# Reducing the risk of a wrong surgery event

**Vizient Patient Safety Organization**

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## Background

A surgery or invasive procedure performed on the wrong site or involving the incorrect procedure or patient can result in significant patient harm. The national incidence rate of wrong site surgeries in the operating rooms and other procedural areas is estimated to be 50 cases per week.[1,2] Despite The Joint Commission's Universal Protocol aimed at prevention, wrong surgeries and invasive procedures still occur.[3]

## Assessment

### Objectives

The Vizient® Patient Safety Organization (PSO) conducted a retrospective analysis of voluntarily reported near miss and adverse events, specifically focusing on wrong site surgeries. The analysis aimed to identify common causes, outcomes and system improvements to prevent such occurrences in the future.

### Findings

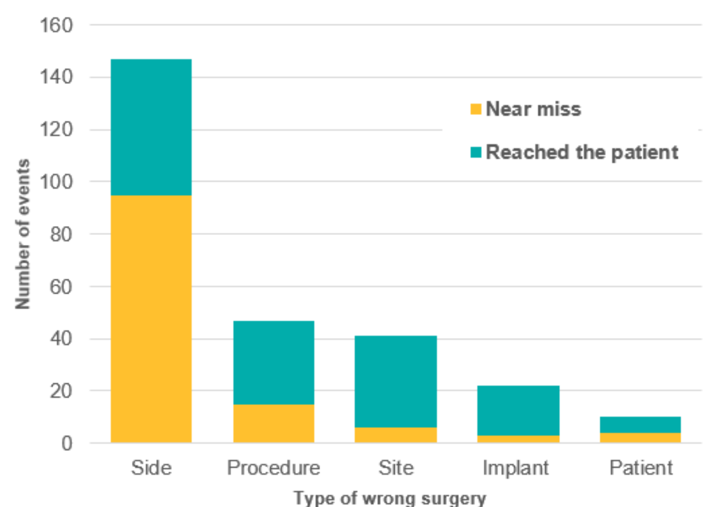
Over a 3-year period from January 2019 to February 2022, Vizient PSO retrieved 267 wrong site surgery events reported by participating organizations from its database. Of these, 144 (54%) were events that reached the patient (whether they resulted in harm); while others (n=123, 46%) were near misses that were caught before or on the day of the procedure, often during the pre-procedure verification process.

#### Type of wrong surgery

Fifty-five percent (n=147) of all events were laterality issues (left vs. right side). Among these, 65% were near misses involving scheduling, ordering or documentation errors that were caught before or on the day of the procedure during pre-procedure verification (Figure 1). However, wrong side procedures reached the patient (n=52) and caused harm more frequently compared to other types of wrong surgeries. Events related to the wrong procedure (n=47, 18%), site (n=41, 15%) or implant (n=22, 8%) tended to reach the patient instead of being intercepted in an earlier phase of care. Wrong patient procedures were less common and included both near misses and events that reached the patient.

**Key Takeaways**

- Leaders define a clear, shared vision and purpose for culture and reliability.
- Define standard work for the perioperative phases of care and create processes to educate and hold leaders, managers, and workforce accountable.
- Build safeguards into the process before the day of surgery to ensure the correct procedure is scheduled and congruent with all documents.
- Align surgical checklists and their use with leading practice recommendations and define role-based responsibilities for each checklist item.
- Require surgeon led and facilitated time-outs to create surgeon accountability as the leader who is responsible for the procedure and to promote team participation.
- Convey to surgical staff the importance of speaking up to promote safety and the escalation process when their concerns are not addressed.
- Conduct postoperative surgical team debriefs to promote a culture of safety and identify improvement opportunities.
- Implement a system of ongoing surveillance, visual management, and coaching.
- Create safeguards for cases involving implants before the day of surgery and in the pre-operative area and develop a process for closed loop communication during the procedure to ensure the correct implant is available and used.

