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Use of the Surgical Safety Checklist to Improve Communication and Reduce Complications

Anne E. Pugel, MD^{a,b}, Vlad V. Simianu, MD^{a,b}, David R. Flum, MD, MPH^{a,b}, and E. Patchen Dellinger, MD^a

^aDepartment of Surgery University of Washington PO Box 356410 Seattle, WA 98195 USA

^bSurgical Outcomes Research Center University of Washington 1107 NE 45th Street Suite 502 Seattle, WA 98105 USA

Abstract

Existing evidence suggests that communication failures are common in the operating room, and that they lead to increased complications, including infections. Use of a surgical safety checklist may prevent communication failures and reduce complications. Initial data from the World Health Organization Surgical Safety Checklist (WHO SSC) demonstrated significant reductions in both morbidity and mortality with checklist implementation. A growing body of literature points out that while the physical act of “checking the box” may not necessarily prevent all adverse events, the checklist is a scaffold on which attitudes towards teamwork and communication can be encouraged and improved. Recent evidence reinforces the fact the compliance with the checklist is critical for the effects on patient safety to be realized.

Keywords

surgical checklist; surgical briefing; surgical safety; communication; compliance

1. The Surgical Safety Checklist

In 2009, the World Health Organization (WHO) published the Surgical Safety Checklist (SSC) as part of their Safe Surgery Saves Lives campaign. The checklist was adapted from the field of aviation, where checklist use is standard practice. In aviation, checklists were developed in response to a crash involving an experienced pilot operating a new airplane with features that were significantly different from previous models. Shortly after takeoff, the plane stalled and crashed. An investigation revealed that the pilot had forgotten to

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Corresponding author. E. Patchen Dellinger, MD, Telephone:01 206 616 9836, patch@uw.edu, Department of Surgery, University of Washington, PO Box 356410, Seattle, WA 98195, USA.

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perform one of the steps necessary for takeoff. In response, the checklist was created to prevent future *avoidable* disasters.(1)

With more than 200 million operations performed annually, the WHO recognized the importance of addressing surgical safety when the checklist was introduced. The purpose of the checklist was to help operating room (OR) teams remember important details that may be missed during an operation. In addition, it served as a tool to encourage teamwork and communication.(2) In a sense, the WHO came to the same conclusion that the plane crash investigation team had: even highly skilled OR teams need tools to help them achieve optimal results. The initial WHO SSC was piloted at eight diverse hospitals around the world and contained 19 items that were to be addressed at defined time points during the operation (Figure 1).(3) The items included in the SSC are aimed at preventing uncommon but serious errors by reminding the team to confirm patient identity, surgical site, and other important characteristics such as comorbid conditions or anticipated complications. Results from the initial prospective, sequential, time-series observational study showed significant reductions in complications, in-hospital mortality, rates of unplanned reoperation, and surgical site infection (SSI) compared to pre-checklist rates. (4)

Since then, the WHO SSC has been implemented in more than 4,000 hospitals worldwide. (5) Hospitals are encouraged to customize the checklist to their needs, but the general format remains the same. Studies validating these various checklists have continued to show, for the most part, a benefit when the SSC or similar checklist is used, (6–11) but the mechanism by which this occurs is unclear. Recent high-profile reports have highlighted the pitfalls of SSCs, such as inconsistent implementation and compliance.(12) In an era of increasing complexity of care, it appears that the checklist is serving as a conduit for improved teamwork and communication through which the improved outcomes result.

The aim of this paper is to review the literature related to SSC use as a communication tool, with a focus on how the checklist is associated with team behaviors and attitudes in the OR. In addition, we describe scenarios where use of the SSC is associated with changes in patient outcomes. We reviewed studies that have been collated by the senior author, who has extensively studied the fields of OR safety, communication and checklist use for the past 10 years. We included studies that addressed the use of the checklist as a tool for improved communication in the OR, with an emphasis on changes in both team behaviors and clinical outcomes after implementation. Additional studies were selected that described compliance with the SSC and how it may be affected by variations in implementation strategy.

2. Communication Lapses are Common

Safety within the OR is an important public health concern. It is estimated that of the complications that occur within the hospital setting, more than half are associated with surgical procedures.(13) Every operation has a series of steps that must be performed correctly every time: surgeons must use the correct equipment, the equipment must be available and in proper working order, and drugs need to be administered in a timely and appropriate fashion. Errors can occur at any step with potential for threats to patient safety. As their roles in an operation are interdependent, it is incumbent on the anesthesia team, the

nursing staff, and surgeons to communicate effectively to prevent avoidable complications such as wrong site surgery and inappropriate antibiotic administration.

