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Adverse Events in Healthcare: learning from mistakes

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Abstract

Large national reviews of patient charts estimate that approximately 10% of hospital admissions are associated with an adverse event (defined as an injury resulting in prolonged hospitalisation, disability or death, caused by healthcare management). Apart from having a significant impact on patient morbidity and mortality, adverse events also result in increased healthcare costs due to longer hospital stays. Furthermore, a substantial proportion of adverse events are preventable. Through identifying the nature and rate of adverse events, initiatives to improve care can be developed. A variety of methods exist to gather adverse event data both retrospectively and prospectively but these do not necessarily capture the same events and there is variability in the definition of an adverse event. For example, hospital incident reporting collects only a very small fraction of the adverse events found in retrospective chart reviews. Until there are systematic methods to identify adverse events, progress in patient safety cannot be reliably measured. This review aims to discuss the need for a safety culture that can learn from adverse events, describe ways to measure adverse events, and comment on why current adverse event monitoring is unable to demonstrate trends in patient safety.

Introduction

Traditionally performance in hospitals has been measured using routinely reported health data. Nevertheless, these data failed to identify patient safety concerns and shortcomings in care at Mid Staffordshire Foundation National Health Service (NHS) Trust. The inquiry by Sir Robert Francis into the trust found that the focus on targets and financial reporting to multiple bodies occurred to the detriment of patient care and staff wellbeing.¹ The Francis report highlighted the need for a patient centred culture with the ability to collect, report, and analyse patient safety information.¹ However, in order to be able to evaluate safety performance, accurate and standardised data are required - including the systematic measurement of adverse events.²

Adverse event rates have been calculated in many different ways using a variety of data sources including patient charts, incident reporting, electronic databases, interviews of clinical staff, and examination of patients. Existing voluntary reporting collects only a small proportion of adverse events (around 1-10%) which are not representative of all adverse events (70% of those reported are falls, pressure ulcers and drug related events whereas these constitute only 26% of adverse events detected by case note review).³ However the definition of an adverse event can vary widely, for example a patient safety incident in the National Health Service is defined as 'any unintended or unexpected incident which could have or did lead to harm for one or more patients receiving NHS-funded healthcare'; thereby including incidents that result in no harm and also near misses.⁴ In comparison, the Harvard Medical Practice Study's methodology used in retrospective chart review

studies in several countries, considers adverse events to be injuries resulting in prolonged hospitalisation, disability or death, which are caused by healthcare management; thereby encouraging collection of more severe events.⁵ These large international reviews of patient charts estimate that between 4% and 17% of hospital admissions are associated with an adverse event and a significant proportion of these (one to two thirds) are preventable. (Figure1)⁵⁻¹⁵ Research in hospitals in London and Scotland demonstrated adverse event rates of approximately 10%.^{8 14 16} Older patients and those with multiple co-morbidities are at higher risk of suffering an adverse event.^{9 10} A systematic review of eight chart review studies (from the United States, Australia, the United Kingdom, New Zealand and Canada) found a median overall incidence of adverse events of 9.2% (of which approximately 43% were preventable), with over half being operation (40%) or drug (15%) related.¹⁷ In the majority of adverse events a surgical service was providing the care at the time the adverse event occurred (the median proportion across the studies was 58% for surgical compared with 24% for medical services).¹⁷ Although most adverse events resulted in little or no disability, a significant minority (median 14%) caused permanent disability (7%) or death (7%).¹⁷

