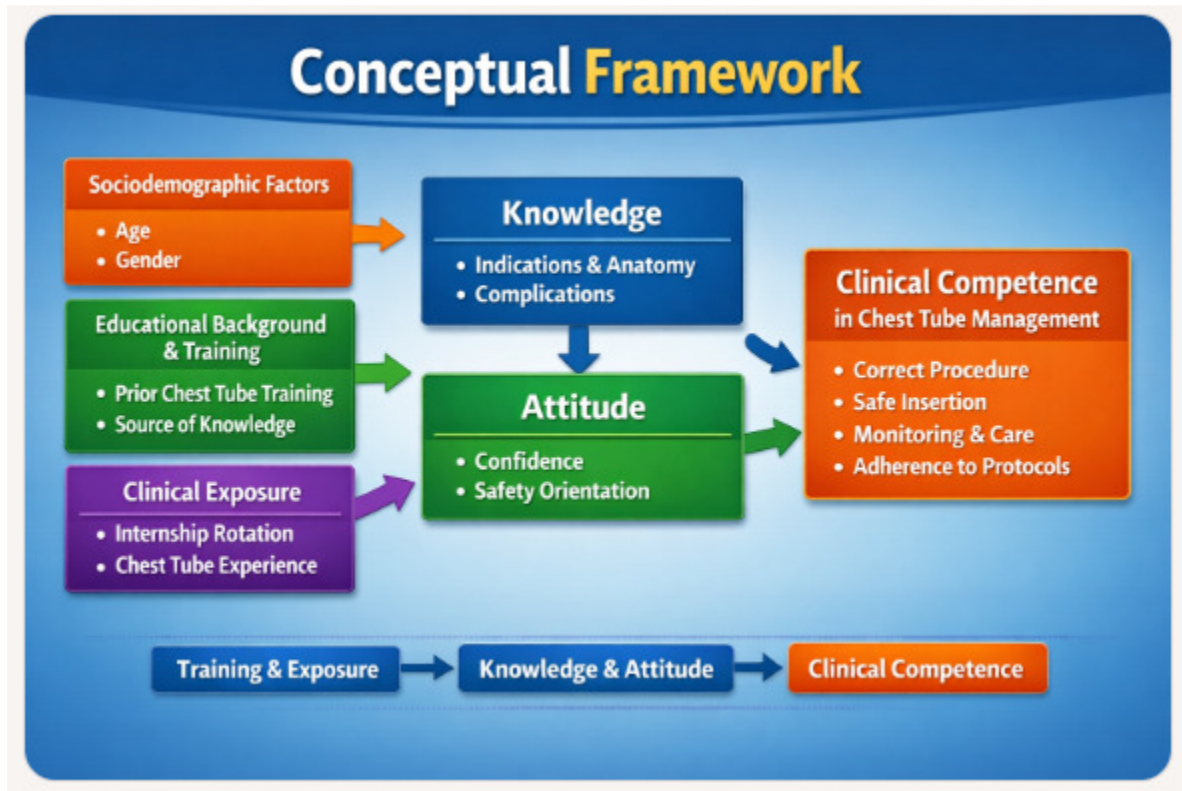


Figure 1: Conceptual framework

Objectives of the Study

General Objective

To assess the knowledge, attitudes, clinical competence of medical interns regarding chest tube management in tertiary teaching hospitals in Addis Ababa, Ethiopia in 2025.

Specific Objectives

1. To assess the level of knowledge of medical interns on chest tube management.
2. To assess the attitudes of medical interns towards chest tube management.
3. To evaluate the clinical competence of medical interns in chest tube management.
4. To identify factors associated with knowledge, attitudes, and competence in chest tube management among medical interns.

Methods and Materials

4.1 Study Area and Period

The study was conducted in selected tertiary teaching hospitals in Addis Ababa, Ethiopia. These hospitals were purposively chosen because they are major referral and teaching centers with high patient volumes, established internship programs, and frequent exposure to chest tube management in emergency and surgical care.

Tikur Anbessa Specialized Hospital (TASH): The largest referral and teaching hospital in Ethiopia, affiliated with Addis Ababa University. It provides specialized services, including thoracic emergency care, and serves as a primary site for medical education and research.

St. Paul's Hospital Millennium Medical College (SPHMMC): A major teaching and referral hospital offering comprehensive services across multiple specialties. It plays a central role in training medical interns and conducting clinical research.

Yekatit 12 Hospital Medical College: A public hospital that delivers general and specialized care while functioning as a clinical training site for medical students and interns.

4.2. Study Design

A hospital-based cross-sectional study design was employed to assess the knowledge, attitudes, and clinical competence of medical interns regarding chest tube management. This design was chosen because it provides a snapshot of interns' preparedness during their rotations, allowing evaluation of training outcomes at a single point in time across multiple hospitals. While appropriate for identifying gaps and associations between training exposure and competence, the cross-sectional nature of the study limits the ability to establish causality or track changes over time.

4.3 Population

4.3.1. Source Population

The source population includes all medical interns currently undergoing clinical rotations at tertiary teaching hospitals in Addis Ababa during the study period which is in the year of 2025 G.C.

4.3.2. Study Population

The study population consists of medical interns who are actively engaged in clinical practice at the selected tertiary teaching hospitals in Addis Ababa and who meet the eligibility criteria at the time of data collection.

4.3.3. Study Unit

The study unit was each individual medical intern participating in the study.

4.3.4. Sampling Frame

The sampling frame consisted of a complete list of all medical interns currently assigned to the selected tertiary teaching hospitals during the study period.

4.4. **Eligibility Criteria**

4.4.1. Inclusion Criteria

Medical interns enrolled in 2025 in clinical internship training at the selected tertiary teaching hospitals in Addis Ababa were eligible to participate. Interns who had completed or were currently rotating in surgery, emergency medicine, or internal medicine departments, where chest tube management is relevant, were included. Participation was limited to those who provided voluntary informed consent.

4.4.2. Exclusion Criteria

Medical interns who were on leave or absent during the data collection period were excluded from the study. A methodological consideration was whether to include interns with no exposure to chest tube management. Including them would allow assessment of overall preparedness among all interns, while excluding them would focus the study on competence among those with relevant exposure.

