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Incidence of Wrong-Site Surgery List Errors for a 2-Year Period in a Single National Health Service Board

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Introduction: Wrong-site/side surgical "never events" continue to cause considerable harm to patients, healthcare professionals, and organizations within the United Kingdom. Incidence has remained static despite the mandatory introduction of surgical checklists. Operating theater list errors have been identified as a regular contributor to these never events. The aims of the study were to identify and to learn from the incidence of wrong-site/side list errors in a single National Health Service board.

Methods: The study was conducted in a single National Health Service board serving a population of approximately 300,000. All theater teams systematically recorded errors identified at the morning theater brief or checklist pause as part of a board-wide quality improvement project. Data were reviewed for a 2-year period from May 2013 to April 2015, and all episodes of wrong-site/side list errors were identified for analysis.

Results: No episodes of wrong-site/side surgery were recorded for the study period. A total of 86 wrong-site/side list errors were identified in 29,480 cases (0.29%). There was considerable variation in incidence between surgical specialties with ophthalmology recording the largest proportion of errors per number of surgical cases performed (1 in 87 cases) and gynecology recording the smallest proportion (1 in 2671 cases). The commonest errors to occur were "wrong-side" list errors (62/86, 72.1%).

Discussion: This is the first study to identify incidence of wrong-site/site list errors in the United Kingdom. Reducing list errors should form part of a wider risk reduction strategy to reduce wrong-site/side never events. Human factors barrier management analysis may help identify the most effective checks and controls to reduce list errors incidence, whereas resilience engineering approaches should help develop understanding of how to best capture and neutralize errors.

Key Words: surgery, never events, human factors

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Wrong-site surgery has consistently been one of the commonest "never events" to occur in UK hospitals since data collection began in 2009.[1,2] In the United Kingdom (UK), a wrong-site surgery never event is defined as "a surgical intervention performed on the wrong patient or wrong site … detected at any time after the start of the procedure."[3] In the United States, "wrong procedure" is also commonly included in the never-event definition.[4–6] It is estimated that wrong-site surgery occurs in approximately 1 in 100,000 cases but could be as common as 4.5 in 10,000 cases dependent on the procedure being performed.[7,8] There were 124 cases of wrong-site surgery recorded between April 2014 and March 2015 in the UK; this is the highest level documented in a single year.[9] By definition, these never events should be avoidable, but wrong-site surgery is far from being eradicated and continues to cause harm to patients and families, attract negative headlines in the mainstream media, and dismay from patient organizations.[10] Other consequences include the psychological impact on the well-being of health professionals involved,[11] complaints, and medicolegal action and damage to individual and organizational reputations.[12]

Much of the emphasis on preventing wrong-site surgery has been placed on the immediate perioperative period, with particular attention paid to site marking and checklist processes. The World Health Organization safer surgery checklist has been mandated in the UK since February 2010[13] with the similar Universal Protocol in the United States established since 2004. While there is evidence for reduction in mortality and morbidity with checklist use,[14,15] this is in the context of more complex cultural shifts.[16] In the UK, there remains considerable variation in checklist implementation.[17] The impact of checklists on wrong-site surgery events is less clear.[7,8] Studies have suggested a downward trend in wrong-site surgery events in different surgical contexts but rarely have these proved statistically significant.[18–22]

There is recognition that given the complexity of the problem, checklist processes cannot prevent all cases of wrong-site surgery. Several upstream and downstream errors have been identified that can propagate through or bypass checklists altogether. In an examination of 308 wrong-site surgery events by Paull et al,[23] 48(16%) were deemed nonpreventable through checklist processes, with 32 (67%) of these identified as upstream errors and 16 (33%) as downstream errors.[23] One commonly identified upstream error is that of incorrect listing of the operation. In a 2014 review of wrong-site procedure data, 59 (11%) of 541 cases of wrong-site procedures were related to incorrect information from the surgeons' office. These included 34 operations on the wrong side, 2 operations at the wrong spinal level, 8 procedures at the wrong site (e.g. wrong finger), and 15 incorrect procedures.[24] Upstream scheduling errors seem to be an important feature generally of wrong-site surgery events. In a review of "near-miss" and true wrong-site surgery events, incorrect scheduling was the most commonly cited contributing factor in 111 of 427 cases.[25] In a follow-up study comparing these near misses and true never events incorrect scheduling information was more commonly captured in the near-miss group compared with the wrong-site surgery group.[26] Finally, Neily et al[27] identified scheduling problems as the fifth most common "root cause" for a wrong procedure behind other human factors issues such as communication, time-out, and nonstandardization problems.