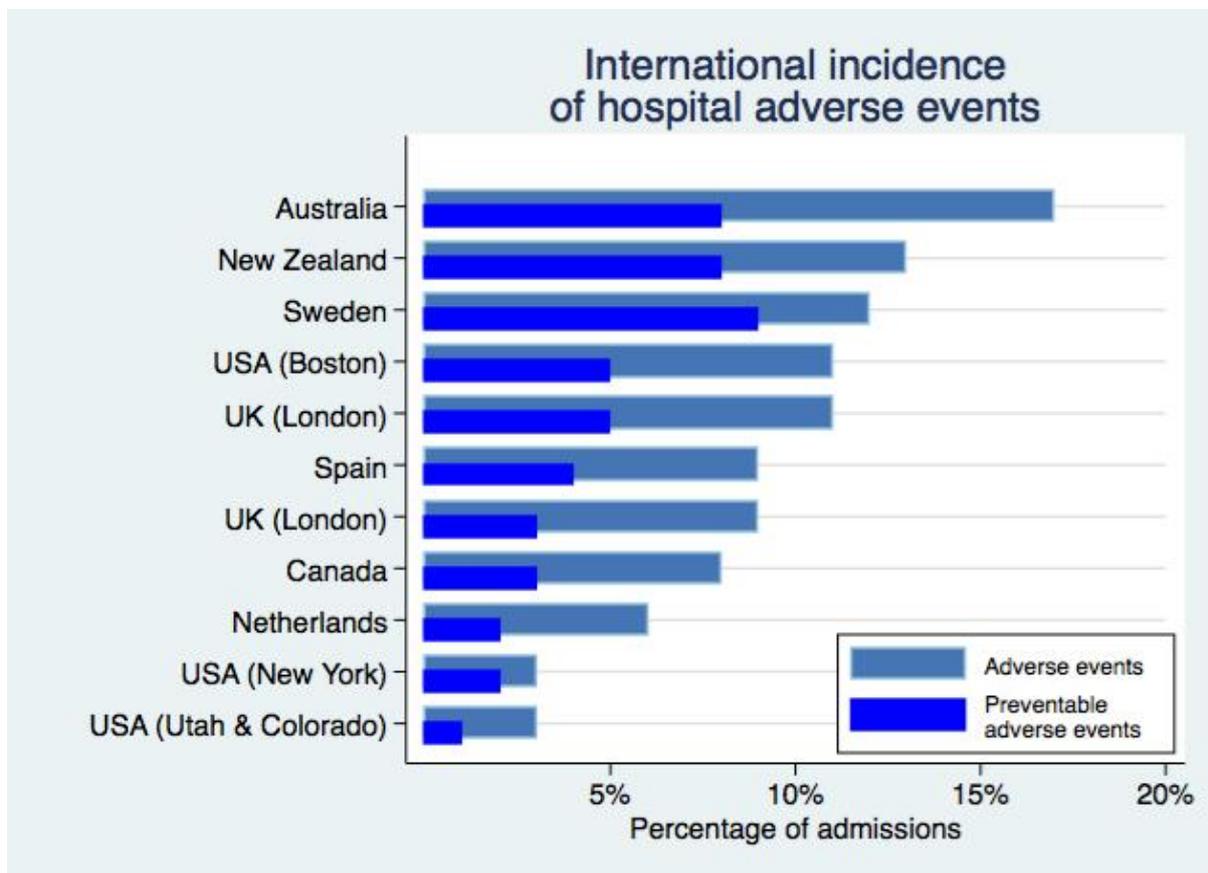


Figure 1 International incidence of hospital adverse events

A systems approach and a safety culture that learns from adverse events

In healthcare, adverse events occur within a complex socio-technical system. An adverse event is not necessarily the result of one person making a mistake at the frontline of healthcare; rather conditions in the system often enable the adverse event to occur.¹⁸ A systems approach assumes humans are fallible and errors are inevitable.¹⁹ Such an approach identifies the prevalence and nature of adverse events so that when errors are made, the apparent causes and underlying factors

are reviewed to generate ideas for system improvements. Systems are therefore designed for safety, making it difficult for adverse events to occur whilst mitigating the ones that do happen. In this way errors are detected and corrected before harm is caused.²⁰ Nevertheless, healthcare systems around the world have been slow to learn. An example is the continuing fatalities from intrathecal vincristine despite multiple reports, enhanced drug labelling, protocols and equipment modifications.²¹

The systems approach requires a shift from a blame culture which incentivises people to cover up, to an ethos of safety management in the context of a just culture to maximise the potential to avoid future adverse events. A just culture reflects the balance between no blame and accountability, with the latter being needed to successfully implement safety strategies through individuals being accountable for their role within a safety system.²² The aviation industry is often held as an exemplar in terms of an industry that was able to change its culture and markedly improve safety with confidential reporting of near-misses providing a rich source of data from which safety lessons can be learned. However, healthcare is a significantly more complex system and represents a broader challenge with barriers including paucity of safety champions and leadership, individual clinician autonomy competing with teamwork, and multiple opportunities for communication breakdown.²³

The Francis report into Mid Staffordshire called for ‘fundamental culture change’ with person centred patient care, and openness.¹ Its recommendations are not new - since 1999 government publications and safety investigations have advocated a national focus on patient safety, learning from failures and changing to a safety culture.¹⁹ The challenge of compliance with targets diverting focus from safer systems highlighted in the Francis report has also been demonstrated in qualitative research with other NHS hospitals, which found that clear organisational goals and leadership in patient safety are associated with greater patient satisfaction.²⁴

