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Critical incident reporting and learning

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Key points

- Critical incident reporting, key in improving safety, is under-utilized in health-care systems.
- Reported incidents should be handled in non-punitive manner.
- The analysis should take human factors approach, using standardized framework.
- Feedback, regular and detailed, is crucial in engaging clinicians 'in the loop'.

Summary. The success of incident reporting in improving safety, although obvious in aviation and other high-risk industries, is yet to be seen in health-care systems. An incident reporting system which would improve patient safety would allow front-end clinicians to have easy access for reporting an incident with an understanding that their report will be handled in a non-punitive manner, and that it will lead to enhanced learning regarding the causation of the incident and systemic changes which will prevent it from recurring. At present, significant problems remain with local and national incident reporting systems. These include fear of punitive action, poor safety culture in an organization, lack of understanding among clinicians about what should be reported, lack of awareness of how the reported incidents will be analysed, and how will the reports ultimately lead to changes which will improve patient safety. In particular, lack of systematic analysis of the reports and feedback directly to the clinicians are seen as major barriers to clinical engagement. In this review, robust systematic methodology of analysing incidents is discussed. This methodology is based on human factors model, and the learning paradigm which emphasizes significant shift from traditional judicial approach to understanding how 'latent errors' may play a role in a chain of events which can set up an 'active error' to occur. Feedback directly to the clinicians is extremely important for keeping them 'in the loop' for their continued engagement, and it should target different levels of analyses. In addition to high-level information on the types of incidents, the feedback should incorporate results of the analyses of active and latent factors. Finally, it should inform what actions, and at what level/stage, have been taken in response to the reported incidents. For this, local and national systems will be required to work in close cooperation, so that the lessons can be learnt and actions taken within an organization, and across organizations. In the UK, a recently introduced speciality-specific incident reporting system for anaesthesia aims to incorporate the elements of successful reporting system, as presented in this review, to achieve enhanced clinical engagement and improved patient safety.

Keywords: medical errors; quality assurance, health care; risk management; safety

Patient safety has been, and still is, a cause for concern in health-care systems all over the world, including the NHS. Every year, ~900 000 incidents and near misses are reported around NHS care, ~2000 of which result in death. Additional hospital stay costs are approximately £2 billion a year, and the negligence claims amount to an extra £400 million a year.[1] Incident reporting systems have been a key tool to improve safety and enhance organizational learning from incidents in a range of high-risk organizations (commercial aviation, rail industry, and others). Although incident reporting has been instituted in health-care systems in many countries for sometime now, similar positive experience is yet to be fully realized.

In this article, I aim to review the essential components of a successful incident reporting system, framework for analysing the reported incidents, and current understanding of barriers and enablers to successful incident reporting.

Incident reporting systems

Investigation of critical incidents was first used in the 1940s by Flanagan[2] as a technique to improve safety and performance among military pilots. Cooper and colleagues,[3] in 1978, used a 'modified critical incident technique' in which they interviewed anaesthetists and obtained descriptions of preventable incidents. Individual departments of anaesthesia now have systems in place to record and discuss adverse incidents and near misses with a view to improve patient safety by learning from these incidents.[4]

The main reason for reporting incidents to improve patient safety is the belief that safety can be improved by learning from incidents and near misses, rather than pretending that they have not happened.[5] In the last two decades, authors have highlighted the need to gather information which can be used to improve hospital systems to minimize

errors in healthcare,[6] and many strategies and tools have also been developed to reduce errors.[7] The calls have been made by quality and safety organizations, and the consumers of health-care systems,[8] for incident reporting to better understand errors and their contributing factors.[9–11] Internationally, WHO has work in progress to develop guidelines for implementing effective reporting systems.[12]

A successful translation of incident reporting to learning the lessons depends upon four basic activities relevant to an iterative loop.[13]

(i) *Data input*. Lessons have been learnt from the aviation industry that the systems for data input need to be independent and non-punitive to enhance learning culture.

(ii) *The data*. The way in which information is gathered and handled is extremely important in determining the quality of the report. Systems which have too many closed questions do not allow free expression of 'what actually happened'. It is vital that the staff are given opportunity to narrate their own version of events. Such data would reflect true nature of the incident, better chronology of events, and would give better feel for the multitude of factors that link in the evolution of an incident.

(iii) *Analysis*. This phase turns a report into a lesson. This key step requires experts from the speciality, and human performance (or safety), to work together to interrogate data and generate meaningful learning outcomes. The analysis phase is probably the lengthiest and will require the experts to link different components of the system and the front-end failures that lead to an incident. It is important that a standardized methodology is adopted at this stage (see below).

(iv) *Feedback*. All parties involved must be prepared to share ideas, abandon defensiveness, and put blame and recriminations aside. The goal of feedback must be to learn from mistakes, and to ensure that the systems are improved for better patient safety in the future. The feedback should be through multiple sources right from the high-level managerial staff to the front-end clinical staff. It is extremely important that all staff can see something positive coming out of the incident reporting for them to continue to participate in the process.

