THE EUROPEAN SOCIETY OF MEDICINE
Medical Research Archives, Volume 13 Issue 5

RESEARCH ARTICLE

A Team-based Approach to Evaluating Surgical Residents' Performance in the Operating Room: A Prospective Survey Study

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OPEN ACCESS

PUBLISHED
31 May 2025

CITATION
Pradhan, S., et al., 2025. A Team-based Approach to Evaluating Surgical Residents' Performance in the Operating Room: A Prospective Survey Study. Medical Research Archives, [online] 13(5). https://doi.org/10.18103/mra.v13i5.6537

DOI
https://doi.org/10.18103/mra.v13i5.6537

ISSN
2375-1924

ABSTRACT

Introduction: The operating room serves as an indispensable arena for the training and assessment of surgical residents, playing a pivotal role in their professional development. Within this high-stakes environment, the surgical team collectively assumes a significant duty towards ensuring patient safety and well-being. Every member of the team, regardless of their role, is in a unique position to offer critical insights that can aid in evaluating and enhancing the competencies of their peers. This collaborative approach not only fosters a culture of continuous learning and improvement but also directly contributes to the advancement of patient care standards. Through such dynamic inter-professional interactions, the operating room becomes a cornerstone for both educational excellence and clinical proficiency, ensuring that surgical residents are well prepared to meet the challenges of their demanding profession.

Methods: This prospective survey study aimed to determine if operating room (OR) nurses evaluate surgical residents differently than attending surgeons. 18 OR nurses and 10 attending surgeons in two hospitals evaluated 15 general surgery residents using seven questions from the ACGME Surgical Milestones (CCC) tool.

Results: A total of 195 evaluations were completed for 15 surgical residents (3 residents from each PGY) by 18 OR nurses and 10 attending surgeons. Significant differences were found in mean scores between attending surgeons and OR nurses in all seven domains: For question 1, patient evaluation and decision making, (4.01 vs. 2.77, P <0.004); question 2, intraoperative care and performance of procedures (3.83 vs. 2.63, P <0.005); question 3, operative patient care and technical skills, (3.86 vs. 2.63, P <0.003); question 4, medical knowledge/anatomy,(3.87 vs. 2.70, P<0.01); question 5, professional behavior and accountability, (2.63 vs. 1.59, P <0.002); question 6, interprofessional and team communication, (3.97 vs. 2.70, P<0.002); and question 7, communication within the healthcare system, (4.03 vs. 2.67, P<0.001).

Conclusion: This study reveals significant differences in how OR nurses and attending surgeons evaluate surgical residents across all seven domains of the ACGME Surgical Milestones. Attending surgeons consistently rated residents higher than OR nurses. These findings suggest that incorporating evaluations from a broader range of team members, including OR nurses, could provide a more comprehensive assessment of surgical residents' performance and identify areas for improvement. Enhancing interprofessional feedback mechanisms leads to improved training outcomes and better patient care.

Keywords: surgical resident evaluation, operating room, multidisciplinary evaluation, ACGME Surgical Milestones

Introduction

The operating room (OR) is a crucial setting for the training and assessment of surgical residents. However, assessing specific aspects of resident performance in the OR should be more routinely measured and documented.[1] Currently, the residents in our five-year accredited general surgery residency program are evaluated using several methods, including the Accreditation Council for Graduate Medical Education (ACGME) case logs, monthly evaluations, bi-annual Clinical Core Committee (CCC) scores by attending surgeons, and 360-degree evaluations from non-physician staff.

The ACGME case log system tracks the surgical experience of each resident, with residents documenting each procedure performed and indicating their level of participation.[2] While this system addresses the extent of resident participation in various operations, it does not adequately assess a resident's overall performance in the OR.[3] Monthly rotation evaluations may cover some aspects of OR performance. However, they typically provide a broad overview of a resident's time in service, requiring faculty to recall multiple individual performances over an extended period.

In addition to these tools, our program utilizes quarterly 360-degree evaluations from non-physician staff, which include feedback from nursing and ancillary staff in hospital wards and outpatient clinical settings. The 360-degree evaluation is the only instrument mediated by non-physicians among the evaluation tools. However, it does not include assessments of residents in the OR, even though surgical residents spend the majority of their training time with OR nurses, sharing direct patient care responsibilities.[3]

Despite this close interaction, OR nurses are not included in the routine evaluations of surgical residents. Most existing OR assessment instruments focus on generic evaluations of resident operative skills rather than specific operations, procedural knowledge, anatomy, or interactions with the surgical team. According to a study by Guerlain et al., there is a need for better integration between attending surgeons and the rest of the OR team.[1] The study highlighted the importance of procedural-focused discussions and clear team hierarchies, noting that attending surgeons are vital in optimizing OR communication and interactions. Integration is necessary for the comprehensive evaluation of resident performance in the OR.[4] Further research by S. Bakhtiari et al. found that OR nurses viewed an "effective learning and teaching process" as vital for successful teamwork, linking effective collaboration with positive patient care outcomes. They also noted the importance of overseeing the performance of higher-ranking team members, such as surgical residents, as part of successful teamwork. This insight suggests that including OR nurses in the evaluation process could enhance the assessment of surgical residents and improve educational outcomes.[5]

The primary objective of this study is to determine if there is a discrepancy in how OR nurses and attending surgeons evaluate surgical residents' performance in the OR. Based on our review, no relevant literature addresses this proposed study, making it a novel contribution to the field of surgical education.

