

Patient Safety Tip of the Week

May 14, 2019

Wrong-Site Surgery and Difficult-to-Mark Sites

Wrong-site surgeries have not gone away. The Joint Commission sentinel event statistics for 2018 ([TJC 2019](#)) show that wrong-site surgery was the third most frequently reported sentinel event (94 cases). Site marking has been one of the most important interventions to prevent cases of wrong-site surgery or other wrong-site procedures. But, one area of concern is the situation in which laterality is not involved or other “difficult-to-mark” sites are involved.

The [Joint Commission’s Universal Protocol](#) requires, at a minimum, the site be marked when there is more than one possible location for the procedure and when performing the procedure in a different location could harm the patient. It recommends:

- For spinal procedures: Mark the general spinal region on the skin. Special intraoperative imaging techniques may be used to locate and mark the exact vertebral level.
- Mark the site before the procedure is performed.
- If possible, involve the patient in the site marking process.
- The site is marked by a licensed independent practitioner who is ultimately accountable for the procedure and will be present when the procedure is performed.
- In limited circumstances, site marking may be delegated to some medical residents, physician assistants, or advanced practice registered nurses (our note: the task of marking the site of the surgery or invasive procedure should only be delegated to another health practitioner if they are sufficiently competent and knowledgeable about the patient’s case to be able to undertake this task; the person performing the procedure remains responsible regardless of who does the site marking)
- Ultimately, the licensed independent practitioner is accountable for the procedure – even when delegating site marking.
- The mark is unambiguous and is used consistently throughout the organization.
- The mark is made at or near the procedure site.
- The mark is sufficiently permanent to be visible after skin preparation and draping
- Adhesive markers are not the sole means of marking the site

- For patients who refuse site marking or when it is technically or anatomically impossible or impractical to mark the site (see below): Use your organization's written, alternative process to ensure that the correct site is operated on. Examples of situations that involve alternative processes: mucosal surfaces or perineum minimal access procedures treating a lateralized internal organ, whether percutaneous or through a natural orifice, teeth, premature infants, for whom the mark may cause a permanent tattoo

The Joint Commission's National Patient Safety Goals Effective January 2019 ([TJC 2018](#)) require that: "A written, alternative process is in place for patients who refuse site marking or when it is technically or anatomically impossible or impractical to mark the site (for example, mucosal surfaces or perineum). Note: Examples of other situations that involve alternative processes include: minimal access procedures treating a lateralized internal organ, whether percutaneous or through a natural orifice, teeth, premature infants, for whom the mark may cause a permanent tattoo."

Examples of sites that are difficult, or impossible, to mark include structures like perineum, mucosal surfaces such as with frenectomy procedures, internal organs, casted limbs, lateralized organs. Others include procedures performed on midline organs/structures such as the umbilical, perineal, anal or penile areas, endoscopic or other procedures performed through the mouth, anus or urethral meatus, and single organ cases such as caesarean section, midline sternotomy, laparoscopy, cholecystectomy, splenectomy, laparotomy or urethrotomy. There are also occasional instances where patients refuse site markings.

The Child Health PSO (Patient Safety Organization) recently analyzed wrong-site surgeries and found that alternative site marking policies often were not followed or were lacking in some respects ([CHA 2019](#)). They noted the policies should:

- Clearly addresses current best practices/protocols for all situations when alternative site marking processes are required
- Have a process to escalate situations where site marking is challenging to further refine and strengthen alternate site marking processes
- Include a standardized timeout process that elicits engagement among the entire surgical team to ensure identification and marking of correct anatomical surgical site(s) (e.g., multiple repositioning of patient during procedure/surgery)
- Have a process to validate actual practice compared to established policies/protocols for the verification of correct surgical site
- Have standard processes to communicate preference of procedure/operating room setup based upon proceduralists' physical preference (e.g., right/left hand dominance).
- Organizational culture that supports high-reliability principles

They recommend use of visual marking methods accessible to the entire procedural team and have some specific recommendations for certain surgery types:

- Eye and eye muscle(s) procedure – Mark a diagram to indicate the eye on which the procedure will be conducted. Another consideration for lateral eye

surgeries is to mark over the eyebrow, on the cheek, or as designated by the proceduralist.

