

# The Role of Nursing and Laboratory Collaboration in Improving Blood Sample Quality and Reducing Pre-Analytical Errors in Hospital Settings

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## Abstract

Pre-analytical errors in laboratory diagnostics are a major source of inaccuracies, which can delay or lead to inappropriate medical interventions. This study explored how collaboration between nurses and laboratory specialists can help reduce these errors in a tertiary hospital setting. We used a cross-sectional observational approach, involving 60 nurses and 40 laboratory specialists. Data were gathered through observational checklists, questionnaires, lab analyses, and semi-structured interviews. While adherence to blood collection protocols was mostly high, some common errors persisted, such as hemolysis (17%) and incorrect labeling (7.5%). Thematic analysis showed that communication gaps and insufficient feedback were major hurdles. The participants suggested strategies like improved interdisciplinary communication, structured feedback, and joint training programs to foster better collaboration and reduce errors. These findings highlight the importance of coordinated efforts between nursing and laboratory teams to improve blood sample quality and ensure patient safety.

**Keywords:** Pre-analytical errors, Nursing, Laboratory collaboration, Blood sample quality, Patient safety, Interdisciplinary communication, Tertiary hospital.

## Introduction

In today's healthcare landscape, collaboration between different professional teams is key to delivering safe, high-quality patient care. One area that heavily depends on such collaboration is the pre-analytical phase of laboratory testing—a phase involving the collection, handling, and transportation of blood samples. Mistakes during this phase can have serious consequences, potentially leading to inaccurate lab results, delayed diagnoses, or wrong treatment decisions (Lippi et al., 2006). The impact of pre-analytical errors is substantial, with studies showing that they account for anywhere between 46% to 68% of all lab errors (Plebani, 2012). Clearly, strategies to reduce these errors are urgently needed.

The partnership between nursing and laboratory staff is vital to ensuring blood samples are collected and handled properly. Nurses handle the initial collection, while laboratory specialists ensure the samples are analyzed correctly. Any slip-up—whether in communication, handling, or protocol adherence—can compromise sample quality and, ultimately, patient care (Simundic et al., 2018). This study set out to

explore how improved collaboration between nurses and lab personnel can minimize pre-analytical errors and boost sample quality in a tertiary hospital.

## Literature Review

The collaboration between nurses and lab specialists is crucial to minimizing errors in the pre-analytical phase of testing. This phase, which covers patient identification, sample collection, handling, and transportation, is prone to errors that could compromise lab results. Pre-analytical errors are responsible for a significant proportion of lab inaccuracies—up to 68% of all mistakes (Plebani, 2012).

### 1. Pre-Analytical Errors and Their Impact on Patient Care

Pre-analytical errors happen due to a range of factors, from incorrect patient identification to improper venipuncture techniques, inadequate sample volume, and incorrect labeling (Lippi et al., 2006). Such errors can lead to inaccurate results, delayed diagnoses, or unnecessary repeat testing—all of which negatively affect patient care. Lippi and colleagues (2006) highlighted that many of these errors are preventable with proper training and better collaboration between nurses and lab staff.

### 2. Nurses 'Role in Blood Sample Collection

Nurses are at the frontlines of the pre-analytical phase, collecting blood samples and ensuring they are labeled and handled correctly. Research shows that better nurse education significantly reduces pre-analytical errors and improves patient safety (Al-Ghaithi, et al., 2017). Continued education on proper blood collection techniques is an effective way to prevent mistakes and ensure high sample quality.

### 3. Laboratory Specialists 'Role in Quality Control

Laboratory specialists, on the other hand, are responsible for assessing the quality of the samples they receive. They play an important role in identifying discrepancies—such as hemolysis or improper anticoagulant use—and providing feedback to nursing staff to prevent such errors from recurring (Kalra and Kopargaonkar, 2016)

### 4. Communication and Teamwork

Effective communication between nurses and lab staff is essential. Studies show that communication gaps are a major factor contributing to pre-analytical errors (Carraro&Plebani, 2007). Building a culture of open communication ensures that any issues are quickly identified and resolved, ultimately leading to better patient outcomes (Houschyar et al., 2012).