4.5. Sample Size Determination and Sampling Technique

4.5.1. Sample Size Determination

The sample size was calculated for all the three specific objectives of the study and summarized below. For objective 1, sample size was calculated using a single population proportion formula assuming a proportion (p) of 50% (as no similar study was found in Ethiopia to provide a prior estimate), to maximize the required sample size. The following formula was used:

$$n = z^2 \times p \times (1 - p) / d^2$$

Where:

- n = required sample size
- Z = Z-score at 95% confidence level = 1.96
- p = assumed proportion (0.5)
- d = margin of error = 0.05

$$n = (1.96)^2 \cdot 0.5(1 - 0.5) / (0.05)^2 = 384$$

Adding 10% for non-response: $N = 384 + 38 = 423$

The final calculated sample size is 423.

4.5.2. Sampling Technique and procedures

At Stage 1, tertiary teaching hospitals (Tikur Anbessa Specialized Hospital, St. Paul's Hospital Millennium Medical College, and Yekatit 12 Hospital Medical College) were selected from the four tertiary teaching hospitals in Addis Ababa. Hospitals were chosen purposively based on the availability of internship programs and the presence of departments where chest tube procedures are performed.

At Stage 2, a complete list of medical interns undertaking clinical rotations in the selected hospitals was obtained from the academic coordinators of each institution. Based on the total number of interns at each hospital, proportional allocation was applied to ensure representative sampling across sites. Subsequently, a simple random sampling technique was employed to select the required number of participants from each hospital's list.

4.6. Study Variables

Dependent Variables

- Knowledge of chest tube management (good/poor based on the distribution of total scores, participants are categorized into poor and good knowledge/)
- Attitude toward chest tube management (Favorable /Unfavorable based on the distribution of total scores, participants are categorized into favorable and unfavorable attitudes/)
- Clinical competence in chest tube management (Incompetent/competent based on the distribution of total scores, participants are categorized into Incompetent and competent /)

Independent Variables

1. Sociodemographic Variables

These describe the background characteristics of the participants.

- Age (in years)

- Gender (Male / Female)

2. Educational Background / Training

These refer to formal or informal learning sources.

- Prior training on chest tube management (Yes / No)
- Source of knowledge (Formal training / Self-study / Peer instruction / Mixed)

3. Clinical Exposure / Experience

These indicate how much hands-on or observational practice the intern has had.

- Internship rotation department (Surgery / Emergency / Internal Medicine / Others)
- Exposure to chest tube procedures during internship (Yes / No)
- Number of procedures observed or assisted (None / 1–2 / ≥ 3)

4.7. Operational Definitions

Good Knowledge: A score equal to or greater than 50% on a structured knowledge questionnaire related to indications, procedure, and complications of chest tube management.

Poor Knowledge: A score below 50%.

Favorable Attitude: A positive response (agree/strongly agree) to $\geq 50\%$ of attitude-related items using a Likert scale.

Unfavorable Attitude: Positive responses to less than 50% of attitude questions.

Clinical Competence: Demonstration of correct steps in chest tube management (preparation, insertion, monitoring) in $\geq 50\%$ of checklist items during simulation-based or observed structured assessment.

Medical Intern: A final-year medical student undergoing clinical rotations prior to graduation.

4.8. Data Collection Tool, Methods and Procedures

A structured, self-administered questionnaire was used, adapted from validated instruments in previous studies (2,3,4). The questionnaire includes:

Part I: Sociodemographic and background information

Part II: Knowledge assessment (multiple-choice questions)

Part III: Attitude assessment (Likert-scale statements)

Part IV: Clinical competence checklist (observational or simulation)

Self-reported questionnaire (knowledge and attitude)

Questionnaire-based self-reported confidence assessment (competence)

The questionnaire was administered primarily via a Google Forms platform. Participants completed the questionnaire electronically; however, in cases where access or familiarity was limited, trained data collectors assisted by filling out the form based on participants' responses. Data collection was conducted in quiet areas within each hospital's academic setting to ensure privacy and minimize distractions.

The competence component was not assessed through direct simulation or structured observation. Instead, it was evaluated using a structured section within the questionnaire that included items designed to assess participants' self-reported confidence levels in performing chest tube-related procedures. These items served as proxy indicators for clinical competence.

Data was collected September 20 - November 21, 2025, in alignment with internship rotation schedules.

Data Collectors

A total of 2 data collectors and one supervisor was recruited for the study. All recruits were medical students to ensure they possess the necessary background knowledge for the task. They

underwent a one-day training session covering the study objectives, ethical considerations, and proper data collection procedures to ensure accuracy and consistency in the research process.

4.9. Data Quality Control

To ensure data quality and reliability, several measures were implemented throughout the study. Data collectors and supervisors underwent two days of intensive training covering the study objectives, ethical considerations, questionnaire content, and effective interview techniques. The training will also include guidance on consistently observing and assessing clinical competence.

Daily supervision was provided by the principal investigator to closely monitor the data collection process. Field supervisors will review all completed questionnaires each day to ensure completeness and accuracy. Discrepancies identified during supervision or cross-verification was resolved through consensus meetings between data collectors and supervisors, with guidance from the principal investigator.

To further strengthen reliability, internal consistency of the questionnaire was assessed using Cronbach's alpha, and other relevant reliability measures was calculated as appropriate. Additionally, random cross-verification of responses was conducted on-site to confirm consistency between observed clinical performance and self-reported knowledge.

4.10. Data Processing and Analysis

Collected data were manually checked for completeness and consistency before entry. The data were then entered into EpiData (version 4.6) due to its superior validation capabilities, and subsequently exported to SPSS (version 29) for cleaning, coding, and analysis. Double data entry was performed to ensure quality.

Knowledge, attitude, and competence scores were computed by summing responses to relevant items. Cut-off points were applied to categorize levels (e.g., good vs. poor knowledge, favorable vs. unfavorable attitudes, competent vs. incompetent performance) based on established scoring criteria. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize sociodemographic characteristics and outcome variables.

Normality of continuous variables was checked prior to applying parametric tests. Bivariate analysis was conducted using Chi-square tests for categorical variables and independent t-tests for continuous variables to assess associations between independent variables (e.g., age, sex, prior training) and outcomes (knowledge, attitudes, competence).

