Using a Medication Event Huddle to Reduce Adverse Drug Events

Features

Methods, Tools, and Strategies
- Sustainable, Effective Implementation of a Surgical Preprocedural Checklist: An “Attestation” Format for All Operating Team Members
- Using a Virtual Breakthrough Series Collaborative to Reduce Postoperative Respiratory Failure in 16 Veterans Health Administration Hospitals

Teamwork and Communication
- Eight Critical Factors in Creating and Implementing a Successful Simulation Program

Operations Management
- “Not So Fast!” The Complexity of Attempting to Decrease Door-to-Floor Time for Emergency Department Admissions

Department

Tool Tutorial
- Medication Event Huddles: A Tool for Reducing Adverse Drug Events

“A core interdisciplinary medication event huddle team is particularly valuable for ensuring consistency and identifying trends across the organization.”

—Medication Event Huddles: A Tool for Reducing Adverse Drug Events (p. 40)
Methods, Tools, and Strategies

Sustainable, Effective Implementation of a Surgical Preprocedural Checklist: An “Attestation” Format for All Operating Team Members

Allison J. Porter, MD; Jon Y. Narimasu, MD; Michael F. Mulroy, MD; Richard P. Koehler, MD

Adoption of a preprocedural pause (PPP) associated with a checklist and a team briefing has been shown to improve teamwork function in operating rooms (ORs) and has resulted in improvements in communication, reduced disruptions and delays, reduced potential for wrong-site surgery, fewer complications, and reduced mortality, even in urgent surgical situations. The format of the World Health Organization (WHO) Safe Surgery Saves Lives checklist developed in 2008 has been used as a template for a PPP. Performing a PPP, described as a “time-out,” is one of the three principal components, along with a preprocedure verification process and marking the procedure site, of the Joint Commission’s Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery™. However, if the surgeon alone leads the pause, its effectiveness may be decreased by lack of input from other operating team members.

Methods: In this study, the PPP was assessed to measure participation and input from operating team members. On the basis of low participation levels, the pause was modified to include an attestation from each member of the team.

Results: Preliminary analysis of our surgeon-led pause revealed only 54% completion of all items, which increased to 97% after the intervention. With the new format, operating team members stopped for the pause in 96% of cases, compared with 78% before the change. Operating team members introduced themselves in 94% of cases, compared with 44% before the change. Follow-up analysis showed sustained performance at 18 months after implementation.

Conclusions: A preprocedural checklist format in which each member of the operating team provides a personal attestation can improve pause compliance and may contribute to improvements in the culture of teamwork within an OR. Successful online implementation of a PPP, which includes participation by all operating team members, requires little or no additional expense and only minimal formal coaching outside working situations.
subsequent audit of performance of the process that we conducted in 2010, we identified concerns about the effectiveness of the PPP for achieving active participation of all operating team members, enhancing teamwork, and empowering communication in the OR. Specifically, in our adopted format (surgeon leading the pause), we observed that not all operating team members were stopping their work, paying attention, introducing themselves, speaking up, or offering comments or observations, and that the checklist was not being completed in all locations. Our primary goal in this project was to improve the format of the PPP checklist in a sustainable manner to encourage participation and empower all operating team members to contribute. A secondary goal was to ensure that the revised checklist could be implemented efficiently, without significant expense or staff training.

Methods

Setting
Virginia Mason Hospital is a 335-bed community teaching hospital with 24 ORs for three surgical groups in the Seattle area (Virginia Mason Medical Center, Pacific Medical Center, and Group Health Cooperative), providing all surgical service lines except obstetrics and trauma. The anesthesia services are provided by two groups under a single leadership, and all surgical providers adhere to standard institutional safety and procedural guidelines. Surgery and anesthesia residents from Virginia Mason Medical Center and from the University of Washington are involved in many procedures. This quality improvement project was undertaken with Institutional Review Board review and waiver of requirement for informed consent.

