

# Optimizing the Role of Pharmacists, Nurses, and CT Technologists in Medication Safety for Patients Undergoing Diagnostic Imaging

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## Abstract

This study evaluates the impact of multidisciplinary collaboration among pharmacists, nurses, and CT technologists on medication safety during diagnostic imaging procedures. Utilizing a mixed-methods approach at a tertiary hospital, the study involved 150 patients, with quantitative data showing a significant reduction in adverse reactions to contrast media and a decrease in hospital stay duration. Qualitative findings highlighted improved communication, enhanced workflow, and increased patient satisfaction, though challenges such as time constraints and the need for additional training were noted. The results indicate that effective multidisciplinary collaboration can enhance patient outcomes, improve safety, and reduce complications in diagnostic imaging.

**Keywords:** Multidisciplinary Collaboration, Medication Safety, Diagnostic Imaging, Pharmacists, Nurses, CT Technologists, Contrast Media, Patient Outcomes

## Introduction

The safety of patients undergoing diagnostic imaging is of paramount importance, particularly when considering the administration of medications and contrast agents that carry potential risks. Diagnostic imaging procedures, such as computed tomography (CT), often require the use of contrast media to enhance image quality, which poses a risk of adverse reactions or complications if not properly managed. Ensuring medication safety in this context requires a coordinated approach involving pharmacists, nurses, and CT technologists. Each professional brings a unique set of skills to the process: pharmacists contribute their expertise in medication management, nurses provide direct patient care and assessment, and CT technologists operate imaging equipment and administer contrast agents (Dobbins et al., 2019).

The collaboration between these disciplines is crucial for identifying potential drug interactions, monitoring patient reactions, and providing appropriate interventions when necessary. Studies have shown that adverse reactions to contrast media, while relatively infrequent, can be severe and even life-threatening if not managed promptly (Boyd et al., 2017). By optimizing communication and workflow between pharmacists, nurses, and CT technologists, hospitals can enhance patient outcomes, reduce the risk of adverse events, and improve overall medication safety during diagnostic imaging.

Furthermore, multidisciplinary efforts are known to enhance patient education, ensuring that patients are adequately informed about the risks and benefits of imaging procedures. This, in turn, contributes to improved patient compliance and a reduction in procedural anxiety (Kane et al., 2007). As the healthcare landscape continues to evolve, the importance of collaborative practice in improving patient safety is

increasingly recognized, making it essential to explore ways to optimize the role of each professional in the imaging process.

### **Literature Review**

The importance of collaboration in healthcare has been emphasized across various medical fields, including diagnostic imaging. A growing body of literature highlights the critical role of multidisciplinary teamwork in enhancing patient safety and optimizing healthcare outcomes. The involvement of pharmacists, nurses, and CT technologists in imaging procedures is an example of how such collaboration can mitigate risks associated with contrast media and improve patient experiences.

Dobbins et al. (2019) emphasized the necessity of integrating pharmacists into the imaging process, as they provide specialized knowledge about medications and their potential interactions with contrast agents. This integration is essential for reducing adverse reactions, particularly in patients with complex medication regimens. Pharmacists' expertise ensures that appropriate pre-procedure screening is conducted and that patients receive adequate instructions on managing their medications before undergoing CT imaging.

Nurses play a pivotal role in patient assessment, preparation, and monitoring during imaging procedures. According to Kane et al. (2007), effective communication between nurses and other healthcare professionals is crucial for ensuring that patients are well-informed and prepared for imaging. This preparation not only reduces patient anxiety but also enhances compliance with procedural requirements, ultimately improving the quality of the imaging results. Nurses are also often the first to identify and respond to adverse reactions, making their role in the imaging process indispensable.

CT technologists are responsible for administering contrast agents and operating imaging equipment. Their role extends beyond technical proficiency, as they must also communicate effectively with patients and collaborate with pharmacists and nurses to ensure safe and efficient imaging procedures (Boyd et al., 2017). Technologists' knowledge of contrast media administration and their ability to recognize early signs of adverse reactions are critical components of patient safety during imaging.

Studies have shown that adverse reactions to contrast media can be minimized through proper patient screening and preparation, as well as close monitoring during and after the procedure (Boyd et al., 2017). A multidisciplinary approach that includes pharmacists, nurses, and CT technologists has been shown to significantly reduce the incidence of adverse reactions and improve overall patient outcomes. The literature also suggests that enhanced communication and teamwork among these professionals lead to more effective management of potential complications and improved patient education.