Theater list errors are commonly implicated in episodes of wrong side, site, or procedure surgery and have the potential to act as a lead point or propagating factor for these never events.[28] Against this background, this study aims to identify the incidence

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of wrong-side, wrong-site, or wrong-procedure (WSSP) theater list errors by surgical specialty in a UK hospital.

METHODS

Setting and Context

The study was conducted in a single National Health Service (NHS) board, which serves a population of approximately 300,000. It includes an 860-bed district general hospital containing 16 operating theaters and a smaller satellite hospital with a day case ophthalmology theater. Included surgical specialties are ear, nose and throat (ENT), general surgery, gynecology, ophthalmology, oral and maxillofacial surgery (OMFS), orthopedics, urology, and vascular surgery.

The hospital theater department has engaged in a systematic program of quality improvement (QI) since 2008 influenced by the model developed by Langley et al.[29,30] Daily safety huddles[31] and weekly safety meetings are used to coordinate QI activities. One strand of this QI project involves the monitoring and improvement of prelist briefing and checklist use. Individual theaters began collecting data on potential "harm prevented" at theater briefs and checklist pauses to determine whether checklist modifications resulted in improvements. These data include all errors discussed or captured at the morning briefing or checklist pauses. Since May 2013, this data collection has been embedded in all theaters across the NHS board.

Data Collection

Data are collected by staff in individual theaters on the principal paper copy of the theater list in real time; this information is collated on a daily basis by a theater coordinator and stored on a spreadsheet alongside data from the Scottish Patient Safety Programme (SPSP).[32] The SPSP is a national QI program, which requires hospitals to audit and improve care processes targeted to reducing specific adverse events; in operating theaters, this includes monitoring and acting on data on briefing and checklist use, glucose control, and prophylactic antibiotics use.

Data Analysis

Data from May 2013 to April 2015 were reviewed and analyzed by A.G. All data relating to theater list errors were extracted for analysis. Additional information was extracted from SPSP data. Data were examined using Microsoft Excel (2010, Microsoft Corp, Redmond, WA) and are presented as simple frequency counts and percentages by surgical specialty.

RESULTS

A total of 29,480 theater cases were performed for the study period. No cases of wrong-side, wrong-site, or wrong-procedure surgery were recorded. The SPSP data confirm all theater lists began with a safety brief and checklist pauses were completed before every procedure. Nine cases, where the side or planned procedures were changed on the day of surgery because of a change in the patients' condition, were not included as WSSP errors. There were further 2 cases where no side was documented on the theater list.

A total of 86 WSSP list errors (0.29%) were recorded for the 2-year period. The incidence of WSSP errors by individual surgical specialty is outlined in Table 1. Ophthalmology recorded the largest proportion of errors per number of surgical cases performed (1 in 87 cases), with gynecology recording the smallest proportion (1 in 2671 cases).

The list error type that occurred most frequently was episodes of potential "wrong-side" surgery (62/86, 72.1%), most (33/62, 53.2%) of which were associated with ophthalmology cases (Table 2).

DISCUSSION

For the 2-year study period, there were no cases of wrong-site/side or procedure surgery in the hospital, but there were a total of 86 WSSP list errors. This approximates to 1 WSSP list error every 10 to 14 days. There was considerable variation in incidence by specialty, with 1 in 87 cases incorrectly listed in ophthalmology theaters to 1 in 2671 in gynecology. In specialties with a high degree of laterality to disease (ophthalmology/orthopedics), there was an increased proportion of wrong-side listing compared with other specialties.

