Golestan University of Medical Sciences
Journal of Clinical and Basic Research
Online ISSN: 2538-3736

Evaluation of safety standards in the operating rooms of educational hospitals affiliated with Golestan University of medical sciences in 2025: A cross-sectional study

Soheyla Kalantari [1,2], Maryam Jafari [3], Fatemeh Chenaparchi [3], Fatemeh Mehravar [4], Amirali Alizadeh [5], Kosar Kordkatuli [6]*

1. Department of Surgical Technology, School of Paramedical Sciences, Golestan University of Medical Sciences, Gorgan, Iran
2. Laboratory Sciences Research Center, Golestan University of Medical Sciences, Gorgan, Iran
3. Student Research Committee, Golestan University of Medical Sciences, Gorgan, Iran
4. Ischemic Disorders Research Center, Jorjani Clinical sciences Research Institute, Golestan University of Medical Sciences, Gorgan, Iran
5. Research Center for Evidence-Based Health Management, Maragheh University of Medical Sciences, Maragheh, Iran
6. Nursing Research Center, Golestan University of Medical Sciences, Gorgan, Iran

* Correspondence: Kosar Kordkatuli. Nursing Research Center, Golestan University of Medical Sciences, Gorgan, Iran. Tel: +989114173160; Email: kosarkordkatuli@gmail.com

Abstract

Background: The operating room is a high-risk environment that requires strict adherence to safety standards. This study aimed to evaluate safety standards in the operating rooms of educational hospitals affiliated with Golestan University of Medical Sciences.

Methods: This cross-sectional study evaluated five safety dimensions in five operating room units across four educational hospitals affiliated with Golestan University of Medical Sciences, Iran. Data were collected through direct observation using a previously applied structured checklist with established reliability; supplementary information was obtained from the operating room head nurse when clarification was required. Each operating room unit was assessed on two occasions at a two-week interval, resulting in 10 observations. Raw scores were converted into standardized percentage scores to enable comparisons across domains, and safety status was classified using a threshold of 80% of the maximum possible score.

Results: The highest standardized mean scores were observed for personnel safety (86.90 ± 4.92), fire safety (85.78 ± 8.13), and the physical environment (84.83 ± 6.91), followed by patient safety (81.11 ± 8.16) and infection control (80.45 ± 7.51). The predefined safety threshold was met in 9 of 10 observations for personnel safety, 8 of 10 for the physical environment, 7 of 10 for fire safety, 6 of 10 for infection control, and 5 of 10 for patient safety.

Conclusion: Overall compliance with operating room safety standards was favorable but varied across domains and observations. Personnel safety demonstrated the strongest overall performance, whereas patient safety had the lowest proportion of observations meeting the safety threshold, and infection control had the lowest mean standardized score. Targeted improvements in patient-safety processes, infection-control practices, communication, and consistent checklist implementation are therefore warranted.

Article Type: Research Article

Article History

Received: 3 May 2026
Received in revised form: 19 June 2026
Accepted: 25 June 2026
Available online:
DOI: 10.29252/JCBR.X.X.X

Keywords

Operating Rooms Safety
Safety Standards
Educational Hospitals
Patient Safety

Highlights

What is current knowledge?

Operating room safety encompasses multiple domains, including the physical environment, fire safety, personnel safety, patient safety, and infection control. However, evidence regarding the simultaneous assessment of these domains in educational hospitals remains limited.

What is new here?

A comprehensive evaluation of five operating room safety domains was conducted using standardized scores and repeated direct observations. Personnel safety had the highest mean standardized score and the greatest level of safety attainment, whereas patient safety had the lowest proportion of observations meeting the predefined safety threshold, and infection control had the lowest mean standardized score. Targeted auditing, improved communication, and consistent checklist implementation are recommended.