### 5. Strategies for Reducing Errors

Standardized procedures, regular training, and shared responsibility between nurses and lab specialists are some of the effective strategies employed to reduce pre-analytical errors (Simundic et al., 2018). A multidisciplinary approach involving both teams has been consistently shown to enhance the quality of sample handling and, by extension, patient safety (Ialongo and Bernardini, 2016).

## Methodology

### Study Design

This study employed a cross-sectional observational design to examine the collaboration between nurses and lab specialists in improving blood sample quality and reducing pre-analytical errors in a tertiary hospital. The research took place over a six-month period at Tertiary Hospital, known for its robust clinical and laboratory services.

## Setting

The study was conducted in a 500-bed tertiary hospital, serving a diverse range of patients across departments such as medical, surgical, and critical care. We focused specifically on the pre-analytical phase of blood sampling, analyzing how samples were collected by nurses and handled by lab personnel.

## Participants

We recruited 100 participants—60 nurses and 40 lab specialists—who were directly involved in blood collection and handling. Nurses needed at least one year of experience in venipuncture, while lab specialists required one year of experience in sample processing.

## Data Collection Methods

Data collection was conducted using several methods:

1. **Observational Checklist:** Observations were made using a checklist based on guidelines from the Clinical and Laboratory Standards Institute (CLSI). We observed nurses during the blood collection process to evaluate how well they adhered to protocols.
2. **Questionnaire:** Both nurses and lab specialists filled out structured questionnaires about their perceptions of collaboration, communication, and the challenges they face in reducing pre-analytical errors.
3. **Laboratory Analysis:** Blood samples collected during the study were analyzed to check for common errors like hemolysis, incorrect labeling, and insufficient volume.
4. **Interviews:** We also conducted semi-structured interviews with 20 participants (10 nurses and 10 lab specialists) to get a deeper understanding of the challenges and their experiences with interdisciplinary collaboration.

## Data Analysis

Quantitative data from the observations and questionnaires were analyzed using descriptive statistics, such as frequency counts and percentages. Chi-square tests were used to identify differences in adherence rates between departments. The qualitative data from interviews were transcribed and analyzed thematically to identify recurring themes related to communication, training gaps, and suggestions for improvement.

## Ethical Considerations

The ethics committee approved the study, and informed consent was obtained from all participants. Observations were conducted in a way that ensured patient privacy and participant anonymity.

The study set out to understand how collaboration between nurses and laboratory specialists can enhance blood sample quality and reduce pre-analytical errors. Below, we summarize the findings from observations, questionnaires, and interviews conducted during the study.

### 1. Observations on Blood Collection Practices

We observed how nurses followed guidelines during the blood collection process using a detailed checklist. The adherence rates for the key steps in blood collection are shown in Table 1.

**Table 1: Adherence to Blood Collection Protocols by Nurses (N = 60)**

Blood Collection Step	Number of Nurses Adhering	Percentage (%)
Patient Identification	57	95%
Use of Appropriate Collection Tube	55	92%
Correct Labeling of Sample	53	88%
Adequate Sample Volume Collected	51	85%
Proper Handling and Transport	49	82%

From the data, it's clear that identifying patients correctly was the strongest point, with 95% adherence. However, transporting samples properly was more challenging, with only 82% adherence. Improper handling was often noted when samples weren't transported to the lab immediately, leading to a higher risk of issues like hemolysis.

## 2. Types of Errors in Blood Samples

The lab analysis revealed several types of pre-analytical errors. Table 2 outlines the errors and how often they occurred.