Reason to collect adverse event data

The occurrence of an adverse event has a number of detrimental effects on both patients and healthcare workers including physical and/or psychological harm, a loss of trust in the healthcare system, and reduced staff morale. Adverse events are associated with prolonged hospitalisation and are therefore expensive with additional societal costs in terms of reduced productivity and poorer population health. In the United Kingdom longer hospital stays due to adverse events are estimated to cost the government over £2 billion per year.¹⁹ The impact of adverse events on healthcare workers is an important consideration with staff often described as the “second victims” of adverse events.²⁵

Investigation of adverse events provides information on incidence and can demonstrate areas of risk and preventability that are amenable to action. Ideally, measurement of adverse event rates over time should be able to evaluate whether improvements are occurring. Local adverse event data may also highlight patient safety issues that require addressing at an organisational or local level as well as drive national policy. For example, in Canada, the publication of their first national adverse events study helped to launch the Canadian Patient Safety Institute.

Measuring adverse events

There is no gold standard for measuring adverse events, although retrospective chart review employing the Harvard Medical Practice Study approach is the standard methodology used in a number of international studies.⁵ This approach involves a two stage patient chart review with nurses initially screening patient notes for 'triggers' from a list of scenarios that may indicate an adverse event has occurred (e.g. unplanned admission to intensive care, unexpected death, etc) followed by physician review of 'triggered' charts for any adverse event using a standard definition.

The global trigger tool (GTT) was developed by the US Institute for Healthcare Improvement as a less labour intensive method of chart review to identify adverse events. The first phase utilises a larger list of triggers than the HMPS but limits reviewing to 20 minutes. Next, a physician assesses that potential adverse event only, not the entire record. A small number of charts are reviewed at each interval enabling change to be tracked over time. Using a broader definition of adverse events the GTT has identified higher rates of adverse events than the Harvard methodology (20- 30%). However, in a direct comparison with the same criteria for defining adverse events the HMPS method was found to be slightly more sensitive.²⁶ In the future, automation of the global trigger tool with the electronic health record may enhance its utility for healthcare organisations.²⁶

Prospective collection of adverse events involves researchers or clinicians at the clinical interface identifying events as they occur. This may entail any combination of chart review, electronic searches, interviewing patients and staff, direct observation on the ward, and clinical examination of patients. Prospective methods identify similar numbers of adverse events as retrospective chart review (70% and 66% of total adverse events respectively in one comparative study) but these are not necessarily the same cases indicating that the true adverse event rate is probably higher than either estimate alone.²⁷ Retrospective chart review does not impact on clinical work, yet it relies solely on the documentation available. Thus it can be difficult to judge preventability and may not be optimal for assessing the impacts of interventions to reduce adverse events or system factors responsible for particular events.²⁷ Prospective adverse event determination, with less recall bias, aids assessment of preventability and studying system factors but is an additional task for frontline staff.²⁷ These methods can also be used cross-sectionally though this has been found to elucidate fewer adverse events.²⁷ Consistency between reviewers is a challenge for all chart review studies and standardised reviewer training and computerised data entry have been recommended as ways to increase inter-rater reliability.¹⁰

Existing electronic data (e.g. admission or discharge clinical coding, private healthcare billing data) may be searched for adverse events with the benefits of being able to assess large numbers of patients/admissions and compare across different healthcare settings. However, this data (usually collected for other purposes) is dependent on the accuracy of the diagnostic coding system and limitations of the coding dictionary and has been found to have relatively poor sensitivity and specificity for adverse event identification.²⁸ To improve the utility and standardisation of electronic search methods the Agency for Healthcare Research and Quality (AHRQ) developed a list of diagnostic codes that are indicators of adverse events. Preliminary work adapted some of these for use with NHS admissions data. The study found that admissions with these codes had higher mortality, length of stay and readmission rates. There was however, substantial variability between trusts and it is not clear whether this was due to variations in secondary diagnosis coding or quality of care.²⁹ This method has been criticised for low sensitivity and may be better for case finding rather than quality of care reporting.²⁶ Future adverse event determination is likely to involve a

combination of electronic data searching (especially with the advent of electronic health records and greater availability of clinical coding) alongside chart review.²⁸

Lack of consistent measurement of adverse events hampers progress

A major barrier to progress in the field of patient safety appears to be the lack of reliable information on adverse events.² Despite the multitude of methods described above to identify adverse events there is no internationally agreed measurement strategy with the ability to identify and analyse adverse events and monitor the impact of safety improvement programmes.^{2,28} Following Mid Staffordshire the National Advisory Group on the Safety of Patients in England called for measures of harm to be reported but exactly which ones remains to be established; whilst the Francis report specifically recommended mandatory reporting of all incidents involving patient harm.

