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Adherence to Protocols for Pleural Fluid Aspiration (Thoracentesis): An Audit Report

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ABSTRACT

Background: Thoracentesis is a routinely performed diagnostic and therapeutic procedure for pleural effusions. Adherence to standardized procedural protocols is essential to minimize complications, ensure diagnostic accuracy, and optimize patient outcomes. However, compliance with established guidelines is often suboptimal in busy clinical settings, particularly in low-resource environments. **Objective:** This audit aimed to evaluate the adherence of healthcare professionals to standard thoracentesis protocols in the Pulmonology Department of Gujranwala Medical College Teaching Hospital and to assess the impact of an educational intervention on improving compliance. **Methods:** A prospective clinical audit was conducted over a one-week period in April 2024. A total of 30 thoracentesis procedures performed by post-graduate residents and house officers were observed using a structured proforma based on British Thoracic Society and Whittington Health NHS guidelines. Parameters assessed included clotting profile documentation, informed consent, aseptic measures, imaging guidance, correct technique, and post-procedural monitoring. Following the initial audit, a departmental educational intervention was implemented. A re-audit was conducted two weeks later using the same methodology. **Results:** The initial audit revealed that only 74.9% of procedures met the required standards. Key areas of non-compliance included documentation of clotting profiles and post-procedural chest X-rays. After the intervention, adherence improved to 86.3%, with notable gains in aseptic technique, proper needle selection, and informed consent. **Conclusion:** The audit demonstrates that protocol adherence in thoracentesis can be significantly improved through structured feedback and targeted educational interventions. Regular clinical audits and reinforcement of procedural standards are vital for enhancing patient safety and maintaining high-quality care.

INTRODUCTION

Pleural effusion, the pathological accumulation of fluid in the pleural space, is a common clinical finding in respiratory medicine that may result from a wide range of underlying diseases including heart failure, malignancy, infection, and pulmonary embolism [1]. Thoracentesis, also known as pleural fluid aspiration, is a standard diagnostic and therapeutic procedure used to remove pleural fluid for both symptom relief and laboratory evaluation [2]. It plays a pivotal role in guiding the management of pleural diseases, especially when the etiology of the effusion is unknown or when patients experience respiratory distress due to large fluid volumes [3].

While thoracentesis is generally considered a safe bedside procedure, its success and safety are heavily dependent on adherence to standardized clinical protocols. These include proper assessment of coagulation profile, informed consent, aseptic technique, imaging guidance, and post-procedural monitoring [4][5]. Non-compliance with such standards has been associated with complications such as pneumothorax, hemothorax, and infection [6]. The British Thoracic Society and other international bodies have established clear procedural guidelines aimed at minimizing such risks and optimizing patient outcomes [7][8].

Audit-based evaluations are an effective tool in identifying gaps in clinical practice and improving healthcare delivery through education, feedback, and protocol reinforcement [9]. Especially in resource-limited settings, clinical audits can be instrumental in promoting evidence-based practices, ensuring patient safety, and enhancing the quality of care. Although thoracentesis is performed routinely in hospitals, there is a paucity of local data

assessing adherence to its procedural standards, particularly in public-sector institutions across South Asia [10].

This study, therefore, aims to bridge this knowledge gap by conducting a clinical audit to evaluate adherence to established thoracentesis protocols in a tertiary care teaching hospital and to assess the impact of an educational intervention on compliance rates.

Rationale

Despite the routine nature of thoracentesis, significant variability exists in its performance, often due to lack of awareness, insufficient training, or non-availability of structured protocols in clinical settings. Inappropriate or incomplete adherence to procedural standards can increase the risk of avoidable complications, delay diagnosis, and negatively affect patient outcomes. Given the growing emphasis on patient safety and quality assurance in healthcare, this audit serves as a quality improvement initiative to identify current gaps in practice, implement targeted educational interventions, and re-evaluate outcomes to determine effectiveness. The rationale is to establish a culture of accountability and evidence-based practice within the pulmonology department.

Objectives

1. To assess the baseline adherence of healthcare professionals to standardized protocols for pleural fluid aspiration (thoracentesis).
2. To implement a structured educational intervention aimed at reinforcing thoracentesis guidelines.

To evaluate the improvement in protocol adherence following the intervention.

METHODS AND MATERIAL

Study Design

This study employed a prospective clinical audit design to assess adherence to established protocols for pleural fluid aspiration (thoracentesis). The audit was conducted in two phases—initial assessment and re-audit—framed within a quality improvement cycle involving observation, intervention, and follow-up evaluation.

Setting and Duration

The audit was conducted in the Pulmonology Department of Gujranwala Medical College Teaching Hospital, Pakistan, over a one-week period in April 2024. The re-audit was completed within two weeks following the implementation of the intervention.