Method

This prospective survey targeted attending surgeons and OR nurses in the elective and emergency operating rooms of hospitals affiliated with the surgical residency program at Community Memorial Healthcare System (CMHS) and Ventura County Medical Center (VCMC). A specific strategy known as purposive sampling was employed to select individuals for participation. This method involves deliberately choosing participants based on specific criteria that are expected to generate the most valuable insights or data for the research objectives. This approach allows the researchers to focus on particular characteristics or experiences among the participant pool, ensuring that the study's outcomes are highly relevant and informative in relation to the research questions being investigated.

The inclusion criteria required OR nurses to have a minimum of six months of work experience with the evaluated residents and a willingness to participate. This study aimed to compare evaluations from OR nurses and attending surgeons, focusing on specific aspects of resident performance within the OR. We selected seven domains (questions) from the ACGME Surgical Milestones (CCC) tool, tailored to the operating room setting. Each participating OR staff member completed the survey for up to ten residents with whom they had worked for at least six months.

The survey questions were rated on a scale from 1 to 5 (Figure 1). The selected domains addressed critical areas of resident competency, ensuring a comprehensive assessment. This survey's structured and validated tool provided a reliable measure of resident performance, capturing detailed feedback from OR nurses and attending surgeons. An Internal Review Board (IRB) approved this study. Descriptive and bivariate analyses were done using SAS version 9.4.

1.

Patient Care 1: Patient Evaluation and Decision Making				
Level 1	Level 2	Level 3	Level 4	Level 5
Gathers necessary information and develops a differential diagnosis for patients in all clinical settings	Evaluates patients; orders and interprets diagnostic testing Manages non-operative patients with straightforward conditions (e.g., bowel obstruction, diverticulitis)	Develops a plan to manage healthy patients with straightforward conditions ((e.g., colon cancer, breast cancer) Adapts management plan for changing clinical situation (e.g., drainage of diverticular abscess)	Develops a plan to manage patients with complex conditions (e.g., patient with multiple comorbidities) and conditions (e.g., hemorrhagic shock) Manages non-operative patients with complex conditions (e.g., severe pancreatitis)	Develops a clinical pathway or guideline for the management of patients with complex conditions
☐	☐	☐	☐	☐

2.

Patient Care 2: Intra-Operative Patient Care – Performance of Procedures				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates basic skills (e.g., knot tying, suturing)	Performs bedside procedures (e.g., central line, chest tube) Teaches basic skills to medical students and junior residents	Performs common operations (e.g., hernia, cholecystectomy, appendectomy) Teaches bedside operations to junior residents	Performs complex operations (e.g., low anterior resection, paraesophegeal hernia, abdominal wall reconstruction) Teaches common operations to junior residents	Performs uncommon complex operations (e.g., Whipple, esophagectomy) Teaches complex operations to junior residents
☐	☐	☐	☐	☐

3.

Patient Care 3: Intra-Operative Patient Care – Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates limited tissue-handling skills Requires prompting to identify appropriate tissue plane Moves forward in the operation only with active direction	Inconsistently demonstrates careful tissue handling Identifies appropriate plane but requires redirection to maintain dissection in the optimal tissue plane Moves forward in the operation but requires prompting to complete the operation	Consistently demonstrates careful tissue handling Visualizes tissue plane, identifies and dissects relevant normal anatomy Moves fluidly through the course of the operation and anticipates next steps	Adapts tissue handling based on tissue quality Visualizes tissue plane, identifies and dissects relevant abnormal anatomy Adapts to unexpected findings and events during the course of the operation	Identifies innovative operative techniques, instrumentation, operative approaches, or significant improvement in established techniques
☐	☐	☐	☐	☐

Medical Knowledge 2: Anatomy				
Level 1	Level 2	Level 3	Level 4	Level 5
Identifies normal anatomy (e.g., inguinal canal) during common operations	Identifies variations in anatomy (e.g., bile duct anatomic variations) during common operations	Identifies normal anatomy (e.g., gastric blood supply) during complex operations	Identifies variations in anatomy (e.g., replaced right hepatic artery) during complex operations	Develops simulation models for teaching anatomy and operations
Articulates the steps of common operations	Articulates the implications of varying anatomy on the steps of common operations	Articulates the steps of complex operations	Articulates the implications of varying anatomy on the steps of complex operations	Leads anatomy instruction for students and co-residents

4. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Professionalism 2: Professional Behavior and Accountability				
Level 1	Level 2	Level 3	Level 4	Level 5
Completes patient care tasks and responsibilities, identifies potential barriers, and describes strategies for ensuring timely task completion	Performs patient care tasks and responsibilities in a timely manner with appropriate attention to detail in routine situations	Performs patient care tasks and responsibilities in a timely manner with appropriate attention to detail in complex or stressful situations	Recognizes situations that may impact others' ability to complete patient-care tasks and responsibilities in a timely manner	Develops systems to enhance other's ability to efficiently complete patient-care tasks and responsibilities
Describes when and how to appropriately report lapses in professional behavior	Takes responsibility for his or her own professional behavior	Demonstrates professional behavior in complex or stressful situations	Intervenes to prevent and correct lapses in professional behavior in self and others Appropriately reports lapses in professional behavior (simulated or actual)	Coaches others when their behavior fails to meet professional expectations
Recognizes limits in the knowledge/skills of self and seeks help	Recognizes limits in the knowledge/skills of team and seeks help	Exhibits appropriate confidence and self-awareness of limits in knowledge/skills	Aids junior learners in recognition of limits in knowledge/skills	

5. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Interpersonal and Communication Skills 2: Interprofessional and Team Communication				
Level 1	Level 2	Level 3	Level 4	Level 5
Respectfully requests and receives a consultation	Clearly and concisely requests and responds to a consultation	Verifies understanding of recommendations when providing or receiving a consultation	Coordinates recommendations from different members of the health care team to optimize patient care, resolving conflict when needed	Coaches flexible communication strategies that value input from all health care team members
Uses language that values all members of the health care team	Communicates information effectively with all health care team members	Uses active listening to adapt communication style to fit team needs	Maintains effective communication in crisis situation	
	Solicits feedback on performance as a member of the health care team	Communicates concerns and provides feedback to peers and learners	Communicates constructive feedback to superiors	Facilitates regular health care team-based feedback in complex situations

6. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Interpersonal and Communication Skills 3: Communication within Health Care Systems				
Level 1	Level 2	Level 3	Level 4	Level 5
Accurately records information in the patient record, including appropriate use of documentation templates	Demonstrates efficient use of electronic medical record to communicate with the health care team	Integrates and synthesizes all relevant data from outside systems and prior encounters into the health record	Appropriately selects form and urgency of communication based on context	Guides departmental or institutional communication around policies and procedures

7. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Figure 1. Evaluation Tool

Results

In total, 195 evaluations were completed for 15 surgical residents (3 residents from each PGY) by 18 OR nurses and 10 attending surgeons. There were significant differences in mean scores in how attending surgeons and OR nurses evaluated surgical residents in all (7) domains. For question 1, patient evaluation and decision making (4.01 vs. 2.77, P=<0.004); question 2, intraoperative care and performance of procedures (3.83 vs. 2.63, P=<0.005); question 3, operative patient care and technical skills (3.86 vs. 2.63, P=<0.003); question 4, medical knowledge/anatomy (3.87 vs. 2.70, P=<0.006); question 5, professional behavior and accountability (2.63 vs. 1.59, P=<0.002); question 6, interprofessional and team communication (3.97 vs. 2.70, P=<0.002); and question 7, communication within the healthcare system (4.03 vs. 2.67, P=<0.001) (Table 1).

Table 1. Comparative analysis of ACGME Surgical milestones (CCC) evaluation scores between operating room nurses and attending surgeons.

Questions	Mean	Standard Deviation	P-Value
1. Patient evaluation and decision making			
OR Nurses	4.010	0.290	0.004
Attending Surgeon	2.770	1.250	
2. Intraoperative patient care: performance of procedures			
OR Nurses	3.832	0.354	0.005
Attending Surgeon	2.633	1.481	
3. Intraoperative patient care: technical skills			
OR Nurses	3.863	0.237	0.003
Attending Surgeon	2.633	1.481	
4. Medical knowledge: Anatomy			
OR Nurses	3.868	0.232	0.006
Attending Surgeon	2.700	1.564	
5. Professional behavior and accountability			
OR Nurses	2.633	1.588	0.002
Attending Surgeon	1.564	0.260	
6. Interprofessional and team communication			
OR Nurses	3.970	0.270	0.002
Attending Surgeon	2.700	1.386	
7. Communication with the healthcare system			
OR Nurses	4.034	0.110	0.001
Attending Surgeon	2.667	1.345	

Note. Significance level set at <0.05

The ACGME Surgical milestones (CCC) evaluation scores *are from 1-5*

Discussion

The surgical field is inherently team-based, especially within the operating room (OR). The ultimate goal of this teamwork is to provide the best patient care possible. To achieve this, continually evaluating and improving our practices is crucial. Our study found that, on average, OR staff ratings of surgical residents were significantly higher than those of attending surgeons across all seven domains evaluated. Specifically, OR nurses rated residents an average of 3.7/5, whereas attending surgeons rated them an average of 2.52/5, with $p < 0.01$ in all domains.

