

The relationship between intraoperative teamwork and management skills in patient care

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Background. Optimal team performance in the operating room (OR) requires a combination of interactions among OR professionals and adherence to clinical guidelines. Theoretically, it is possible that OR teams could communicate very well but fail to follow acceptable standards of patient care and vice versa. OR simulations offer an ideal research environment to study this relationship. The goal of this study was to determine the relationship between ratings of OR teamwork and communication with adherence to patient care guidelines in a simulated scenarios of malignant hyperthermia (MH).

Methods. An interprofessional research team (2 anesthesiologists, 1 surgeon, an OR nurse, and a social scientist) reviewed videos of 5 intraoperative teams managing a simulated patient who manifested MH while undergoing general anesthesia for an epigastric herniorrhaphy in a high-fidelity, in situ OR. Participant teams consisted of 2 residents from anesthesiology, 1 from surgery, 1 OR nurse, and 1 certified surgical technician. Teamwork and communication were assessed with 4 published tools: Anesthesiologists' Non-Technical Skills (ANTS), Scrub Practitioners List of Intra-operative Non-Technical Skills (SPLINTS), Non-Technical Skills for Surgeons (NOTSS), and Objective Teamwork Assessment System (OTAS). We developed an evidence-based MH checklist to assess overall patient care.

Results. Interrater agreement for teamwork tools was moderate. Average rater agreement was 0.51 for ANTS, 0.67 for SPLINTS, 0.51 for NOTSS, and 0.70 for OTAS. Observer agreement for the MH checklist was high (0.88). Correlations between teamwork and MH checklist were not significant. Teams were different in percent of the MH actions taken (range, 50–91%; $P = .006$).

Conclusion. In this pilot study, intraoperative teamwork and communication were not related to overall patient care management. Separating nontechnical and technical skills when teaching OR teamwork is artificial and may even be damaging, because such an approach could produce teams with excellent communication skills as they unsuccessfully manage the patient. OR simulations offer a unique opportunity to research how to best integrate both of these domains to improve patient care. (*Surgery* 2015;158:1434-40.)

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ERRORS IN COMMUNICATION and teamwork in the operating room (OR) have been associated with adverse perioperative events and malpractice claims.¹⁻⁴ The OR team generally consists of professionals including surgeons, nurses, surgical technologists,

anesthesiologists, certified registered nursing anesthetists, resident trainees, nursing students, anesthesia assistants, anesthesia technicians, bioengineers, and other ancillary staff. Depending on the institution, members of the OR team often meet and work together on a daily basis without the benefit of practicing together first. Errors in the OR have been associated with both technical problems as well as mistakes in communication and professionalism.⁵⁻⁷ Therefore, the construct of OR team performance is a combination of nontechnical and technical skills, including effective teamwork, communication, leadership, role clarity, mobilization of resources, and appropriate patient care. Previous studies have demonstrated that improvement in OR team performance can improve the clinical process and patient

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outcomes⁸⁻¹⁰; however, it is unclear from these studies if better patient outcomes are owing ultimately to improved teamwork behaviors versus following appropriate patient care guidelines (ie, timely administration of preoperative antibiotics, patient temperature regulation, appropriate equipment availability).

Recently published strategies for OR team training have focused on communication, leadership, shared mental models, collective orientation/efficacy, back-up behaviors, situational awareness, mutual trust, and mission analysis.^{8,11-15} However, because the ultimate goal of all OR teams is to improve patient care, it is vital that OR teams possess not only excellent nontechnical teamwork skills, but also the ability to perform technical skills, such as following appropriate patient care guidelines. High-fidelity teamwork simulation offers an ideal opportunity to provide instruction and feedback on teamwork skills.¹⁶ In addition, because all of the variables associated with the clinical scenario can be controlled and remain identical for each OR team, simulation can also ensure that proper clinical guidelines are followed. This pilot study is exploratory research into the correlation between OR teamwork and adherence to patient care clinical guidelines during high-fidelity teamwork simulation.

METHODS

Raters. Raters were members of the Massachusetts General Hospital (MGH) Inter-professional OR Simulation Team and included 2 anesthesiology attendings (R.M., M.P.-S.), 1 OR clinical nurse specialist (M.W.H.), 1 psychologist (E.P.), and 1 general surgeon (R.P.). All raters had logged previously >100 hours of simulation experience. All of the clinical raters had completed coursework on simulation education from the Center for Medical Simulation in Boston, Massachusetts, and themselves had provided education in OR teamwork principles to colleagues and resident/student trainees.

Teamwork rating forms. To rate the OR teamwork of the nursing and scrub technician group, the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS)¹⁷ assessment tool was used. This assessment consists of 3 categories: situation awareness, communication and teamwork, and task management. Each category has 3 elements/items that are rated on a 4-point scale of good, acceptable, marginal, and poor. To rate the OR teamwork of the anesthesia group, the Anesthesiologists' Non-Technical Skills (ANTS) was used. The ANTS tool contains the same categories

and Likert scale as the SPLINTS form with the addition of a fourth category called decision making.¹⁸ Finally, to rate the OR teamwork of the surgery group, the Non-Technical Skills for Surgeons (NOTSS) tool was used, which utilizes the same Likert scale and 4 categories of ANTS as well as adds a fifth category of leadership.¹⁹ ANTS, NOTSS, and SPLINTS have all been validated externally by previous researchers.¹⁷⁻¹⁹

The Observational Teamwork Assessment for Surgery (OTAS) was also used to assess performance of the entire team and not just the individual team members. OTAS was selected for this purpose, because it did not require specialized training for rating and seemed to complement the ANTS, NOTSS, and SPLINTS tools.²⁰ OTAS has 5 behavioral categories—(1) communication, (2) coordination, (3) cooperation and backup, (4) leadership, and (5) team monitoring and situation awareness—and was used for each of the 3 professional OR groups (nurses/technicians, surgery residents and anesthesiology residents). Behaviors were rated on a 7-point Likert scale indicating the degree to which each behavior hinders (0 points) or enhances (6 points) team functioning during the 3 major phases (preoperative, intraoperative, and postoperative) of an operation. This study used only the intraoperative phase of OTAS, which has also been externally validated for this purpose.²⁰

Patient care guideline checklist: Malignant hyperthermia. A checklist form for the patient care guideline form was created based on a review of current malignant hyperthermia (MH) guidelines and reference materials from the American Malignant Hyperthermia Association of the United States (available from: www.mhaus.org).^{21,22} Content experts in anesthesia reviewed this form, and successive revisions were made until the entire research team agreed on all of the essential elements. A copy of the form is available in [Appendix A](#) (available online only).

Rating procedure. All raters met for 1 hour to review the assessment tools and study procedure as well as to clarify definitions and terms. Each rater received secured, encrypted links to the 5 videos and used all OR teamwork assessment tools in the same order for the 5 recorded simulations. Specific simulation sessions were rated in the same order by all raters over a 3-week time period. Once all of the videos were rated for teamwork, the raters then re-reviewed all of the videos in the same order again to complete the patient care guideline checklist. Raters could stop, rewind, and review each recording as often as needed while

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