Despite this, research has shown that surgeons, anesthesiologists, and nurses have rather different concepts of what constitutes teamwork and communication in the OR.(14, 15) One study used the Safety Attitudes Questionnaire (SAQ) to assess perception of patient safety in the OR. The SAQ is a standardized survey that uses a five-point Likert scale to measure items such as teamwork and safety.(16) This particular study found that women reported significantly lower aggregated scores than men on the domain “teamwork climate” (69 vs 76, $p<0.05$). (17) A separate study investigated specific aspects of teamwork and found that nurses reported significantly lower scores than surgeons regarding reception of nursing input (3.8 vs 4.3, $p<0.001$), ability to voice concern (3.5 vs 3.7, $p=0.03$), and whether physicians and nurses work well as a team (3.3 vs 3.7, $p<0.001$). (14) The consequences of this disparity can be serious. In one study investigating reports of wrong site surgery, OR personnel voiced concern in only 22% of cases ($p<0.001$). Of these times, surgeons responded to the concern 69% of the time. Pooled results predicted that in cases with the potential for wrong-site surgery, concerns would be raised and addressed only 41% of the time.(18)

While wrong site surgery is an uncommon event, communication failures are common, occurring every 7–8 minutes and affecting up to 30% of interactions in the OR.(19, 20) For a routine case lasting 2–3 hours, this means that up to 25 attempts at communication may be unsuccessful. Use of a checklist may prevent more than half of communication failures from occurring (21) by orienting the team to the individual patient, alerting each member to potential complications, and encouraging team members to voice concern when they notice an error occurring.

3. The Checklist can Improve Communication and Teamwork

One of the primary arguments in favor of checklists is that they help to decrease surgically associated morbidity and mortality, and can be implemented in most settings. Use of system-wide checklists can improve compliance with other metrics, such as increased timely antibiotic administration, decreased unexpected delays in the schedule, and reduced time spent outside of the OR gathering supplies during an operation.(21–23) Timely antibiotic administration has been linked to a decrease in surgical site infection. In one study, pre-precision antibiotics were not administered 12.1% of the time; after introduction of a checklist, this number decreased to 7.1% ($p=0.015$).(23) While introducing the checklist can initially be viewed as disruptive, staff members typically have a favorable attitude after it has been initiated.(24)

Substantial work has been undertaken to understand if the use of checklists actually improves communication in the OR. In a pilot study investigating the utility of pre-procedural briefing in cardiac surgery (similar to the WHO SSC), the number of miscommunication events declined by 50% in the briefing group compared to the group that did not use the briefing tool.(21) Other studies have found that communication failures declined by two thirds after initiation of a surgical briefing.(24) In a study investigating pre-

and post-implementation scores using the SAQ, respondents were more likely agree that checklists are important for safety (4.58 vs 4.79, $p=0.0058$), and they were more likely to report a culture that encouraged team members to voice concern (4.02 vs 4.21, $p=0.0225$). Additionally, 93.4% of the clinicians who responded to the survey stated that if they were undergoing an operation, they would want the checklist used.(25)

Critics of the SSC have noted that while use of the checklist may identify problems, the person conducting the checklist is ultimately responsible for resolving the problem and redirecting the team.(26) For example, if the checklist demonstrates that the patient did not receive appropriate antibiotics in a timely fashion, the surgeon, anesthesiologist, and circulating nurse must rectify this mistake prior to proceeding with the operation. This begins to address an important concern: while the checklist itself might be improving patient safety, there may be something different about teams who routinely use the checklist. Checklists are rarely comprehensive enough to catch every possible error. Instead, proper use of the checklist may be a marker for teamwork and cooperation within the OR.