Audit of Performance on the Original Preprocedural Pause Checklist (January 2010)

In January 2010 (Figure 1, above), we performed an audit of performance on our checklist (Appendix 1, available in online article) in 31 cases of varying surgical subspecialties in a random sampling of our ORs. Initial attempts by external observers to record compliance produced enhanced performance, so the audit was performed by a trained anesthesia technician or a junior member of the surgical team [A.J.P] who was not identified as an observer. In this audit, we evaluated whether each element of the checklist was covered during the pause, which was quantified on a yes/no scale. We also evaluated the surgical attending, surgical resident, circulating nurse, scrub technician, anesthesia attending, and anesthesia resident in terms of the four categories of participation—that is, were they ready for the pause, did they stop, did they say their name, and did they express concern. All members were assessed for compliance regarding stopping for the pause. In addition, to assess the active participation of operating team members, we monitored their speaking their full names and offering comments or expressing concerns during the pause. The surgeon was also evaluated on whether he or she solicited additional responses. This audit revealed inadequate participation in the PPP at all levels, but particularly among the nurses and surgical technicians.

Developing a New Format for the Preprocedural Pause Checklist (February 2010–April 2010)

On the basis of the audit results, in February 2010 we convened a task force led by three of the four authors [A.J.P., M.F.M., R.P.K.], which was made up of representatives from surgery, nursing, surgical technicians, and anesthesiology to review and recommend changes in the process and some of the content of the PPP. To improve participation and empowerment by all operating team members, the group revised the PPP format to mandate that each member of the team was responsible for a scripted section of the checklist, with each section containing el-
ments to which only the specific individual could be expected to attest to their validity. For example, the circulating nurse would attest to the completeness of the consent, the technician to the adequacy of the instruments and the presence of a surgical site mark. The anesthesiologist would attest to having reviewed the patient’s allergies and administered appropriate preoperative antibiotics, while the surgeon confirmed the procedure, anticipated blood loss, and potential operative concerns, and solicited input or additional concerns from the team. The sequence of participation allowed the nurse, technologist, and anesthesiologist to speak in order, each asking the next participant to speak, concluding with the surgeon, who then specifically invited any additional comments. In addition, in the new format, each member was asked to speak both his or her first and last names, on the basis of data suggesting a correlation of teamwork attitudes with familiarity with full names.24

**IMPLEMENTING THE NEW FORMAT (JUNE 2010–AUGUST 2010)**

The task force members rehearsed use of the new format, which was then used in a trial format in six ORs, with feedback solicited. Minor changes to the wording and the order of the check boxes were incorporated, and the final draft was presented as part of a Surgical Forum (a quarterly one-hour meeting of all operating room staff) in April 2010. The presentation included an explanation of why the format changes were made and a two-minute video demonstration of the performance of the new “Attestation Pause.” During the next eight weeks, implementation of the new procedure was enhanced by placing 3 foot × 5 foot laminated posters in several ORs, and task force members coached the operating teams in ideal performance of the pause. Minor changes were made to the content during the trial period, but the format remained the same through trial to implementation; no additional formats were tested.

After the eight-week trial period, which began in June 2010, the new surgical pause format (Figure 2, page 6) was introduced to every OR in the medical center and was adopted as a new hospital process for all operating teams. Although there were no specific incentives or penalties associated with compliance, there was clear strong institutional commitment to the project, as articulated at the previous Surgical Forum, and awareness that auditing would be performed. Check boxes on a paper copy of the checklist were completed by the circulating nurse in each room, but these forms were not retained or reviewed.

In August 2010 a second “blinded” audit was performed by anesthesia technicians and members of operating teams [A.J.P., J.Y.N.], who, again, were not identified as observers. The results of the initial intervention for all ORs were presented in February 2011 to the quarterly Surgical Forum. Finally, in November–December 2011, a follow-up audit was again performed with the operating teams blinded to the process.