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**Procedure type**

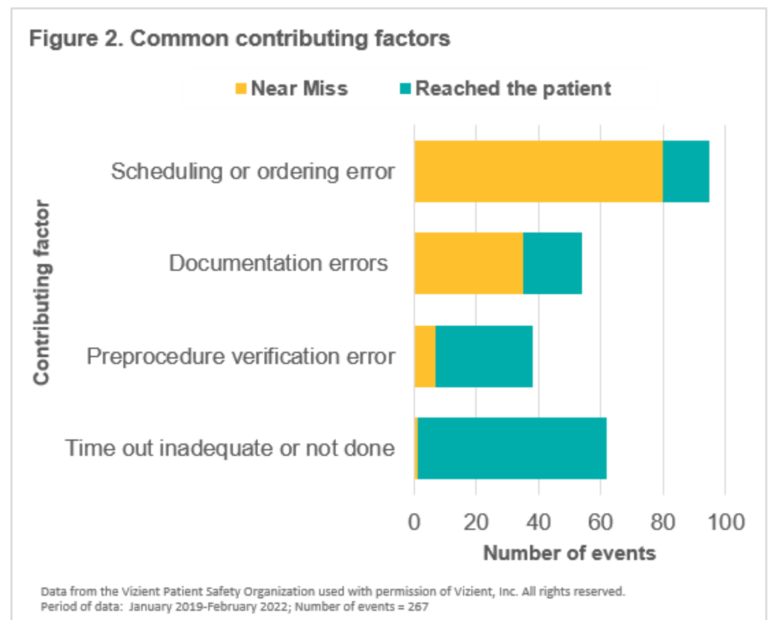
The top four procedure types involved in events were orthopedics (n=70, 26%), spine (n=23, 9%), ophthalmology (n=20, 7%) and chest/thorax (n=20, 7%). Although orthopedic procedures had the greatest number of events, 67% were near misses that involved a laterality issue in scheduling, ordering or documentation. Orthopedic procedures that reached the patient involved the wrong site, side, procedure and implant. Procedures involving the spine, anesthesia or chest/thorax usually reached the patient and resulted in temporary or permanent harm. Spine procedures were mostly performed on the wrong vertebrae level or side (n=18). Regional blocks were performed on the wrong side, and chest/thoracic procedures occurred on the wrong side or involved the incorrect procedure. Ophthalmology procedure events that reached the patient involved the wrong implant (64%), or a procedure performed on the wrong side.

**Contributing factors**

The three most common contributing factors in events were scheduling and ordering errors (36%), time outs that were performed incorrectly (23%) and clinical documentation errors (20%) (Figure 2). However, the closer the patient got to the procedure, the more likely the error was to reach the patient and cause harm.

Eighty-four percent of scheduling and ordering errors (e.g., wrong side, incorrect or incomplete procedure) and 65% of documentation errors (e.g., missing, incorrect or incongruent information on the side, site, or procedure on the consent, history and physical [H&P], clinical note or imaging test) were near misses. These errors were often identified and corrected during the pre-operative verification process, either before the patient entered the operating room or before the procedure day. Scheduling or documentation errors that were caught during pre-procedure verification may have caused OR delays due to the time required to clarify the procedure and/or to correct the OR set up.

**Figure 2. Common contributing factors**




In events that reached the patient, the factor that contributed to the event occurred before the day of the procedure or during a transition in care (30%), in the pre-procedure area (8%), before anesthesia (9%), during the time-out (17%), or during the procedure (13%). The contributing factor was unknown in 23% of events. Thirty-five events involving scheduling, ordering and documentation issues reached the patient. Of these, 9% were discovered before anesthesia, 17% after anesthesia, 26% during the procedure and 49% after the procedure. Time-out failures (incorrectly performed or not conducted at all) were the most common factor contributing to events that reached the patient. Issues included:

- The site marking was not visually confirmed by the team during the time out.
- Source documents or images were not referenced to verify the procedure or site.
- Time-out was not performed after the prep and drape or immediately before starting the invasive procedure.
- All team members were not present, attentive or actively engaged.
- An inadequate or no time out was performed before regional blocks.
- Time out or pause was not conducted for separate procedures.
- OR staff were afraid to speak up.

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During pre-procedure verification, events that reached the patient involved incomplete verification; missed or unreconciled discrepancies in scheduling or documentation; or unmarked or incorrect procedure site markings. Existing physical issues on both sides or multiple areas of the body contributed to site marking errors. Other factors involved were failure to actively involve the patient or family in verifying the correct procedure and/or failure to address language or cognitive barriers.

In cases involving the wrong or a suboptimal implant, ocular implants were more common, followed by orthopedic implants. Despite pre-procedure checkpoints to ensure the correct implant is available, the incorrect implant was used in some cases because the correct implant was not available. Intraoperatively, after the patient was under anesthesia, the surgeon elected to use an available, suboptimal implant without the patient's informed consent. In other cases, the use of the incorrect implant was discovered after the procedure was completed because the wrong implant was placed on the sterile field and there was no intraoperative readback process to confirm the implant was correct.

Some events occurred intraoperatively despite completion of the universal protocol due to inadequate training or supervision, an emergent situation, diagnostic or imaging test issues or failure to do intraoperative imaging. Anatomic abnormalities frequently make it difficult or impossible to determine the correct site or level for spine, rib or other procedures.

### Time of discovery

Of the 144 events that reached the patient, 6% were discovered before anesthesia, 17% after anesthesia, 18% during the procedure or 56% after the procedure was completed (the remaining were unknown). Eight percent of wrong site procedures went unnoticed until a subsequent episode of care. In 20% of the events that were discovered after the procedure, the surgical team was unaware of the error until the patient or caregiver brought it to their attention.

