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Following of Protocols for Chest Drain Insertion-an Audit Report

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ABSTRACT

Background: Chest drain insertion is a common, potentially life-saving procedure indicated for conditions such as pneumothorax, hemothorax, and pleural effusion. Despite the availability of evidence-based guidelines from the British Thoracic Society (BTS), variable adherence has been reported, with lapses in essential steps such as aseptic technique, clotting disorder assessment, and provision of analgesia. Inadequate compliance with protocols can increase the risk of complications, underscoring the need for regular audits. **Objective:** To evaluate adherence to BTS chest drain insertion protocols in a tertiary care hospital, identify deficiencies in practice, implement corrective interventions, and assess improvement through re-audit. **Methodology:** A prospective, closed-loop clinical audit was conducted in the Department of Pulmonology and Internal Medicine of a tertiary care teaching hospital in Pakistan. All adult patients (≥18 years) undergoing chest drain insertion over a four-week period were included, with emergency cases also considered to reflect real-world practice. Baseline data were collected prospectively using a structured proforma aligned with BTS standards. Following presentation of results and reinforcement of protocols through departmental teaching, a re-audit was conducted two weeks later using the same methodology. Compliance with each standard was analyzed descriptively and presented as percentages. **Results:** The baseline audit revealed an overall compliance rate of 81.3%. High adherence was observed in consent taking, imaging guidance, and insertion technique, while moderate compliance was noted in aseptic practice, securing of drains, and post-procedure chest X-rays. Assessment of clotting disorders in non-urgent cases demonstrated poor adherence (<20%). Following intervention, overall compliance improved to 91.4%, with significant progress in aseptic technique, patient positioning, analgesia, and securing the drain. However, clotting disorder assessment remained suboptimal despite improvement. **Conclusion:** The audit demonstrated that structured feedback and departmental reinforcement of guidelines significantly improved adherence to chest drain insertion standards. While most procedural aspects achieved near-universal compliance, persistent deficiencies in coagulation assessment highlight the need for targeted strategies such as mandatory documentation and checklist integration. Regular re-audits and continuous training are essential to sustain improvements and ensure patient safety.

INTRODUCTION

Chest drain insertion, also referred to as intercostal drain insertion or tube thoracostomy, is a common and potentially life-saving procedure performed for a variety of pleural conditions, including pneumothorax, hemothorax, pleural effusion, and empyema [1]. Despite its frequent use in both emergency and elective settings, chest drain insertion carries significant risks if performed incorrectly, including infection, hemorrhage, visceral injury, and tube malposition. To mitigate these risks, international bodies such as the British Thoracic Society (BTS) have established evidence-based guidelines outlining the essential steps of safe chest drain insertion [2]. These guidelines emphasize not only technical accuracy but also adherence to safety checks such as consent, aseptic technique, analgesia, and post-procedural imaging.

However, previous audits and studies have demonstrated variable compliance with these guidelines in clinical practice. In many institutions, while core procedural aspects such as insertion technique and use of imaging are generally followed, other critical steps, including assessment of coagulation profile, provision of adequate analgesia, and securing of the drain, are frequently overlooked [3]. A study conducted in the United Kingdom highlighted that although chest drains were

inserted appropriately in terms of technique, deficiencies in aseptic practice and documentation of consent were common, reflecting gaps between guidelines and real-world implementation [4]. Another audit reported that failure to perform basic safety checks contributed directly to complications, including avoidable infections and prolonged hospital stays [5]. These findings underscore the importance of regular audits to identify deficiencies in practice and to reinforce guideline-based standards.

Audits serve as an essential tool in quality improvement cycles. By systematically comparing current practice against established standards, deficiencies can be identified, corrective measures implemented, and improvements measured through re-audit [6]. In chest drain insertion, this approach is particularly valuable because the procedure is performed across multiple specialties, often by junior doctors or trainees, and variability in training or supervision can affect outcomes [7]. The closed-loop audit model provides an opportunity not only to assess compliance but also to enhance patient safety by reinforcing consistent, evidence-based practice.