Introduction

The operating room (OR) is one of the most complex, dynamic, and high-risk environments within the healthcare system (1). Globally, unsafe surgical care contributes substantially to the burden of disease, with millions of disabling complications and deaths occurring annually, a considerable proportion of which are considered preventable (2). Characterized by rapid technological advances, high-stakes clinical interventions, and intensive interprofessional collaboration, the OR is inherently susceptible to adverse events and human error (3). Ensuring optimal surgical outcomes and safeguarding the well-being of the healthcare team require strict adherence to comprehensive safety standards. Consequently, cultivating a robust surgical safety culture is recognized not merely as a regulatory requirement but as a fundamental cornerstone of high-quality perioperative care. A proactive approach to establishing standardized safety protocols is strongly associated with a lower incidence of surgical complications, shorter hospital stays, and reduced preventable morbidity and mortality (4,5). In addition to causing direct patient harm, intraoperative adverse events can increase hospital readmissions, length of stay, and healthcare costs and may impose substantial emotional distress on the clinicians involved (6).

[DOI: 10.29252/JCBR.X.X.X]

To systematically manage and evaluate the multifaceted nature of surgical safety, clinical guidelines typically categorize OR standards into distinct yet interconnected domains. The critical dimensions most commonly assessed include the physical environment, fire safety, personnel safety, patient safety, and infection control (7). Vulnerabilities or deviations within any of these domains can lead to cascading clinical and occupational failures. For example, inadequate infection-control protocols are directly associated with a higher prevalence of healthcare-associated infections (HAIs) (8), whereas deficiencies in physical layout and fire-safety standards pose serious occupational hazards to perioperative staff (9). Previous literature indicates inconsistent compliance across these domains. Although clinical patient safety often receives high priority, structural domains such as fire safety and the physical environment frequently exhibit suboptimal adherence, particularly in developing healthcare systems (10,11). Therefore, an integrated evaluation of these five dimensions is essential for identifying systemic weaknesses, promoting continuous quality improvement, and maintaining a secure clinical environment for both patients and healthcare providers.

Maintaining these safety standards is considerably more complex in educational hospitals. These institutions have a dual mandate: to provide high-quality patient care and facilitate hands-on medical education (12). The continuous influx of medical, nursing, and allied health students, combined with the high turnover of rotating trainees, introduces additional variables into the perioperative environment. Empirical evidence suggests that, in such dynamic settings, the large number of personnel and the learning curves of novices may inadvertently strain safety protocols (13). Consequently, the regular and rigorous evaluation of safety standards is not merely a theoretical ideal but an operational necessity in educational hospitals. Nevertheless, the existing literature has predominantly focused on isolated safety domains, such as infection control or patient safety alone (12), leaving a notable empirical gap in the simultaneous, multidimensional assessment of OR safety within educational hospitals, particularly in the regional context of Iran (14).

Available evidence from Iran also indicates incomplete and variable compliance with operating room safety practices. In educational hospitals in Rasht, compliance with infection-control guidelines was reported to be 72.7% for physical structure and 59.1% for personnel performance (15). In two educational hospitals in Tehran, overall adherence to the WHO Surgical Safety Checklist was characterized as moderate, although several core items were completed in more than 90% of observed cases (16). A survey conducted across eight tertiary hospitals in Tehran also found that 92% of operating room personnel were aware of the checklist, but only 73.9% understood its objectives, and uncertainty remained regarding the appropriate timing of its use (17).

To address this empirical gap, the present study aimed to comprehensively evaluate safety standards in the operating rooms of educational hospitals affiliated with Golestan University of Medical Sciences in 2025. By systematically assessing five core dimensions-physical environment, fire safety, personnel safety, patient safety, and infection control-through direct observation and a structured checklist, this cross-sectional study provides a detailed safety profile of these educational hospitals. The findings may help identify existing vulnerabilities, inform evidence-based managerial interventions, and ultimately promote a safer clinical environment for both patients and the perioperative workforce in educational hospitals.

Methods

Study design and setting

This cross-sectional study was conducted in the operating rooms of all educational hospitals affiliated with Golestan University of Medical Sciences in Gorgan, Iran. Five safety dimensions were assessed: physical environment, fire safety, personnel safety, patient safety, and infection control. Each dimension was evaluated through direct observation using a structured checklist.

Study population and sampling

The study population comprised all operating rooms in four educational hospitals affiliated with Golestan University of Medical Sciences: Sayad Shirazi Hospital, Taleghani Hospital, Al Jalil Hospital, and 5 Azar Hospital. At 5 Azar Hospital, the operating rooms in both the Nabavi Building and the Burn Center Building were included in the evaluation. Given the small study population, census sampling was used, and all operating room units were included. Each operating room unit was evaluated twice, resulting in a total of 10 observations.