### Level of harm

Seventy-six percent (n=110) of events that reached the patient were identified as a sentinel event—"a surgery or other invasive procedure performed at the wrong site, on the wrong patient, or that is the wrong (unintended) procedure for a patient regardless of the type of procedure or the magnitude of the outcome".[3] Seventy-one percent of events that reached the patient resulted in mild, moderate, or severe temporary harm. About 14% resulted in mild, moderate or severe permanent harm. Wrong surgeries resulted in the patient receiving an unnecessary procedure, an additional procedure, and/or a return to the OR. Patients returned to the OR either shortly after discovering the issue in the PACU or if the wrong surgery was discovered later, the patient returned to the OR in another episode of care. There were delays in or the length of the procedure was extended when the issue was discovered just before or during the procedure.

## Recommendations

Although invasive procedures occur in many settings, our recommendations are geared toward procedures and regional blocks performed in the operating room. Processes and checklists may need to be tailored to the procedural settings.

### Leadership, culture, and teamwork

Prevention of wrong surgery requires leader-defined vision of culture and reliability, standard system strategies before and on the day of surgery, a strong culture of safety and teamwork, vigilance by all members of the team, and ongoing surveillance and feedback.[4,5] Poor communication and teamwork are a frequent cause of patient harm in the operating room.[6] In high performing teams, members have strong team leadership; a clear, shared vision and purpose; clearly defined roles and responsibilities, the right mix of competencies; trust and confidence in the team; psychological safety; and mechanisms for ongoing communication, collaboration, and feedback.[6] Checklists, briefings and/or time-outs,[7] debriefing, structured language to voice concerns, and closed-loop communication can help improve communication and

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teamwork.[6] To better understand how team members view communication and teamwork, we recommend that institutions routinely administer a culture of safety survey.[6,8]

## Effective system solutions before and on the day of surgery

### Scheduling

- Address the factors that contribute to errors at the time of surgical scheduling
  - Do not accept unapproved abbreviations (spell laterality out on schedule, order and consent), cross-outs or illegible writing.[1,9,10]
  - Require physician's office to enter case request orders electronically so that the information in the order flows through the patient's entire record and is the main source of information.[11]
  - Use an electronic scheduling system that requires the completion of certain data elements such as the procedure, laterality, digit or level, the implant name/brand/specifications including size and laterality and required documents) and aids in flagging errors before the case[9,12,13]
  - Require that all providers submit case request orders and other documents in the organization's standard format (e.g., H&P, consent form, etc.). Consents should be written in a language understandable to the patient.[10]
  - Establish a consistent process for verifying that office staff independently cross-check documents to confirm the accuracy of the procedure.[9]
  - Educate office staff on the scheduling process and the importance of accurate and complete scheduling.[1]
- Before the day of surgery, build safeguards into the process with a checklist:
  - Verify the scheduled procedure is accurate with the office staff (written verification).[1]
  - Verify the scheduled procedure is accurate with the patient or family and document the planned procedure in the patient's own words in the medical record.[10,14]
  - *Establish a deadline of at least 48 business hours in advance of the procedure for receipt of all necessary documents and implants* so that there is adequate time to reconcile any issues or discrepancies. Ensure the process is *fair and consistent.* If relevant documents or implants are not received, postpone surgery.[1]
  - Pair the deadline for receipt of documents with a standard process and checklist for a dedicated nurse that
    - Confirms the presence and cross-check the accuracy of the scheduled procedure and all required, relevant documents (e.g., H&P, imaging test and pathology results, and signed consent)[1,10]
    - Confirms the presence of the implants and compares them to the source documents.
    - Notify the surgeon when information in the documents or the implant is not in agreement and require reconciliation of discrepancies the day before surgery or it will be postponed.
  - Develop a daily process for key stakeholders—service line nurse leaders, OR materials management, central sterile supply and radiology staff—to review scheduled surgical cases in the upcoming days before surgery. Each patient's medical, psychosocial (including language barriers) and operative needs (including the availability of implants, equipment or supplies) are discussed so that any identified issues can be addressed in advance of the procedure and scheduling adjustments made as needed.[11]
- Monitor and address scheduling issues
  - Conduct a common cause analysis to identify factors contributing to scheduling errors (both near misses and events that reached the patient) involving laterality, site, procedure, or patient and address risks in the process.

