

Reducing Specimen Loss and Mislabeling in Operating Rooms:

A Risk Management Approach (A Cross-Sectional Survey of Operating Room Nurses)

وممرضي ممرضات بين مقطعي مسح) المخاطر إدارة مدخل: العمليات غرف في وسمها خطأ/وسوء العينات فقدان من الحد
(العمليات غرف

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Abstract

Background: The pre-analytical pathway represents the set of activities from the request to analysis in a laboratory investigation. These events may lead to a delay in diagnosis, unwarranted therapeutic decision and repeats of any procedures as well as higher costs for the health system. Most hospitals had written specimen-handling policies, but occurrences probably persist because intraoperative routines include numerous handoffs and interruptions, time constraints, and inconsistent or abbreviated adherence to verification activities.

Objective: This study investigates the risk management of specimen loss and mislabeling that occur in operating rooms (ORs) from the viewpoint of OR nurses, with a conceptual focus to find out knowledge, practices, and perceived risk factors which contribute to OR specimens loss and mislabeling.

Methods: A cross-sectional descriptive survey will be conducted at Al-Madinah General Hospital in Al-Madinah Al-Munawarah, Saudi Arabia. Total population sampling will be used to find all 54 operating room nurses. We will use a structured self-administered questionnaire to get information about nurses' expertise, how they say they handle specimens, how they feel about risk (for example, interruptions, workload, and the difficulty of handoffs), and their beliefs about safety culture and risk management. We will use SPSS to examine the data both descriptively and inferentially.

Future Uses and Importance: The study is expected to identify and rectify deficiencies in knowledge and practice, as well as to highlight the systemic and human-factor hazards linked to lost or misidentified specimens. The study results will help to provide the evidence base for

interventions designed to control risk in these areas (e.g., standardized time-out procedures, two-person verification of patient name and medical record number; traceability improvements, staff education, policy revisions) and improve specimen safety as well as overall patient safety in perioperative care.

المخلص

تأخر إلى يقود وقد ،العمليات غرف في المرضى سلامة على الجوهرية المخاطر من وسمها وسوء العينات فقدان يُعد :الخلفية لإدارة مكتوبة سياسات وجود من الرغم وعلى .التكاليف وزيادة ،الإجراءات تكرار ،ملائمة غير علاجية قرارات ،التشخيص بخطوات الالتزام وتفاوت ،والانقطاعات ،والاستلام التسليم عمليات وتعدد ،العمل سير تعقيد بسبب الحوادث تستمر قد ،العينات .التحقق

لدى المخاطر إدارة منظور من العمليات غرف في وسمها خطأ/سوء العينات فقدان فحص إلى الدراسة هذه تهدف :الهدف .المتصورة الخطرة والعوامل والممارسات المعرفة على التركيز مع ،العمليات غرف وممرضى ممرضات دعوة سيتم .السعودية العربية المملكة ،المنورة بالمدينة العام المدينة مستشفى في مقطعية وصفية دراسة سُنستخدم :المنهجية البيانات جمع سيتم .المجتمع حصر أسلوب باستخدام للمشاركة (54 عددهم) العمليات غرف وممرضى ممرضات جميع سياسات وإدراك السلامة وثقافة الخطرة والعوامل ذاتيًا عنها المُبلغ والممارسات المعرفة يقيس منظم ذاتي استبيان بواسطة مناسبة واستدلالية وصفية أساليب عبر SPSS برنامج باستخدام إحصائيًا البيانات سُحلل .المخاطر إدارة العينات بفقدان المرتبطة الخطر مصادر أهم ورصد والممارسة المعرفة في فجوات تحديد المتوقع من :والأهمية المتوقعة النتائج وتعزيز ،المزدوج والتحقق ،الإجراءات توحيد تشمل المخاطر إدارة على قائمة ضوابط تطوير النتائج ستدعم .وسمها خطأ أو .الجراحية البيئة في المرضى سلامة يعزز بما السياسات وتحسين ،موجهة تدريب وبرامج ،النتبع

1. Research Title

Reducing Specimen Loss and Mislabeling in Operating Rooms: A Risk Management Approach
(A Cross-Sectional Survey of Operating Room Nurses)

الدراسة عنوان (Arabic)

وممرضي ممرضات بين مقطعي مسح) المخاطر إدارة مدخل: العمليات غرف في وسمها خطأ/وسوء العينات فقدان من الحد
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2. Introduction

Specimen loss and mislabeling remain among the most consequential patient safety events in perioperative practice. In the operating room, specimens are often collected under time pressure and transferred through multiple steps before reaching the pathology laboratory. Any breakdown in identification, labeling, documentation, or handoff can compromise diagnostic accuracy and timely treatment. The effects may extend beyond clinical outcomes to include patient distress, delays in care pathways, medicolegal exposure, and avoidable resource use. Many institutions maintain formal policies for specimen handling; however, real-world performance may be influenced by workflow design and human factors. Common contributors include interruptions during labeling, variations in how staff apply identifiers, unclear role responsibilities, incomplete documentation, and weak traceability during handoffs. From a risk management perspective, these failures reflect both individual-level factors (knowledge, skills, attention) and system-level factors (process standardization, staffing, technology, and safety culture). Quality improvement and risk-focused literature supports structured controls such as specimen time-outs, two-person verification, barcode identification, root cause analysis, and failure mode approaches to detect and prevent errors. Because operating room nurses lead or perform key steps in labeling, documentation, preservation, and transfer, their knowledge, practices, and perceptions provide an essential foundation for risk prioritization and targeted interventions.