One of the strengths of this study is that data have been collected prospectively in real time. The data collection process has been refined through application of QI methodology[30] to minimize any additional workload to frontline theater staff and, therefore, to maximize reporting. Information is handwritten on the principal theater list during the morning theater briefing and subsequent safety pauses without the need for any additional forms or repetition. The collation of data by theater coordinators is paired with the established SPSP data collection process, again minimizing additional workload. Because there were no episodes of wrong-site surgery for the study period, it is likely that all WSSP errors were reported on theater lists; any underreporting could only occur at the collating level. One shortcoming of this real-time data collection process is that there is limited detail on the

TABLE 1. Incidence of WSSP List Errors by Surgical Specialty

	List Errors	Surgical Cases		
Specialty	**n**	**n**	**Incidence**	
Ophthalmology	39	3389	0.01150782	1 in 87 cases
Orthopedics	14	6973	0.00200774	1 in 498 cases
General	9	5622	0.00160085	1 in 625 cases
OMFS	6	1438	0.00417246	1 in 240 cases
Urology	6	2723	0.00220345	1 in 454 cases
ENT	5	2146	0.00232992	1 in 429 cases
Vascular	2	1516	0.00131926	1 in 758 cases
Gynecology	1	2671	0.00037439	1 in 2671 cases
Unknown	4	—	—	—
Total	86	29480	0.00291723	1 in 343 cases

TABLE 2. Number of List Errors by Type Across Different Surgical Specialties

	Wrong Side	Wrong Site	Wrong Procedure	Bilateral/ Unilateral*	Total
Ophthalmology	33	5	—	1	39
Orthopedics	11	1	—	2	14
General	3	1	4	1	9
OMFS	5	—	1	—	6
Urology	3	1	2	—	6
ENT	1	—	4	—	5
Vascular	2	—	—	—	2
Gynecology	—	—	1	—	1
Unknown	4	—	—	—	4
Total	62	8	12	4	86

*Bilateral/unilateral errors where the patient was listed for a unilateral procedure but required bilateral or vice versa.

underlying nature of the errors and no further investigation to determine what other system-wide factors interacted to contribute to the errors that occurred, minimizing opportunities for team or organizational learning and improvement. On identifying the incidence of list errors by specialty, the head of each department was notified allowing them to set up independent audit processes. In addition, the "harm-prevented" data collated within theaters are shared on a monthly basis across all departments, mid and senior management, and the chief executive to provide regular updates on errors identified and captured within the theater department. The hospital is shortly to begin a wider analysis of the listing process, barriers, and checks in partnership with the Patient Safety & Quality Improvement team within NHS Education for Scotland.

Nine instances where the theater list was altered on the day of surgery because of a change in patient circumstances were not included as errors. These episodes were felt to be symptomatic of disease progression and occurred approximately once every 2 to 3 months. It is possible that the data set underreports these episodes if these details were not recorded at the time. However, with application of the NHS 12-week waiting time guarantee between a patient being placed on a waiting list and the procedure being carried out these types of errors should be minimized. A further potential source for changes to the list on the day of surgery is the use of pooled surgical lists. This entails numerous surgeons sharing a combined waiting list for common procedures, but there is potential for differing clinical opinions as to the best operative management of a patient; again, this detail is not recorded in the data set. It is unclear why ophthalmology has a greater incidence of list errors compared with other specialties, including those with a high degree of laterality. It is possible that the specialty includes a higher proportion of patients with bilateral disease such that clinicians and patients necessarily have to identify a "worst" side to begin unilateral treatment. This could introduce more subjectivity to the decision-making process, in differing clinical opinion, or in variation of day-to-day patient experience.

The data are consistent with previously published data on scheduling errors. Wu et al[33] examined the characteristics and cost of scheduling errors, with the data set including the incidence of WSSP errors. Of 17,606 procedures, there were a total of 77 WSSP errors (incidence = 0.00437351, 1 in 229 cases). This included 55 cases of wrong-side listing, 14 wrong procedure, 7 wrong site, and 1 listed with both the wrong procedure and wrong side. In Neily et al's[27] 2009 review of wrong-site surgery the incidence of wrong site never events is broken down by specialty; it is noteworthy that this incidence closely resembles the incidence of WSSP listing errors by specialty identified in this study. This again suggests an association between list errors and wrong-site surgery and its potential as a target to reduce never events.