The operating room units constituted the units of analysis in this observational study. No individual participants or respondents were enrolled because the data were collected through direct observation using a structured checklist.

Data collection

Data were collected using a structured checklist based on operating room safety standards that had previously been applied by Ramezan Pour et al. (18). The checklist evaluates five principal safety domains: infection control (22 items), physical environment (20 items), fire safety (15 items), personnel safety (14 items), and patient safety (12 items).

Each item was scored as "Yes" = 3 points, "Partially" = 2 points, "No" = 1 point, and "Not applicable/Unclear" = no score. Higher scores indicated greater compliance with operating room safety standards and, consequently, a higher level of safety. Because the five domains contained different numbers of items, raw domain scores were converted into standardized percentage scores using the following formula: standardized score = (Observed domain score / Maximum possible domain score) × 100. The maximum possible scores were 60 for the physical environment, 45 for fire safety, 42 for personnel safety, 36 for patient safety, and 66 for infection control. No checklist item was rated as "Not applicable/Unclear" in any of the 10 observations. Therefore, the full theoretical maximum score for each domain was used as the denominator when calculating standardized percentage scores. A standardized score of 80% or higher was classified as safe, whereas a score below 80% was classified as unsafe. The 80% threshold was specified a priori as an operational criterion representing the attainment of at least four-fifths of the maximum achievable checklist score. It was used solely for descriptive classification and should not be interpreted as a validated diagnostic cutoff. Previous studies using the same checklist and percentage-based scoring framework were cited to document the instrument and scoring approach (18,19). The reliability of the checklist was reported by Ramezan Pour et al. (18), with a correlation coefficient of 0.80, and was subsequently confirmed by Mousavi et al. (19).

The checklist was completed by two trained assessors, both of whom were sixth-semester undergraduate students in Surgical Technology. Since their second semester, both assessors had participated in continuous clinical rotations in operating rooms, corresponding to approximately two academic years of perioperative exposure. Before data collection, they attended a standardized training and orientation session led by a faculty member from the Department of Surgical Technology who holds a PhD in Nursing. The session covered the study protocol, checklist-item definitions, scoring categories, and the standardized application of the assessment procedure. The checklists were completed through direct observation of the operating room environment and practices. Supplementary information was obtained from the operating room head nurse only when a checklist item could not be evaluated through direct observation.

Each operating room unit was assessed on two occasions separated by a two-week interval. Repeated observations were used to reduce the influence of short-term variations in routine operating room conditions and provide a more representative assessment of safety practices. The two-week interval separated the assessments while preserving comparability within the same data-collection period.

Statistical analysis

Descriptive statistics, including the mean, standard deviation, minimum, and maximum values, were calculated for the raw and standardized safety scores. Frequencies and percentages were used to classify each observation as safe or unsafe within each domain. Because the number of operating room units and observations was small, the analysis was limited to descriptive statistics, and no inferential statistical tests were performed. For the hospital-level presentation, standardized scores from repeated observations were summarized as the mean (Standard deviation). The four observations from the Burn Center and Nabavi units were combined under 5 Azar Hospital.

[DOI: 10.29252/JCBR.X.X.X]

Results

Descriptive statistics of safety dimensions

Raw and standardized safety scores are presented in Table 1. Based on the standardized scores, personnel safety had the highest mean score (86.90 ± 4.92), followed by fire safety (85.78 ± 8.13) and the physical environment (84.83 ± 6.91). Patient safety had a mean standardized score of 81.11 ± 8.16, whereas infection control had the lowest mean standardized score (80.45 ± 7.51).

Safety status of operating rooms

Based on the predefined 80% threshold, 9 of 10 observations (90%) were classified as safe for personnel safety, 8 (80%) for the physical environment, 7 (70%) for fire safety, 6 (60%) for infection control, and 5 (50%) for patient safety (Figure 1).

Descriptive comparison across hospitals

Hospital-level standardized scores are presented in Table 2 and Figure 2. Sayad Hospital had mean standardized scores above 80% in all five domains. At 5 Azar Hospital, the mean scores for patient safety and infection control were below 80%; at Taleghani Hospital, the mean score for infection control was below 80%; and at Ale-Jalil Hospital, the mean scores for fire safety and patient safety were below 80%. These comparisons are descriptive and should be interpreted in light of the small number of observations.

