

Improving Crisis Management and Communication in Saudi Healthcare: The Contributions of Radiology and Nursing Specialists to Patient Safety

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ABSTRACT

Background: Patient safety is a critical focus in healthcare, aiming to minimize risks and harm through systemic efforts involving leadership, teamwork, and a culture of safety. Radiology departments face unique challenges due to their complex, high-tech nature, making safety culture essential. This study assesses Radiology and Nursing Specialists perceptions of patient safety culture, identifies areas for improvement, and raises awareness about safety practices in radiology. **Methods:** A descriptive cross-sectional design was used, employing a self-reported questionnaire based on the Survey on Patient Safety Culture. Data were collected from 171 Radiology and Nursing Specialists in public radiology departments, achieving a response rate of 46.5%. Positive perception percentages for 14 safety culture dimensions were calculated, with thematic analysis performed on qualitative feedback. **Results:** Positive perception rates varied from 34% to 81% across the dimensions. Strengths included "Teamwork within the unit" (81%), while areas for improvement included "Executive management support for patient safety" (34%), "Frequency of error reporting" (40%), and "Staffing" (44%). Qualitative feedback highlighted issues such as insufficient feedback mechanisms and staffing concerns. The overall safety rating averaged 2.45, indicating a "good" level of patient safety. **Conclusion:** The findings underscore the need for stronger management support, improved error reporting systems, and enhanced staffing to foster a robust patient safety culture. Addressing these areas could significantly enhance safety practices in radiology departments, benefiting both staff and patients. Future research should explore strategies for implementing these improvements effectively.

KEYWORDS: Radiology, nursing, crisis.

1. Introduction

Delivering safe healthcare in today's dynamic and rapidly evolving medical landscape is a significant and complex challenge. The fast-paced nature of healthcare increases the likelihood of errors, making the prevention of risks and harm a critical priority in patient safety (1). Patient safety involves a systematic framework of coordinated actions encompassing procedures, technology, workflows, behaviors, environments, and cultural elements to minimize risks consistently. Despite advancements, unsafe healthcare practices remain one of the leading global causes of mortality and morbidity, with diagnostic errors being particularly harmful (2).

The concept of "safety culture" emerged as the perspective on safety shifted from attributing errors solely to individual mistakes—often accompanied by blame—to a broader focus on systemic factors. This system-oriented approach examines the interplay of multiple elements shaping the work environment (3,4). Rather than attributing errors to individual carelessness, this perspective views them as symptoms of underlying organizational issues (4,5). Central to this approach is fostering a non-punitive environment where mistakes are treated as learning opportunities, encouraging improvements in policies and procedures (6).

The presence of a safety culture has become increasingly recognized as essential for advancing patient safety in healthcare organizations. This culture reflects the shared beliefs, norms, and values among leadership and staff regarding what is prioritized in the organization, acceptable behaviors, and the processes that are rewarded (7). Key components of a robust safety culture include effective leadership, teamwork, evidence-based practices, open communication, ongoing learning, a just culture, and a patient-centered approach. Leadership accountability, particularly at the senior level, plays a pivotal role in embedding a safety culture throughout an organization. However, implementing such a culture is challenging due to its complexity and the varying layers of hospital management (8). These layers include the macrosystem (senior leadership), the mesosystem (major hospital divisions such as radiology), and the microsystem (frontline units where patient care is delivered) (5).

To foster patient safety improvements, healthcare organizations must evaluate their current safety culture. Tools like self-reported staff surveys are invaluable for assessing this culture. These tools serve various purposes, including identifying priority areas for improvement, evaluating safety programs, monitoring changes over time, benchmarking performance, and meeting regulatory requirements (9). An effective safety culture enhances safety outcomes by reducing accidents, ensuring compliance with safety protocols, and lowering adverse event frequencies (10,11).