Although list errors are not a prerequisite for a never event, they can play a significant role, working through 3 distinct mechanisms. Firstly, theater lists can act as a lead point for never events if the error is copied on to patient consent and subsequent documentation. Secondly, they can act as a compounding factor because the list is used to inform theater layout and equipment setup, that is, theater could be set up for a right- or left-sided procedure. Indeed, patient positioning errors are a known independent risk factor for wrong-site surgery.[25] Finally, regular list errors have the potential to normalize discrepancies between documentation and procedure being carried out. This could have an impact on staff raising concerns and cultural drift more generally.[34] Scheduling errors have been identified as the fifth most common root cause of wrong-site/side never events[27] and may contribute to approximately 25% of all such events.[25] With the incidence of wrong-site/side never events seemingly static across the UK, list errors need to be addressed as part of a wider risk reduction strategy.

The Joint Commission Center for Transforming Healthcare previously identified 3 contributing factors to incorrect scheduling; these can be seen in Box 1.[4]

BOX 1. Factors that contribute to incorrect scheduling and potential contributory factors in wrong-site surgery

1. Booking documents not verified by office schedulers
2. Schedulers accepting verbal requests for surgical bookings instead of written documents
3. Unapproved abbreviations, cross-outs, and illegible handwriting used on the booking form

Computer software also has a role in the generation of, or protection against, list errors. Cima et al[35] reported on the introduction of a new electronic scheduling system within the Mayo Clinic, which significantly reduced scheduling errors in both gynecology and colorectal surgery. The UK software interfaces should be reviewed to ensure risk of left/right slips and lapses are minimized during list formulation. For the clinician, a pragmatic approach must ensue. List errors should be recognized as a real and recurring threat. Surgeons must resist the temptation to "short cut" and use the theater list as a primary source for consenting. Consenting should include a reconciliation process to ensure patient findings, imaging, letters, and lists match. Surgeon involvement in this reconciliation process has been identified as being the greatest contributor to the prevention of wrong-site surgery.[25] As the UK increasingly moves toward pooled surgical lists and patients arriving on the day of surgery, there can be considerable time pressure to meet patients for the first time, review notes, and consent before the start of theater. Organizations should, therefore, examine clinical and administrative systems to ensure that there is adequate time to complete these procedures properly and ensure that all notes and imaging, be they electronic or paper, are easily accessible in consenting areas.

Different human factors concepts and approaches routinely used in safety-critical industries may be helpful to NHS care teams

in better understanding and minimizing system hazards and risks related to complex problems such as surgical list errors and never events.[36] The use of barrier management methods can assist us to better assess care systems to identify and improve existing patient safety "controls" and "safeguards" for reducing risks.[37] This can be achieved either as a proactive safety management approach or retrospectively as part of incident investigations. This enables assessment and identification of the full range of protective controls thought to be in place, how robust they actually are and how they can be defeated, and who in the organization has responsibility for implementing, supporting and maintaining each type of safety control.[37]

Similarly, there is growing interest in healthcare and other high hazard industries in the human factors subdomain of resilience engineering.[38] This discipline advocates the need to strike a balance between the traditional approaches to safety management, which are focused on reducing and eliminating the number of things that go wrong (termed Safety-I), while optimizing and improving the number of things that go right (termed Safety-II). Given that list errors and never events are comparatively rare, it arguably makes sense to begin to explore, understand, and learn from why things go right in most surgical cases.

To more effectively influence surgical wrong-site/side list errors and related never events will require targeted education and training of the surgical workforce (and others including organizational leaders and NHS policymakers) in fundamental human factors principles and approaches. This goal is embedded in policy in NHS England[39] and is now appearing in national surgical training curricula. However, a broader and more comprehensive understanding of human factors as a systems and design-based discipline will be necessary if frontline care teams ("field experts") are to untangle the complexities of system interactions that can contribute to list errors and never events and design effective solutions to reduce risks thereby enhancing human and organizational performance and well-being in this area.

