The Extended Surgical Time-Out: Does It Improve Quality and Prevent Wrong-Site Surgery?

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Abstract

Purpose: To review the initial results of implementing an extended surgical time-out (STO) in pediatric surgery.

Methods: Starting in January 2006, all members of our surgical team implemented and used an extended STO, confirming the patient's identity, technical and anesthetic details, administered and available medications, and need for blood products and special equipment. To avoid disrupting work flow, the STO was initially after anesthesia induction. Starting in October 2007, the STO was done before anesthesia induction. Initial results, elapsed time to incision, and surgical team surveys were reviewed before and after implementing the preinduction STO.

Results: The elapsed time to incision was similar for elective and urgent operations before and after implementing the preinduction STO. All antibiotics were administered and confirmed during the STO. Four significant equipment findings were detected, altering the planned procedure (two before and two after implementing the preinduction STO). Operating room staff felt more confident and prepared for the operations because communication was improved. One near-miss occurred during the postinduction STO. One wrong-site operation occurred despite the preinduction STO, because of inadequate marking. Root-cause analysis demonstrated that this was due to a systems error.

Conclusions: Using the extended STO before anesthesia induction improved communication among the surgical team members and did not disrupt work flow. An extended STO may also have broader value, such as confirming timely antibiotic administration or meeting other quality measures. The extended STO did not eliminate wrong-site surgery. However, implementation of the STO placed the responsibility for wrong-site surgery with the whole team and system, rather than with the individual surgeon.

The Joint Commission's Universal Protocol aims to prevent wrong-site, wrong-procedure, and wrong-person surgeries. Currently, the protocol consists of a preprocedure verification, marking of the procedure site, and a time-out before starting the procedure.[1] Site-verification protocols vary across hospitals and must balance safety, simplicity, and efficiency. The pause, or surgical time-out (STO), before incision has also been recognized as an opportunity to improve communication among surgical team members, and in many centers it has also been used to incorporate quality parameters suggested by the Surgical Care Improvement Project.[2] Some centers also use the time-out for a formal briefing for the entire surgical team, similar to the safety practices in the aviation industry.[3,4] Finally, formal checklists have also been added to this process, with promising results.[5]

Despite all of these safety measures, implementation of the protocol and how effective the protocol will be at preventing patient harm is not known.[6] In addition, application of the Universal Protocol has not been well studied in pediatric patients. When developing protocols for pediatric surgical patients, such factors as how to mark infants and small children, when to perform the time-out, whether the time-out distresses the patient, and how effective the protocol is must be considered. The purpose of our report here is twofold: first, to describe the process, rationale, and implementation of an extended STO in pediatric patients, and second, to review the results before and after implementing the extended STO.

Materials and Methods

The institutional review board at Kaiser Permanente Center for Medical Education approved this study. Before January 2006 at KP Bellflower Medical Center, patient and procedure verification included the following steps: 1) confirmation of the patient

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and procedure by the preoperative nurse, with marking of the surgical site by the preoperative nurse or surgeon; 2) confirmation of the patient's identity and the procedure by the circulating nurse before entering the operating room (OR); and 3) a pause by the surgeon just before making the incision, to confirm the patient's identity and the procedure. Starting in January 2006, our facility added an extended STO to this safety process. The purpose of the STO was to mimic the safety practices of the aviation industry, specifically to improve communication and level the playing field for all members of the surgical team. Before implementation of the extended STO, multiple joint sessions with all members of the surgical team were conducted to promote and review the importance of communication and teamwork to improve patient safety. To avoid disrupting work flow, the extended STO was initially done after anesthesia induction, with all of the previous steps remaining the same. All members of the surgical team, which included the surgeon, anesthesia team, circulating nurse, and scrub technician or scrub nurse, participated in the extended STO. The extended STO consisted of confirmation of the patient's identity, the procedure, technical details of the procedure, the anesthetic plan, administered medications, possible medication needed during the operation, blood product availability, and need for special equipment (Table 1). Starting in October 2007, the time for doing the extended STO was switched; it is now performed before anesthesia induction. Initial results, time to incision, and surgical team surveys were reviewed before and after implementing the preinduction STO. Our study focused only on pediatric surgical patients. Statistical analysis was performed using the Student's t-test, with a p value $<.05$ being considered significant.