Participants

A total of 30 pleural fluid aspiration procedures were observed during the audit. These procedures were performed by post-graduate residents and house officers. Technicians and other healthcare staff not directly involved in thoracentesis were excluded. No personal identifiers were collected, and ethical approval was deemed unnecessary as the project qualified as a clinical audit rather than research.

Audit Standards

The standards for evaluating thoracentesis were derived from clinical guidelines established by the British Thoracic Society and the Whittington Health NHS Trust [2][3]. The audit proforma was designed to assess multiple procedural components, including documentation of clotting profile in high-risk patients, obtaining informed consent, adherence to aseptic techniques, performance of a pre-procedure chest X-ray, use of ultrasound (USG) guidance, appropriate patient positioning and needle insertion, cleaning of the procedural site, administration of local anesthesia when indicated, selection of the correct needle size, aspiration of an adequate volume in diagnostic procedures, and performance of a post-procedure chest X-ray. Each of these parameters was evaluated by direct observation and marked as either “Met” or “Not Met” on the proforma.

Data Collection

Data were collected through direct observation by a designated chief observer who was part of the audit team. The healthcare professionals performing the procedures were not informed that they were being assessed to minimize behavioral alterations due to observation. This approach was adopted to reduce potential Hawthorne effect bias. The observations were recorded in real time using a structured proforma designed for the audit. The audit team consisted of the Head of Department, senior registrars, residents, and house officers.

Intervention

After completion of the initial audit phase, a departmental meeting was organized and led by the Head of Department. During this meeting, the findings from the audit were presented, and the clinical standards for pleural fluid aspiration were thoroughly reviewed with all relevant staff. Educational materials were shared, including visual aids and protocol summaries. An interactive discussion was held to address knowledge gaps and reinforce adherence to recommended practices. Two weeks following this intervention, the re-audit phase was conducted using the same criteria and observation methods to assess improvements in protocol adherence.

Statistical Analysis

Descriptive statistics were used to quantify adherence to each procedural parameter before and after the intervention. The results were presented as percentages and visualized using bar charts (Figure 1 and Figure 2) to compare compliance levels in the pre- and post-intervention phases. The analysis emphasized key areas showing significant improvement, such as informed consent, aseptic techniques, and the use of correct needle size. Due to the small sample size, inferential statistical testing was not performed.

Ethical considerations

This audit did not require ethical approval, as it was conducted for quality improvement purposes and did not involve identifiable patient data.

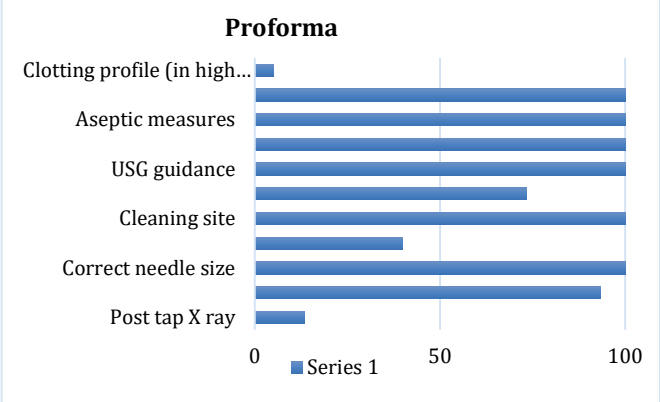
RESULTS

The results of the audit showed that the standards were followed by only 74.9% of the participants. The proforma used for the audit included parameters such as clotting profile (in high risk cases), consent, aseptic measures, chest X-ray before procedure, USG guidance, patient

positioning and needle insertion, cleaning site, local anesthesia (in special cases), correct needle size, adequate volume (in diagnostic pleural fluid aspiration), and post-tap x-ray. The bar chart below shows the percentage of each criteria met before the audit meeting.

Figure 1

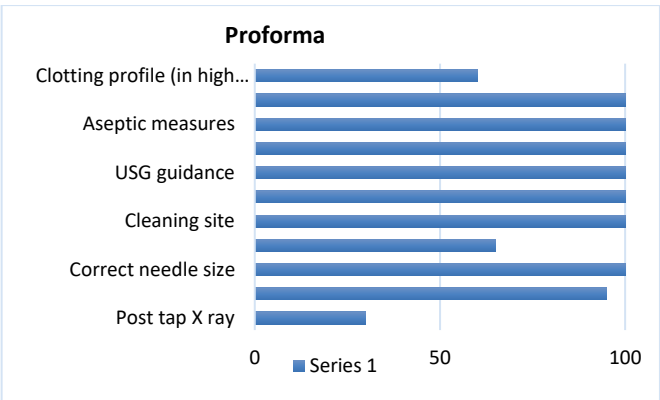
Compliance with Pleural Aspiration Standards Before Audit Intervention