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- Build relationships with physician offices to improve the accuracy of scheduling and develop confirmation processes.[1]
- Monitor trends in scheduling issues by office and create a process for notifying the scheduler, office manager, and surgeon about errors to increase their awareness, and if necessary, put a risk mitigation plan in place.
- Require that office managers define a process for cross-checking documents to confirm the accuracy of the procedure.[11]

**Standardized surgical safety checklists**

Surgical safety checklists provide standardized work to improve critical review of the procedure and discussions or debriefings among the surgical team to consistently ensure safe patient care. If implemented as intended within a culture of safety and teamwork, the use of checklists can assist in physician and staff engagement in quality improvement, reduce silos and improve communication and teamwork. This results in improved safety, outcomes and efficiency.[8,15,16]

Factors that are critical to the successful implementation of surgical safety checklists include securing executive and clinical leadership and surgeon support, engaging representatives from all surgical disciplines in process improvement, providing meaningful education, monitoring, coaching and using data. Clinician concerns regarding the checklist should be addressed and the reasons it is important.[8,17,18]

Ariadne Labs, a joint center for health systems innovation at Brigham and Women's Hospital and the Harvard T.H. Chan School of Public Health, developed a framework for Safe Surgery Checklist implementation based on lessons learned in over 4,000 facilities globally. Their Safe Surgery Checklist items are based on the WHO Surgical Safety Checklist and were refined by surgical team experts globally. Checklist items were tested in many facilities over many years. The implementation guide includes a master list of Safe Surgery Checklist items with rationale for hospital and ambulatory surgery centers as well as a cardiac surgery checklist. Best practices on how to make improvements to an existing surgical checklist or adapt the Safe Surgery Checklist to local realities and contexts are provided.[8] The guide also provides observation tools for assessing the use of the checklist and coaching for improvement.[8]

- Define *role-based responsibilities for members of the surgical team* for each item on the checklist at each phase.[8]
- Determine the format that the checklist will be displayed in (e.g., paper, poster or displayed on an OR monitor and integrated with the electronic health record)[8]
- Design the poster checklist and font size and test it in the OR to determine that it is easily readable by all surgical team members.[8]
- Review Ariadne Labs' A Checklist for Checklists to aid in creating or improving your surgical checklist.
- Use the Safe Surgery Checklist Culture Survey in the checklist implementation guide to measure the quality of communication, teamwork and safety practices in your surgical environment.[8]

**Pre-procedure verification in the pre-operative holding area**

The purpose of the pre-procedure verification process is to ensure that all relevant documents are available and reviewed before the start of the procedure. The documents must agree with the scheduled procedure, be labeled and matched to the patient's identifiers and be consistent with the patient's and surgical team's understanding of the procedure and site. Additionally, the availability of all necessary equipment, implants and blood products must be verified. Pre-procedure verification may occur more than once before the procedure.[5]

- Confirm the correct patient, procedure, side/site and all necessary equipment and implants by the pre-operative nurse, anesthesiologist, surgeon and circulating nurse independently[19]
- Consistently use a standardized checklist to verify the availability of items for the procedure including:
  - Relevant documentation such as a current H&P (not more than 30 days before the date of the scheduled surgery), signed procedure consent form, nursing assessment and pre-anesthesia assessment[5]

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- Labeled diagnostic and radiology test results including radiology images and scans, or pathology and biopsy reports which must be properly displayed[5]
- Required blood products, implants, devices, and/or special equipment for the procedure[5]
- Identify and match the items that are to be available in the procedure area to the patient[5]
- Enhance your process for reviewing that the correct implants are available for the procedure when the patient is in the pre-procedure area. For example, the circulating nurse verifies the surgical equipment and implant(s) against the source documents and contacts the surgeon performing the procedure to verify the equipment and implants with the surgeon. During the pre-operative verification, the circulating nurse confirms equipment and implants are available and ready. If the optimal implant is not available, review the risks, benefits and alternatives with the patient and family before proceeding with the procedure.[13]
- Devote extra attention to communication with patients who have language barriers and ensure systems for accessing interpreters are readily available and used by all team members during pre-procedure verification.

***Verify the correct patient***

- Verify the correct patient using a minimum of two patient identifiers as defined by the organization.[5]
- Compare the patient's identifiers on their armband with their relevant documents and the OR schedule.[1,5]
- Actively engage the patient in verbally confirming their identity (or a family member or legal representative when the patient is not physically, cognitively or emotionally able to participate or they are a minor).[5] Confirm the correct spelling of the patient's name. Prohibit passive identification techniques; for example, the pre-procedure nurse should ask the patient to *state their name and date of birth* rather than the nurse stating this information and asking the patient to confirm with a yes/no response.

***Verify the correct procedure, side and site***

- Cross check all required documents with the scheduled procedure to ensure they are congruent. Verify the correct procedure, for the correct patient, at the correct site.[5]
- Actively involve the patient in the verification process (or a family member or legal representative when the patient is not able), by having them *state the procedure and site*.[5,20]
- Reconcile any missing information or discrepancies while in the pre-procedure area.[5]
- Evaluate electronic records so that procedure descriptions on the status board align with the consent.