Table 1. Raw and standardized operating room safety scores across the five assessed domains

Safety domain	N	Raw Mean ± SD	Raw Min-Max	Standardized Mean ± SD (%)	Standardized Min-Max (%)
Physical environment	10	50.90 ± 4.15	42-55	84.83 ± 6.91	70.00-91.67
Fire safety	10	38.60 ± 3.66	33-44	85.78 ± 8.13	73.33-97.78
Personnel safety	10	36.50 ± 2.07	33-40	86.90 ± 4.92	78.57-95.24
Patient safety	10	29.20 ± 2.94	26-36	81.11 ± 8.16	72.22-100.00
Infection control	10	53.10 ± 4.95	43-58	80.45 ± 7.51	65.15-87.88

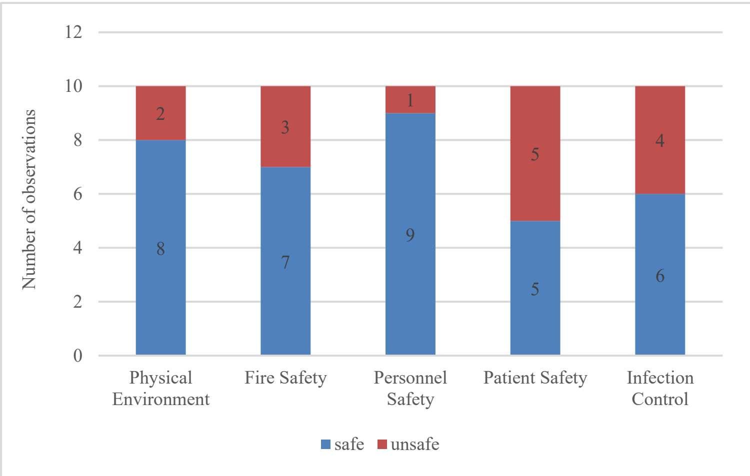

Figure 1. Number of observations classified as safe or unsafe in each domain using the standardized 80% cutoff

Table 2. Hospital-level standardized safety scores, reported as mean (Standard deviation), across the five assessed domains

Hospital	Observations (n)	Physical environment (%)	Fire safety (%)	Personnel safety (%)	Patient safety (%)	Infection control (%)
Sayad	2	90.00 (0.00)	87.78 (1.57)	85.71 (0.00)	90.28 (13.75)	87.88 (0.00)
5 Azar	4	80.42 (8.86)	83.89 (8.96)	86.90 (6.87)	78.47 (7.31)	74.62 (6.82)
Taleghani	2	87.50 (5.89)	95.56 (3.14)	91.67 (1.68)	81.94 (1.96)	78.79 (6.43)
Ale-Jalil	2	85.83 (3.54)	77.78 (0.00)	83.33 (0.00)	76.39 (1.96)	86.36 (2.14)

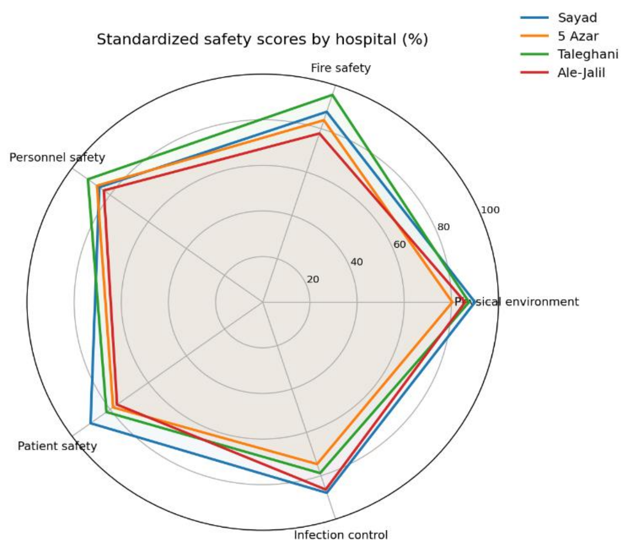

Figure 2. Hospital-level mean standardized safety scores across the five assessed domains

[DOI: 10.29252/JCBR.X.X.X]

Discussion

The present study evaluated five core safety domains in the operating rooms of educational hospitals affiliated with Golestan University of Medical Sciences. After standardization, compliance was generally favorable but varied across domains and observations. Personnel safety had the highest mean standardized score and the largest proportion of observations meeting the 80% threshold. In contrast, patient safety had the lowest proportion of safe observations, whereas infection control had the lowest mean standardized score. These findings indicate that the safety profile was not uniformly strong and that both process-related and protocol-based domains require targeted improvement.