This bar chart illustrates the baseline compliance with established clinical standards for pleural fluid aspiration among healthcare providers prior to the departmental audit meeting. The parameters assessed include documentation of clotting profile in high-risk cases, obtaining informed consent, adherence to aseptic measures, pre-procedure chest X-ray, utilization of ultrasound (USG) guidance, proper patient positioning and needle insertion, cleaning of the procedural site, administration of local anesthesia in special cases, selection of correct needle size, ensuring adequate volume in diagnostic cases, and post-procedure tap X-ray. The chart indicates that overall adherence was suboptimal, with several critical steps such as clotting profile checks and post-tap X-rays being poorly

Figure 2

Compliance with Pleural Aspiration Standards After Audit Intervention



This bar chart presents the level of compliance with pleural fluid aspiration standards following the audit intervention, which included educational sessions and reinforcement of clinical guidelines. A marked improvement was observed across all parameters, with notable increases in adherence to pre-procedural assessments, aseptic techniques, proper use of imaging guidance, and post-procedural care. The intervention led to a rise in overall compliance from 74.9% to 86.3%, reflecting the effectiveness of targeted training and standardized procedural enforcement.

DISCUSSION

This audit aimed to assess the adherence of healthcare professionals to established clinical standards for pleural fluid aspiration (thoracentesis) in a tertiary care hospital. The baseline compliance was found to be suboptimal, with only 74.9% of procedures meeting the required standards. Following the audit intervention, which included structured feedback and educational sessions, compliance improved significantly to 86.3%. These findings underscore the critical role of continuous clinical auditing and education in enhancing patient safety and procedural accuracy.

Thoracentesis is a widely performed diagnostic and therapeutic procedure in pulmonary medicine. However, despite its routine nature, studies have consistently reported procedural variability and associated complications due to lapses in standardized care [11]. Institutions such as the British Thoracic Society (BTS) and Whittington Health NHS Trust have provided comprehensive guidelines to ensure procedural safety and efficacy [12][13]. The criteria used in our audit proforma—ranging from obtaining informed consent to ensuring post-procedure imaging—were derived from these validated protocols.

The most notable deficiencies In the pre-audit phase were observed in three critical areas: documentation of clotting profile in high-risk patients, post-procedural chest X-ray, and administration of local anesthesia in special cases. These deficiencies pose significant clinical risks. For instance, omitting coagulation screening in high-risk patients may predispose them to hemorrhagic complications [14], while failing to perform a post-tap X-ray could delay detection of iatrogenic pneumothorax, a known complication of thoracentesis [15].

The marked Improvement seen post-intervention highlights the positive impact of targeted training and procedural standardization. Prior studies have shown that structured feedback mechanisms and multidisciplinary discussions significantly improve compliance with clinical guidelines and reduce adverse events [16]. The increase in adherence across nearly all parameters in our post-audit findings reinforces these conclusions. Furthermore, the relatively short timeline between the audit and re-audit—just two weeks—demonstrates the potential for rapid improvement when clear protocols are communicated and reinforced effectively.

Limitations

Despite the strengths of this audit, including its practical relevance and immediate quality improvement outcomes, there are certain limitations. Being a single-centered audit, its findings may not be generalizable across institutions with different patient demographics, staffing patterns, and resource availability. Additionally, observer bias may have influenced healthcare professionals' behavior during the post-audit phase, a phenomenon known as the Hawthorne effect [17]. The small sample size also limits the statistical power and broader applicability of the findings.

Future Directions

Going forward, hospitals should consider institutionalizing periodic audits for all high-risk procedures, particularly in resource-limited settings where variability in care is common. The introduction of standardized thoracentesis kits, electronic checklists, and automated reminders could further enhance protocol compliance. Additionally, integrating thoracentesis protocol training into the curriculum for residents and interns may help instill procedural rigor from the outset of clinical practice [18]. Future studies should also consider multi-centered audit models to strengthen generalizability and assess long-term sustainability of improvements.

CONCLUSION

In conclusion, this audit reinforces the need for continuous monitoring and structured training to ensure adherence to clinical standards in pleural fluid aspiration. The improvement from 74.9% to 86.3% in compliance rates following a simple yet focused intervention illustrates the transformative potential of clinical audits. Institutions should leverage such quality improvement models to enhance procedural safety and improve patient outcomes. Regular re-auditing, protocol reinforcement, and data-driven feedback loops can help maintain high standards of care and foster a culture of accountability and excellence in procedural medicine.

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