***Site marking***

- Develop a standardized process and readily available resources for site marking.[5] The operative site is marked by the attending surgeon performing the procedure in the pre-procedure area while visualizing the procedural consent and engaging the patient in the site marking process (or a family member or legal representative when the patient is not able).[5,20]
- Use an approved single use, indelible surgical skin marker *with the surgeon's initials*. If the surgeon's initials are N.O., use three initials. Place the markings as close as anatomically possible to the incision site. Use a marker that is sufficiently permanent to be visible after skin preparation and draping.[1,5]
- *For regional/nerve blocks, epidural insertion that involve laterally or spine levels, the anesthesiologist marks the site after the surgeon marks the surgical site using a standard marking as defined by the organization that is distinctly different from the surgeons (e.g., a capital "A" with a circle around the "A").*[21,22]
- Mark the surgical site for every procedure unless it is exempt per the organization's policy, not possible, impractical or the patient refuses.[5]
- When it is not possible to mark the site, develop a written, alternative practice (e.g., wristband with procedure site and laterality), including documenting the reasons a site mark was not performed.[5]
- Define cases where an alternative site marking is necessary including[5]

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- Dental procedures
- Premature infants for whom the mark may cause a permanent tattoo
- Minimal access procedures treating a lateralized internal organ, whether percutaneous or through a natural orifice
- Procedures where it is technically or anatomically impossible or impractical to mark the site, such as mucosal surfaces or perineum
- Patient refusal of a conventional site marking

- To improve the consistency among surgeons marking the site, develop a resource such as a body diagram poster that provides clear expectations on when, how, and where site marking is necessary and alternative sites.
- Do not move patient to the operating room before the attending surgeon has marked the site.[1,10]
- *When the site or level is not visually identifiable during the pre-incision time-out, such as procedures involving the spine, a rib or ureter, the surgeon obtains an intraoperative radiological image, and for spine level or rib resection, use markers that do not move to confirm the exact level/site and another interpretation by a radiologist or second surgeon.*[5,20,23-25]

**Pre-operative or induction briefing in the OR**

- Develop a standardized handoff process from pre-procedure staff to surgical or procedural staff.[10]
- Conduct a pre-operative briefing in the OR before anesthesia, including regional and local anesthetics, and involve the patient in the process when possible.[8]
- Suspend activities to the extent possible so that team members (e.g., anesthesiologist and circulating RN) can focus on active confirmation of the patient, site, and procedure and other critical items on the checklist that are not part of the final time-out process (e.g., allergies, antibiotics, verify implants and blood product available, patient positioning, imaging displayed in correct orientation, risk of hypothermia, venous thromboembolism or blood loss, difficult airway or aspiration risk, or anesthesia safety check completed).[1,8,10,13]
- If the optimal implant is not available, review the risks, benefits and alternatives with the patient and family before proceeding with the procedure.

**Pre-incision Time-out**

The purpose of the time-out is to conduct a final assessment that the correct patient, site and procedure are identified.[5] During a time-out, activities are suspended to the extent possible so the team can focus on active confirmation of the patient, site and procedure.[5] Participants in the final time-out should include the individual performing the procedure (including the attending surgeon), the anesthesia provider, the circulating nurse, the operating room technician and other active participants who will be participating in the procedure from the beginning.[5]

- Ensure that your standardized time-out is consistently performed by monitoring the following elements to prevent common causes associated with wrong surgery.[5]
  - Display the checklist in the operating room so that all participants can view it on a poster, dry erase board or checklist boards or monitor screens.[8]
  - Require that the surgeon initiate the time-out process as the leader who is accountable for the procedure to promote team participation and reinforce its importance.[16,19]
  - Conduct the time-out *after the prep and drape*.[1,5]
  - Conduct a time-out *immediately* before starting the invasive procedure or making the incision.[5]
  - Reduce noise and cease all other activity in operating room so that all team members focus on the time-out.[5]
  - Perform a standardized role-based time-out in which every team member has an active role and checklist items that they are responsible for facilitating the discussion on. All team members are expected to speak up.[5]
  - Confirm the patient's identity, procedure, site and consent(s).[5]

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   - *Point and touch verification* of visible surgical site marking by the surgeon and nurse/technician while the procedure is *read directly from the consent*.[5,10]
   - Verify the presence of the implant(s) in the room and state the requested implant name, specifications, sizing and laterality during the time out.[13] If more than one implant was requested, confirm the implant that will be used and remove any implant not being used from the OR.
   - Address any concerns raised by the team before proceeding. To create openness and a sense of safety, the surgeon should invite other team members to voice any concerns and address them to the team's satisfaction before proceeeding.[19,20]
   - Perform a pause between each procedure or repositioning that occurs within a single case to ensure that each procedure is performed accurately and according to the procedure, site and laterality contained within the signed surgical consent.[1]
   - Conduct separate time-outs for two or more procedures that have a change in surgeon.[5]
- Create an environment of safety in which staff are expected to speak up if they have a patient safety concern.
- Identify situations where staff was afraid to speak up or their concerns were not addressed through observations, debriefings and events reports.
- Create an escalation procedure when the time-out is not conducted appropriately.