**Table 2: Prevalence of Pre-Analytical Errors (N = 200 Samples)**

Type of Pre-Analytical Error	Number of Samples Affected	Percentage (%)
Hemolysis	34	17%
Incorrect Labeling	15	7.5%
Insufficient Volume	10	5%
Clotting in Anticoagulated Samples	8	4%
Incorrect Tube Selection	5	2.5%

Hemolysis, affecting 17% of samples, was the most common issue. Incorrect labeling also stood out, impacting 7.5% of the samples. These findings highlight areas where improvements could be particularly beneficial.

## 3. Perspectives on Team Collaboration

We used a questionnaire to understand how nurses and lab specialists viewed collaboration and communication. Table 3 summarizes their responses.

**Table 3: Perceptions of Collaboration Between Nursing and Laboratory Staff (N = 100)**

Statement	Agree (%)	Neutral (%)	Disagree (%)
Effective communication exists between departments	60%	25%	15%
Training is adequate	70%	15%	15%

for blood sample collection			
Pre-analytical errors can be reduced through better collaboration	85%	10%	5%
Feedback from laboratory staff is timely and helpful	55%	30%	15%

The results show that 85% of participants believe better collaboration could help reduce errors, highlighting a shared recognition of the value of teamwork. However, only 60% felt that effective communication currently exists between nurses and lab staff, indicating that there's still work to be done in this area.

#### 4. Insights from Interviews

We interviewed 20 participants—10 nurses and 10 lab specialists—to gain deeper insights into their experiences. Here are the key themes that emerged:

- **Communication Gaps:** Many participants pointed out that communication between the nursing and lab teams wasn't always timely. Lab specialists, in particular, noted that delays in informing nurses about rejected samples often led to the need for repeat sampling, which had a negative impact on patient experience.
- **Joint Training:** Both groups expressed a desire for joint training sessions. Nurses and lab specialists agreed that these sessions could help them better understand each other's roles, leading to fewer mistakes and a more efficient workflow.
- **Feedback Mechanisms:** Lab specialists emphasized the importance of providing prompt feedback on sample quality. Most felt that the current feedback system wasn't adequate, and improving it could help prevent recurring errors.

#### Discussion

The study highlighted the importance of effective collaboration between nursing and lab teams in reducing pre-analytical errors. Adherence to protocols was generally high, but the handling and transportation of samples needed improvement, especially since improper handling was linked to a higher prevalence of hemolysis. This finding aligns with other studies that have identified hemolysis as a common error in the pre-analytical phase (Lippi et al., 2006).

Interdisciplinary collaboration was key, but communication gaps were a major challenge. Establishing regular, real-time feedback mechanisms could help prevent repeated mistakes. Joint training sessions for both teams were also suggested, as they could improve understanding of each other's roles and responsibilities, thus enhancing patient safety and reducing errors. This echoes the findings of Houshyar et al. (2012), who found that regular feedback and interdisciplinary training play a significant role in minimizing pre-analytical errors.

### Practical Implications

The results of this study suggest several practical steps for hospitals. First, there's a need for standardized protocols for handling and transporting samples, with regular audits and feedback sessions to monitor adherence. Encouraging a culture of open communication between nursing and lab teams is also vital. Regular interdisciplinary meetings could facilitate this. Lastly, joint training programs would not only improve technical skills but also foster mutual respect and understanding, leading to better patient outcomes.

### Limitations and Future Research

One limitation of this study is that it was conducted in a single hospital, which may limit the generalizability of the findings. Also, the observational nature of the study may have influenced participant behavior. Future research could explore whether similar findings apply across different settings, and it could also investigate the impact of specific interventions, such as joint training programs, on reducing pre-analytical errors.

### Conclusion

This study underscores the importance of effective collaboration between nurses and laboratory specialists in reducing pre-analytical errors and improving blood sample quality. Key areas for improvement include enhancing communication channels, establishing feedback mechanisms, and implementing joint training programs. Addressing these areas can help hospitals reduce errors, improve laboratory diagnostics, and enhance overall patient care.

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