The rationale for conducting this audit stemmed from observed variability In adherence to chest drain insertion protocols within the institution. While some clinicians demonstrated good compliance with standards such as informed consent and imaging, lapses were noted in areas including clotting disorder assessment and analgesia provision. Given that chest drain insertion is a high-risk procedure with potential for significant morbidity, even small deviations from protocol may compromise patient safety. Conducting this audit was therefore essential to quantify the level of compliance, identify specific gaps, and reinforce guidelines through departmental education.

Objectives

The primary objective of this audit was to evaluate adherence to established standards for chest drain insertion as defined by the BTS guidelines. Specific objectives included:

1. To assess compliance with each step of the chest drain insertion protocol, including pre-procedure, intra-procedure, and post-procedure criteria.
2. To identify deficiencies in current practice that could compromise patient safety.
3. To implement corrective interventions through departmental teaching and reinforcement of guidelines.
4. To re-audit practice after intervention to measure improvement in compliance.

Through this process, the audit aimed to strengthen adherence to best practice standards, minimize preventable complications, and promote a culture of continuous quality improvement in the performance of chest drain insertion.

METHODOLOGY

Study Design

This audit was conducted as a prospective, closed-loop clinical audit to evaluate adherence to established standards for chest drain insertion. The standards were based on the British Thoracic Society (BTS) Pleural Disease Guidelines 2010. The audit followed the recommended cycle of baseline data collection, feedback and intervention, and a subsequent re-audit to measure improvement.

Setting and Duration

The audit was carried out in the Department of Pulmonology and Internal Medicine at a tertiary care teaching hospital in Pakistan over a four-week period. The baseline audit was conducted during the first two weeks, followed by an intervention in the form of departmental teaching and reinforcement of protocols, and finally a re-audit over the subsequent two weeks.

Participants and Inclusion Criteria

All adult patients (≥18 years) undergoing chest drain insertion for diagnostic or therapeutic purposes during the study period were included. Emergency cases requiring immediate intervention without complete pre-procedure evaluation were also included to reflect real-world practice. Pediatric patients and cases with incomplete medical records were excluded.

Audit Standards and Criteria

Audit standards were derived from the BTS Pleural Disease Guidelines 2010. Each chest drain insertion was assessed for documentation of informed consent, use of appropriate imaging guidance prior to insertion, and evaluation of clotting disorders, particularly in non-urgent cases. Other parameters included adherence to aseptic technique, provision of analgesia or sedation, appropriate patient positioning, and proper cleaning of the insertion site. Technical aspects such as securing the chest drain and performing a post-procedure chest X-ray to confirm placement were also evaluated. For all parameters, the expected compliance level was set at 100%, consistent with best practice standards.

Data Collection

Data were collected prospectively by trained observers using a structured proforma aligned with the audit standards. Each case was reviewed for documentation, procedural adherence, and post-procedure confirmation. To reduce observer bias, collected data were cross-checked with clinical records and radiological reports.

Intervention

Following completion of the baseline audit, the results were presented during a departmental meeting attended by consultants, residents, and house officers. Deficiencies were highlighted, updated guidelines were reviewed, and best practice protocols were reinforced. Consultants emphasized mandatory steps in chest drain insertion, and visual aids/checklists were circulated to standardize practice.

Re-Audit

A re-audit was performed two weeks after the intervention using the same methodology and criteria. Compliance rates were compared with the baseline audit to assess the effectiveness of the intervention.

Data Analysis

Data were analyzed descriptively using Microsoft Excel. Compliance for each parameter was calculated as a percentage of total eligible cases. Comparative analysis

between baseline and re-audit cycles was conducted to measure improvement, and results were presented graphically using bar charts.