### Intraoperative Implant verification

- Develop a process to ensure consistent, intraoperative closed loop communication between the surgical team before opening the implant onto the sterile field. At minimum, the communication should include:
   - The surgeon verbally specifies the implant name, brand, model, size and laterality, and the information is read and confirmed against source documents.[13]
   - Before placing the implant in the sterile field, the circulating nurse states the implant name, specifications, sizing, laterality and expiration date from the packing.
   - The surgeon visualizes, states and confirms the specifications of the implant.
   - The circulator verbally confirms the implant specifications, sterility and expiration date with the scrub person before opening the implant in the sterile field.
   - The scrub person verbally communicates the size of the implant as it is handed to the surgeon.
- Develop and require vendor representatives to complete an orientation that includes their role in implant verification before handling implants before or during a case.[13] The vendor representative cannot participate in the selection, verification or opening of the implants. Hospital employees are solely responsible.
- If the optimal sterile implant is not available, review the risks, benefits, and alternatives with the legal guardian before proceeding with the procedure or consider postponing the procedure to review the risks, benefits, and alternatives with the patient for informed consent.

### Immediate post-procedure debriefing

Postoperative surgical team debriefs—a structured review of key aspects, issues and concerns after a case—positively affect operating room safety culture and improve patient safety. Debriefings provide a valuable opportunity for teams to identify equipment problems and other issues that can help improve the outcome and efficiency of subsequent operations.[6,8,26,27] Debriefing checklist items should include[6,8,28]

- Name of operative procedure
- Completion of sponge, sharp, and instrument counts and RFID scan (if applicable)
- Specimen confirmation including proper identification and labeling
- Equipment problems encountered
- Discussion of wound classification

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- Key concerns for patient recovery and management
- Team performance
- Key events
- Any permanent changes in the preference card
- Other opportunities for improvement

The debriefing should be documented, used for quality improvement and shared with those in oversight, quality and safety positions who review, escalate and act to address identified issues.[6]

## Education and training

- Educate scheduling staff and perioperative staff on standard work.[1]
- Educate all surgical staff and newly hired staff on communication and team skills, handoffs, culture of safety, the surgical safety checklists and their roles and responsibilities.
  - Describe the rationale for why standardized processes are important[1,8]
  - Use a team approach when teaching all staff how the process should be executed to foster the mutual understanding of individual priorities, perspectives and motivations and convey the expectation of cooperation between the surgical team and the realignment of routines.[1,29]
  - Explain and demonstrate how to use the checklist.[8]
  - Develop videos of effective team communication using the checklist in each phase of the process to supplement training and generate buy-in.[8,12]
  - Use active learning techniques, including practice sessions on using the checklist in a setting outside the OR[1,8] For practice scripts, see the Safe Surgery Checklist Implementation Guide – Ariadne Labs[8]

## Ongoing monitoring and surveillance to improve performance

- Establish processes to *routinely monitor compliance* in all phases of care including scheduling, pre-procedure verification and site marking, time out and post-procedure debrief.[1,30]
- Ensure routine observations of standard work and team communication by managers and leaders and provide *just-in-time coaching*.[30]
- Prepare surgical team champions in every role to train and coach their colleagues.[8]
- *Measure success by the quality of checklist use and team member interaction* (e.g., level of team engagement and communication of critical information) rather than checklist compliance. Implement a mechanism to provide feedback to help teams learn how to improve.[8]
- Collect information from debriefings and use for performance improvement.[8]
- Display compliance to standard work on a visual management board.
- Use an ongoing measurement system for identifying inconsistencies in practice (Table 1).[1,8]
- Consider other innovative methods of surveillance to improve performance and promote transparency and accountability.[31,32]
  - Operating room video monitoring can help improve an organization's ability to understand communication, teamwork, situational awareness, clinical decision making and surgical education in the operating room.[31] The video can be replayed and used to explore the prevalence of certain behaviors (e.g., inattention, side conversations), the effects of certain behaviors (e.g., poor checklist compliance and team communication), and the association of certain behaviors with contextual factors (e.g., impact of loud music).[31] Anonymized video clips can be used to trigger reflection and discussion of team practices to promote identification of actions for change. Videos can be used to improve team performance and for root cause analyses.[31]