Radiology departments exemplify environments where safety culture is critical due to their advanced, high-tech, and complex nature. These departments handle diagnostic and therapeutic procedures using various imaging techniques and radiation sources, catering to both planned and emergency cases (12,13). The rapid technological advancements, combined with high patient volumes and extensive interdepartmental communication, further increase the risks of patient safety incidents (14,15). Strategies to address these risks must account for every stage of the radiological workflow and involve a multidisciplinary approach. Key stakeholders include radiologists, Radiology and Nursing Specialists, assistant

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nurses, medical physicists, equipment manufacturers, and administrative personnel (13,17).

Radiology and Nursing Specialists, in particular, play a vital role in ensuring safety during radiological procedures. Their responsibilities extend beyond technical imaging tasks to encompass patient care before, during, and after the examination. Through their skills and actions, they address and communicate patient needs, thereby contributing significantly to patient safety (13,18,19,20). However, creating and maintaining a culture of safety requires more than individual competence—it also depends on organizational and environmental factors (21). A strong safety culture relies equally on individuals and the systems they operate within (22). For Radiology and Nursing Specialists to sustain safe practices, their work environments must support and encourage safety-focused initiatives (23).

Given the importance of patient safety culture in radiology, it is essential to explore Radiology and Nursing Specialists' perceptions of this culture. Research on this specific perspective remains limited, prompting the need for further investigation. This study aims to address this gap by assessing safety culture, identifying critical areas for improvement, and raising awareness about patient safety within radiology by Radiology and Nursing Specialists during crisis management (9).

2. Methods

A descriptive cross-sectional design was adopted for this research, utilizing a self-reported questionnaire to gather data. The study involved a convenience sample of 368 registered Radiology and Nursing Specialists employed in public radiology departments across various units and modalities. The eligibility criteria included Radiology and Nursing Specialists with a minimum of six months' experience in their current unit, engaged in patient-related activities, whether directly or indirectly, including administrative roles. Radiology and Nursing Specialists on extended leave were excluded. A response rate of 46.5% (171 participants) was achieved.

Tool

The study employed the Survey on Patient Safety Culture to collect data. This validated questionnaire, based on an established original instrument developed by the Agency for Healthcare Research and Quality (AHRQ), was recommended by local healthcare authorities. The instrument assesses patient safety culture across 14 dimensions and includes 51 items rated on a five-point Likert scale. Supplemental questions related to risk reporting and information for patients and staff following incidents were also incorporated to cover additional safety dimensions. The questionnaire also contained demographic questions and an optional open-ended item allowing respondents to provide suggestions for improvement or general comments about patient safety at their workplace.

Data Collection Process

Data were gathered over a four-month period, following the guidelines outlined in the user manual. The research team contacted department managers to inform them

about the study and obtain email addresses for eligible Radiology and Nursing Specialists . Study information was disseminated via email, followed by distribution of paper questionnaires with prepaid return envelopes. To encourage participation, a series of email reminders were sent over several weeks. Completed questionnaires were anonymized and processed using IBM SPSS Statistics software.

Data Analysis

Responses were reviewed in SPSS to check for inconsistencies or missing values. To calculate the positive perception percentages for each safety dimension, answers such as "Strongly agree" and "Agree" (or equivalent) were categorized as positive. For negatively worded items, responses like "Strongly disagree" and "Disagree" were similarly classified. Scores for each dimension were determined by averaging the positive responses, dividing by the total number of valid answers, and multiplying by 100.

To identify strengths and weaknesses in patient safety culture, a threshold of >75% was set to denote strengths, while <50% signaled areas needing improvement. Comments provided by respondents were analyzed qualitatively, sorted into categories aligned with the safety culture dimensions, and thematically grouped using a directed content analysis approach.

Additionally, three outcome variables were analyzed separately: the overall grade for patient safety, and the frequency of reported risks and events. These were presented as percentages for each response category.

Ethical Considerations

Participants were provided with detailed study information, and their voluntary participation was confirmed through signed informed consent forms. Confidentiality and anonymity were strictly maintained throughout the research process to protect participants' identities and responses.