CONCLUSIONS

This is the first UK data to identify the incidence of WSSP list errors. Data are similar to a previously published study from the United States,[33] but there is no other direct UK comparison. It would be very useful to repeat this data collection process in similar surgical settings for comparison. A wider project to understand and define the association between system failures, including list errors, and wrong-site surgery events in the UK could further legitimize it as a target for reducing wrong-site surgery. We have demonstrated considerable interspecialty variation in WSSP list error incidence. This requires further examination with more comprehensive data collection, informed by human factors thinking and methods, to understand the exact nature of these differences and begin to formulate system (re)design interventions to reduce error incidence.

List errors are an attractive target and act as strong system signals[40] in the fight against wrong-site surgery. They are clearly implicated in the development of wrong-site surgery events, and it would be useful to more clearly understand and define this association and begin to design solutions to strengthen system barriers and safety management procedures. Tracking theater list errors could be an attractive process measure in national QI strategies because it provides a clear binary end point—an operation can be listed either correctly or incorrectly. There is potential for such data to act as a lagging indicator[41] to help identify hospitals at increased risk of wrong-site surgery never events. Overall, the list errors themselves need to be addressed by examining how lists are compiled, processed, and implemented from human factors–based systems and design perspective to develop and test interventions for further minimizing the risk of catastrophic wrong-site surgery.

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REFERENCES

1. National Patient Safety Agency. *Never Events*. 2010. Available at: http://www.nrls.npsa.nhs.uk/neverevents/. Accessed March 4, 2016.
2. NHS England. *Never Events Data*. Available at: https://www.england.nhs.uk/patientsafety/never-events/ne-data/. Accessed November 28, 2016.
3. NHS England Patient Safety Domain. *Never Events List 2015/16*. 2015: London.
4. The Joint Commission Center for Transforming Healthcare. *The Wrong Site Surgery Project*. 2011.
5. Health Research & Educational Trust and Joint Commission Center for Transforming Healthcare. In: *Reducing the Risks of Wrong-Site Surgery: Safety Practices From The Joint Commission Center for Transforming Healthcare project*. Chicago, IL: Health Research & Educational Trust; 2014.
6. National Quality Forum. *List of Serious Reportable Events*. Available at: http://www.qualityforum.org/Topics/SREs/List_of_SREs.aspx#sre1. Accessed November 28, 2016.
7. Hempel S, Maggard-Gibbons M, Nguyen DK, et al. Wrong-site surgery, retained surgical items, and surgical fires: a systematic review of surgical never events. *JAMA Surg*. 2015;150:796–805.
8. Devine J, Chutkan N, Norvell DC, et al. Avoiding wrong site surgery: a systematic review. *Spine (Phila Pa 1976)*. 2010;35:S28–S36.
9. NHS England Patient Safety Domain. In: *Never events reported as occurring between 1 April 2014 and 31 March 2015 – final update*. 2016.
10. The Patients Association. *Patients association calls for 'never' incidents to cease*. 2016.
11. Dekker S. *Second victim: error, guilt, trauma, and resilience*. Boca Raton: CRC Press; 2013.
12. *House of Commons Parliamentary Report, Public Administration - Sixth Report Investigating clinical incidents in the NHS*. 2015.
13. National Patient Safety Agency. *WHO Surgical Safety Checklist*. 2009. Available at: http://www.nrls.npsa.nhs.uk/resources/?entryid45=59860. Accessed December 10, 2016.
14. Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med*. 2009;360:491–499.
15. de Vries EN, Prins HA, Crolla RM, et al. Effect of a comprehensive surgical safety system on patient outcomes. *N Engl J Med*. 2010;363:1928–37.
16. Bosk CL, Dixon-Woods M, Goeschel CA, et al. Reality check for checklists. *Lancet*. 2009;374:444–445.
17. Russ S, Rout S, Caris J, et al. Measuring variation in use of the WHO surgical safety checklist in the operating room: a multicenter prospective cross-sectional study. *J Am Coll Surg*. 2015;220:1–11. e4.
18. Simon JW, Ngo Y, Khan S, et al. Surgical confusions in ophthalmology. *Arch Ophthalmol*. 2007;125:1515–1522.
19. Starling J 3rd, Coldiron BM. Outcome of 6 years of protocol use for preventing wrong site office surgery. *J Am Acad Dermatol*. 2011;65:807–810.
20. Simon JW. Preventing surgical confusions in ophthalmology (an American Ophthalmological Society thesis). *Trans Am Ophthalmol Soc*. 2007;105:513–529.