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- Operating room black box (analogous to the “black box” used in a plane crash investigation) captures synchronized audio, video, patient clinical (e.g., vital signs), and environmental (e.g., room temperature, noise level, air quality, frequency of door openings) data in real time and provides a comprehensive review of what occurred in the OR. Information is analyzed by software-based algorithms and trained analysts to evaluate the complex factors impacting safety and patient outcomes and used to improve efficiency, quality, safety and culture.[31,33]

Surgical complications often originate from deficiencies in non-technical skills such as communication skills, teamwork and leadership. Surgeons who exhibit poor non-technical skills are associated with poor surgical outcomes and medical malpractice claims.[34-36] As the leader of the procedure, surgeons with poor non-technical skills can adversely impact the culture of safety, teamwork, and adherence to surgical safety checklists, time-outs, and postoperative debriefings.[34,36] Surgeon coaching and multisource feedback are strategies that identify and help surgeons improve their non-technical skills and are perceived by surgeons as valuable.[34,35,37-39] These strategies can generate buy-in from surgeons on the use of checklists, improve the culture of safety, and ultimately, result in the improved safety and quality of patient care.[34,36]

- Multisource feedback or intraoperative 360-degree feedback from surgical team members, colleagues, supervisors is a valuable, reliable and valid method in assessing and improving surgeon competency in communication, teamwork, professionalism, leadership and medical expertise.[34,37,40,41] Through feedback, goal setting, coaching, and education, surgeon’s performance improves.[35,37,41] When protected by anonymity, surgical team members are willing to provide feedback on surgeon performance. Additionally, surgeons are interested in their team members’ feedback. This simple process of giving others feedback can positively impact a culture of safety.
- Surgical coaching is a strategy for continuous professional development and performance improvement in a safe space for surgeons. It involves pre-operative goal setting, intraoperative observation and postoperative collaborative learning and feedback by experts or their peers.[42] Coaching frameworks focus on technical, cognitive (e.g., situational awareness, decision-making), and non-technical, interpersonal skills (e.g., communication, teamwork, leadership).[38,43-44] Trained surgical coaches encourage, motivate, develop and guide surgeons to help them improve.[43-44]

  Surgeons perceive coaching as a positive way to improve their practice, performance, surgical culture, collegiality, and reduce stress.[38,39,42,43,45] Studies show that surgeons have a high interest and acceptance of the peer coaching model for continuous professional development.[46] Additionally, the American Board of Medical Specialties envision surgical coaching as a foundational strategy for continuing board certification in surgery,[47] and some organizations had begun providing continuing medical education (CME) for surgeon coaching time. CME is provided for the coach and coachee since both benefit from practice changes after participating in a coaching relationship.[48]

To learn more, view the Vizient PSO 2022 Topical Safety Series Webinar: Preventing wrong site surgery (PPT) which includes presentations on the intraoperative 360-concept, surgeon coaching and use of video in the operating room and the Vizient PSO 2023 Topical Safety Series Webinar: Reducing the risks of wrong surgery events (PPT) which includes use of a standard, high-performance checklist and key recommendations for implementing the checklist, methods to monitor standard work and the surgical environment and help teams improve, closed-loop intraoperative communication to ensure the correct implant is used and strategies for sustaining a culture of safety within procedural areas and operating rooms.

To identify your organization’s improvement opportunities, complete the checklist on page 14 (Table 2).

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**Table 1. Quality measures for surgery**

| Volume | J | F | M | A | M | J | J | A | S | O | N | D | T/E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # of surgeries performed | | | | | | | | | | | | | |
| **Process** | | | | | | | | | | | | | |
| % of cases that all relevant documents were received 48 hours before the procedure | | | | | | | | | | | | | |
| Pre-operative verification: % of documents that are present, complete, correct and in agreement in the pre-op holding area | | | | | | | | | | | | | |
| Pre-operative verification: % of cases that were compliant with policy on site marking by surgeon | | | | | | | | | | | | | |
| Pre-operative verification: % of cases that were compliant with policy on site marking by anesthesiologist | | | | | | | | | | | | | |
| Pre-operative briefing: % of cases that were compliant with pre-operative briefing process | | | | | | | | | | | | | |
| Time-out: % of cases that were initiated by the surgeon doing the procedure and actively empowered the team to speak up if they had concerns | | | | | | | | | | | | | |
| Time-out: % of cases that all team members actively participated in the time-out script | | | | | | | | | | | | | |
| Time-out: % of cases where point/touch verification of visible surgical site mark (prepped/draped) by the surgeon and nurse/technician while procedure is read directly from consent | | | | | | | | | | | | | |
| # of cases where staff stopped the line to address non-compliance with time-out or other safety concerns or escalated their concerns | | | | | | | | | | | | | |
| % of cases that the surgeon stopped to address a team member's concern | | | | | | | | | | | | | |
| % of cases with required implants at the start of the procedure | | | | | | | | | | | | | |
| % of cases that were compliant with postoperative debriefing | | | | | | | | | | | | | |
| **Outcomes** | | | | | | | | | | | | | |
| % of on-time case starts | | | | | | | | | | | | | |
| Average turnover in minutes | | | | | | | | | | | | | |
| # of cases of an actual wrong site, patient, or implant surgery | | | | | | | | | | | | | |
| # of wrong implants inserted | | | | | | | | | | | | | |
| # of close calls involving the correct site, patient or implant identified > or =1 day before the procedure | | | | | | | | | | | | | |
| # of close calls involving the correct site, patient or implant discovered on the day of the procedure | | | | | | | | | | | | | |
| # of delays due to close calls involving the correct site, patient or implant discovered on the day of the procedure | | | | | | | | | | | | | |
| # of cancellations due to a wrong site, patient, or implant issue | | | | | | | | | | | | | |
| # of flash sterilizations of implants | | | | | | | | | | | | | |
| # of returns to OR due to wrong site, patient, or implant surgery | | | | | | | | | | | | | |

