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EDITORIAL

Understanding A Surgeon's Worst Nightmare: Wrong Site Surgery

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For the patient, the only thing more unnerving than the long list of potential risks revealed during the informed consent process before a surgical procedure is what isn't said, namely that the surgical team may also potentially be a risk. Medical errors are common, have deadly consequences, and are the third leading cause of death in the United States.[1] The most catastrophic medical errors are often called "sentinel events." The Joint Commission defines a sentinel event as a patient safety event that results in death, permanent harm, or severe temporary harm.[2] Of these events, wrong-site surgery (WSS) is currently the fifth most common sentinel event in the United States.[3] WSS is of the utmost importance to hospital administrators, clinicians, and patients alike.

Despite the implementation of the Universal Protocol (a checklist intended to reduce surgical errors that includes pre-procedure verification, marking of the procedure site, and a preoperative timeout) in 2003, WSS events persist. One of the most commonly identified causes of WSS is an inability to follow established safety protocols.[4,5] WSS frequently goes unreported, with more discussion in the media than in the medical literature,[6] and only 2% of estimated sentinel events are reported to The Joint Commission.[3] The challenges of WSS may be addressed, in part, through studies examining this complex issue.

The study of WSS by Tan et al.[5] in this issue of the *Journal* draws attention to a topic that results in patient harm and significant costs to the healthcare system. Tan and colleagues[5] have reviewed closed claims data from one malpractice company to describe details of the WSS events, the specialties and procedures with the greatest incidence of WSS, the physical harm to the patient, and monetary costs of these events. The authors found that 33.3% of inpatient WSS events led to a high-severity injury, including death in 7.4%, a unique finding among the available literature on WSS.[5] Tan and colleagues[5] also examined the monetary costs of WSS events and found that 60.3% of cases were settled with a mean payment of $136,452. Fifteen different explanations for the errors were provided. The most common reason, accounting for 84% of WSS, was inability to follow an established policy.. Specialties with the highest incidence of WSS (orthopedics, neurosurgery) were identified, drawing attention to procedures that pose the highest risk, such as arthroscopy and spinal surgery.

The data described by Tan et al.[5] are similar to a recently published study from France,[7] which also examined national insurance claims involving WSS. Like Tan et al.,[5] this study found that orthopedic and neurosurgery procedures have the highest incidence of WSS and the causes of these errors were similar between the two studies, including failure to follow the perioperative protocols.[7] The costs of WSS events were much higher in the work by Tan et al.,[5] which may be explained by differences in United States tort law, legal costs, and precedent, as well as differences in compensation models between the two countries.[8,9] Although injury severity has been described in WSS,[10] this study by Tan et al.[5] is novel in the detail in which the type and severity of the injuries are specified. Thus, Tan et al.[5] provide new insight into the harmful consequences of WSS and how the costs of WSS reflect the magnitude of the inflicted patient harm.

One of the key limitations of this study is that the data examined were obtained through malpractice insurance claims and not verified clinical data. Thus, these data were likely collected with the intention of understanding and resolving insurance claims and not for the purpose of research. This may create measurement bias with data that focus more on medicolegal variables and less on clinical outcomes. Additionally, selection bias may stem from the fact that all data examined were from a single malpractice insurance company. The authors correctly noted that malpractice claims likely underestimate the proportion of mild injury in WSS, which may underly the strikingly high incidence of severe injury and death in the study population. Additionally, it has been shown that patients who suffer negligent injury and do not sue are more likely to be poor, uninsured, using Medicare or Medicaid, and elderly[11]; this brings into question the generalizability of the findings by Tan et al.[5] as their dataset likely fails to capture significant proportions of these groups. Finally, although the work by Tan et al.[5] examines nine different specialties for WSS events, dentistry and ophthalmology were not included in the data analysis. Data obtained from the United Kingdom's National Health Service has found that dentistry is responsible for 16% to 24% of WSS and 7% to 10% of all never-events.[12] Ophthalmology is also frequently described as a specialty that contributes to WSS,[10,13-15] and rates of greater than 30% have been described.[16]

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When a WSS event occurs, clinicians must be prepared to investigate and disclose these errors to maintain trust among patients and the community at large. Hospital-level investigation must occur, utilizing methods such as a root cause analysis.[17] Root cause analysis can identify solutions[18] to bolster adherence to the Universal Protocol and incorporate other processes to improve safety. It has been shown that proper use of the Universal Protocol may have prevented 85% of WSS in a retrospective case series,[10] and Tan et al.[5] have excellently described potential breakdowns in the Universal Protocol in WSS. The healthcare team must share the sentiment that WSS is a never-event and that every team member can contribute to or prevent WSS. Developing a culture in which all involved are responsible for reporting WSS when it occurs, participating in meaningful investigation of the event, and assisting with corrective measures will help to ensure that WSS does not occur in the future.