**Results**

**BASELINE AUDIT (JANUARY 2010)**

Prior to the intervention, staff were ready for the PPP and ceased all other activity to participate in it 85% and 78% of the time, respectively. Participation of the entire operating team was low. The surgeon solicited responses from the team members in only 56% of ORs, and only 21% of the time were contributions or concerns offered by staff. Names were spoken in only 44% of the cases; speaking of a name was counted at baseline if either the first name or last name was spoken.

**POSTINTERVENTION PREPROCEDURAL PAUSE COMPLIANCE (JUNE 2010)**

Following revision to the attestation format, as described, there was substantial improvement in compliance with the PPP in all groups, as shown in Table 1 (page 7). The respective staff groups stopped for the pause in 89%–100% of cases, with overall improvement of 2%–78%. In addition, we observed substantial improvement in our markers for team member engagement—self-introductions using both first and last names. After the intervention, team members introduced themselves in 89%–100% of the cases (Table 1), with increases ranging from 70% to 141% in frequency of introductions.

**SUSTAINED COMPLIANCE AT 18 MONTHS (NOVEMBER 2011)**

Pause compliance improved after the attestation checklist introduction. At baseline, during only 54% of cases were all items on the checklist performed. By comparison, after implementation of the attestation pause, all items were completed in 97% of cases. At the 18-month audit, compliance remained very high, with maintenance of significant improvements in nearly all categories. The PPP was performed routinely in every room, with minor decreases in the frequency of stopping and full-name introductions. The coverage of “all items” decreased from 100% to 74%. That represented the omission of a single item in deficient cases; in the 34 audits, 99% of total items were addressed. Both at baseline and in the immediate postintervention period, surgeons solicited responses from other team members in 56% of cases, but at 18 months, this had increased to 94% of cases.
Preprocedural Pause Attestation Tool

<table>
<thead>
<tr>
<th>Member</th>
<th>Standard Presentation Attestation—what you know for sure</th>
</tr>
</thead>
</table>
| Attending Surgeon or Primary Surg Resident | □ Call for time-out  
 □ Solicit report from Circ RN |
| Circulating RN                 | □ **Identify self/guest (PRN)—full name and role**  
 □ Identify patient 1. State full name  
 □ Identify patient 2. State date of birth  
 □ Consent signed for (state site and procedure)  
 □ Foley—inserted/NA  
 □ SCDs—in place/turned on/NA  
 □ Heating blanket—in place/turned on/NA  
 □ Rainbow sheet documentation accountability  
 □ Whiteboard updated  
 □ Solicit report from Scrub Tech |
| Surgical Scrub Tech            | □ **Identify self/guest (PRN)—full name and role**  
 □ Specific instrumentation available and ready to start case  
 □ Specialty implants/equipment present for consented surgery  
 □ Need for vendor/trainer with new equipment  
 □ Confirms “YES” is visible in prepped field  
 □ Drugs AND solutions are all labeled  
 □ Preliminary counts were performed/done  
 □ Solicit report from Anesthesia |
| Anesthesiology                 | □ **Identify self/guest (PRN)—full name and role**  
 □ State significant drug allergies  
 □ Antibiotics—ordered/administered/redosing plan  
 □ State blood and/or blood products ordered/NA  
 □ Amount blood and/or blood products availability/NA  
 □ Cell saver plan/NA  
 □ Concerns, comorbidities and hemodynamics  
 □ Beta-blocker plan/NA  
 □ Diabetes or glucose plan/NA  
 □ Plan for postop pain management  
 □ Solicit report from Surgeon |
| Surgeon                        | □ **Identify self/resident/PA/guest (PRN)—full name and role**  
 □ State name of procedure, site, fields, time needed  
 □ State relevant patient clinical history  
 □ Verify imaging—patient/site/sidedness  
 □ State anticipated difficulties/significant comorbidities  
 □ State anticipated blood loss  
 □ Postop plan—disposition/special bed?  
 □ Solicit any others in room to identify self and role  
 □ State additional information  
 □ Encourage—any additional input or safety concerns |

