

Bridging the Gap: Enhancing Laboratory-Nursing Communication to Improve Diagnostic Turnaround in Emergency Care

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Abstract

Objective: This study aimed to evaluate the impact of streamlined laboratory-nursing communication on diagnostic efficiency and patient outcomes in a tertiary hospital emergency department.

Methods: A mixed-methods study was conducted over six months, incorporating interdisciplinary training and the implementation of a digital communication tool. Quantitative data, including turnaround time (TAT) and diagnostic delays, were analyzed pre- and post-intervention. Qualitative insights were gathered through interviews and focus group discussions with nursing and laboratory staff.

Results: The intervention significantly reduced TAT for critical lab tests (e.g., arterial blood gas: 45 to 30 minutes; $p < 0.01$), diagnostic delays (15% to 5%), and ED length of stay (5.5 to 4.2 hours). Qualitative findings revealed improved real-time notifications, clarity in reporting, and staff satisfaction. Themes highlighted enhanced workflow efficiency, reduced stress, and better coordination.

Conclusion: Streamlining laboratory-nursing communication through interdisciplinary collaboration and digital tools significantly improves diagnostic efficiency, patient outcomes, and staff satisfaction. These findings support adopting similar strategies in other tertiary care settings.

Keywords: Laboratory-nursing communication, diagnostic efficiency, turnaround time, emergency care, interdisciplinary collaboration, digital health tools, tertiary hospital.

Introduction

Efficient communication between laboratory staff and nursing teams is crucial in the dynamic environment of emergency care. Emergency departments (EDs) often operate under intense pressure, where rapid diagnostic processes can significantly impact patient outcomes. Delays in communication of critical laboratory results can lead to treatment delays, increased patient risk, and prolonged hospital stays (Steindel & Howanitz, 2001). Conversely, streamlined communication workflows contribute to faster diagnosis, improved patient management, and overall healthcare efficiency (Hicks et al., 2001).

Despite advancements in diagnostic technology, the integration of these technologies into clinical workflows remains challenging. Studies suggest that factors such as pre-analytical errors, inefficient result reporting systems, and a lack of interdisciplinary communication contribute to these challenges (Nestler et al., 2009). For instance, in a study by Redfern et al., (2009), enhanced communication channels between

laboratory and nursing staff were identified as key to improving diagnostic turnaround times for acute myocardial infarction patients.

Innovative solutions, such as point-of-care testing (POCT) and digital health systems, have shown promise in mitigating these barriers. POCT, which enables diagnostic tests to be conducted near the patient, has been particularly effective in reducing turnaround times (Nichols, 2020). Additionally, digital communication tools have emerged as critical assets in fostering real-time information exchange between departments (Yang et al., 2018). However, the successful implementation of these solutions requires robust interdisciplinary collaboration, comprehensive training, and continuous evaluation of communication protocols (Hammer & Vasset, 2019).

This paper aims to explore the impact of streamlined laboratory-nursing communication on diagnostic efficiency in emergency settings. By examining current practices, identifying gaps, and proposing practical solutions, we hope to contribute to a better understanding of how interdisciplinary collaboration can enhance patient care.

Literature Review

1. Challenges in Laboratory-Nursing Communication

The complexity of emergency department workflows often contributes to inefficiencies in communication between laboratory and nursing staff. Delays in test results or miscommunication can significantly affect patient outcomes. For example, Steindel and Howanitz (2001) found that misaligned priorities between laboratory and nursing staff often result in diagnostic delays, especially during peak times. Similarly, Nestler et al. (2009) highlighted that a lack of real-time communication channels exacerbates turnaround times for critical diagnoses such as myocardial infarction.

2. Impact of Poor Communication on Patient Care

Ineffective communication can lead to errors, increased patient risk, and prolonged hospital stays. Hicks et al. (2001) demonstrated that miscommunication during critical times leads to delayed initiation of lifesaving treatments. Moreover, Redfern et al., (2009) emphasized that communication failures during cardiac emergencies often result in increased door-to-balloon times, which are directly correlated with higher mortality rates.

3. Innovations in Communication

Advancements in digital health tools and point-of-care testing (POCT) have shown promise in addressing communication gaps. POCT devices provide rapid diagnostic capabilities, reducing the dependency on centralized laboratories for certain tests. Nichols (2020) reviewed the application of POCT in emergency settings and found a significant reduction in diagnostic turnaround times, leading to faster clinical decision-making. However, the integration of these technologies into existing workflows requires seamless collaboration between laboratory and nursing teams.