4. Is it the Checklist or the Teamwork?

Regardless of checklist use, the link between team behaviors and patient safety is well recognized. Infrequent use of team behaviors (defined in one study as “briefing,” “information sharing,” “inquiry,” “vigilance and awareness,” “assertion,” and “contingency management”) is associated with increased risk of death and other complications,(27) while high levels of communication and collaboration are associated with overall lower rates of risk-adjusted morbidity.(28) Other evidence shows a correlation between increased teamwork and a lower frequency of errors during an operation.(29) Wiegmann, in examining when errors in the OR are discovered and by whom, concluded that while poor teamwork can lead to errors, good teamwork leads to the detection and correction of mistakes.(30)

Investigators have attempted to describe the link between checklist use and improved patient outcomes. One explanation is that use of the checklist improves the safety culture within an institution by facilitating communication. Makary and colleagues administered an OR based version of the SAQ to assess changes after implementation of an OR briefing protocol. They found that introduction of an OR briefing improved collaboration amongst providers. Respondents reported increased scores on items such as awareness of surgical site brought about by the briefing (3.74 vs 3.18, $p<0.001$), coordinated efforts by surgical staff and anesthesia staff (4.54 vs 3.68, $p<0.000$), and on the importance of the briefing to patient safety (3.24 vs 2.75, $p<0.001$). (31)

However, checklist implementation may introduce new challenges that had not previously been considered. In a viewpoint discussing checklist use, Rydenfalt contends that merely introducing a checklist without monitoring compliance may actually make the OR *less* safe because previous safety checks are dropped.(32) OR staff have reported in interviews that use of the checklist can interrupt the performance of other safety tasks that are simultaneously being performed by individuals. Additionally, without a firm sense of commitment to the checklist it may become a routine activity of checking off boxes without

actually driving behavior change or improvement. (33) Running through the list in such fashion may give OR staff a false sense of security that issues have truly been resolved when in fact they have not. (34) Without providing team members proper instruction regarding the use and value of the checklist, it may actually become a nuisance to the OR staff.

While there is a significant amount of data showing that checklist use leads to improvements in patient outcomes, investigators have also performed checklist audits to evaluate how the OR team uses the SSC in everyday practice. Levy and colleagues examined the efficacy of the checklist for ensuring performance in the OR and found that administrative records confirmed 100% performance while auditing by observers in the OR recorded less than 50% completion for most elements, and in some cases less than 10% of the checklist elements were completed.(35) Subsequently, the same group organized safety workshops as well as a stakeholder engagement group to customize the checklist for local concern. With these two interventions, overall adherence improved from 30% to 96% ($p<0.001$). (36)

5. Case Study

A recent report raised serious questions about the utility and effectiveness of surgical checklists. In 2010, the Canadian Province of Ontario mandated that each hospital use the WHO SSC and that they report their compliance. In this real-world observational study, hospitals were evaluated before and after implementation of the SSC. Information about compliance was abstracted from administrative records. Change in surgical mortality was the primary outcome, but the investigators also looked at other outcomes such as morbidity and readmission. The results of the study showed that despite widespread adoption of the WHO SSC, there was no significant difference in mortality (0.71% vs 0.65%, $p=0.13$) or surgical complications (3.86% vs 3.83%, $p=0.29$). (12)

It is unclear why the results of the Ontario study were so different from the original WHO study. The findings sparked a debate about what the surgical community should expect from the SSC, and whether its use was directly associated with a change in outcome. One of the criticisms of the Ontario study was related to implementation strategy, as it seemed that individual hospitals were responsible for implementation without being given administrative support. In the WHO SSC study, the task of implementation required considerable resources and support in order to be effective. Additionally, there was concern that compliance with the SSC was likely lower than what it had been in previous studies so the expected effects were not realized.(37) Despite operational flaws, many say that the findings from Ontario should be seriously considered, as the observational nature of this study is likely to be characteristic of typical use of the checklist.(38, 39) The results found in the rigorously controlled environment of a randomized controlled trial do not always approximate the effects that are seen in “real world” conditions, which may explain why there was no difference in morbidity or mortality rates in Ontario. Additionally, simply telling people to change their behavior without providing any guidance or support on how to do so may not be the most effective strategy.

6. Conclusion

The modern surgical environment is complex, and communication errors are relatively common. As described, use of the SSC has become common throughout the world. While checklists show promise in the reduction of surgical morbidity and mortality, there is also evidence that these improvements are not realized without careful attention to implementation strategy. When deciding to implement checklists in the OR, administrators should assess the climate of their hospital in order to make the checklist relevant to those who will be using it rather than an additional hurdle to jump over. Providing feedback to teams regarding patient outcomes and OR performance may be a valuable strategy to promote buy-in at the provider level.⁽³³⁾ In addition, encouraging customization of the checklist to fit the needs of the team may promote a feeling of ownership over the checklist, increasing compliance along the way. ^(33, 36) Without the support of staff members, it is unlikely that the checklist will lead to any changes in patient outcomes. For now, the surgical community should view the checklist as a tool for improving communication and safety culture, and be realistic about its direct impact on patient safety.

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