To identify predictors of clinical competence, multivariable logistic regression analysis was performed, including variables with $p < 0.25$ in bivariate analysis. Adjusted odds ratios (AOR) with 95% confidence intervals were reported to account for potential confounders. Missing data were handled using listwise deletion, excluding incomplete cases from analysis.

The level of statistical significance was set at $p < 0.05$. Findings were presented in tables, graphs, and charts, with frequency distributions, cross-tabulations, and regression outputs clearly displayed.

4.11. Ethical Considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical clearance was obtained from the Institutional Review Board (IRB) of SPHMMC. Support letters were secured from the IRB to be submitted to the respective hospital administrations for permission to collect data.

Written informed consent was obtained from all participants after a clear explanation of the study's purpose, procedures, potential risks, and expected benefits. Participation was entirely voluntary, and respondents retained the right to withdraw at any point without penalty or loss of benefit.

To maintain confidentiality, all collected data was anonymized through coded identifiers, and no personal identifiers appear in reports or publications. Data was stored securely in password-protected electronic files and, where applicable, in locked cabinets accessible only to the research team. Privacy is respected by ensuring that interviews and clinical assessments take place in private settings.

The study involves minimal risk to participants, with its main benefit being the contribution to a better understanding of medical training needs and supporting future improvements in patient care. No invasive procedures or personal health risks were involved.

4.12. Plan for Dissemination of Results

The results of this study will be disseminated to relevant stakeholders through multiple channels to maximize impact and accessibility. Priority will be given to medical interns themselves, with feedback sessions organized at each participating hospital to directly enhance their learning and address identified gaps. A final report will be submitted to SPHMMC, and copies of the findings will be shared with all participating tertiary teaching hospitals.

Beyond local dissemination, a summary of the results will be presented at national medical education and clinical practice conferences to reach a wider professional audience. Manuscripts will be prepared for submission to both national and international peer-reviewed journals, including open-access outlets such as *BMC Medical Education*, to ensure global visibility and accessibility. Policy briefs will also be developed and shared with stakeholders in the Ministry of Health to support evidence-based improvements in medical training. Finally, an executive summary of the study will be made available online through institutional websites or research repositories, ensuring open access for broader dissemination.

Results

5. Results

5.1 Sociodemographic Characteristics

A total of 297 medical interns participated in this study, achieving a response rate of 74.3%. The mean age of the participants was 24.99 years (SD=0.87), with a range of 23 to 28 years. Female interns represented the majority of the study population (57.6%). Participants were relatively evenly distributed across four tertiary teaching hospitals, with SPHMMC having the highest representation (28.3%), followed by TASH (27.3%), Yekatit 12 (23.6%), and Menelik II (20.9%).

5.2 Training and Clinical Experience

The study found that while formal training was nearly universal, practical clinical exposure was severely limited. Specifically, 97.0% of interns (n=288) reported receiving formal training on chest tube management. However, only 6.1% (n=18) had performed a supervised chest tube insertion, and 57.6% (n=171) had observed the procedure. This indicates a significant gap between theoretical instruction and hands-on experience.

5.3 Knowledge, Attitude, and Clinical Competence

The distribution of knowledge, attitude, and clinical competence among the participants was dichotomized to assess preparedness. Approximately half of the interns (48.8%) demonstrated good knowledge, while 51.2% had poor knowledge. A concerning majority (75.8%) exhibited unfavorable attitudes towards chest tube management. Furthermore, only 33.3% of interns were classified as clinically competent, with 66.7% reporting a lack of confidence and procedural skill.

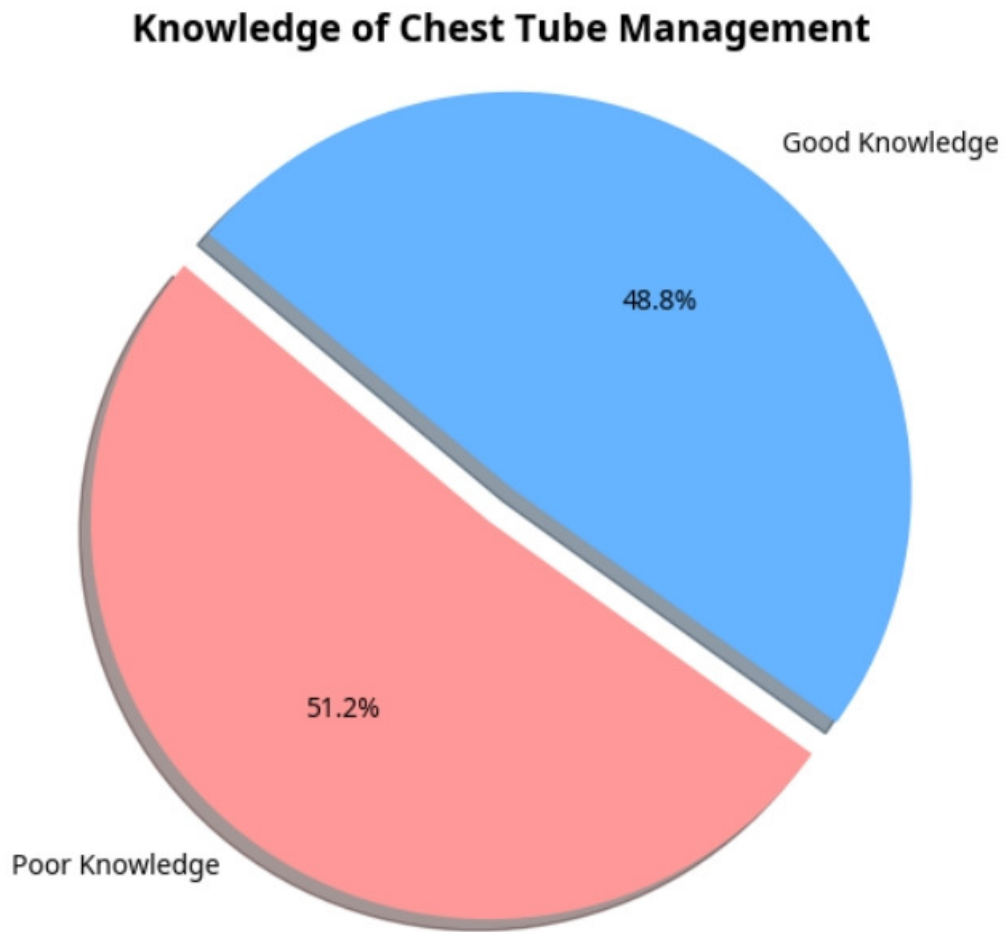


Figure 2: Distribution of Knowledge Levels on Chest Tube Management Among Medical Interns (N = 297)