Ethical Considerations

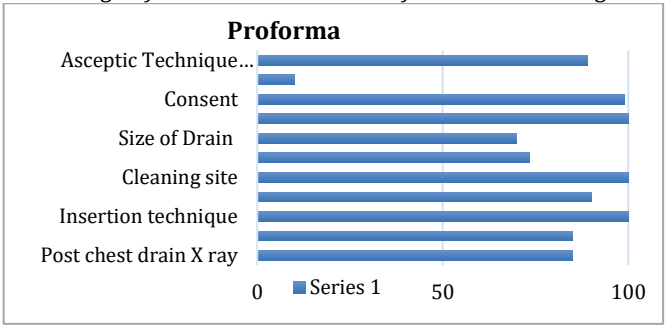
As this was a quality improvement audit conducted in accordance with institutional policy, formal ethical approval was not required. All patient data were anonymized to maintain confidentiality.

RESULTS

The initial audit demonstrated that adherence to the established standards for chest drain insertion was 81.3% overall. However, compliance across individual parameters varied considerably, with certain aspects being well-followed while others showed significant deficiencies. The findings of the baseline audit and the subsequent re-audit are illustrated in Figures 1 and 2.

Figure 1

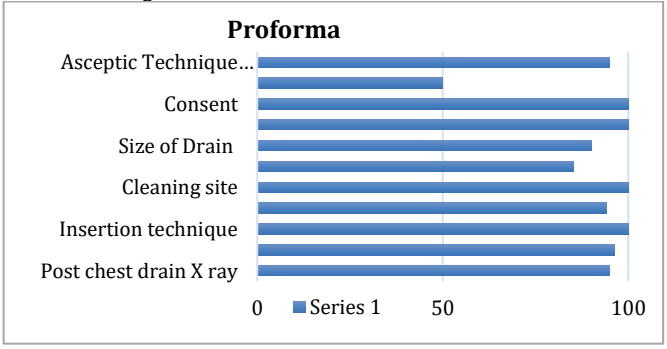
Percentage of Each Criterion Met Before Audit Meeting



Before the audit meeting, the overall compliance with chest drain insertion protocols was suboptimal. Consent taking, use of imaging guidance, and correct insertion technique showed the highest adherence, with nearly all procedures meeting the standards. Moderate compliance was observed in aseptic technique, securing of the drain, and obtaining a post-procedure chest X-ray, where adherence ranged between 70% and 85%. However, the assessment of clotting disorders in non-urgent cases was poorly practiced, with fewer than one-fifth of cases fulfilling this criterion, which highlighted a significant gap in patient safety measures. Other domains, including patient positioning, cleaning of the insertion site, and provision of analgesia or sedation, showed variable results, reflecting inconsistencies in practice.

Figure 2

Bar chart to show the percentage of each criteria met after audit meeting.



The re-audit conducted two weeks later, after the departmental meeting and reinforcement of protocols, showed a marked improvement, with overall compliance increasing from 81.3% to 91.4%. Most parameters exhibited a clear upward trend, particularly aseptic technique, patient positioning, analgesia and sedation, and securing the drain, where adherence approached near-universal levels. The parameters of consent, imaging guidance, and insertion technique continued to maintain their consistently high compliance, reflecting sustained strength in these areas. Despite the improvements, assessment of clotting disorders in non-urgent cases still lagged behind, although it demonstrated some progress compared to the baseline audit. This finding indicated that while education and monitoring improved practice significantly, certain safety checks required continued emphasis.

DISCUSSION

Summary of Main Findings

This clinical audit assessed adherence to chest drain insertion protocols in a tertiary care setting, identifying an initial overall compliance rate of 81.3%, which improved to 91.4% following departmental intervention and reinforcement of guidelines. The results demonstrate that while several aspects of the procedure were consistently followed, key gaps remained in the assessment of clotting disorders in non-urgent cases. These findings are important, as they highlight both the effectiveness of audit-based feedback and the areas that require continued attention for patient safety and procedural standardization.