In addition to minimizing adverse reactions, multidisciplinary collaboration has been found to enhance patient education. Kane et al. (2007) highlighted that providing patients with comprehensive information about the imaging procedure, including potential risks and benefits, helps to reduce anxiety and improve compliance. This education is most effective when delivered by a team of healthcare professionals who can address various aspects of the patient's care, from medication management to procedural details.

Overall, the literature supports the idea that optimizing the roles of pharmacists, nurses, and CT technologists in diagnostic imaging is key to improving patient safety and outcomes. By fostering collaboration and clear communication, healthcare teams can ensure that patients receive the highest quality of care, reducing the risk of complications and enhancing the overall imaging experience.

## Methodology

This study utilized a mixed-methods approach to evaluate the impact of multidisciplinary collaboration among pharmacists, nurses, and CT technologists on medication safety in diagnostic imaging. The study was conducted at a tertiary hospital over a six-month period, involving both quantitative and qualitative data collection to comprehensively assess the effectiveness of the collaboration.

### Study Design and Participants

The study included a sample of 150 patients undergoing CT imaging procedures that required the use of contrast media. The participants were selected through purposive sampling to include patients with varying levels of risk for adverse reactions to contrast media. In addition, 20 pharmacists, 25 nurses, and 15 CT technologists were recruited to participate in the study. The healthcare professionals were selected based on their direct involvement in the imaging process and their experience in managing patients receiving contrast media.

### Quantitative Data Collection

Quantitative data were collected through the review of medical records and incident reports related to adverse reactions to contrast media. The data focused on the incidence of adverse reactions, types of reactions, and interventions provided. In addition, patient outcomes were assessed using clinical parameters such as vital signs, kidney function tests, and length of hospital stay. A pre- and post-intervention comparison was conducted to evaluate the impact of the multidisciplinary approach on reducing adverse events.

### Qualitative Data Collection

Qualitative data were gathered through semi-structured interviews with the participating healthcare professionals. The interviews explored their experiences with multidisciplinary collaboration, communication strategies, and perceived barriers to effective teamwork. Additionally, focus group discussions were conducted with patients to understand their experiences, concerns, and satisfaction with the imaging process.

### Data Analysis

Quantitative data were analyzed using statistical software to determine the significance of the changes in adverse reaction rates and patient outcomes. Descriptive statistics were used to summarize the data, and inferential statistics, such as paired t-tests, were employed to assess the effectiveness of the intervention. Qualitative data were analyzed thematically to identify key themes related to the benefits and challenges of multidisciplinary collaboration.

### Ethical Considerations

The study was approved by the ethics committee, and informed consent was obtained from all participants. Patient confidentiality was maintained throughout the study, and participants were informed of their right to withdraw from the study at any time without any repercussions.

### Quantitative Findings

The quantitative findings indicated a significant reduction in the incidence of adverse reactions to contrast media following the implementation of the multidisciplinary collaboration approach. The comparison of pre- and post-intervention data is summarized in Table 1.

**Table 1. Incidence of Adverse Reactions to Contrast Media**

Measurement	Pre-Intervention (n=150)	Post-Intervention (n=150)
Total Adverse Reactions	25 (16.7%)	10 (6.7%)
Mild Reactions	18 (12.0%)	7 (4.7%)
Moderate Reactions	5 (3.3%)	2 (1.3%)
Severe Reactions	2 (1.3%)	1 (0.7%)

The results show a decrease in the total number of adverse reactions from 25 to 10, representing a 60% reduction. The severity of the reactions also declined, with fewer moderate and severe reactions observed post-intervention.

**Table 2. Patient Outcomes Pre- and Post-Intervention**

Outcome Measure	Pre-Intervention Mean	Post-Intervention Mean	p-value
Length of Hospital Stay (days)	5.2	4.1	< 0.05
Kidney Function (Creatinine, mg/dL)	1.3	1.2	0.08

The data in Table 2 demonstrate improvements in patient outcomes, with a significant reduction in the length of hospital stay ( $p < 0.05$ ). Although there was a slight improvement in kidney function, it was not statistically significant.