Patient safety had the lowest proportion of observations meeting the predefined threshold, with 5 of 10 observations classified as safe. Although its mean standardized score was slightly above 80%, the variability across observations indicates inconsistent implementation of patient-safety practices. Patient safety is a dynamic, human-centered domain that depends on nontechnical skills, interprofessional communication, structured handovers, and the consistent use of tools such as the WHO Surgical Safety Checklist. In educational hospitals, trainee rotation, hierarchical communication, and the competing demands of clinical care and teaching may further complicate the reliable implementation of these practices.

This interpretation is consistent with evidence that workload and hierarchical pressures can impede compliance with the Surgical Safety Checklist among operating room teams (20). Trainees may also perceive limited team cohesion or fear reprisal, which can suppress incident reporting and weaken the just culture required for patient safety in educational hospitals (21). At the same time, operating room staff and students in Iranian educational hospitals have demonstrated generally favorable attitudes toward teamwork (22). Collectively, these findings suggest that inconsistent patient-safety performance may reflect organizational and workflow barriers rather than an unwillingness to collaborate. Targeted training in nontechnical skills, structured supervision, and continuous nonpunitive feedback may therefore support more reliable safety practices.

Personnel safety, the physical environment, and fire safety demonstrated comparatively strong performance, with 90%, 80%, and 70% of observations, respectively, meeting the predefined threshold. However, infection control had the lowest mean standardized score (80.45 ± 7.51), and only 6 of 10 observations were classified as safe. These results indicate that compliance within structural and protocol-based domains was not uniform and that infection-control performance requires continued monitoring. The comparatively stronger performance in some structural domains may reflect the influence of standardized infrastructure requirements and institutional accreditation processes.

The infection-control findings are broadly consistent with previous regional evidence. Mohammad Ali Nejad et al. (15) reported compliance rates of 72.7% for physical structure and 59.1% for personnel performance in operating rooms in Rasht, Iran. Differences among studies may reflect variations in local resources, managerial oversight, and quality-improvement activities. Continued attention to infection-control practices remains essential because poor compliance with measures such as hand hygiene and instrument sterilization is associated with the risk of surgical site infections (23).

Overall, the findings demonstrate favorable but inconsistent compliance across the five safety domains. The lower level of safety attainment in patient safety and the variability in infection control warrant focused managerial attention, while the remaining domains also require continued auditing to maintain performance. Practical measures include reinforcing interprofessional communication, supporting nontechnical skills, ensuring consistent use of the WHO Surgical Safety Checklist, and conducting regular feedback-based monitoring. Interventions should be tailored to the specific weaknesses identified within each hospital and operating room unit.

This study has several limitations. First, its cross-sectional design provides a snapshot of safety standards and does not permit the assessment of long-term trends or causal relationships. Second, the study was confined to educational hospitals affiliated with a single medical university in northern Iran, which may limit the generalizability of the findings to other institutions and regions. Third, although census sampling covered all eligible operating room units in the study setting, the small number of units and observations precluded reliable inferential analysis; therefore, the findings are descriptive. Finally, direct observation may have introduced a Hawthorne effect if staff temporarily modified their practices while being observed.

Conclusion

In conclusion, the standardized assessment demonstrated generally favorable but uneven compliance with operating room safety standards across educational hospitals. Personnel safety showed the strongest overall performance, whereas patient safety had the lowest proportion of observations meeting the safety threshold, and infection control had the lowest mean standardized score. These findings support targeted improvements in patient-safety processes, infection-control practices, communication, and consistent checklist implementation, alongside the continued monitoring of all safety domains. The results should be interpreted cautiously because the cross-sectional design and small number of observations limit causal inference and generalizability.

Acknowledgement

The authors express their gratitude to the Vice-Chancellor for Research and Technology of Golestan University of Medical Sciences for supporting and approving this project. The authors also sincerely thank the management teams of Sayad Shirazi, Taleghani, and 5 Azar Hospital (Including the Burns and Nabavi units) in Gorgan, as well as Ale-Jalil Hospital in Aq-Qala, for their cooperation and support during data collection.