Comparison With Previous Literature

The high compliance with informed consent, use of imaging guidance, and proper insertion technique in both the baseline audit and re-audit is consistent with findings from other institutions. A national audit conducted in the United Kingdom reported near-universal compliance with consent and imaging prior to pleural procedures, as these aspects are strongly emphasized in training and medicolegal frameworks [8]. Similarly, research from a teaching hospital in Ireland demonstrated that technical aspects of chest drain insertion tend to achieve high adherence, whereas pre-procedure safety checks such as coagulation screening are often neglected [9]. This suggests that while procedural competence is reinforced during training, systematic risk assessments remain a weak link across different healthcare systems.

The moderate adherence observed in aseptic technique, securing the drain, and obtaining post-procedure chest radiographs in the baseline audit aligns with findings from other published audits. A study by Corcoran et al. [10] reported that only 70–80% of procedures were compliant with aseptic precautions, and similar figures were found for post-insertion chest X-rays. Importantly, in the present audit, these parameters showed marked improvement after reinforcement of guidelines, supporting the effectiveness of short, focused interventions in addressing gaps in practice. The impact of departmental teaching and feedback has been highlighted in several previous studies, which show that compliance

improves significantly when staff are reminded of institutional protocols and when adherence is monitored [11].

Persistent Gaps in Practice

The most notable deficiency in both cycles of this audit was the inadequate assessment of clotting disorders in non-urgent cases, with compliance below 20% in the baseline and remaining relatively low even after intervention. This mirrors previous literature, where coagulation assessment has been identified as an area of persistent non-compliance. A multicenter audit in the UK reported that pre-procedure coagulation screening was often overlooked, despite guideline recommendations that it should be performed for all patients undergoing pleural procedures, particularly in non-emergency cases [12]. Possible reasons include time pressures, assumptions of low risk in younger or stable patients, and a lack of integration of clotting assessment into pre-procedure checklists.

Areas of Improvement

Another key observation was the improvement in patient positioning, cleaning of the insertion site, and provision of analgesia or sedation after the audit meeting. Similar improvements have been described by Walker et al. [13], who demonstrated that introducing a standardized checklist for chest drain insertion improved both analgesia use and patient positioning. This underlines the value of structured checklists, which ensure that essential but sometimes under-prioritized steps are consistently followed.

Strengths and Limitations

The findings of this audit emphasize the importance of an audit cycle in improving clinical practice. The overall improvement from 81.3% to 91.4% compliance demonstrates that audits are not merely evaluative tools but can serve as catalysts for change. Literature supports this role, as regular audits have been shown to enhance guideline adherence, reduce procedural complications, and improve patient outcomes [14]. The persisting gaps in clotting disorder assessment highlight the need for more targeted strategies, such as incorporating this criterion into mandatory documentation, embedding reminders into electronic health records, or assigning responsibility for safety checks to specific team members.

One strength of this audit was the inclusion of both pre- and post-intervention cycles, which provided clear evidence of improvement attributable to feedback and reinforcement. However, limitations include the short duration between the two cycles and the limited sample size, which may not fully capture long-term adherence patterns. Future audits should include larger cohorts and assess whether improvements are sustained over time.

Recommendations and Future Directions

In conclusion, this audit demonstrates that departmental reinforcement of protocols significantly improves adherence to chest drain insertion standards. While technical aspects of the procedure are consistently well performed, pre-procedure safety checks—particularly coagulation assessment in non-urgent cases—require greater attention. Embedding these checks into routine practice through mandatory documentation, regular teaching sessions, and periodic re-audits is recommended. Sustained improvement depends on a culture of continuous evaluation, feedback, and accountability within clinical teams.

CONCLUSION

This audit demonstrated that adherence to chest drain insertion protocols was high overall and improved from 81.3% to 91.4% after departmental reinforcement of guidelines. Significant progress was observed in aseptic technique, patient positioning, analgesia, and post-procedure imaging, confirming the effectiveness of structured feedback and monitoring. However, assessment of clotting disorders in non-urgent cases remained consistently low, highlighting a persistent gap in practice. Regular teaching sessions, mandatory checklists, and periodic re-audits are recommended to sustain improvements, enhance patient safety, and ensure adherence to evidence-based standards.

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