Attitude Towards Chest Tube Management

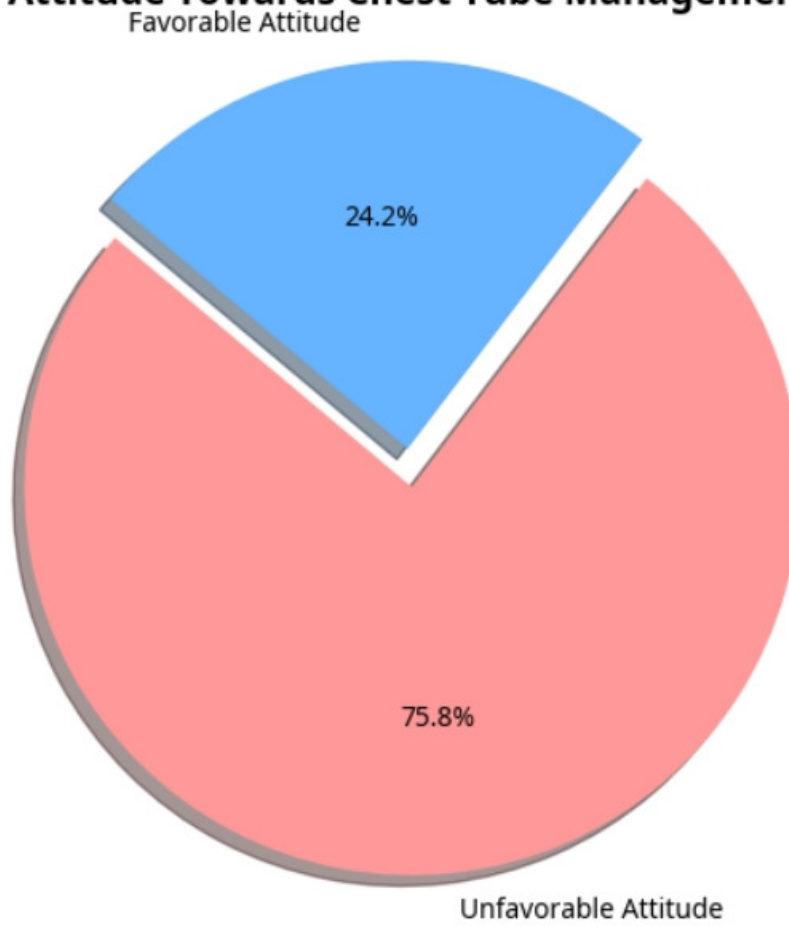


Figure 3: Distribution of attitude Levels towards Chest Tube Management Among Medical Interns (N = 297)

Clinical Competence in Chest Tube Management

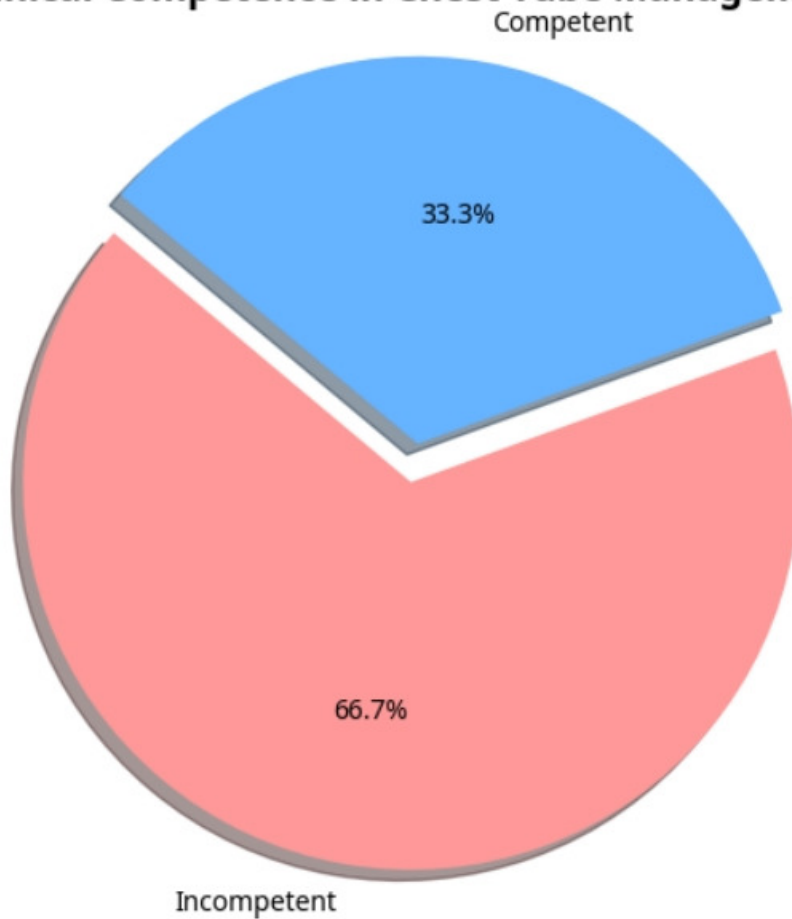


Figure 4: Distribution of Clinical Competence in Chest Tube Management Among Medical Interns (N = 297)

5.4 Factors Associated with Knowledge, Attitude, and Competence

To identify independent predictors of preparedness, multivariable logistic regression analysis was performed. This analysis prioritized the adjusted impact of formal training, observation, and supervised practice on Knowledge, Attitude, and Competence (KAP).

As shown in Table 1, clinical exposure was a stronger predictor of favorable attitudes and competence than formal training alone. Specifically, interns who observed a chest tube procedure were significantly more likely to have favorable attitudes ($p=0.0001$) and clinical competence ($p=0.0042$). Similarly, performing a supervised procedure was strongly associated with a more favorable attitude ($p=0.0189$). Formal training showed a borderline association with clinical competence ($p=0.0726$) but did not significantly influence knowledge or attitude in this cohort.