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## Table 2. Checklist for identifying improvement opportunities

In addition to ensuring that your organization is meeting all regulatory and accreditation requirements, determine whether there are opportunities for improvement using the below checklist.

| Component | Opportunity |
|---|---|
| **Leadership** | ❒ Leaders define a clear, shared vision and purpose for culture and reliability.<br>❒ Clinical leaders define standard work for the perioperative phases; create processes to educate and hold leaders, managers and workforce accountable. |
| **Culture** | ❒ A culture of safety survey is disseminated at regular intervals and results are utilized to improve.<br>❒ Staff are educated on, speak up to promote safety and use the escalation process.<br>❒ Fear of speaking up is identified through observations, debriefings and events reports. |
| **Scheduling** | ❒ Safeguards are built into the process before the day of surgery<br>  ❒ A process to verify the accuracy of the scheduled procedure with the office staff.<br>  ❒ A 48-hour deadline before the day of surgery for receiving all documents and implants followed by a nurse crosschecking and confirming the presence and accuracy of the scheduled procedure and all required, relevant documents and implants and reconciling issues.<br>  ❒ A process to verify the accuracy of the scheduled procedure with the patient/parent.<br>  ❒ A daily process for key departments—service line leaders, OR materials management, central sterile supply and radiology staff---to review/plan upcoming surgical cases before surgery. |
| **Surgical safety checklist** | ❒ Surgical checklists and their use align with leading practice recommendations and role-based responsibilities are defined for each item on the checklist. |
| **Pre-procedure verification** | ❒ A standardized checklist to confirm the correct patient, procedure, site and all necessary equipment and implants is used by the pre-operative nurse, anesthesiologist, surgeon and circulating nurse independently.<br>❒ A process for reviewing that the correct equipment and implants are available for the procedure and confirming this with the surgeon. |
| **Pre-operative briefing in the OR** | ❒ A standardized handoff process occurs from pre-operative staff to surgical staff.<br>❒ A role-based pre-operative briefing in the OR is conducted before anesthesia, including regional and local anesthetics, and the patient is involved in the process when possible. |
| **Time-out** | ❒ The time-out checklist identifies role-based responsibilities and active participation by the team.<br>❒ The surgeon facilitates the time-out as the leader who is accountable for the procedure to promote team participation and invite other team members to voice any concerns.<br>❒ Surgical staff understand the importance of speaking up to promote safety and the escalation process when their concerns are not addressed.<br>❒ The quality of time-outs is monitored and team member interaction. |
| **Intraoperative** | ❒ For cases involving implants, develop a process for closed loop communication during the procedure to ensure that the correct implant is available and used.<br>❒ For procedures involving the spine, a rib, or ureter, the surgeon obtains an intraoperative radiological image, and for spine level or rib resection, use markers that do not move to confirm the exact level/site and another interpretation by a radiologist or second surgeon. |
| **Postprocedure debriefing** | ❒ Postoperative surgical team debriefs are conducted to promote a culture of safety and mitigate risks.<br>❒ Documented debriefings are used for quality improvement, and shared with those in oversight, quality and safety positions who review, escalate and act to address identified issues. |
| **Education** | ❒ Surgical staff understand their role and responsibilities in safety and the importance of speaking up to promote safety and the escalation process when their concerns are not addressed. |
| **Surveillance** | ❒ A system of ongoing surveillance, visual management and coaching is in place.<br>  ❒ Surveillance dashboard of process and outcome measures<br>  ❒ Ongoing visual monitoring by manager<br>  ❒ Monitoring via technology such as video monitoring or black box<br>  ❒ Processes to coach surgeons and surgical teams to improve |

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## Appendix A. Expert advisory team

The Vizient PSO developed leading practice recommendations with an expert advisory team and is grateful for the following individuals' contributions to this work.

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