Table 1. Patient safety briefing checklist (before anesthesia induction)

	Discussed	N/A
Surgeon		
Address patient and explain briefing		
Confirm patient identity and procedure (chart, consent, armband)		
Plan for surgery (type, duration, position, potential challenges)		
Special equipment and special needs (implants, grafts, Foley catheter)		
Radiology (images, fluoroscopy)		
Blood products		
Anesthesia provider		
Allergies reviewed		
Type of anesthesia (potential challenges)		
Prophylactic antibiotics administered		
Postoperative issues (pain, ventilation management)		
Circulator		
Information on the whiteboard		
Confirm correct patient, side, site		
Confirm position		
Confirm implants and special needs		
Confirm preoperative medications given		
Confirm intraoperative medications and fluids		
Scrub technician or scrub nurse		
Surgical equipment in the operating room		
Special equipment and instruments available and functioning		
All solutions available and labeled		
All medications available and labeled		
Any other concerns?		

Results

The elapsed time to incision when using the extended STO before anesthesia induction was similar to that for using the extended STO after induction for elective surgery (24 ± 3 min; $n = 195$ vs 25 ± 8 min, respectively; $n = 156$; $p = 0.33$) and urgent surgery (36 ± 7 min; $n = 114$ vs 32 ± 16 min; $n = 118$, respectively; $p = 0.25$). With respect to surgical quality measures, all prophylactic antibiotics were administered at the appropriate time and confirmed during the extended STO. Four significant equipment findings were detected that altered the planned procedure. Two of these findings were discovered when the extended STO was performed after anesthesia induction. In one case, the laparoscopic pyloric spreader was missing and the operation was performed open. In the second case, the appropriate coagulation device and instruments to perform laparoscopic Nissen fundoplication were not available, necessitating an open procedure. Because both of these problems were discovered before an incision was made, laparoscopy was avoided altogether and only the open procedure was performed. Two significant problems were also detected when the extended STO was performed before anesthesia induction. The first was that the laparoscopic pyloric spreader was broken. Because this was discovered early, we had enough time to locate a second spreader and proceed with laparoscopic pyloromyotomy. In the second case, it was noted that the desired tunneled catheter was not available. Again, because this was discovered early, the catheter was located (in the interventional Radiology Department) and we were able to proceed with the operation without delay.

One near-miss occurred when the extended STO was done after anesthesia induction. Because the intended procedure involved right open hernia repair, laparoscopic left groin exploration, and possible left inguinal hernia repair, both groins were marked. Without the briefing, the procedure would have started on the incorrect side. Of note, transinguinal laparoscopy showed that the patient did not have a hernia on the left side. One wrong-site surgery was performed when the extended STO was done before anesthesia induction. The patient was scheduled for right inguinal hernia. The patient was marked on the correct side, but the marking was not visible after draping the patient. The patient was examined while under anesthesia and noted to have a left inguinal hernia. Despite the briefing and pause, the patient underwent a left inguinal hernia repair; near the completion of this procedure, it was noticed by the surgical team that this was the incorrect side. The right side was then repaired. If the surgeon had not been notified of this finding, the right side would not have been repaired. A root-cause analysis was performed, and because all of the safety steps, including the briefing, were performed by the surgeon, this error was deemed a major systems issue caused by the inadequate marking process.

Team surveys demonstrated that OR staff felt more confident and prepared for the procedures because of improved communication. Hospital surveys also showed that 95% of OR staff felt actively involved with improving patient safety, compared with 55% of the rest of hospital staff.

Discussion

To prevent patient harm in the form of wrong-site, wrong-procedure, and wrong-person surgery, the Joint Commission[1] implemented the Universal Protocol. Despite ongoing protocols, checklists, and surgical briefings, the effectiveness of these safety measures is still not known.[6–9] The purpose of our study was not to debate the validity of the Universal Protocol or to argue whether the STO should be used to incorporate quality measures but rather to highlight some of the unique features of implementing an extended STO in pediatric patients.

Before January 2006, patient and procedure verification included confirmation of the patient and procedure by the preoperative team, with marking of the surgical site by the preoperative nurse or surgeon, confirmation of the patient's identity and the procedure by the circulating nurse before entering the OR, and a pause by the surgeon just before making the incision to confirm the patient's identity and the procedure. Starting in January 2006, an extended STO was added to this safety process. The rest of this discussion focuses on the extended STO because the other steps remained the same. The first decision was to determine what to include in the extended STO. Given that all of the procedures in children are performed in general hospitals as part of the same system and not in a children's hospital, our institution elected to continue the same process as in adults. All pediatric surgeons were required to perform the extended STO. It was decided to use the extended STO as a briefing to improve communication, quality, and safety. Thus, all members of the surgical team, including the surgeon, anesthesia team, circulator, and scrub nurse, were involved. All had specific roles and all were expected to participate equally. The surgeon again confirmed the patient's identity and the procedure, the diagnosis, the plan for surgery (duration, position, potential challenges), special equipment, and need for radiology and/or blood products. The anesthesia team reviewed the allergies, type of anesthesia, prophylactic antibiotics, and postoperative issues, including pain management and possible ventilator needs. The circulator had all of the information on the whiteboard and confirmed the patient's identity, the procedure, the side to be operated on, position, available blood products, administration of preoperative medications, and intraoperative medications and fluids. The scrub nurse confirmed that the surgical equipment, special equipment, and all solutions and medications were available and labeled. To minimize disruptions in work flow, we initially performed this extended STO after anesthesia induction. Another pause, just before incision, was also used, to confirm the patient's identity, the procedure, and the proper side for the procedure.