Table 1: Multivariable Analysis of Factors Associated with Knowledge, Attitude, and Clinical Competence (N=297)

Outcome Variable	Independent Factor	Unadjusted OR (COR)	Adjusted OR (AOR)*	P-Value
Knowledge	Formal Training	0.26	0.25	0.1538
	Observed Procedure	1.21	1.15	0.4788
	Supervised Procedure	0.38	0.36	0.1097
Attitude	Formal Training	–	–	0.1840
	Observed Procedure	0.34	0.32	0.0001**
	Supervised Procedure	3.43	3.26	0.0189**
Competence	Formal Training	–	–	0.0726
	Observed Procedure	0.48	0.46	0.0042**
	Supervised Procedure	2.10	1.99	0.1972

*Adjusted for age, sex, and hospital institution. **Statistically significant ($p < 0.05$).

6. Discussion

This study reveals significant gaps in the knowledge, attitudes, and clinical competence of medical interns regarding chest tube management in tertiary teaching hospitals in Addis Ababa. Despite nearly universal exposure to formal training (97.0%), the findings demonstrate that theoretical knowledge alone is insufficient to develop clinical competence. The nearly equal distribution of knowledge levels (48.8% good vs. 51.2% poor) suggests that the quality and effectiveness of current formal training may be suboptimal, failing to provide a solid foundation for procedural safety.

The highly significant association between observing a chest tube procedure and favorable attitudes ($p=0.0001$) is particularly noteworthy. Interns who observed the procedure were significantly more likely to have favorable attitudes (35.7%) compared to those who did not (15.8%). This finding aligns with Bandura's Social Learning Theory, which posits that observational learning (modeling) is a critical component of skill acquisition (1). By watching a competent practitioner, interns develop a mental blueprint of the procedure and enhance their self-efficacy, which reduces anxiety and fosters a more positive attitude toward performing the task themselves. Similarly, observation was significantly associated with clinical competence ($p=0.0042$), with 42.9% of those who observed feeling competent compared to 26.3% of those who did not. This reinforces the value of "vicarious experience" in building the confidence necessary to transition from theory to practice (1).

Furthermore, performing a supervised chest tube insertion was significantly associated with favorable attitudes ($p=0.0189$), with 50.0% of those who performed the procedure having favorable attitudes compared to only 22.6% of those who did not. This relationship can be interpreted through Kolb's Experiential Learning Cycle, where learning is a process of creating knowledge through the transformation of experience (2). The cycle moves from concrete experience (performing) to reflective observation and active experimentation. The severe limitation in practical experience identified in this study—where only 6.1% of interns had performed a supervised insertion despite 97% receiving theory—indicates a critical breakdown in this learning cycle. Without the opportunity for "active experimentation," interns remain stuck in the "abstract conceptualization" phase, leading to the high prevalence of unfavorable attitudes (75.8%) and clinical incompetence (66.7%) observed.

The findings of this study are consistent with previous research in Ethiopia and other low- and middle-income countries (LMICs). Dejene et al. (2024) reported suboptimal competence scores (mean 72%) among graduating medical students in Ethiopia, highlighting a broader systemic challenge in procedural training (3). Similarly, a study in Nigeria found that recent graduates had poor exposure to essential surgical skills and low confidence in performing basic life-saving procedures (4). In South Africa, Kong et al. (2014) demonstrated a significant "experience gap," with junior doctors having a 24% complication rate compared to only 5% for senior doctors (5). These comparisons situate the current study within a global evidence base that underscores a persistent disconnect between medical curricula and the practical demands of clinical practice, particularly in resource-constrained settings where high patient volumes and limited supervision further impede trainee development (6).

Despite the strength of these findings, several limitations must be acknowledged. First, the cross-sectional design of the study means that a causal relationship between training exposure and competence cannot be definitively established. Second, the reliance on self-reported attitudes and perceived competence may be subject to social desirability bias, where interns might overestimate or underestimate their skills to align with perceived expectations. Third, competence assessed in a theoretical or simulated context may not fully reflect an intern's ability to perform under the high-pressure, real-world conditions of an emergency department.

To address these gaps, comprehensive reforms in medical education are urgently required. It is recommended that tertiary hospitals integrate mandatory, structured simulation-based training into the medical curriculum before interns begin their clinical rotations. Furthermore, clear minimum exposure thresholds should be established; for instance, each intern should be required to observe at least three procedures and perform at least one to two under direct supervision before being considered for independent practice, in line with international training standards (7). Faculty development is also essential, as senior residents and consultants require training in effective bedside teaching and procedural supervision to ensure that "supervised practice" is both safe and educational. Finally, the implementation of standardized procedural checklists and protocols across all teaching hospitals would help reduce variability in practice and safeguard patient safety.

In conclusion, this study highlights a critical disconnect between theoretical training and practical competence in chest tube management among medical interns in Addis Ababa. The

overwhelming lack of hands-on experience and the resulting high levels of incompetence and unfavorable attitudes underscore the urgent need for a shift toward competency-based medical education. Without such reforms, the gap between theory and practice will continue to pose a significant risk to patient safety in emergency thoracic care.

Strengths and limitations of the Study

Strengths This study is highly relevant as it focuses on chest tube management, a critical life-saving procedure with direct implications for patient safety. The simultaneous assessment of knowledge, attitudes, and competence provides a comprehensive view of the theory–practice gap. Statistical analyses, including cross-tabulations and regression, strengthen the evidence by linking experiential factors such as observation and supervised practice to improved outcomes. The findings are contextually significant, offering actionable insights for curriculum and policy reform in Ethiopia’s medical education system.

Limitations While the study provides valuable evidence, competence was measured through self-reported data rather than direct observation, which may introduce bias. The cross-sectional design captures data at a single point in time, limiting causal interpretation. Interns may also have misreported past exposures due to recall bias, and the absence of qualitative data restricts deeper exploration of barriers and mentorship quality. These limitations suggest that future studies should adopt longitudinal designs, incorporate OSCEs or direct observation for competence assessment, and include qualitative interviews to enrich contextual understanding.

7. Conclusion and Recommendations

7.1. Conclusion

This study identified substantial gaps in medical interns' knowledge, attitudes, and clinical competence regarding chest tube management in Addis Ababa's tertiary teaching hospitals. Although nearly all interns received theoretical instruction, limited supervised practice left many unprepared and hesitant. The analysis confirmed that experiential learning—through observation and hands-on training—was strongly linked to improved attitudes, greater confidence, and higher competence, directly addressing the study's objective of evaluating both knowledge and practical preparedness.