In the UK, subsequent to two seminal reports ('To Err Is Human' and 'An Organization with a Memory'; 2000),[10 11] in 2001, the National Patient Safety Agency (NPSA) set up a reporting and learning system (RLS) for the NHS. This system is generic for all the specialities, and to date, has accumulated over 4 million incidents. Catchpole and colleagues[14] recently reviewed more than 12 000 anaesthesia-related incidents reported to RLS. The review provided extremely useful insight into the kinds of incidents that had been reported to RLS, and therefore, highlighted the areas of practice where further efforts are required to reduce errors. However, as admitted by the authors, and pointed out in the accompanying editorial,[15] the analyses were significantly hampered by the quality of the reports. There is no doubt that good 'quality' of reports is a definite prerequisite for meaningful analysis. For this, engagement of clinicians, in particular doctors, is crucial. Lack of engagement from doctors and under-utilization of a potentially valuable national resource (RLS) were highlighted in the report of the Health Committee of House of Commons on Patient Safety.[16] This committee has called for efforts to be made at all levels to enhance clinical engagement in incident reporting.

Analysis of the reported incidents

A good quality report should lend itself for detailed analysis of the chain of events that lead to the incident. This knowledge can then be used to consider what interventions, and at what level in the chain, can prevent the incident from occurring again. The concept and proposed framework of investigating and analysing clinical incidents, as reviewed in the following, highlight the areas of information which a good quality report should be able to capture.

In the context of individual and organizational factors, often a complex chain of events can be seen that lead to an adverse outcome.[17–19] It has been argued that the comprehensive analysis of incidents must pay attention to psychological and human factors in the nature, mechanisms, and causes of the error.[6] In this regard, the national reporting systems have to work alongside the local risk management structures for comprehensive analyses and cross-learning from the incidents. Therefore, it becomes logical that a standardized framework is used at all levels for analysis of the incidents.

A high-level analysis of the number and kinds of incidents can be performed at the national level, and disseminated widely. This has the advantage of highlighting the areas for improvement (e.g. medication errors, retained throat packs), and for further focus by national organizations to trigger further actions such as raising awareness, research, audits, training initiatives, curriculum, and specific guidelines. However, such high-level analyses are not sufficient, on their own, to improve safety at the local level. Local safety initiatives of investigating and analysing incidents are extremely important to get into the root cause of the incidents and how these can be prevented in the future.

The paradigm for analysis and learning

The traditional approach of quick judgements and routine assignment of blame often obscure a more complex truth. Also, the usual practice of analysing only those incidents which lead to actual patient harm, in fact, misses big opportunities to learn from near misses, or where an incident was effectively managed without actual harm. Hence, the learning paradigm for incident reporting has to be shifted from the traditional 'judicial' approach towards a mutual search for opportunities for improvement.

Human factors approach

The causation of a safety incident which, at first, is identified by an obvious departure from good practice, or active failures, often has a number of factors related to the working environment and wider organizational context working in the background and influencing the outcome. The 'human factors' approach focuses on the human component within complex organizational (socio-technical) systems. Thus, it has less focus on the individual who makes an error and more on the pre-existing organizational factors that set up the conditions for an error to occur.[20–22] The approach, based on Reason's model of organizational accidents and adapted for medical settings,[20–24] allows examination of the chain of events that lead to an accident.

The contribution of human decisions, actions, or both to an accident can be due to active failures, latent failures, or both.[20] Active failures are unsafe acts or omissions performed by the front-end workers (anaesthetists, surgeons, nurses), and these include slips (wrong label, wrong syringe), cognitive failure (memory lapses, ignorance, misreading a situation), or violations (deviations from safe practices, procedures, or standards). Latent failures,[22] in the context of health-care systems, refer to decisions taken by senior management or clinicians, which create the conditions in an organization for unsafe acts to occur; these conditions include inadequate or inappropriate staffing, heavy workload, poor supervision, stressful environment, poor communication, poor maintenance of equipment, and conflict of priorities (finance *vs* clinical need). Hence, in the analyses of adverse events, a systematic approach of understanding the anatomy of evolution or generation of incidents, and a hierarchy of the factors which are involved, should be undertaken.