4. Interdisciplinary Collaboration

Interdisciplinary training programs and standardized communication protocols have been proposed as solutions to improve laboratory-nursing coordination. Yang et al. (2018) studied the implementation of virtual simulation training for nursing staff and highlighted its effectiveness in fostering communication skills and improving response times. Hammer and Vasset (2019) further reinforced the importance of interprofessional learning environments, where both nursing and laboratory staff are trained to work cohesively under simulated emergency scenarios.

5. Benefits of Digital Communication Systems

Digital tools, such as electronic health records (EHRs) and real-time communication platforms, have significantly enhanced laboratory-nursing communication. Studies show that these systems not only improve efficiency but also reduce the likelihood of miscommunication. For example, Redfern et al., (2009) demonstrated the benefits of integrating digital communication systems, such as instant messaging platforms, to notify nurses of critical lab results in real-time.

6. Barriers to Implementation

Despite the potential benefits of new technologies and training programs, several barriers hinder their widespread adoption. Financial constraints, resistance to change, and lack of training are common challenges. According to Hicks et al. (2001), hospitals often struggle to justify the upfront costs of implementing digital communication tools despite their long-term benefits. Additionally, Nestler et al. (2009) pointed out that cultural resistance among staff members poses a significant challenge to adopting interdisciplinary collaboration practices.

7. Recommendations from Previous Studies

Research has emphasized the need for tailored interventions to address communication challenges in emergency settings. Implementing standardized protocols, such as critical value reporting systems, can minimize delays. Furthermore, investing in interprofessional education and technology adoption can significantly improve the efficiency and quality of care. Nichols (2020) recommended creating a structured feedback loop to continuously evaluate and improve communication strategies.

Summary of Gaps in the Literature

While existing research highlights the challenges and potential solutions for enhancing laboratory-nursing communication, few studies have comprehensively evaluated their impact on patient outcomes in emergency settings. Most studies are limited to either technological or educational interventions, without exploring their combined effect. This research aims to fill these gaps by assessing the integration of digital tools, POCT, and interdisciplinary training programs in a real-world emergency department setting.

Methodology

Study Design

This study employed a **mixed-methods approach** conducted in the emergency department (ED) of a tertiary hospital to evaluate the impact of streamlined communication between laboratory and nursing staff on diagnostic efficiency and patient outcomes. Quantitative methods were used to measure turnaround times

(TAT) for critical lab tests, while qualitative data were gathered to assess staff satisfaction and perceived barriers to communication.

Study Setting

The study was conducted over six months (January to June 2021) in the emergency department of [Hospital Name], a tertiary healthcare facility with an average of 300 daily emergency visits. The hospital's laboratory services include centralized and point-of-care testing (POCT) capabilities.

Study Population

The study involved:

- **Nurses:** 50 ED nurses who are responsible for patient care and managing lab test requests.
- **Laboratory Staff:** 30 technologists involved in processing and reporting lab results.
- **Patients:** 200 patients requiring urgent lab tests, selected using purposive sampling to include cases with high diagnostic urgency (e.g., suspected sepsis, myocardial infarction).

Intervention

A tailored intervention aimed at improving laboratory-nursing communication was implemented in two phases:

1. Training and Awareness:

- Conducted interdisciplinary training sessions focusing on communication protocols, critical value reporting, and the use of digital communication tools.
- Simulated emergency scenarios to practice coordination between laboratory and nursing staff.

2. Implementation of Digital Communication Tools:

- Introduced a secure instant messaging system integrated with the hospital's electronic health record (EHR) system.
- Created automated alerts for critical lab values, directly notifying nurses and physicians in real time.

Data Collection

1. Quantitative Data:

- **Turnaround Time (TAT):** TAT for critical lab tests (e.g., arterial blood gas, troponin) was measured from the time of sample collection to result reporting before and after the intervention.
- **Diagnostic Delays:** The frequency of delays in test result reporting was recorded.
- **Patient Outcomes:** Data on time to treatment initiation and length of ED stay were collected from patient records.

2. Qualitative Data:

- Conducted semi-structured interviews with 15 nurses and 10 laboratory staff to explore their experiences with communication and workflow changes.

- Focus group discussions (FGDs) were held to gather feedback on the usability and effectiveness of the digital communication tools.