Figure 2. To improve participation and empowerment by all operating team members, the preprocedural format mandated that each member be responsible for a scripted section of the checklist. Circ, circulating; PRN, as needed; NA, not applicable; SCD, sequential compression device; Tech, technician.
Discussion

Our experience confirmed that adoption of a checklist without attempts to support cultural change in the OR does not create effective implementation even with institutional support. Entrusting compliance to a single member of the operating team who was a strong authority figure produced only 54% completion of the checklist. We found that creating the expectation of full participation by each member of the operating team to speak his or her full name and attest to the components that he or she identified with was effective in ensuring consistent sustainable completion of virtually all elements of the checklist, and provided a forum for exchange of additional information pertinent to the case. Our process has continued in use for more than three years, in contrast to other attempts at checklist innovations.22,25,26

Moreover, we have extended use of the attestation format beyond ORs—for use in interventional radiology, gastroenterology, and electrophysiology suites. Since the 18-month audit, we have made minor additional modifications, such as enhanced emphasis on perioperative glucose control and patient disposition. In addition, continued auditing of the process has identified a need for improvement in the third portion of the WHO checklist—the debriefing. Efforts are being launched at our medical center to improve compliance and teamwork within this sphere as well.

Although the efficacy of the PPP in reducing complications and mortality has been well documented,6–8,21 the checklist alone is not sufficient. Commercial airlines have used preflight checklists since 1938, but it was not until team training (first described as “Crew Resource Management” [CRM]) was included after 1977 that significant changes in safety attitudes and behaviors were accomplished.27 The other essential component of an effective PPP is the encouragement of open communication and team building,28,29 attained by the discussion component, as described in the original WHO report.7 The challenge of attaining enhanced teamwork in the OR is increased by the tradition of autonomy and the hierarchical nature of the surgical suite.13,22,30,31 Historically, there is a documented gap in the perception of teamwork among surgeons and nurses. Although the former often believe that teamwork is good, the latter frequently have a lower perception of cooperation and respect for their contribution.32–34

Lingard and colleagues, who studied communication patterns in the OR, identified opportunities for improvement,35 which were facilitated by the development of scripted preoperative team “briefings” based on a checklist. Much as we found, their format improved communication patterns, and they also found a reduction in adverse consequences associated with communication failures.36,37 This group also observed that attempts to improve teamwork atmosphere through procedural briefings have been less effective when conducted by a few physicians rather than used as an opportunity to enhance team communication.1

Experience has confirmed that even with national and state organizational and local hospital administration support for the use of PPPs, effective implementation is variable and appears to require a cultural change.14 Fourcade and colleagues identified
11 barriers to successful adoption of a surgical safety checklist, with the top 2 being organizational—failure to integrate into existing workload and “cultural habits”—that is, OR “staff practices are rooted in a time-honoured hierarchy,” leading open communication and acceptance of change.

A dramatic example of variability in checklist adoption and its impact on effectiveness was provided by a retrospective cohort study reported by van Klei and colleagues. The University Medical Centre Utrecht adopted the WHO checklist in April 2009, and electronically recorded compliance in all their ORs, with completion categorized as “not performed,” “partially performed” (at least one item), and “completely performed” (all 22 items). For the 25,513 adult patients undergoing surgery, after adjustment for baseline differences, mortality was significantly decreased after checklist implementation—an effect that was strongly related to the extent of checklist compliance.