These deficiencies represent not only an educational shortfall but also a patient safety concern, as inadequate competence in chest tube management can delay care and increase complications. Strengthening experiential learning through simulation, structured mentorship, and supervised clinical practice is essential to bridge the gap between theory and real-world competence. Future research should assess the effectiveness of these interventions in improving interns' skills and patient outcomes, ensuring safer and more effective care in emergency and surgical settings.

7.2 Recommendations

The critical findings of this study—particularly the 66.7% incompetence rate and the 75.8% unfavorable attitudes among medical interns—highlight an urgent need for coordinated action across multiple levels of Ethiopia's medical education and healthcare system.

For Medical Schools and Curriculum Committees

- Integrate mandatory Simulation-Based Training (SBT) into the core curriculum for all medical interns.
- Require a minimum number of objectively assessed simulation repetitions before live patient contact.

- Transition toward a Competency-Based Medical Education (CBME) framework, replacing time-based progression with skill-based assessments such as OSCEs.
- Revise didactic teaching to include case-based discussions and interactive sessions to strengthen theoretical knowledge.

For Tertiary Teaching Hospitals (TASH, SPHMMC, Yekatit 12, Menelik II)

- Establish structured mentorship and supervised practice programs with verifiable procedural logbooks.
- Ensure interns meet a documented threshold of observed and supervised chest tube procedures before graduation.
- Create formal observation opportunities early in internship to improve attitudes and perceived competence.

For Senior Clinicians and Mentors

- Actively participate in supervised training and mentorship programs.
- Maintain procedural logbooks and provide constructive feedback to interns.
- Advocate for protected teaching time and recognition of mentorship contributions in promotion criteria.

For the Ministry of Health (MoH) and Regulatory Bodies

- Mandate national standards for procedural competence in internship programs.
- Allocate funding and resources for simulation labs and faculty development.
- Monitor and evaluate implementation of CBME and mentorship programs across teaching hospitals.

These reforms—simulation, structured mentorship, logbooks, and CBME—must be implemented in concert to bridge the theory-practice gap, transform professional attitudes, and safeguard the quality of emergency care in Ethiopia’s tertiary teaching hospitals.

8. References

1. Adal O, Tareke AA, Bogale EK, Anagaw TF, Tiruneh MG, Fenta ET, Endeshaw D, Delie AM. Mortality of traumatic chest injury and its predictors across sub-Saharan Africa: systematic review and meta-analysis. *BMC Emerg Med.* 2024;24(1). <https://doi.org/10.1186/s12873-024-00951-w>
2. Anderson D, Chen SA, Godoy LA, Brown LM, Cooke DT. Comprehensive review of chest tube management: a review. *JAMA Surg.* 2022;157(3). <https://doi.org/10.1001/jamasurg.2021.7050>
3. Boullhesen Williams T, Fletcher D, Fusco J, Bichoupan A, Weikert L, Barenas M, Menard J. Retrospective evaluation of the use and complications of small-bore wire-guided thoracostomy tubes in dogs and cats: 156 cases (2007–2019). *Front Vet Sci.* 2022;9. <https://doi.org/10.3389/fvets.2022.818055>
4. Chetty GK, Battula NR, Govindaswamy R, Elahi MM. Comparative analysis of the Bonanno catheter and tube thoracostomy in effective aspiration of pleural effusion. *Heart Surg Forum.* 2006;9(4). <https://doi.org/10.1532/HSF98.20061040>
5. Doelken P. Placement and management of thoracostomy tubes. *UpToDate.* 2013.
6. Fawzi IM, Mahdi SA, Fawzi SM, Jaafar IF. Assessment of interns' training in the teaching hospitals of Baghdad Medical City Complex. *Wiad Lek.* 2022;75(1). <https://doi.org/10.36740/wlek202201227>
7. Ghazali DA, Ilha-Schuelter P, Barreyre L, Stephan O, Barbosa SS, Oriot D, Tourinho FSV, Plaisance P. Development and validation of the first performance assessment scale for interdisciplinary chest tube insertion: a prospective multicenter study. *Eur J Trauma Emerg Surg.* 2022;48(5). <https://doi.org/10.1007/s00068-022-01928-9>
8. Gilbert TB, McGrath BJ, Soberman M. Chest tubes: indications, placement, management, and complications. *J Intensive Care Med.* 1993;8(2). <https://doi.org/10.1177/088506669300800203>
9. Kesieme E, Olusoji O, Inuwa I, Ngene C, Aigbe E. Management of chest drains: a national survey on surgeons-in-training experience and practice. *Niger J Surg.* 2015;21(2). <https://doi.org/10.4103/1117-6806.162569>
10. Kong VY, Oosthuizen Gv, Sartorius B, Keene C, Clarke DL. An audit of the complications of intercostal chest drain insertion in a high-volume trauma service in South Africa. *Ann R Coll Surg Engl.* 2014;96(8). <https://doi.org/10.1308/003588414X14055925058599>
11. Lamb CR, Shaw RD, Hilty BK, Wong SL, Rosenkranz KM. A targeted needs assessment for the development of a surgical sub-internship curriculum. *J Surg Educ.* 2021;78(6). <https://doi.org/10.1016/j.jsurg.2021.06.017>
12. Legesse TK, Gissial A, Tizatu A. Malpositioned chest tubes and their indications; an experience from Addis Ababa, Ethiopia. *Ethiop Med J.* 2022;60(4).
13. Liepert AE, Velic AJ, Rademacher B, Blumenfeld AA, Bingman E, O'Rourke AP, Sullivan S. Proficiency development for graduating medical students, using skills-level-appropriate mastery learning versus traditional learning for chest tube placement: assessing anxiety, confidence, and performance. *Surgery.* 2019;165(6). <https://doi.org/10.1016/j.surg.2019.01.015>
14. Manjunatha SN, Chandrakumar SG, Devi RML, Shekar MA, Murthy K, Prashantha B. A study of self-perceived need for management training among interns at a government

