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Is video observation as effective as live observation in improving teamwork in the operating room?

Anthony H. Bui [a], Shanice Guerrier [a], David L. Feldman [a,b], Patricia Kischak [b], Santosh Mudiraj [b], Donna Somerville [b], Minimole Shebeen [a], Cynthia Girdusky [a], and I. Michael Leitman [a,*]

[a] Department of Surgery, Icahn School of Medicine at Mount Sinai, New York, NY, USA
[b] Hospitals Insurance Company, New York, NY, USA

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ABSTRACT

Background. Teamwork in the operating room decreases the risk of preventable patient harm. Observation in the operating room allows for evaluation of compliance with best-practice surgical guidelines. This study examines the relative ability of video and live observation to promote operating room teamwork.
Methods. Video and audio cameras were installed in 2014 into all operating rooms at an 875-bed, urban teaching hospital. Recordings were chosen at random for review by an internal quality improvement team. Concurrently, live observers were deployed into a random selection of operations. A customized tool was used to evaluate compliance to TeamSTEPPS skills during surgical briefs and debriefs.
Results. A total of 1,410 briefs were evaluated: 325 (23%) through live observation and 1,085 (77%) through video; 1,398 debriefs were evaluated: 166 (12%) live and 1,232 (88%) video. For briefs, greater compliance was observed under live observation compared to video for recognition of team membership (87% vs 44%, $P < .001$), anticipation of complex procedural events (61% vs 45%, $P < .001$), and monitoring of resources (58% vs 42%, $P < .001$). For debriefs, greater compliance was observed under live observation for determination of team structure (90% vs 60%, $P < .001$), establishment of a leader (70% vs 51%, $P < .001$), postoperative planning (77% vs 48%, $P < .001$), case review and feedback (49% vs 33%, $P < .001$), team engagement (64% vs 41%, $P < .001$), and check back (61% vs 46%, $P < .001$) compared to video.
Conclusion. Video observations may not be as effective as evaluating live performance in promoting teamwork in the OR. Live observation enables immediate feedback, which may improve behavior and decrease barriers to compliance with surgical safety practices.

Introduction

Preventable errors in the operating room (OR) are a major cause of patient injury. More than 230 million operations are performed every year in the United States.[1] Among cases, 3% to 17% result in a serious complication, and 0.4% to 0.8% result in death.[2,3] Up to one-half of all operative complications appear to be avoidable.[2-5] Examples of preventable surgical errors include wrong-site, wrong-patient surgery and retention of surgical instruments within the wound.[6-10]

Poor teamwork and communication between members of the OR team has been implicated as the most common cause of preventable errors.[11,12] Examples of communication failures include inadequate personnel and resource management, inaccurate or missing information related to the patient or procedure, and failure to resolve issues or conflict; these failures of communication have been associated with inefficiency, waste of resources, and workarounds in care,[13-15] as well poor surgical outcomes.[16-18]

The use of surgical checklists and the practice of time-outs (briefs), during which team member roles and anticipated events are reviewed before skin incision, and sign-outs (debriefs) during which resources are counted and postoperative instructions reviewed immediately after skin closure, have been shown to improve communication between members of the OR team and to decrease the incidence of preventable errors.[19-25] Better compliance with checklists and practices to promote team behavior has been associated with improved OR performance and decreased odds of major complications and death.[18,26,27] Despite this, there continues to be high variability in compliance with surgical safety practices.[26] Merely introducing surgical safety checklists into the OR without also providing the proper teamwork training necessary to

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* Corresponding author. Mount Sinai Downtown, 10 Union Square East, Suite 2M, New York, NY 10003, USA.
E-mail address: michael.leitman@mountsinai.org (I.M. Leitman).

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implement these measures fully is likely to have little effect on operative mortality or complications.[28,29]

It is therefore, important to monitor teamwork skills to maximize the value of OR safety protocols. Team behavior in the OR may be promoted via external observation of all aspects of the operative procedure. Operations may be observed directly (i.e., live) or indirectly (e.g., through the use of video recordings). A review of live and video observations in health care settings showed that these methods are effective at detecting errors and evaluating teamwork and communication.[30] Information from these observations can be used to provide feedback to surgical teams on their performance, either immediately during direct observation or delayed after review of video recordings, but there remains a need to compare how different strategies for monitoring and evaluating team behavior translate to improved teamwork in the OR.

The goals of this study were 2-fold: (1) to evaluate the degree to which standardized safety protocols were being utilized by surgical teams and (2) to assess whether compliance with these protocols differed under live versus video observation.