Funding Sources

The authors received no financial support for the research, authorship, and/or publication of this article.

Ethical Statement

The study was approved by the Ethics Committee of Golestan University of Medical Sciences (Approval Number: IR.GOUMS.REC.1404.062).

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Author Contributions

K.K. and S.K.: Conceptualization, Study design, Project administration, and Supervision. F.C. and M.J.: Investigation, Data curation, and Data collection. F.M.: Formal analysis, Data interpretation, and Methodology. K.K. and A.A.: Writing - Original draft preparation and Writing - Review and Editing. All authors contributed to the development of the study, critically reviewed the manuscript, approved the final version, and agreed to be accountable for all aspects of the work.

Data Availability Statement

All data generated or analyzed during this study are included in this published article.

Use of Artificial Intelligence

During the preparation and revision of this work, the authors used ChatGPT (OpenAI) to support language editing, improve clarity and organization, check consistency across manuscript sections, and assist in preparing responses to the reviewers. ChatGPT was not used to generate, fabricate, or alter the underlying research data, replace the authors' scientific judgment, or make autonomous methodological or interpretive decisions. After using this tool, the authors critically reviewed and edited the content as needed and assume full responsibility for the accuracy, integrity, and content of the published article.

References

1. Liao H, Lou L. Impact of Safety Risk Defense Mechanism in Operating Room Nursing on Quality and Risk Incidents. Risk Manag Healthc Policy. 2025:18:1827-35. [View at Publisher] [DOI] [PMID] [Google Scholar]

[DOI: 10.29252/JCBR.X.X.X]