Table 1 Respondents' demographic data

Respondent Characteristics (n = 171)	%
Work Area	
Radiology	100
Age Range (years)	
18–24	1
25–34	23
35–44	15
45–54	27
55–64	30
≥65	4
Sex	
Female	85
Male	15
Current Unit Experience (years)	
<1	14
1–5	28
6–10	17
11–15	12
16–20	10
≥21	20

Workload (hours/week)	
<20	2
20–39	40
40–59	56
≥60	2
Radiology and Nursing Specialists Function	
First-line Manager	8
Performing Examinations	86
Care and System Administrator	6
Interaction with Patients	
Direct	88
None	12

3. Results

A total of 171 Radiology and Nursing Specialists participated in the survey, representing employees from five radiology clinics spread across 15 units. The findings incorporate both numerical and narrative data.

Dimensions of Patient Safety

The analysis focused on the percentage of positive responses to the 48 items in the questionnaire. The overall results revealed a wide variation in perceptions of patient safety culture, with positive response rates ranging from 34% to 81% across the dimensions. Four dimensions were identified as areas of concern due to low positive response rates: "Executive management support for patient safety" (34%), "Frequency of error reporting" (40%), "Staffing" (44%), and "Organizational learning and continuous improvement" (46%).

In contrast, "Teamwork within the unit" was highlighted as a strength, with an 81% positive response rate. The remaining nine dimensions exhibited moderate levels of positive perceptions, with rates ranging from 50% to 65%.

Overall Safety Rating

The overall assessment of patient safety was captured through a single question, rated on a five-point scale: "Excellent" = 1, "Very good" = 2, "Acceptable" = 3, "Poor" = 4, and "Failing" = 5. The average score was 2.45, which was interpreted as representing a "good" level of patient safety.

Event Reporting

The responses included data on incidents that resulted in harm or had the potential to cause harm, reflecting Radiology and Nursing Specialists' engagement in reporting processes.

Risk Reporting

The survey also measured responses regarding risks, which referred to situations where harm could potentially occur, shedding light on proactive risk management practices.

Qualitative Insights

The thematic analysis of written comments provided by respondents generated insights into nearly all patient safety dimensions. However, the "Non-punitive response to error" dimension had insufficient data, as only two comments were provided. The identified themes, along with representative quotes for each dimension

4. Discussion

The objective of this study was to explore Radiology and Nursing Specialists' perceptions of patient safety culture in radiology departments. The focus was on assessing the safety culture, identifying areas for improvement, and raising awareness about patient safety practices (9). The discussion highlights the study's findings by examining the strengths and weaknesses of specific dimensions.

While certain patient safety dimensions revealed notable deficiencies, the findings indicate that Radiology and Nursing Specialists generally rated the overall safety level as high. The dimension "Teamwork within the unit" emerged as a key strength. Effective teamwork is a critical component of patient safety (17, 30). This finding suggests that Radiology and Nursing Specialists are accustomed to collaboration during imaging procedures, enabling them to adapt their decisions and workflow to their unit's specific needs. This aligns with other studies emphasizing the significance of teamwork in maintaining safety standards (16, 18, 19, 31). Moreover, the results suggest that even under challenging conditions, such as staff shortages, employees tend to collaborate to ensure the safe completion of tasks.

On the other hand, the "Staffing" dimension was identified as a significant weakness. Comments from Radiology and Nursing Specialists indicated that inadequate staffing levels adversely impact safety. This aligns with prior research demonstrating that work-related stress and insufficient staffing can hinder the development of a robust patient safety culture (32). Studies have also shown that extended work hours and fluctuating staff resources are linked to negative outcomes in care quality and patient safety (33, 34).