For healthcare, Vincent and colleagues[25] have described a framework for analysing critical incidents. This framework includes factors of relevance to medicine by combining the strengths of Reason's model of organizational accidents[20 21] with socio-technical pyramid of Hurst and Ratcliffe.[26–29] The framework has been summarized in Table 1. In this framework, the hierarchy of factors has been derived from previous publications,[6 17–19 22 23 29 30] and includes the factors which are known to influence clinical practice and outcome. In this hierarchy of factors, patients and staff as individuals are at the front-end (bottom) of the factors, team factors and working conditions in the middle, and organizational/institutional factors at the top. The condition of the patient, clearly, is an important direct predictor of outcome. Also, the adverse events are more likely to occur when the patient is already seriously ill.[31 32] The experience, training, and familiarity with the working environment of the staff may also be influential. Each member of the staff is part of a team, and his/her performance may be influenced by other members of the team, and how teams are organized, and how they support, supervise, monitor, and communicate with each other. The team performance, in turn, is influenced by management decisions made at a higher level in the organization. Hence, the senior clinicians and managers may influence a team's performance by influencing the 'work environment', which includes factors such as staffing level, working hours, equipment availability and maintenance, guidelines and protocols, and education and training. Finally, external factors such as political climate and priorities, financial constraints, regulatory bodies, and public expectation may have a powerful effect on the working of an organization.

Table 1 Framework as proposed by Vincent and colleagues[24] for analysing critical incidents

Main factors	Contributory factors
Institutional	Economic pressures, regulations, NHS executive, clinical negligence schemes
Organizational	Financial priorities, structure, local policies, standards, safety culture
Work environment	Staffing, skill mix, workload, shift patterns, design, equipment availability and maintenance, support
Team factors	Communication, supervision, team culture
Individual	Knowledge, skills, competence, health
Task factors	Task design, availability and use of protocols, test results, patient notes—accuracy and availability
Patient factors	Complexity and seriousness, language, communication, personality, social factors

The framework for analysis can also be taken to understand what components of information are required in a good quality report to allow a detailed, systematic, and meaningful analysis. Crucially, the framework provides the researchers and the risk managers a formal structure for collection of information and analysis of critical incidents, where rather than focusing mainly on the actions of the front-line staff, the emphasis is on examining the whole gamut of possible influences. The safer practice can only come from acknowledging all the possible factors in the potential for error, and building in multi-level error reduction strategies at every stage of the chain that leads to generation of an error.[6] This comprehensive approach of multiple levels of intervention requires the clinicians and the managers to significantly shift away from the often practiced, and rarely effective, approach of one-level of intervention (e.g. staff training or tightening protocols).

Components of incident analysis

A clear definition is required of which incidents should be reported and investigated. An incident that leads to patient harm always gets investigated according to its seriousness as per local governance policies. In this regard, some investigations are started almost immediately. However, this process should not underestimate the potential of analysing incidents that are near misses, or which have not led to patient harm.

The elements of an investigative or analytic process, as in practice, are summarized in the following.[13]

Identifying the most obvious active failure(s)

The active failures are also known as care management problems (CMP). These include delayed diagnosis, inadequate handover, failure to monitor, lack of preoperative check, protocol violation, incorrect treatment, not seeking help, inadequate supervision, etc.

Framing the problem

This is not straightforward. Often the problem originates at a time point which is earlier than the time point at which the problem occurs. Therefore, accurate assessment of chronology and the details of the events leading on to the incident is important in framing the problem.

Defining the problem (what, how, and why)

In addition to the reported incident, case notes studies and interviews of the key staff members may be undertaken. The line of enquiry should first determine exactly *what* happened in terms of CMPs and chronology of the events. In the next stage, it should establish, without being punitive, *how* it happened. All important acts or omissions made by staff, and with hindsight the important chain of events which set up the conditions for the incident to occur. Subsequent line of enquiry should elicit the reasons behind certain acts or omissions. The next step is to define *why*. For each CMP, contributory factors, as outlined in the framework, should be explored. These could be specific contributory factors at different levels (e.g. lack of knowledge or training at individual level, unavailability of protocols at task level, poor communication at team level, or inadequate staffing at organizational level). The specific factors will need to be distinguished from, or studied in context with, general contributory factors such as poor safety culture within an organization, overall poor communication, poor training, overstretched staff rotas, or faulty/incomprehensible guidelines.

A separate analysis should be carried out for each CMP using a standardized framework. The final analysis will report summary of chronology, CMPs, and their contributory causes, and give recommendations for further actions for each contributory factor (in particular, the general contributory factors).

Strengths, limitations, barriers, and enablers

Among different strategies to gather information and reduce errors,[7] review of a randomly selected, or targeted, sample of medical records has also been used to identify problem areas. However, because of the limitations in the exiting classification system,[33] infrequently occurring errors may not be picked up using this method. One of the strengths of incident reporting is that it tends to capture more contextual information about the incidents.[34] Also, successfully implemented incident reporting can detect more preventable adverse events than medical record review,[35] and it is more cost-effective.[36]

The medical records, although reasonably good at describing adverse events, rarely document near misses. In practice, near misses occur more frequently than the adverse events[37] and provide equally valuable information for drawing up of important clinical lessons without the detrimental consequences of an adverse event.[10 11] Hence, reporting of near misses provides valuable information for systems improvement without patients or staff having suffered the consequences of adverse events.