- Dental procedure – Mark site on a diagram to clearly identify which teeth are present, decayed (including surfaces), or anomalies after performing an oral examination and reading intra-and extraoral films, if available, prior to tooth preparation or extraction.
- Spine surgery – Verify site intra-operatively by radiographic markers (e.g., osseous landmark or disk) to confirm the site.

The recommendations go on to discuss identifying which procedures should be subject to an alternative marking protocol, the role of timeouts, how to do simulations and use real-time reminders to help ensure compliance with the policies, auditing, and what to do in cases where patients or families refuse site marking.

One of the resources they relied upon was from Boston Children's Hospital ([Norton 2011](#)). They had developed an Alternative Site Marking Form. It was a paper form that includes a body diagram for situations when normal site marking would not be acceptable or practical. Clinicians identify the location of the surgical site by initialing the site on the form. Before surgery, the physician marks the diagram with his or her initials by following the same guidelines established for routine site marking. Several years earlier their dental service had begun using a dental diagram or dental radiograph to indicate which operative tooth name(s) and number(s) are indicated for the procedure. The new form they developed included on the back side a close-up of a face, a diagram of an open mouth, and diagrams of male and female genitalia. The open mouth diagram is intended for oral mucosa surgery sites as opposed to teeth (the dentists still use a more specific dental diagram or radiographs). See the Norton paper ([Norton 2011](#)). for a copy of the diagram.

The Minnesota Hospital Association has a [Safe Site Toolkit](#) that includes good [site marking recommendations and guidance](#) and includes a [dental chart](#).

Laparoscopic procedures are also problematic since the incision is typically made in the midline but the target of the procedure may be on one side. A recent report of a hemicolectomy done on the wrong side ([CDPH 2018](#)) did not discuss the role of site marking. Laparoscopic oophorectomy is probably more common and might involve just one ovary so there needs to be a way to clearly delineate laterality so that all the OR staff understand which side will be removed. We'd anticipate that use of a form with a diagram, like that in the Norton paper ([Norton 2011](#)), would be useful in such cases.

The Minnesota Hospital Association recommendations noted above do comment on procedures with midline incisions but internal laterality. They suggest the incision site be marked with the surgeon's initials and an arrow to indicate the internal side. Alternatively, they suggest marking on a diagram or use of an armband on the correct side.

Spine surgery classically presents a specific problem. Since the spine is a midline structure, laterality is usually not a prime consideration. However, getting the correct **spinal level** is a prime consideration. Surgeons typically use radiopaque markers and intraoperative X-rays to mark the correct spinal level. But sometimes the images are poor due to patient or technical issues and other times there may be anomalous anatomy that leads to incorrect level marking. Researchers at Johns Hopkins developed an algorithm, called LevelCheck, to assist in identifying and marking the correct spinal level. “The LevelCheck program uses a patient’s MRI or CT scan images taken before the operation. By feeding the imaging data into the Level Check computer program, engineers use mathematical algorithms to compare anatomical landmarks, line them up, and transfer the digital labels of each spinal segment from the preoperative scan to the digital X-ray taken in the operating room.” ([Bartlett 2019](#)).

Early studies of the LevelCheck algorithm ([De Silva 2016](#)) showed it to be helpful in 42.2% of cases (168/398), to improve confidence in 30.6% of cases (122/398), and in no case diminished performance (0/398), supporting its potential as an independent check and assistant to decision support in spine surgery. In a more recent exercise ([Manbachi 2018](#)), 5 surgeons were asked to label spine X-rays that had been specifically chosen because they were the most difficult to read and label. They performed the task in two ways: with LevelCheck assistance and without. The median localization error without assistance was 30.4%, due to the challenging nature of the cases. With LevelCheck, the median error was 2.4% and the surgeons found LevelCheck increased confidence in 91% of cases. The second part of the study was a clinical study involving 20 patients undergoing spine surgery. It demonstrated accuracy in all cases. The algorithm runtime varied from 17 to 72 seconds in its current implementation.