Other groups have also reported incomplete implementation of checklists. The Washington State Hospital Association mandated and achieved 100% use of OR checklists in 2009, but follow-up evaluation showed incomplete implementation in three of the five hospitals included in the study. A surgeon-led PPP at Northwestern Memorial Hospital (Chicago) produced only 66% compliance, even after a formal four-hour class on OR communication and teamwork. At Witten/Herdecke University in Cologne, Germany, the gains in “information transfer” attained with the original checklist implementation in 2010 were not maintained in their follow-up at 18 and 24 months. Mandated CRM teamwork training achieved only 60% compliance at Vanderbilt University Medical Center without an associated cultural shift. Use of an electronic “whiteboard” in their ORs that documented the performance of each step in a checklist increased compliance to 82% and 86% at one and nine months follow-up, although the discussion of “special considerations” only increased to 57% compliance at nine months. Although computer-generated records indicated 100% compliance in the ORs at Children’s Memorial Hermann Hospital in Houston, observers of actual performance found far lower rates of compliance, including 10% identification of team members, 32% confirmation of surgical site, and maintenance of quiet in the OR during the PPP only 63% of the time.

Key to compliance with checklists and other methods to promote teamwork are institutional leadership and support, individual champions, and explanations as to “why” as well as “how.” Involving all team members early in development of an innovation also appears critical; for example, at Johns Hopkins, including all perioperative members in the adoption of a new operative procedure (intraoperative radiation) eliminated errors and minimized complications.

In addressing our secondary goal of efficiently implementing a revised checklist, without significant expense or staff training, we noted that many institutions addressing checklist compliance have used extensive “off-line” efforts to facilitate team training—often with limited success. For example, the Kaiser Permanente Anaheim Medical Center’s adoption of a preprocedural pause entailed the hiring of additional personnel and an expenditure of approximately $50,000. Although many experts agree that team building is a critical step to checklist adoption, resources may not be available in all institutions to provide extensive training nor evaluation of outcomes associated with such interventions. Our experience suggests that successful online implementation of a PPP, which includes participation by all operating team members, requires only minimal formal coaching outside working situations.

There are limitations to our study. First, the small sample size (17,000 cases per year) does not allow conclusions about surgical morbidity and mortality in this short time frame. Second, there is the potential bias of the observations, many of which were performed by study authors. As mentioned, early attempts were made to collect data by observers in the OR who were not part of the current team, but these individuals were readily recognized as “evaluators” and evoked enhanced performance of the checklist. This variation of the Hawthorne effect has been noted by several other investigators in studying checklist performance. Thus, we chose to use observers who would naturally be part of the OR team at the time of PPP performance. We recognize the potential for bias in this situation, but the use of a simple “yes/no” scoring system likely reduced the potential for individual interpretation. Third, the strong institutional emphasis on safety perhaps could put into question the reproducibility of our results at another hospital (there was no institutional sanction for noncompliance). Yet we believe that the modification of the format of the PPP was the major impetus for the change in behavior.

**Conclusion**

Team-based implementation of the preprocedural checklist in an attestation format was more effective than a surgeon-led format in attaining the goals of improved communication in the OR. Further study is needed to confirm that increased participation persists permanently after initial implementation and to assess whether it results in measurable changes in patient outcome. Preliminary findings of the work described in this article were presented at the Annual Meeting of the American Society of Anesthesiologists, San Diego, October 16, 2010.
References


Appendix 1. The Original Preprocedural Pause Checklist

**Time Out**
Before the Incision is Made: STOP
Must Do’s

☐ The surgeon calls for the procedural time out
☐ The surgeon calls for all activity to stop
☐ The patient is identified using two identifiers
☐ The correct procedure is verified
☐ The correct site is verified and marked, if applicable
☐ The correct position is verified
☐ Films are available for review, if applicable
☐ Relevant documents are available
☐ Required equipment and supplies are available

**Additional Elements**
☐ Antibiotics infused
☐ Alcohol based prep dried completely
☐ Medications and solutions labeled
☐ For organ transplants: ABO/UNOS #s match
☐ Bundle protocol required
☐ Beta blocker
☐ Central line
☐ Glucose
☐ Normothermia
☐ DVT prevention initiated

* UNOS, United Network for Organ Sharing; DVT, deep vein thrombosis.*