21. James MA, Seiler JG 3rd, Harrast JJ, et al. The occurrence of wrong-site surgery self-reported by candidates for certification by the American Board of Orthopaedic Surgery. *J Bone Joint Surg Am*. 2012;94:e2(1–12).
22. Vachhani JA, Klopfenstein JD. Incidence of neurosurgical wrong-site surgery before and after implementation of the universal protocol. *Neurosurgery*. 2013;72:590–595.
23. Paull DE, Mazzia LM, Neily J, et al. Errors upstream and downstream to the Universal Protocol associated with wrong surgery events in the Veterans Health Administration. *Am J Surg*. 2015;210:6–13.
24. Clarke JR. Is your office helping you prevent wrong site surgery? *Bull Am Coll Surg*. 2014;99:28–31.
25. Clarke JR, Johnston J, Finley ED. Getting surgery right. *Ann Surg*. 2007; 246:395–403.
26. Blanco M, Clarke JR, Martindell D. Wrong site surgery near misses and actual occurrences. *AORN J*. 2009;90:215–218, 221–222.
27. Neily J, Mills PD, Eldridge N, et al. Incorrect surgical procedures within and outside of the operating room. *Arch Surg*. 2009;144:1028–1034.
28. Robinson PM, Muir LT. Wrong-site surgery in orthopaedics. *J Bone Joint Surg Br*. 2009;91:1274–1280.
29. Ferguson LGA, McIlhenny C, Jack E, et al. Developing a Safe, Effective Theatre Department: Adopting a Quality Improvement Model, in NHS Scotland Event. Glasgow: NHS Scotland; 2013.
30. Langley GJ. *The improvement guide: a practical approach to enhancing organizational performance*. San Francisco: Jossey-Bass; 2009.
31. Allard J, Bleakley A, Hobbs A, et al. Pre-surgery briefings and safety climate in the operating theatre. *BMJ Qual Saf*. 2011;20:711–717.
32. Scottish Patient Safety Programme. Available at: http://www.scottishpatientsafetyprogramme.scot.nhs.uk. Accessed December 10, 2016.
33. Wu RL, Aufses AH Jr. *Characteristics and costs of surgical scheduling errors*. *Am J Surg*. 2012;204:468–473.
34. Reason JT. *The Human Contribution: Unsafe Acts, Accidents and Heroic Recoveries*. Farnham, England; Burlington: VT: Ashgate; 2008.
35. Cima RR, Hale C, Kollengode A, et al. Surgical case listing accuracy: failure analysis at a high-volume academic medical center. *Arch Surg*. 2010;145:641–646.
36. Stanton N. *Human Factors Methods: A Practical Guide for Engineering and Design*. Farnham: Ashgate Publishing Group; 2013.
37. Mcleod R, Randle I, Hamilton I, et al. Human Factors in Barrier Management: A White Paper. Loughborough, UK: Chartered Institute of Ergonomics and Human Factors; 2016.
38. Hollnagel E. Making health care resilient: from Safety-I to Safety-II. In: Hollnagel E, Wears RL, eds. *Resilient Health Care*. Surrey, England: Ashgate Publishing Limited; 2013:3–18.
39. National Quality Board. *Human Factors in Healthcare A Concordat from the National Quality Board*. London: NHS England; 2013.
40. Fruhen LS, Flin RH, McLeod R. Chronic unease for safety in managers: a conceptualisation. *J Risk Res*. 2014;17:969–979.
41. Vincent C, Burnett S, Carthey J. Safety measurement and monitoring in healthcare: a framework to guide clinical teams and healthcare organisations in maintaining safety. *BMJ Qual Saf*. 2014;23: 670–677.