And, though it is not directly related to site markings, another facet of avoiding wrong site surgery is worth mentioning. A hospital in the UK recently had to formally ban using abbreviations for **right** and **left** after one patient had two procedures on the wrong site ([Ord 2019](#)). While we have included avoiding abbreviations like OD and OS and OU (instead writing out right eye and left eye and both eyes, respectively) or AD and AS and AU (instead writing out right ear and left ear and both ears, respectively), most “do not use” lists have not specifically commented on avoiding other abbreviations for “left” and “right”. But it probably also makes sense to write out “left” or “right” or “both” rather than using L or R or B (either alone or within a circle) as we often do. We’ve previously noted that such abbreviations on booking logs and forms can especially be problematic and should not be used (see our October 30, 2012 Patient Safety Tip of the Week “[Surgical Scheduling Errors](#)”). Indicating right or left or bilateral by using circles around an “R”, “L”, or “B” respectively is particularly dangerous in scheduling since it is very easy to mistake these for the wrong side, particularly on faxed forms (yes, unfortunately, surgical case scheduling still often relies on faxed forms!). You really shouldn’t use abbreviations at all on your booking forms. Similarly, you should not use acronyms on your scheduling forms since all parties may not understand those.

Some of our prior columns related to wrong-site surgery:

September 23, 2008	“Checklists and Wrong Site Surgery”
June 5, 2007	“Patient Safety in Ambulatory Surgery”
July 2007	“Pennsylvania PSA: Preventing Wrong-Site Surgery”
March 11, 2008	“Lessons from Ophthalmology”
July 1, 2008	“WHO’s New Surgical Safety Checklist”
January 20, 2009	“The WHO Surgical Safety Checklist Delivers the Outcomes”
September 14, 2010	“Wrong-Site Craniotomy: Lessons Learned”
November 25, 2008	“Wrong-Site Neurosurgery”
January 19, 2010	“Timeouts and Safe Surgery”
June 8, 2010	“Surgical Safety Checklist for Cataract Surgery”
December 6, 2010	“More Tips to Prevent Wrong-Site Surgery”
June 6, 2011	“Timeouts Outside the OR”
August 2011	“New Wrong-Site Surgery Resources”
December 2011	“Novel Technique to Prevent Wrong Level Spine Surgery”
October 30, 2012	“Surgical Scheduling Errors”
January 2013	“How Frequent are Surgical Never Events?”
January 1, 2013	“Don’t Throw Away Those View Boxes Yet”
August 27, 2013	“Lessons on Wrong-Site Surgery”
September 10, 2013	“Informed Consent and Wrong-Site Surgery”
July 2014	“Wrong-Sided Thoracenteses”
March 15, 2016	“Dental Patient Safety”
May 17, 2016	“Patient Safety Issues in Cataract Surgery”
July 19, 2016	“Infants and Wrong Site Surgery”
September 13, 2016	“Vanderbilt’s Electronic Procedural Timeout”
May 2017	“Another Success for the Safe Surgery Checklist”
May 2, 2017	“Anatomy of a Wrong Procedure”
June 2017	“Another Way to Verify Checklist Compliance”
March 26, 2019	“Patient Misidentification”

Some of our previous columns on the impact of abbreviations in healthcare:

March 12, 2007	“10x Overdoses”
June 12, 2007	“Medication-Related Issues in Ambulatory Surgery”
September 2007	“The Impact of Abbreviations on Patient Safety”
July 14, 2009	“Is Your “Do Not Use” Abbreviations List Adequate?”
April 2015	“Pediatric Dosing Unit Recommendations”
December 22, 2015	“The Alberta Abbreviation Safety Toolkit”

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dental chart

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