### Qualitative Findings

Thematic analysis of the qualitative data revealed several key themes related to the benefits and challenges of multidisciplinary collaboration. The findings are summarized below:

#### Theme 1: Improved Communication and Workflow

##### Sub-themes:

1. Clear Role Definition - Participants emphasized that defining each professional's role improved efficiency. A nurse stated, "Knowing exactly what the pharmacist and CT technologist are responsible for helped streamline the process."
2. Enhanced Information Sharing - Healthcare professionals reported improved sharing of patient information. A pharmacist mentioned, "Having a structured communication protocol made it easier to get all the information needed before administering contrast."

#### Theme 2: Patient-Centered Care

##### Sub-themes:

1. Increased Patient Satisfaction - Patients expressed feeling more informed and cared for. One patient said, "The nurse explained everything clearly, and I felt safe knowing that different specialists were involved."
2. Reduction in Anxiety - Patients reported reduced anxiety levels due to comprehensive pre-procedure education. A patient stated, "Understanding what was going to happen made me much less nervous."

#### Theme 3: Challenges in Collaboration

##### Sub-themes:

1. Time Constraints - Some participants noted time limitations as a barrier to effective collaboration. A CT technologist explained, "With the tight schedule we have, sometimes it's hard to gather everyone for a quick discussion."
2. Need for Additional Training - A few professionals highlighted the need for more training on communication and teamwork. A nurse mentioned, "We could benefit from more training sessions on how to work together more effectively."

#### Theme 4: Professional Satisfaction

##### Sub-themes:

1. Increased Confidence - Healthcare professionals reported increased confidence in managing complex cases. A CT technologist said, "Working closely with pharmacists and nurses gave me more confidence in handling high-risk patients."
2. Recognition of Contribution - Participants felt that their roles were better recognized and valued within the team. A pharmacist commented, "I feel like my contributions are more appreciated now that we're working together more closely."

### Discussion

The findings of this study demonstrate the significant benefits of multidisciplinary collaboration among pharmacists, nurses, and CT technologists in enhancing medication safety during diagnostic imaging procedures. The quantitative results showed a notable reduction in the incidence of adverse reactions to contrast media, with a 60% decrease in overall adverse reactions following the implementation of a collaborative approach. This decrease suggests that the coordinated efforts of healthcare professionals can effectively mitigate the risks associated with contrast administration, thereby improving patient safety.

The reduction in the severity of adverse reactions, as well as the decrease in the length of hospital stays, highlights the effectiveness of a multidisciplinary approach in optimizing patient outcomes. Although improvements in kidney function were not statistically significant, the overall trend suggests that careful monitoring and collaboration may still contribute positively to patient health. These findings align with the literature, which emphasizes the importance of involving pharmacists in medication management and ensuring thorough patient screening to prevent adverse events (Dobbins et al., 2019).

The qualitative findings further support the value of a multidisciplinary approach by highlighting improved communication, enhanced workflow, and increased patient satisfaction. Clear role definition and structured information sharing contributed to the efficiency of the imaging process, as mentioned by participants. These aspects are crucial for minimizing errors and ensuring that each healthcare professional is fully aware of their responsibilities, ultimately benefiting patient care. Improved communication and defined roles were also seen to enhance confidence among healthcare professionals, leading to increased professional satisfaction.

However, challenges in collaboration were also identified. Time constraints and the need for additional training were common themes, indicating barriers to the full realization of the benefits of multidisciplinary collaboration. The tight schedules often faced by healthcare professionals can hinder their ability to coordinate effectively, potentially affecting the quality of care. Furthermore, the call for more training highlights the need for ongoing education to enhance teamwork skills and optimize the collaborative process. Addressing these barriers through targeted interventions, such as allocating time for team meetings and providing formal training on teamwork and communication, could further improve outcomes.

Patient-centered care was another significant theme, with patients expressing satisfaction with the care they received and reporting reduced anxiety levels due to thorough pre-procedure education. The involvement of multiple healthcare professionals in patient education ensured that all aspects of the imaging procedure were clearly explained, which not only increased patient confidence but also contributed to a smoother imaging process. These findings are consistent with Kane et al. (2007), who found that comprehensive patient education delivered by a multidisciplinary team leads to improved patient compliance and reduced anxiety.

Overall, the study demonstrates that multidisciplinary collaboration among pharmacists, nurses, and CT technologists is effective in enhancing medication safety and patient outcomes in diagnostic imaging. By addressing the challenges identified, such as time constraints and training needs, healthcare institutions can further optimize collaborative practices to ensure the highest quality of patient care. Future research could explore strategies to overcome these barriers and assess the long-term impact of multidisciplinary collaboration on patient outcomes in different healthcare settings.

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