- medical college in Karnataka. Indian J Public Health Res Dev. 2018;9(6).
<https://doi.org/10.5958/0976-5506.2018.00521.1>
15. Mefire AC, Fokou M, Din Dika L. Indications and morbidity of tube thoracostomy performed for traumatic and non-traumatic free pleural effusions in a low-income setting. Pan Afr Med J. 2014;18. <https://doi.org/10.11604/pamj.2014.18.256.3963>
 16. Nakayama DK, Steiber A. Surgery interns' experience with surgical procedures as medical students. Am J Surg. 1990;159(3). [https://doi.org/10.1016/S0002-9610\(05\)81232-2](https://doi.org/10.1016/S0002-9610(05)81232-2)
 17. Owuor WO, Talaam RC, Parker RK, Ooko PB. Indications and outcome of patients managed with tube thoracostomy at AIC Litein Hospital: a prospective case series. East Cent Afr J Surg. 2024;29.
 18. Tatli O, Turkmen S, Imamoglu M, Karaca Y, Cicek M, Yadigaroglu M, Bayrak ST, Asik O, Topbas M, Turedi S. A novel method for improving chest tube insertion skills among medical interns. Saudi Med J. 2017;38(10). <https://doi.org/10.15537/smj.2017.10.21021>
 19. Tatli O, Turkmen S, Imamoglu M, Karaca Y, Cicek M, Yadigaroglu M, Bayrak ST, Asik O, Topbas M, Turedi S. A novel method for improving chest tube insertion skills among medical interns: using biomaterial-covered mannequin. Saudi Med J. 2017;38(10). <https://doi.org/10.15537/smj.2017.10.21021>
 20. Yoshimura A, Kosaihiro S, Morimoto T, Kim C, Tsueshita T, Adachi K, Aso R, Shimura T, Nakano H, Gemma A. An effective training program for chest tube drainage for medical interns in a clinical simulation laboratory. J Nippon Med Sch. 2012;79(6). <https://doi.org/10.1272/jnms.79.403>

Annexes

Annex 1: Participants Information Sheet

Title of the Research Project: Knowledge, Attitudes, and Clinical Competence in Chest Tube Management Among Medical Interns at Tertiary Teaching Hospitals in Addis Ababa, Ethiopia

Name of Principal Investigator: Amanuel Tekle Mekonnen (Medical Intern)

Name of the Organization: Saint Paul's Hospital Millennium Medical College (SPHMMC)

Introduction

This information sheet is prepared to inform study team members and relevant stakeholders about the purpose and procedures of this study. The study aims to evaluate medical interns' understanding, perceptions, and practical readiness in performing and managing chest tube procedures, and to identify potential gaps in training and clinical exposure within tertiary teaching hospitals in Addis Ababa.

Participants: Participants for this study includes medical interns who are currently enrolled in TASH, SPHMMC and Yekatit hospital

Purpose of the Research Project

To assess the knowledge, attitudes, clinical competence of medical interns regarding chest tube management in tertiary teaching hospitals in Addis Ababa, Ethiopia in 2025.

Confidentiality: Participant identities will remain anonymous throughout the study. Participation is voluntary, with no associated risks, and respondents may withdraw at any time. All data collected will be used exclusively for research purposes and will not be shared beyond the stated objectives.

Risk and /or discomfort

There are no physical risks associated with participation. However, the questionnaire will take approximately 15-20 minutes of your time.

Compensation: Thank you for your valuable time and for sharing your valuable insights. Please note that this engagement is voluntary and does not include financial compensation.

Voluntary Participation and Withdrawal Rights: Participation in this study is entirely voluntary. You have the right to withdraw from the study for any reasons at any time. Your decision will not affect health or social services you receive. If you choose to withdraw, all tape-recorded interviews will be permanently deleted and any collected data will not be used in the study.

How Your Information will be used: No personally identifiable information will be used in reporting the findings. All collected data will be securely stored electronically for five years and protected with password encryption to ensure confidentiality.

Concerns or Questions about the Research: If you have any concerns about your participation in this research, please contact co-principal investigator and the Institutional Research Ethics Review Committee (SPHMMC-IRERC) using the following addresses:

Contacts

For any questions about the study, please contact:

Amanuel Tekle Mekonnen

Email: amanueltekme18@gmail.com

Phone: 0953419774

Annex 2: Questionnaire

Section 1: Socio-demographic Information

No.	Question	Response Options
Q101	Age (in years)	_____
Q102	Sex	0. Male 1. Female
Q103	Name of Teaching Hospital	_____
Q104	Department currently assigned	_____
Q105	Have you ever received formal training on chest	0. NO

	tube management?	1. Yes
Q106	If yes, what type of training?	1. Lecture 2. Workshop \ 3. Simulation 4. Bedside Teaching 5. Other: _____
Q107	Duration of the training	_____ hours/days
Q108	Have you ever performed chest tube insertion under supervision?	0. No 1. Yes
Q109	Have you observed a chest tube procedure being performed?	0. No 1. Yes

Section 2: Knowledge on Chest Tube Management

Instructions: Please select the most appropriate answer for each question.

Part II: Knowledge Assessment

(Choose the best answer)

#	Question	a	b	c	D
1	What is the most common indication for chest tube insertion?	☐ Pneumonia	☐ Pneumothorax	☐ Asthma	☐ Pulmonary embolism
2	Where is the ideal site for chest tube insertion?	☐ 2nd ICS, midclavicular	☐ 5th ICS, anterior axillary	☐ 7th ICS, midaxillary	☐ 3rd ICS, midclavicular
3	Which of the following is the correct patient	☐ Supine	☐ Sitting upright or semi-	☐ Prone	☐ Lateral decubitus

	position during chest tube insertion?		recumbent		
4	What is the main purpose of connecting a chest tube to an underwater seal drainage?	☐ Prevent air entry	☐ Administer medication	☐ Provide oxygen	☐ Increase pressure
5	Which of the following complications can occur during chest tube insertion?	☐ Infection	☐ Injury to organs	☐ Bleeding	☐ All of the above
6	How often should the drainage system be checked for air leaks?	☐ Once daily	☐ Every hour	☐ Every 4 hours	☐ Only if patient complains
7	What should you do if the chest tube becomes disconnected from the drainage system?	☐ Reconnect or immerse end	☐ Remove the tube	☐ Ignore if patient stable	☐ Call surgeon
8	When should the chest tube be removed?	☐ No air leak & minimal drainage	☐ Patient requests removal	☐ After 3 days	☐ When tube clogs
9	Which antiseptic is commonly used to clean the insertion site before placement?	☐ Alcohol	☐ Chlorhexidine	☐ Iodine	☐ Hydrogen peroxide
10	What is the correct chest tube size for	☐ 8-12 French	☐ 28-32 French	☐ 36-40 French	☐ 50 French