HARD SKILLS VS. SOFT SKILLS

When breaking down the evaluations into procedural hard skills (patient evaluation and decision making, intraoperative care and performance of procedures, operative patient care and technical skills, medical knowledge/anatomy), OR nurses rated residents an average of 3.89/5. In contrast, surgical attendings rated them 3.54/5, with $p < 0.006$. This higher score from nurses may be due to a need for more understanding of the procedural skills and knowledge base taught at higher training levels (i.e., medical school and surgical residency). According to Schlitzkus et al., surgical nurses often need a greater understanding of surgical residents' capabilities, particularly regarding procedural skills.[6] This lack of understanding may lead OR nurses to perceive residents as more competent than they are, resulting in higher evaluations compared to those given by attending surgeons.[6,7]

In contrast, when evaluating non-procedural soft skills (professional behavior and accountability, interprofessional and team communication, and communication within the healthcare system), OR nurses rated residents an average of 2.68/5, while attending surgeons rated them 2.32/5, all with $p < 0.002$. Both groups rated residents lower on soft skills. Surgery is a hands-on, technical field where training focuses primarily on surgical skills, potentially leading to lower scores in soft skills areas. Moreover, OR nurses spend more perioperative time with residents compared to attending surgeons, allowing them more opportunities to observe and evaluate interprofessional interactions, which may contribute to higher ratings.[8-10]

IMPACT OF HIERARCHAL DYNAMICS.

The difference in ratings may also be attributed to the diminished hierarchical dynamics between OR staff and residents compared to those between attending surgeons and residents.[1,11,13] Residents and OR staff often work closely together more equally, leading to more collegial and friendship-based relationships. Viewing residents as friends may influence OR nurses to rate them higher. Conversely, attending surgeons have more hierarchical and strictly educational relationships with residents, focusing on rigorous evaluation standards, resulting in lower scores. Attendings grade residents higher once they have demonstrated sufficient progress in their training. [11-13]

INCORPORATING MULTISOURCE FEEDBACK

Although attending surgeons are currently the primary evaluators, they may only directly oversee residents occasionally throughout their interactions within the surgical team.[14-16] This presents an opportunity to involve OR nurses in the evaluation process, especially in non-procedural areas where they can witness residents' teamwork, communication, and leadership skills. Incorporating multisource feedback, including evaluations from OR nurses, can provide a more comprehensive assessment of surgical residents and highlight areas for improvement.[17-18] This approach aligns with the shift in medicine from a paternalistic model to a more patient-centered care model, emphasizing the importance of well-rounded care providers.[16,18-19]

STUDY LIMITATIONS AND FUTURE DIRECTIONS

One limitation of our research was the time discrepancy of about six months between the CCC attending evaluations and the OR nurse evaluations. Given the potential for rapid growth in resident education, this time gap contributed to higher ratings from OR nurses. Another limitation is the educational background of the nurses concerning the evaluation criteria. Alternatively, nurses may need more formal

training in detailed anatomy, surgical procedures, or technical skills required to be a proficient surgeon, leading to potential misperceptions of residents' abilities. We recommend creating a simultaneous evaluation tool for OR nurses and surgeons to address these limitations in future studies. Additionally, educating nurses on the evaluation parameters of attending surgeons can help ensure a more equitable assessment basis. By refining the evaluation process, we can better identify areas for improvement and enhance surgical residents' overall education and performance.

Conclusion

On average, the OR nurses' ratings were significantly higher than those of the attending surgeons in all seven domains. Alternatively, nurses evaluated residents ~3.7 out of 5, whereas attending physicians evaluated ~2.5 out of 5 for residents, with $P<0.1$ for all domains. Based on this data, OR nurses evaluate surgical residents' clinical and communication skills differently and more leniently than attending surgeons. The significant difference in scoring may be due to less hierarchical dynamics between OR nurses and residents than between attending surgeons and residents, the attending surgeon's perception that residents need to "earn" a higher score, and possible lack of complete understanding of OR nurses on the requirements for a higher score in practical surgical skills/knowledge. In the future, a novel questionnaire given to attending surgeons and OR nurses simultaneously may result in more equitable and proportional evaluations of residents. Additionally, facilitating the education of OR nurses on what faculty look for in residents may improve the ability of ancillary staff to contribute more accurately to complete evaluations of surgical residents. Residency is a time of growth, and this is better facilitated when we use all of our available resources to reflect and improve in all aspects.

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