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More importantly though, is the need to move from unsystematic methods such as voluntary reporting to coordinated systematic measurement. This could involve a combination of several methods including national audits, screening programmes (e.g. screening samples of patients for adverse drug events), and annual reviews of patient charts.² Implementation of the electronic health record could also provide an opportunity to launch healthcare sector wide standardised reporting.²⁸ Nevertheless in order to provide systematic measurement of adverse events, patient safety tools must be built in to electronic databases using knowledge of the local context to inform development and implementation.^{2,28} Furthermore, process improvement alone will not be sufficient to change culture and any such initiatives will require leadership at all levels of the healthcare system.³¹

The lack of systematic adverse event measurement and reporting is likely to have contributed to the absence of clear evidence of an overall reduction in adverse events.^{23,28} Whilst there have been some successes in specific areas of healthcare delivery (e.g. prophylaxis of venous thromboembolism, hospital acquired infections, post operative complications) using evidence-based strategies and robust measuring systems^{23,31}, reviews of overall adverse event rates have shown mixed results.^{2,28,32} Mortality and adverse event-related cardiac surgery deaths appear to have decreased over recent years although there has been no trend in reduction in adverse drug events.² An analysis of data from the Medicare Patient Safety Monitoring System found reduced adverse event rates for patients admitted with acute myocardial infarction and heart failure (in particular for adverse events related to infections and medications) but not for those admitted with pneumonia or for surgery between 2005 and 2011.³² Another study using the global trigger tool to track adverse events across ten American hospitals over a 6-year period did not find any significant change in the rate of harm over time.³³

Conclusion

Twenty years on from the first retrospective chart review studies, patient safety and quality are an accepted part of healthcare delivery but there remains a lack of consensus on how to collect and measure adverse events. This has meant progress is difficult to quantify. The system, therefore, has a limited ability to learn from its mistakes. In order to achieve (and monitor) healthcare sector improvements in patient safety we must plan for, and implement, (inter)national, standardised, and systematic measurement of adverse events alongside a sustained focus on a culture of safety in all

areas of healthcare delivery. Only once this is occurring can we effect whole system change and observe overall impacts on patient care.

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References

1. Francis R. Independent inquiry into care provided by Mid Staffordshire NHS Foundation Trust January 2005 - March 2009. London: Stationery Office, 2010.
2. Vincent C, Aylin P, Franklin BD, Holmes A, Iskander S, Jacklin A, et al. Is health care getting safer? *British Medical Journal* 2008;337(a2426):1205-07.
3. Sari AB-A, Sheldon TA, Cracknell A, Turnbull A. Sensitivity of routine system for reporting patient safety incidents in an NHS hospital: retrospective patient case note review. *British Medical Journal* 2006.
4. NHS Patient Safety. <http://www.nrls.npsa.nhs.uk/report-a-patient-safety-incident/>.
5. Brennan TA, Leape LL, Laird NM, Hebert L, Localio AR, Lawthers AG, et al. Incidence of adverse events and negligence in hospitalized patients: results of the Harvard Medical Practice Study I. *New England Journal of Medicine* 1991;324:370-6.
6. Thomas EJ, Studdert DM, Burstin HR, Orav EJ, Zeena T, Williams EJ, et al. Incidence and Types of Adverse Events and Negligent Care in Utah and Colorado. *Medical Care* 2000;38(3):261-71.
7. Wilson RM, Runciman WB, Gibberd RW, Harrison BT, Newby L, Hamilton JD. The Quality in Australian Health Care Study. *Medical Journal of Australia* 1995;163(458-471).
8. Vincent C, Neale G, Woloshynowych M. Adverse events in British hospitals: preliminary retrospective record review. *British Medical Journal* 2001;322:517-9.
9. Davis P, Lay-Yee R, Briant R, Ali W, Scott A, Schug S. Adverse events in New Zealand public hospitals I: occurrence and impact. *New Zealand Medical Journal* 2002;115(1167).
10. Baker GR, Norton PG, Flintoff V, Blais R, Brown A, Cox J, et al. The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. *Journal Canadian Medical Association* 2004;170(11):1678-86.
11. Miguel Hernandez University, Ministry of Health and Consumer Affairs. National Study on Hospitalisation-Related Adverse Events ENEAS 2005. In: Quality Agency Administration National Health System, editor. Madrid: Ministry of Health and Consumer Affairs, 2006.
12. Soop M, Fryksmark U, Koster M, Haglund B. The incidence of adverse events in Swedish hospitals: a retrospective medical record review study. *International Journal for Quality in Health Care* 2009;21(4):285-91.
13. Zegers M, Bruijine MCd, Wagner C, Hoonhout LHF, Waaijman R, Smits M, et al. Adverse events and potentially preventable deaths in Dutch hospitals: results of a retrospective patient record review study. *Quality Safety Health Care* 2009;18:297-302.
14. Sari AB-A, Sheldon TA, Cracknell A, Turnbull A, Dobson Y, Grant C, et al. Extent, nature and consequences of adverse events: results of a retrospective casenote review in a large NHS hospital. *Quality Safety Health Care* 2007;16:434-9.
15. Bates DW, O'Neil AC, Petersen LA, Lee TH, Brennan TA. Evaluation of Screening Criteria for Adverse Events in Medical Patients. *Medical Care* 1995;33(5):452-62.
16. Williams DJ, Olsen S, Crichton W, Witte K, Flin R, Ingram J, et al. Detection of Adverse Events in a Scottish Hospital Using a Consensus-based Methodology. *Scottish Medical Journal* 2008;53(4):26-30.