2. Reddy C, Bains L, Krishna Kumar P, Zadey S. Transforming surgical care and safety: dissecting the impact of checklists in the global south. Front Surg. 2025:12:1664277. [View at Publisher] [DOI] [PMID] [Google Scholar]
3. Jalali M. Human factors and prevention of medical errors. In: Gül H, editor. Protection and Prevention Approaches in Occupational Health and Safety. London: IntechOpen; 2025. [View at Publisher] [DOI] [Google Scholar]
4. Odell DD, Quinn CM, Matulewicz RS, Johnson J, Engelhardt KE, Stulberg JJ, et al. Association Between Hospital Safety Culture and Surgical Outcomes in a Statewide Surgical Quality Improvement Collaborative. J Am Coll Surg. 2019;229(2):175-83. [View at Publisher] [DOI] [PMID] [Google Scholar]
5. Baradaran K, Gracia C, Alimohammadi E. Exploring strategies to enhance patient safety in spine surgery: a review. Patient Saf Surg. 2025;19(1):3. [View at Publisher] [DOI] [PMID] [Google Scholar]
6. Kawa N, Araji T, Kaafarani H, Adra SW. A Narrative Review on Intraoperative Adverse Events: Risks, Prevention, and Mitigation. J Surg Res. 2024.295:468-76. [View at Publisher] [DOI] [PMID] [Google Scholar]
7. Batool A, Naeem A, Rehman KU. Evaluating Surgical Safety and Quality Assurance by Conducting an Audit of WHO Checklist Implementation in a Tertiary Care Hospital. Cureus. 2025;17(4):e82212. [View at Publisher] [DOI] [Google Scholar]
8. Rezaee N, Sartipi M, Jahantigh M, Pezaro S, Mardani-Hamooleh M. Barriers to the prevention and control of healthcare-associated infections in public hospitals: a qualitative study of Sistan and Baluchistan province, Iran. BMC Nurs. 2025;24(1):972. [View at Publisher] [DOI] [PMID] [Google Scholar]
9. Alamer A, Alharbi F, Aldhilan A, Almushayti Z, Alghofaily K, Elbehiry A, et al. Healthcare-Associated Infections (HAIs): Challenges and Measures Taken by the Radiology Department to Control Infection Transmission. Vaccines (Basel). 2022;10(12):2060. [View at Publisher] [DOI] [PMID] [Google Scholar]
10. Vaismoradi M, Susanna Tella S, Logan PA, Khakurel J, Vizcaya-Moreno F, et al. Nurses' Adherence to Patient Safety Principles: A Systematic Review. Int J Environ Res Public Health. 2020;17(6):2028. [View at Publisher] [DOI] [PMID] [Google Scholar]
11. Hessels AJ, Larson EL. Relationship between patient safety climate and standard precaution adherence: a systematic review of the literature. J Hosp Infect. 2016;92(4):349-62. [View at Publisher] [DOI] [PMID] [Google Scholar]
12. Mistri IU, Badge A, Shahu S. Enhancing Patient Safety Culture in Hospitals. Cureus, 2023;15(12):e51159. [View at Publisher] [DOI] [PMID] [Google Scholar]
13. Xie A, Duff J, Munday J. Perioperative Nursing Shortages: An Integrative Review of Their Impact, Causal Factors, and Mitigation Strategies. J Nurs Manag. 2024:2024:2983251. [View at Publisher] [DOI] [PMID] [Google Scholar]
14. Ghalkhani M, Abaszadeh F, Tavakkol R, Fakhrealizadeh F, Mottahedi M, Bagheri H, et al. Emotional and psychological challenges faced by students in the operating room: a scoping review. Discov Psychol. 2026;6:208. [View at Publisher] [DOI] [Google Scholar]
15. Mohammad Ali Nejad P, Moosavi S, Ghanbari Khaneghah A, Atrkar Roushan Z, Feyz Mangouh N. Compliance With Infection Control Guidelines in the Operating Rooms. JHNM. 2018;28(4):224-30. [View at Publisher] [DOI] [Google Scholar]
16. Khorshidifar A, Kadkhodaee H, Zamen Z. Degree of Observance of the WHO Surgical Safety Checklist. Trauma Mon. 2012;17(3):315-8. [View at Publisher] [DOI] [PMID] [Google Scholar]
17. Sokhanvar M, Kakemam E, Goodarzi N. Implementation of the surgical safety checklist in hospitals of Iran; operating room personnel's attitude, awareness and acceptance. Int J Health Care Qual Assur, 2018;31(6):609-18. [View at Publisher] [DOI] [PMID] [Google Scholar]
18. Ramezan Pour E, Rahmani H, Raadabadi M, Rajabi vasokolaei G, Rashidi N. Observance of Safety Standards in Operating Room of Mazandaran University of Medical Sciences. Hospital, 2020;19(2):35-41. [View at Publisher] [Google Scholar]
19. Mousavi SMH, Dargahi H, Hasibi M, Mokhtari Z, Shaham G. Evaluation of safety standards in operating rooms of Tehran University of Medical Sciences (TUMS) Hospitals in 2010. Payavard Salamat. 2011;5(2):10-7. [View at Publisher] [Google Scholar]
20. Gong J, Ma Y, An Y, Yuan Q, Li Y, Hu J. The surgical safety checklist: a quantitative study on attitudes and barriers among gynecological surgery teams. BMC Health Serv Res. 2021;21(1):1106. [View at Publisher] [DOI] [PMID] [Google Scholar]
21. Hebballi NB, Kilcullen MP, Broussard M, Ottosen MJ, Thomas EJ, Salas E, et al. Attending physicians and trainees' perspective of patient safety culture in operating room: A mixed methods study. Journal of Pediatric Surgery Open, 2024;7:100152. [View at Publisher] [DOI] [Google Scholar]
22. Ghods AA, Alaei S, Abdollahi F, Assarhossainy M. Evaluating the attitude of students and operating room staff about teamwork and its related factors. Payesh . 2025;24(3):409-19. [View at Publisher] [DOI] [Google Scholar]
23. Zhu S, Yang X, Zhang P, Chen C. Operating room-related risk factors for surgical site infection in general surgeries: A retrospective cohort study. Medicine (Baltimore). 2025;104(37):e44565. [View at Publisher] [DOI] [PMID] [Google Scholar]

Cite this article as:

Kalantari S, Jafari M, Chenaparchi F, Mehravar F, Alizadeh A, Kordkatuli K. Evaluation of safety standards in the operating rooms of educational hospitals affiliated with Golestan University of medical sciences in 2025: A cross-sectional study. *JCBR.* 2026;X(X):X. http://dx.doi.org/10.29252/JCBR.X.X.X

[DOI: 10.29252/JCBR.X.X.X]