Innovative ways to mark the surgical site on the patient are one potential solution to reducing WSS. Colored gowns denoting procedure-specific details for patients are being used in ophthalmologic surgery.[19] Spinal surgeons are investigating the potential of augmented reality software, whereby CT scans are reconstructed into 3D images and uploaded to a headset worn by the physician. The physician is able to see both the patient and a superimposed hologram of the spine, allowing for accurate recognition of the intended surgical site.[20] Identifying disparities in patients who may experience WSS is also a topic worthy of additional study. For example, darker skin tones obscuring surgical site marking have been identified as a potential risk factor for WSS.[10] In line with the title of the seminal work on this subject, *To Err is Human*, people make mistakes. Designing systems to help prevent errors and make the right thing to do the easiest thing to do can all be applied to prevention of WSS events.

WSS is a preventable injury that can severely harm patients and is a critical topic that must be addressed in providing best patient care. Despite efforts to reduce this sentinel event, WSS persists. The study by Tan et al.[5] contributes new information to our understanding of WSS. Health care systems and practitioners should continue to study WSS events, look to implement new methods to prevent WSS, and continue to work toward achieving the goal of making WSS a true never-event.

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REFERENCES

1. Makary MA, Daniel M. Medical error-the third leading cause of death in the US. BMJ. 2016;353:i2139.
2. The Joint Commission. Sentinel Event. Accessed Feb 20, 2023. www.jointcommission.org/resources/sentinel-event.
3. The Joint Commission. Sentinel Event Data Released for First 6 Months of 2022." Sep 7, 2022, Accessed Feb 20, 2023. https://www.jointcommission.org/resources/news-and-multimedia/newsletters/newsletters/joint-commission-online/sept-7-2022/sentinel-event-data-released-for-first-6-months-of-2022/#.ZBhmcnbMJD9.
4. Stahel PF, et al. Wrong-site and wrong-patient procedures in the universal protocol era: analysis of a prospective database of physician self-reported occurrences. Arch Surg. 2010;145(10):978–984.
5. Tan J, et al. A contemporary analysis of closed claims related to wrong-site surgery. Jt Comm J Qual Patient Saf. 2023;50(5) xxx–xxx.
6. Seiden SC, Barach P. Wrong-side/wrong-site, wrong-procedure, and wrong-patient adverse events: Are they preventable? Arch Surg. 2006;141(9):931–939.
7. Vacheron CH, et al. Insurance claims for wrong-side, wrong-organ, wrong-procedure, or wrong-person surgical errors: a retrospective study for 10 years. J Patient Saf. 2023;19(1) e13–e17.
8. Barbot J, Parizot I, Winance M. No-fault" compensation for victims of medical injuries. Ten years of implementing the French model. Health Policy. 2014;114(2–3):236–245.
9. Williams TR. A cultural and global perspective of United States health care economics. Semin Radiat Oncol. 2008;18(3):175–185.
10. Simon JW, et al. Surgical confusions in ophthalmology. Arch Ophthalmol. 2007;125(11):1515–1522.
11. Studdert DM, et al. Negligent care and malpractice claiming behavior in Utah and Colorado. Med Care. 2000;38(3):250–260.
12. Pemberton MN. Wrong tooth extraction: further analysis of "never event" data. Br J Oral Maxillofac Surg. 2019;57(9):932–934.
13. Neily J, et al. Incorrect surgical procedures within and outside of the operating room: a follow-up report. Arch Surg. 2011;146(11):1235–1239.
14. Steeples LR, et al. Wrong intraocular lens events-what lessons have we learned? A review of incidents reported to the National Reporting and Learning System: 2010–2014 versus 2003–2010. Eye (Lond). 2016;30(8):1049–1055.
15. Loft ES, Marcus DM. Wrong-site eye surgery. Ophthalmic Surg Lasers Imaging. 2004;35(3):182–184.
16. Shen E, Porco T, Rutar T. Errors in strabismus surgery. JAMA Ophthalmol. 2013;131(1):75–79.
17. Engelhardt KE, Barnard C, Bilimoria KY. Wrong-Site Surgery. JAMA. 2017;318(20):2033–2034.
18. Kellogg KM, et al. Our current approach to root cause analysis: is it contributing to our failure to improve patient safety? BMJ Qual Saf. 2017;26(5):381–387.
19. Moharana B, et al. A novel color-coding method to prevent wrong-site surgery in ophthalmology. J Patient Saf. 2022;18(2) e447.
20. Aoyama R, et al. Augmented reality device for preoperative marking of spine surgery can improve the accuracy of level identification. Spine Surg Relat Res. 2021;6(3):303–309.