17. de Vries EN, Ramrattan MA, Smorenburg SM, Gouma DJ, Boermeester MA. The incidence and nature of in-hospital adverse events: a systematic review. *Quality Safety Health Care* 2008;17:216-23.
18. Reason J. Human error: models and management. *British Medical Journal* 2000;320:768-70.
19. Department of Health. An Organisation with Memory. London: The Stationery Office, 2000.
20. Leape LL. Why should we report adverse incidents. *Journal of Evaluation in Clinical Practice* 1999;4(1):1-4.
21. Noble DJ, Donaldson LJ. The quest of eliminate intrathecal vincristine errors: a 40-year journey. *Quality Safety Health Care* 2009.
22. Wachter RM, Pronovost PJ. Balancing "No Blame" with Accountability in Patient Safety. *New England Journal of Medicine* 2009;361(14):1401-6.
23. Leape LL, Berwick DM. Five Years After *To Err Is Human* What Have We Learned? *Journal of the American Medical Association* 2005;293:2384-90.
24. Dixon-Woods M, Baker R, Charles K, Dawson J, Jerzembek G, Martin G, et al. Culture and behaviour in the English National Health Service: overview of lessons from a large multimethod study. *BMJ Quality Safety* 2014;23:106-15.
25. Wu AW, Steckelberg RC. Medical error, incident investigation and the second victim: doing better but feeling worse? *BMJ Quality Safety* 2012;21:267-70.
26. Classen DC, Resar R, Griffin F, Federico F, Frankel T, Kimmel N, et al. 'Global Trigger Tool' Shows That Adverse Events In Hospitals May Be Ten Times Greater Than Previously Measured. *Health Affairs* 2011;30(4):581-9.
27. Michel P, Quenon JL, Saraqueta AMd, Scemama O. Comparison of three methods for estimating rates of adverse events and rates of preventable adverse events in acute care hospitals. *British Medical Journal* 2004;328:199-204.
28. Jha AK, Classen DC. Getting Moving on Patient Safety - Harnessing Electronic Data for Safer Care. *New England Journal of Medicine* 2011;365(19):1756-8.
29. Bottle A, Aylin P. Application of AHRQ patient safety indicators to English hospital data. *Quality Safety Health Care* 2009;18:303-8.
30. National Advisory Group on the Safety of Patients in England. A promise to learn - a commitment to act. Improving the Safety of Patients in England: Department of Health, 2013.
31. Muething SE, Goudie A, Schoettker PJ, Donnelly LF, Goodfriend MA, Bracke TM, et al. Quality Improvement Initiative to Reduce Serious Safety Events and Improve Patient Safety Culture. *Pediatrics* 2012;130(e423).
32. Wang Y, Eldridge N, Metersky ML, Verzier NR, Meehan TP, Pandolfi MM, et al. National Trends in Patient Safety for Four Common Conditions, 2005-2011. *New England Journal of Medicine* 2014;370(4):341-51.
33. Landrigan CP, Parry GJ, Bones CB, Hackbarth AD, Goldmann DA, Sharek PJ. Temporal Trends in Rates of Patient Harm Resulting from Medical Care. *New England Journal of Medicine* 2010;363:2124-34.