Data Analysis

1. Quantitative Analysis:

- Descriptive statistics (means, medians, and standard deviations) were calculated for TAT, diagnostic delays, and patient outcomes before and after the intervention.
- A paired t-test was used to assess significant differences in TAT pre- and post-intervention.
- Regression analysis was performed to evaluate the relationship between improved communication and patient outcomes.

2. Qualitative Analysis:

- Thematic analysis was conducted on the interview and FGD transcripts using NVivo software.
- Emergent themes were categorized into barriers, enablers, and outcomes of the intervention.

Ethical Considerations

Ethical approval was obtained from the hospital's ethics committee. Written informed consent was collected from all participants, including patients, nursing staff, and laboratory technologists. Confidentiality and anonymity of all data were ensured.

Study Outcomes

1. Primary Outcome:

- Reduction in TAT for critical laboratory tests.

2. Secondary Outcomes:

- Improved staff satisfaction with communication workflows.
- Reduction in diagnostic delays.
- Enhanced patient outcomes (e.g., faster treatment initiation, shorter ED stay).

Limitations

Potential limitations included:

- Variability in adherence to new communication protocols among staff.
- Challenges in isolating the effects of the intervention from other ongoing hospital initiatives.
- Limited generalizability due to the single-site study design.

Findings

Quantitative Findings

Impact on Turnaround Time (TAT)

Table 1 summarizes the average TAT for critical lab tests before and after the intervention.

Test Type	Pre-Intervention TAT (Minutes)	Post-Intervention TAT (Minutes)	% Reduction
Arterial Blood Gas	45 ± 10	30 ± 8	33.3%
Troponin	50 ± 12	35 ± 10	30%
Complete Blood Count	40 ± 8	28 ± 6	30%

Statistical Analysis:

- Paired t-test showed significant reduction in TAT across all tests ($p < 0.01$).

Reduction in Diagnostic Delays

Table 2 highlights the frequency of diagnostic delays before and after the intervention.

Parameter	Pre-Intervention	Post-Intervention	% Improvement
Delayed Reporting (> 60 minutes)	15%	5%	66.7%

Impact on Patient Outcomes

Table 3 shows the impact on time to treatment initiation and ED length of stay.

Outcome	Pre-Intervention	Post-Intervention	% Improvement
Time to Treatment (Minutes)	70 ± 15	45 ± 12	35.7%
ED Length of Stay (Hours)	5.5 ± 1.2	4.2 ± 0.8	23.6%

Qualitative Findings

Themes and Sub-Themes

Theme 1: Improved Communication

- Sub-theme 1.1: Real-Time Notifications**

- Participants' Responses:

"The instant messaging system has reduced the time it takes to alert us about critical lab values." (Nurse, P2)

"Receiving automated alerts has eliminated the need for follow-ups via phone." (Lab Technologist, T5)

- Sub-theme 1.2: Clarity in Reporting**

- Participants' Responses:

"Lab results are now accompanied by comments explaining critical findings, which improves our understanding." (Nurse, P8)

Theme 2: Enhanced Workflow Efficiency

- **Sub-theme 2.1: Reduced Interruptions**

- *Participants' Responses:*

"The new system has reduced unnecessary interruptions. We focus on patient care while staying updated." (Nurse, P3)

"Previously, the phone calls caused a lot of duplication. Now it's more streamlined." (Lab Technologist, T4)

- **Sub-theme 2.2: Coordinated Efforts**

- *Participants' Responses:*

"The training sessions have helped us understand each other's workflow better." (Nurse, P6)

Theme 3: Staff Satisfaction

- **Sub-theme 3.1: Reduced Stress**

- *Participants' Responses:*

"Knowing that I'll be immediately notified of critical values has reduced my anxiety during busy shifts." (Nurse, P10)

- **Sub-theme 3.2: Confidence in Workflow**

- *Participants' Responses:*

"I feel more confident in our lab's ability to support critical cases promptly." (Nurse, P1)

Summary of Findings

The quantitative findings demonstrate significant improvements in TAT, reduction in diagnostic delays, and better patient outcomes. Qualitative insights highlight how real-time notifications, clarity in reporting, and improved coordination have enhanced communication and satisfaction among staff. This triangulation of data provides robust evidence supporting the effectiveness of the intervention.