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Because of the success with the extended STO as well as its universal acceptance across all surgical subspecialties, our institution elected to perform the extended STO before anesthesia induction with the patient awake (all surgical subspecialties switched to the preinduction STO). Doing the extended STO before anesthesia induction allowed more time to correct equipment errors, obtain necessary blood products, and administer preoperative medications, the requirements for which were discovered during the briefing. In our study, a significant equipment error was identified in two cases during the preinduction briefing. Because there was ample time to obtain the correct equipment, both procedures were performed without delay. Conversely, in the two cases with equipment errors discovered during the postinduction briefing, going with an open procedure was required to prevent a prolonged delay because there was not enough time to correct the problem. Despite this logical advantage of the preinduction extended STO, a few concerns were raised. The first concern was that the preinduction briefing would disrupt the surgical work flow and delay the start of the procedure. In our study, we found little if any disruption in work flow. The elapsed time to incision when performing the extended STO before anesthesia induction was similar to that for performing the extended STO after induction for elective and urgent operations. We intentionally did not look at the types of procedures performed, given that the overall numbers were small. Not only was the preincision work flow not disrupted, but also, another study showed a significant decrease in work-flow disruptions during the operation due to similar briefings.[4] Another concern of performing the extended STO with the patient awake was whether this would cause significant anxiety, particularly in pediatric patients. All of the children were adequately premedicated before entering the OR. Although we did not specifically survey the pediatric patients, nearly all were lying comfortably on the OR table and did not appear distressed. Furthermore, when we initially implemented the preinduction extended STO, the first 60 adult patients were surveyed: 65% did not remember the briefing, 29% remembered and felt reassured, and 6% remembered and were indifferent. These survey results seem to indicate that the preinduction extended STO did not cause patients to experience more anxiety.

In the new process, the surgeon must mark the site in the preoperative area … The mark must be visible after preparation and draping the patient for the procedure.

The preinduction STO was also successful in building team communication and the perception of improving safety. Team surveys demonstrated that the OR staff felt more confident and prepared for the operations because of improved communication. In addition, an annual hospital survey that is administered to all employees showed that 95% of OR staff felt actively involved with improving patient safety, compared with 55% of the rest of hospital staff. Currently, the preinduction extended STO is done 100% of the time.

Despite the perception of patient safety provided by the preinduction extended STO, using the STO did not eliminate wrong-site surgery. Overall, there were similar wrong-site events both before and after implementation of the preinduction briefing for all patients. Specific to pediatric patients, there was one wrong-side operation performed, as described earlier. Given that all of the safety steps, including the briefing, were performed by the surgeon, a root-cause analysis deemed this error a major systems issue caused by the inadequate marking process. Since this time, the marking process has changed and there have been no further wrong-site events. In the new process, the surgeon must mark the site in the preoperative area; no longer is the nurse or another team member allowed to mark the site. The mark must be visible after preparation and draping the patient for the procedure. If the mark is no longer visible, the site will be marked again during the pause and confirmed by the surgical team before incision. Although it is too early to determine whether this new marking process, along with the preinduction STO, will eliminate wrong-site events, it is important to point out that having *any* established protocol that is properly followed places the responsibility of patient safety on the whole surgical team and not on one individual.

Opportunities for wrong-site events occur regularly, given the high-risk nature of surgery, the volume of surgical procedures, and the realities of human behavior. Having a standard safety process has many advantages, one of which is to involve the whole surgical team with patient safety instead of assigning it primarily to a single individual. In addition, incorporating an extended STO in this process resulted in improved communication among surgical team members. Furthermore, quality measures, such as administration of prophylactic antibiotics, can be confirmed in the extended STO. Finally, performing the extended STO before anesthesia induction did not disrupt work flow or cause patient anxiety. Despite safety measures, checklists, and protocols, these tools have not been shown to eliminate these "never" events. For this reason, hospitals and surgical teams must continue to implement, refine, and research interventions to minimize and possibly eliminate these events. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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On the Surgery

The things relating to surgery, are—the patient; the operator;
the assistants; the instruments; the light, where and how;
how many things, and how; where the body,
and the instruments; the tie; the manner; the place.

— Hippocrates, 460-400 BCE, Greek physician known as the father of modern medicine