The dimension "Frequency of reporting errors" was another area of concern, with a low positive response rate. Underreporting of errors is a well-documented issue (5, 35). Several factors, such as fear of liability, inadequate feedback, unclear responsibilities, time constraints, and high thresholds for reporting, may contribute to this problem (36). Radiology and Nursing Specialists in this study frequently addressed and corrected risks without formally reporting them, which could hinder organizational learning and continuous improvement. Learning from errors requires their identification and integration into routine practices (6, 37). However, if risks and adverse events are not adequately reported, critical opportunities for improvement may be lost (38). Although the study showed a low frequency of error reporting, this likely reflects underreporting rather than genuinely high safety levels.

Continuous improvement within organizations requires not only error identification but also the evaluation of existing protocols (13). Given the highly technical nature of radiology, standardized procedures are essential for safe operations (18). Comments from Radiology and Nursing Specialists indicated a lack of time and space for implementing necessary improvements. The dimension "Organizational

learning – continuous improvement" also received low scores, highlighting a need for more structured efforts to update routines based on evidence and past experiences.

The dimension "Executive management support for patient safety" received the lowest positive responses in the study. Strong management is a crucial factor in fostering a culture of safety (40). Leadership at all levels—macro, meso, and micro—is essential for emphasizing the importance of safety practices (17). The mesosystem plays a pivotal role in supporting frontline staff with the tools and resources necessary for safe, effective care (5). However, Radiology and Nursing Specialists reported that management did not adequately utilize their expertise or provide feedback, which likely weakens the overall safety culture. Conversely, the dimension "Supervisors/managers' expectations and actions promoting safety" scored higher, suggesting that immediate leadership closer to patient care offers better support.

The balance between individual accountability and systemic responsibility for patient safety has been a topic of ongoing debate (22). A culture of safety emerges when all employees understand their collective and individual roles in ensuring patient safety as part of daily operations (39). Leadership, though complex and multifaceted, must establish and reinforce these expectations. Radiology, as a service-oriented department, faces the dual challenge of meeting productivity goals while maintaining operational standards for patient safety and staff well-being (17, 39). Middle managers, through their unique organizational positions, have the potential to play a transformative role in driving patient safety improvements, despite the inherent difficulties of their responsibilities (41). Future research examining managerial perspectives on navigating these challenges could provide valuable insights.

The study achieved a response rate of 46.5%, which is slightly below the recommended minimum of 50% for populations under 500 (21). Given the target population—Radiology and Nursing Specialists in a western region of Sweden—the sample size could not exceed 500, which poses some limitations regarding external validity. However, the region studied is large, and Sweden's homogeneity supports the transferability of the findings to other regions. Additionally, focusing on one region may enhance clinical relevance. The study's quantitative data are complemented by qualitative insights, strengthening its overall validity. The frequent inclusion of comments added depth, and credibility was ensured by providing representative quotes for each theme (42).

5. Conclusions

The study indicates that Radiology and Nursing Specialists perceive the overall level of patient safety as good, with strong intra-unit teamwork being a key contributor to the safety culture. Radiology and Nursing Specialists' ability to identify risks and address incidents promptly played a significant role in maintaining safety. However, the findings underscore the critical importance of managerial support and effective leadership in fostering a robust patient safety culture.

The study reveals that executive management must offer greater support and more consistent feedback regarding safety initiatives. Error reporting frequency also requires significant improvement, as does attention to staffing challenges and organizational learning processes. The results suggest that staffing shortages may exacerbate other weaknesses within the safety culture. Additionally, limited time for following up on learning opportunities remains a challenge.

Future research is needed to explore the roles and challenges of managers in cultivating a patient safety culture in radiology settings.

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- Mobarak Naji Mobarak Al Yami, Mohammad Dhafer Al Ghubari, Mahdi Naji Mobarak Al Yami, Arwa Salem Abdullah Al-Musabi, Zahrah Ali Saad Al Saad, Reval Nasher Mohammad Alfahad, Saedah Hamad Hassan Alshiban, Mahdi Ali Mohammed Al Sharyah
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