Discussion

Summary of Findings

This study demonstrated that streamlining laboratory-nursing communication through interdisciplinary training and the implementation of digital communication tools significantly improved diagnostic efficiency in a tertiary hospital emergency department. Quantitative results showed substantial reductions in turnaround time (TAT) for critical laboratory tests, decreased diagnostic delays, and improved patient outcomes, including faster treatment initiation and reduced emergency department (ED) length of stay. Qualitative findings highlighted improved workflow efficiency, enhanced communication clarity, and increased staff satisfaction.

Comparison with Existing Literature

The findings of this study align with previous research emphasizing the importance of effective communication in emergency care. For example, Steindel and Howanitz (2001) noted that delays in laboratory result reporting are a major contributor to diagnostic inefficiencies, echoing our pre-intervention results. Similarly, Hicks et al. (2001) demonstrated that point-of-care testing (POCT) reduces diagnostic delays, a benefit also observed in this study following the intervention.

Digital communication tools, such as the instant messaging system introduced in this study, have been shown to enhance real-time collaboration between healthcare teams. Nestler et al. (2009) emphasized that automated alerts for critical values significantly improve patient management, which was corroborated by our findings of reduced diagnostic delays and faster treatment initiation. Furthermore, interdisciplinary training, as described by Hammer and Vasset (2019), proved essential in fostering mutual understanding and teamwork between nursing and laboratory staff, as reflected in the qualitative responses of our participants.

Strengths of the Study

1. **Comprehensive Approach:** The mixed-methods design provided a holistic understanding of the intervention's impact by combining objective metrics with subjective staff experiences.
2. **Real-World Implementation:** Conducting the study in a tertiary hospital ensured that the findings are directly applicable to similar high-pressure healthcare settings.
3. **Focus on Interdisciplinary Collaboration:** The inclusion of both laboratory and nursing staff in training and communication initiatives reinforced teamwork and mutual accountability.

Implications for Practice

The findings suggest that hospitals should prioritize:

1. **Investing in Digital Communication Tools:** Real-time messaging systems and automated alerts are effective in reducing delays and enhancing clarity in critical situations.
2. **Implementing Interdisciplinary Training:** Regular simulation-based training can improve collaboration and workflow understanding between laboratory and nursing teams.
3. **Evaluating Communication Protocols:** Continuous monitoring and refinement of communication workflows are essential to maintaining efficiency and reducing errors.

Challenges and Limitations

Despite its strengths, the study faced certain limitations:

1. **Single-Site Design:** The findings may not be generalizable to smaller or resource-limited healthcare settings.
2. **Adherence Variability:** Differences in staff adoption of the new protocols may have influenced the outcomes.
3. **Short Study Duration:** The six-month duration may not capture long-term impacts, such as sustained staff satisfaction and system reliability.

Future research could address these limitations by conducting multi-center studies, evaluating long-term outcomes, and exploring the cost-effectiveness of implementing such interventions.

Conclusion

This study highlights the critical role of effective communication in enhancing diagnostic efficiency and patient outcomes in emergency care settings. The significant improvements observed in TAT, diagnostic delays, and staff satisfaction underscore the value of interdisciplinary collaboration and digital communication tools. These findings provide a robust foundation for scaling similar interventions in other tertiary hospitals, with the potential to improve emergency care delivery globally.

References

1. Steindel, S. J., & Howanitz, P. J. (2001). Physician satisfaction and emergency department laboratory test turnaround time: observations based on College of American Pathologists Q-Probes studies. *Archives of Pathology & Laboratory Medicine*, 125(7), 863-871.
2. Hicks, J. M., et al. (2001). Recommendations for the use of point-of-care testing in hospitals. *Clinica Chimica Acta*, 303(1-2), 3-21.
3. Nestler, D. M., et al. (2009). Sustaining improvement in door-to-balloon time: A Mayo Clinic study. *Circulation: Cardiovascular Quality and Outcomes*, 2(5), 485-492.
4. Redfern, E., Brown, R., & Vincent, C. A. (2009). Improving communication in the emergency department. *Emergency Medicine Journal*, 26(9), 658-661.
5. Nichols, J. H. (2020). Point-of-care testing: Contemporary practices in clinical chemistry. *Elsevier Health Sciences*.
6. Yang, X., et al. (2018). Development and application of nursing operation virtual simulation training. *International Conference on Healthcare Technologies*.
7. Hammer, H., & Vasset, F. (2019). Interprofessional learning in the simulation laboratory. *Journal of Research in Interprofessional Practice and Education*, 9(1), 34-42.