3. Study Problem (Problem Statement)

Even with current rules and guidelines, operating rooms may still lose specimens and label them incorrectly. Some things that could be causing the problem are gaps in knowledge, inconsistent use of standards, frequent interruptions, mistakes in documentation, and failures to transfer off between the operation room and receiving departments. In the local perioperative setting, the magnitude of these hazards and the primary contributing factors, as viewed by operating room

nurses, remain inadequately delineated. Without this knowledge, executives may have trouble figuring out which risks are most important and putting in place focused, evidence-based controls utilizing a structured risk management strategy.

4. Importance of the Study

4.1 Theoretical Significance

- Offers supplementary evidence about specimen-related risk variables in the perioperative pre-analytical process and their associations with safety culture and risk management preparedness.
- Enhances the body of research on human factors and system design approaches aimed at minimizing pre-analytical mistakes in surgical specimen paths.

4.2 Practical Significance

- Finds the most important gaps in nurses' knowledge and practices so that targeted training and skill development may take place.
- Helps improve policies by setting standard specimen time-outs, requiring two-person verification, using barcodes, and keeping records.
- Helps patient safety initiatives by making mechanisms for preventing, reporting, getting feedback on, and learning from specimen occurrences stronger.

4.3 Beneficiaries

- Nurses and leaders in the operating room and perioperative departments.
- Services for pathology and labs.
- Departments for quality and risk management in hospitals.
- Patients and their families get safer and quicker diagnosis and treatment.

5. Objectives of the Study

1. To find out how much operating room nurses know about handling, labeling, documenting, and transferring specimens.
2. To check how well people follow important specimen safety precautions and what they say they do.
3. To find out what people think are the risk factors that lead to specimen loss and mislabeling.
4. To look into how nurses feel about safety culture and risk management procedures when it comes to handling specimens.
5. To investigate correlations between nurse attributes (e.g., years of experience, training exposure) and knowledge/practice scores.

6. Study Questions

Main Research Question

From a risk management point of view, what are the main risk factors, knowledge gaps, and practice weaknesses that operating room nurses face when specimens go missing or are mislabeled?

Sub-questions

1. How much do operating room nurses know about the rules for labeling, documenting, and transferring specimens?
2. What specimen management techniques are most often followed, and what measures are less often followed?
3. What do nurses think are the biggest risk factors for losing or mislabeling specimens (for example, interruptions, heavy workloads, or complicated handoffs)?
4. What do nurses think about the present safety culture and risk management policies for handling specimens?
5. Do levels of knowledge and practice correlate with demographic or training-related factors?

7. Research Hypotheses (Optional)

- H1: More formal training on how to handle specimens is linked to higher knowledge scores.
- H2: People who have a better view of safety culture are more likely to say they follow specimen safety rules.
- H3: People who think they have a lot of work to do and a lot of interruptions are more likely to think they are at danger of losing or mislabeling specimens.

8. Previous Studies and Theoretical Framework (Brief)

Recent research show that there are several ways to lower specimen errors, including as standardizing verification methods and redesigning processes. When used in everyday work, two-person verification and controlled specimen time-outs can help cut down on labeling mistakes. Quality initiatives based on protocols have shown that they can lower the number of adverse events in specimens. On the other hand, monitoring the pre-analytical phases has shown that documentation and identification mismatches are common problems. Root cause analysis (RCA) and failure mode, effects, and criticality analysis (FMECA) are two risk management approaches that help find failure sites in handoffs and choose the right policies. Technology solutions, especially barcode identification and traceability systems, may enhance matching and decrease rejection or non-compliance when bolstered by governance, training, and monitoring. This proposal takes a risk management approach that combines (1) human factors and safety culture with (2) process dependability approaches like standardization, checklists, verification, and traceability. In this perspective, specimen safety is affected by person proficiency and system architecture, necessitating enhancements that fortify both.

9. Theoretical Premises of the Study

- Theory and research are interconnected; evidence-based risk management principles will direct measurement and analysis in this project.
- The study can make useful suggestions for improving specimen safety measures by finding risks that can be measured and factors that can be changed.

10. Methodology and Research Methods

10.1 Study Design

A cross-sectional descriptive survey approach will be employed to investigate specimen loss and mislabeling in operating rooms from a risk management standpoint among operating room nurses.