Methods

Intervention and setting

TeamSTEPPS is a crew resource management tool designed by the Agency for Healthcare Research and Quality and the Department of Defense to improve teamwork between health care personnel in high risk environments, this tool promotes competency in 5 core domains: team structure, communication, leadership, situation monitoring, and mutual support.[31-33] TeamSTEPPS training has been shown to increase rates of briefings and debriefings, decrease communication barriers, and improve perceptions of teamwork,[34] as well as being able to decrease the incidence of perioperative issues of patient safety.[35]

Video and audio cameras were installed in 2014 to record all activities within the ORs at the Mount Sinai Beth Israel Hospital, an 875-bed, urban teaching hospital in New York, NY, as part of a patient safety quality improvement initiative facilitated by the hospital's professional liability insurer (Hospitals Insurance Company). Prior to this study, all surgical staff at the hospital were trained in TeamSTEPPS. During a 2-year period (2014–2015), recordings of operative cases were chosen at random for review by an internal quality improvement team. Concurrently, live observers were deployed into a random selection of operations. The research was considered exempt by the hospital institutional review board.

TeamSTEPPS evaluation

A customized tool was developed by a multidisciplinary group of surgeons, nurses, and anesthesiologists. The observation tool was based on the Medical Team Performance Assessment Tool (MTPAT), a previously published software application developed by the TRICARE Management Activity team of the US Department of Defense for the measurement of TeamSTEPPS.[36] The MTPAT is a tablet-based interface which provides a structured framework for OR observers to rapidly record and evaluate observed behaviors by the team members.

The customized tool was created specifically to evaluate briefs and debriefs by the OR team, serving as a proxy measure of compliance with TeamSTEPPS skills. The briefs and debriefs represent the points during the operative case during which the most critical aspects of the cases are reviewed, as outlined by the TeamSTEPPS domains (team structure, communication, leadership, situation monitoring, and mutual support). Furthermore, communication between the members of the OR team during briefs and debriefs is fully standardized. Therefore, these measures were thought to allow for the most objective and structured assessment of OR teamwork.

For briefs, reviewers evaluated the performance of the OR team with the following skills: team assembly or the presence of core members of the team; establishment of a leader and a time-out called; recognition of team membership by all team members; discussion of the plan of care, including identifying the patient, procedure, and operative site; anticipation of the complexity of the procedure; anticipation of the medical status (American Society of Anesthesiologists classification) of the patient; status of potentially needed resources, including staff and equipment; active engagement of all team members; and a check back.

For debriefs, the following elements were evaluated: team assembly; establishment of a leader and a sign-out called; discussion of the postoperative plan, including the procedure, intraoperative untoward events, prevention of retained surgical items, and postoperative care; active engagement of all team members; assessment of what went well and what needs improvement related to procedures and equipment management; and check back. Each skill was rated using a 2-point scale: "pass" all elements of the skill present or "fail" ≥ 1 elements missing; compliance to the skill was defined as a rating of "pass."

Additionally, behaviors that posed barriers to compliance were noted when observed. These behaviors were recorded as detailed notes based on the subjective evaluation of the situation by the observer. These notes were then abstracted into a series of behaviors representing barriers that prevented compliance with TeamSTEPPS skills (Table 1).

Feedback to OR teams

Feedback was given to OR teams either in real-time during live observation or in writing after review of the video recording. OR teams were notified of TeamSTEPPS skills and elements missed during their brief and debrief. They also were notified of behaviors that interfered with compliance.

Statistical analysis

Descriptive statistics (counts, percentages) were calculated to characterize the distribution of observations by type (live- or video-observed), surgical specialty, compliance with TeamSTEPPS skills, and observed barriers to compliance. Fisher exact tests were then performed to compare the rate of compliance to TeamSTEPPS skills during live- versus video-observed cases. The following outcomes were assessed: compliance with each individual TeamSTEPPS skill in the brief and debrief protocols, full compliance with every TeamSTEPPS skill during the brief or debrief, and observation of behaviors that posed barriers to compliance.

Because this study included a large number of surgeons and surgical services, it is possible that surgical cases designated for live versus video observation may not have been assigned evenly between individual surgeons or surgical specialties (i.e., some surgeons or services may have had a greater percentage of their cases observed via video recording than others); this possibility introduced the potential for analytical bias. To account for this, hierarchical models were fit using multilevel, mixed-effects logistic regressions. In these models, the observations are grouped according to the lead surgeon on the case, who themselves are further nested within the surgical specialties represented in the study. Each regression model featured compliance to a TeamSTEPPS skill, as described above, as the outcome variable. Observation type (live versus video) was included in the regression as a fixed effect. The identity of the lead surgeon nested within their surgical specialty was included as random effects. Grouping the observations as such controlled for baseline variations in compliance with TeamSTEPPS

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