	adult pneumothorax?				
11	Which signs indicate possible pneumothorax after chest tube removal?	☐ Chest pain & SOB	☐ Headache	☐ Abdominal pain	☐ Nausea
12	Best method to confirm proper chest tube placement?	☐ Chest X-ray	☐ Physical exam only	☐ Abdominal ultrasound	☐ Blood test
13	What should be done if the chest tube is clogged?	☐ Flush with saline	☐ Remove and replace	☐ Increase suction	☐ Leave it
14	Which is NOT a common cause of chest tube malfunction?	☐ Tube kinking	☐ Tube dislodgement	☐ Patient cough	☐ Air leak
15	How long should suction be applied in pneumothorax management?	☐ Until lung re-expansion	☐ Always 48 hours	☐ Only during procedure	☐ Never
16	Role of water seal chamber in drainage system?	☐ Allows air escape/prevents re-entry	☐ Collects blood	☐ Administers meds	☐ Monitors vital signs
17	First step if patient with chest tube develops sudden respiratory distress?	☐ Check blockage/disconnection	☐ Increase O2	☐ Remove tube immediately	☐ Call for discharge
18	How often should the insertion site be inspected for infection?	☐ Every shift (8-12 hrs)	☐ Once a week	☐ Only if fever	☐ Never
19	What to do if an air	☐ Identify & repair	☐ Remove tube	☐ Ignore if	☐ Increase

	leak is detected in the chest tube system?	source		stable	suction blindly
20	Primary purpose of clamping chest tube before removal?	☐ Check lung remains expanded	☐ Prevent pain	☐ Stop drainage permanently	☐ Administer medication

Score each correct answer as **1** point. Total possible: **20 points**

Section 3: Attitude Toward Chest Tube Management

Instructions: Please indicate your level of agreement with the following statements.

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Chest tube management is an essential skill for interns.	1	2	3	4	5
2	I feel confident in identifying indications for chest tube insertion.	1	2	3	4	5
3	Practical experience is more important than theoretical knowledge in chest tube management.	1	2	3	4	5
4	More training sessions should be provided on chest tube care.	1	2	3	4	5
5	I am afraid to perform chest tube procedures even under supervision.	1	2	3	4	5
6	Adequate supervision improves my confidence in performing chest tube management.	1	2	3	4	5
7	Simulation-based training should be mandatory for chest tube insertion.	1	2	3	4	5

Attitude scoring: Positive statements can be scored from 1 (Strongly Disagree) to 5 (Strongly Agree).

Section 4: Self-Reported Clinical Competence

Instructions: Indicate how confident you feel in performing the following steps of chest tube management.

No.	Clinical Task	Not Confident	Slightly Confident	Confident	Very Confident
1	Identifying candidates for chest tube insertion	☐	☐	☐	☐
2	Explaining the procedure to a patient	☐	☐	☐	☐
3	Preparing sterile instruments for the procedure	☐	☐	☐	☐
2	Identifying the insertion site accurately	☐	☐	☐	☐
5	Infiltrating local anesthesia properly	☐	☐	☐	☐
6	Performing the incision and insertion correctly	☐	☐	☐	☐
7	Connecting the chest tube to the drainage system	☐	☐	☐	☐
8	Securing and dressing the tube	☐	☐	☐	☐
9	Monitoring for complications	☐	☐	☐	☐
10	Knowing when to remove the chest tube	☐	☐	☐	☐

Scoring can be done to assess overall competence (e.g., 1–4 scale). Total possible: 40 points.

Declaration

Declaration

I, the undersigned, hereby declare that the research proposal entitled "*Knowledge, Attitudes, and Clinical Competence in Chest Tube Management Among Medical Interns at Tertiary Teaching Hospitals in Addis Ababa, Ethiopia*" is my original work, prepared and submitted in partial fulfillment of the requirements for the Bachelor Degree of Doctor of Medicine (MD) at Saint Paul's Hospital Millennium Medical College. I affirm that this work has not been submitted, in whole or in part, for any other academic degree or qualification at this or any other higher educational institution. All sources of information, data, and materials used in the preparation of this research have been duly acknowledged. I accept full responsibility for the scientific integrity, ethical conduct, and academic honesty of this study, in accordance with institutional and international standards.

Name of the student: Amanuel Tekle Mekonnen (Medical Intern)

Signature: 

Submission Date: 27 March, 2026

Advisor Approval

The undersigned academic advisors have reviewed and fully approved the submission of this proposal.

Primary Advisor (Public Health): Takele Gezaehgn, (MPH, Assistant Professor)

Signature:  Takele GD

Date: March 27, 2026

Clinical (Secondary) Advisor: Dr Nathan Negash ECCM

Signature: _____

Date: _____

Declaration

I, the undersigned, hereby declare that the research proposal entitled:

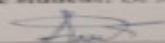
"Knowledge and practice of research topic here"

is my original work, prepared and submitted in partial fulfillment of the requirements for the Bachelor Degree of Doctor of Medicine (MD) at Saint Paul's Hospital Millennium Medical College. I affirm that this work has not been submitted, in whole or in part, for any other academic degree or qualification at this or any other higher educational institution.

All sources of information, data, and materials used in the preparation of this research have been duly acknowledged, in accordance with institutional and international standards.

I accept full responsibility for the scientific integrity, ethical conduct, and academic honesty of this study, in accordance with institutional and international standards.

Name of the student: Dr Amanuel, Medical Intern

Signature: 

Submission Date: 27 March, 2026

Advisor Approval

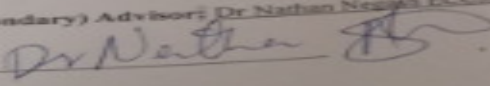
The undersigned academic advisors have reviewed and fully approved the submission of this proposal.

Primary Advisor (Public Health): Takele Gezaehgn, MPH
Assistant Professor of Public Health

Signature: _____

Date: 27 march 2026

Clinical (Secondary) Advisor: Dr Nathan Negash ECCM

Signature: 

Date: 27 march 2026