10.2 Study Setting

The study will be conducted at Al-Madinah General Hospital, located in Al-Madinah

Al-Munawarah, Saudi Arabia. The hospital offers secondary-level healthcare services and has operating room suites where surgical specimens are regularly handled, tagged, documented, and sent to the pathology laboratory.

10.3 Study Population

The study population will include all registered nurses working in the operating rooms at Al-Madinah General Hospital (N = 54).

10.4 Inclusion Criteria

- Registered nurses who are now working in the operation room.
- Directly involved in handling, labeling, documenting, or transferring surgical specimens.
- At least six months of experience working in an operating room at the research site.
- Willingness to take part on their own.

10.5 Exclusion Criteria

- Nurses were not assigned to the operation room during the time that data was being collected.
- Nurses who just do administrative or managerial work and don't handle specimens directly.

- Nurses who have been employed recently and have less than six months of experience in the operating room.

10.6 Sampling Technique and Sample Size

Because the population is small and well-defined, total population sampling will be used. All 54 nurses who work in the operating room at Al-Madinah General Hospital will be asked to take part. This method makes the sample more representative, lowers sampling bias, and makes the results more reliable.

10.7 Variables and Operational Definitions

The following will be used to measure key variables: • Knowledge: a score based on how many accurate answers you gave to questions about labeling, IDs, documentation, container/fixative requirements, and chain-of-custody. • Self-reported practice/adherence: a score based on how often people did important safety actions like time-outs, two-person checks, barcode use, full documentation, and organized handoffs.

- Perceived risk factors: assessments of things like interruptions, workload, multitasking, communication gaps, unclear responsibilities, and technology restrictions.
- Safety culture and risk management perception: how clear policies are, how much assistance leaders give, how easy it is to report problems and get feedback, and how much learning is encouraged.

10.8 Data Collection Tool

A systematic self-administered questionnaire with five parts will be used to gather data: demographics/professional background, knowledge, practices, perceived risk factors, and perceptions of safety culture and risk management policies. A Likert-type response structure will be used for most perceptual and practice items so that they may be scored and tested statistically.

10.9 Validity and Reliability

- A perioperative nurse educator, a risk management/quality specialist, and a pathology/laboratory representative will analyze the content to see if it is accurate.
- A small number of OR nurses will take a pilot test to see how clear, how long it takes to finish, and how well they understand the items.
- We will use Cronbach's alpha to check the internal consistency of multi-item scales.

10.10 Data Collection Procedure

1. Get permission from the Al-Madinah General Hospital administration.
2. Get ethical approval from the right Institutional Review Board.
3. Give out an information sheet that explains the study's goal, how it will be done, how to keep your information private, and that you can choose to participate.
4. Send out the questionnaire by email or mail, depending on what is possible and what people can get to.
5. Collect answers without revealing who they are; filling out and sending in the questionnaire will mean that the person agrees.
6. Send reminders during the collecting period to get the most responses.

10.11 Data Analysis Plan

- Descriptive statistics include standard deviations, means, percentages, and frequencies.
- Inferential statistics (where applicable): chi-square tests for categorical relationships; independent t-tests or ANOVA for group comparisons; correlation and regression modeling to analyze predictors of knowledge/practice scores.
- The level of statistical significance will be $p < 0.05$. We will use SPSS (or something similar) to do the analyses.

11. Ethical Considerations

- People will be able to choose whether or not to take part, and they will be given explicit information before they do.
 - No personal information will be collected, and anonymity and confidentiality will be kept.
 - The data will be kept safe and solely used for research reasons.
- Participants can leave at any moment without any consequences.

12. Study Limitations

- The single-center setting may restrict generalizability to other institutions.
- Self-reported behaviors may be influenced by social desirability or memory bias.
- The patterns of shifts and the amount of labor may affect how many people respond during the data collection period.
- Cross-sectional approach identifies relationships but does not demonstrate causality.

13. Expected Outcomes and Utilization Plan

The study aims to delineate a comprehensive profile of knowledge strengths and deficiencies, pinpoint practice steps with diminished adherence, and prioritize perceived risk factors linked to specimen loss and mislabeling. The results will be used to make a practical risk management action plan that may include: standardizing specimen time-out, reinforcing two-person verification at key points, improving traceability and barcode use where possible, making roles clearer at handoffs, and giving targeted training based on gaps found. Findings may also help with audits and feedback systems that keep improvements going.

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Focus on pre-analytical stage.

Appendix A: Questionnaire Outline (Proposed)

A structured questionnaire will be developed with the following domains and example item types. The full instrument will be finalized after expert review and pilot testing.

- Section 1: Demographics and professional background (e.g., education, years in OR, prior training).
- Section 2: Knowledge (multiple-choice/true-false items on identifiers, labeling rules, documentation, and chain-of-custody).
- Section 3: Practices (Likert-type frequency items on time-out, two-person check, barcode use, documentation completeness, and handoff).
- Section 4: Perceived risk factors (Likert-type agreement items on interruptions, workload, communication, and system issues).
- Section 5: Safety culture and risk management (items on reporting, feedback, leadership support, and policy clarity).