Despite the known and well-advertised strengths of the incident reporting systems, under-reporting, in particular by doctors, remains a significant problem. It is possible that the incidents are just not recognized, or are not simply documented properly.[38] However, there may be deeper cultural issues acting as barriers to incident reporting. The rates of adverse events are estimated to range between 2.9% and 16.6% in acute care hospitals.[39] It is therefore only logical to assume that the doctors and the nurses working in hospitals will be familiar with these events, and would have come across and reported them. In a recent study,[40] despite most staff being aware of the existence of an incident reporting system, 25% did not know how to access an incident form, and more than 40% of consultants and registrars had never completed a report.

The research has shown that, in general, only a small percentage of doctors report incidents formally.[41 42] One of the reasons could be unfamiliarity with the process.[43] Other factors which have been identified are cultural issues such as fear of punitive action,[44 45] legal ramifications, and discrimination at the workplace.[46] Poor reporting practices by doctors may also reflect prevailing deeply entrenched belief in medicine that only bad doctors make mistakes.

Other factors responsible for poor reporting are related to lack of clarity regarding what should be reported, and how the reports might lead to improvement in the existing systems.[42 47–51] A recent study has confirmed the commonly observed phenomenon that the incidents which were immediate, and often witnessed (e.g. falls, equipment problems, drug errors) are better reported than the incidents which had gradual development, and could not be assigned to a single causative factor, or were considered to be known complications of hospitalization (hospital acquired infections, deep vein thrombosis).[40] Many staff do not consider near misses to be reportable incidents, which are a rich source for learning.[37] Also many doctors do not consider omission of medication to be reportable, which again indicates lack of essential knowledge about what should be reported, given that acts of omission have been implicated in twice as many adverse events as acts of commission.[52] Organizational factors which make reporting difficult (long forms, insufficient time, and no feedback) have also been identified as major barriers to reporting.[41]

Studies that have shown to improve incident reporting have used strategies of intense facilitation, either through

ward rounds or staff reminders.[35 36 53] The level of reporting in an organization has also been correlated with the existing safety culture.[54] Therefore, at organizational level, any effort to improve incident reporting and learning should begin with assessment of prevailing safety culture within an organization, and long-term, sustained programme of improving it. The key to the success of incident reporting systems in improving patient safety lies in the fact that the front-line clinician must know and believe that the reported incidents will not end up in a 'dark hole', but will be analysed in a systematic non-punitive manner, and will result in actions which will ultimately improve patient safety. At present, most of the world class reporting systems in healthcare have a long way to go in engaging clinicians. Keeping the clinicians 'in the loop' by providing robust, regular, and direct feedback is essential in achieving it.

Almost two-thirds of respondents in a survey believed that lack of feedback was the greatest deterrent to reporting.[40] The perceptions that management does not act on the submitted reports and that no measurable change results from reporting lead to apathy among clinicians and reluctance to report incidents.[48] Small studies have shown that dissemination of information in newsletters and at monthly departmental meetings increases the rate of reporting.[55] In another study involving eight US hospitals, data quality, timeliness and credibility, leadership, and persistence in data feedback processes were identified as important factors for effective improvement.[56]

Other measures that improve reporting include demonstrating the local usefulness of data, development of external reports,[57] follow-up from incident reporting, root cause analysis, and executive leadership walkrounds.[58] A variety of feedback mechanisms are currently being used by different systems. These include safety committee processes, publications, electronic dissemination, staff bulletins, manuals, conferences, education and training, and leadership walkarounds.[58–67] However, more work is required to gather conclusive evidence that such measures have an impact on the level and quality of reporting, existing safety culture, and ultimately patient safety. Provision of such evidence will be crucial in setting up an upward spiral in which the front-line clinicians feel part of the 'loop' and empowered to improve existing systems and patient safety.

Recently, in the UK, in partnership with the Royal College of Anaesthetists (RCoA) and Association of Anaesthetists in Great Britain and Ireland (AAGBI), the NPSA has developed and launched a speciality-specific critical incident reporting system for anaesthesia, which incorporates most of the features of a potentially successful system, in terms of data capture, analysis, and feedback, which have been covered in this review.[68 69] The three partner organizations in this endeavour cover a range of areas of governance and professional expertise. The NPSA has the machinery and mechanisms to facilitate reporting, and the RCoA and AAGBI have strong commitment to professional standards, training, curriculum, examinations, guidelines and recommendations, national audits, and research. This collaboration in anaesthesia between professional bodies and a Department of Health organization at the national level, to improve patient safety, is unique in the world. The evidence that this endeavour will, in fact, enhance the level and quality of reporting, and safety culture, within and across NHS hospitals, will be instrumental in triggering other clinical specialities to follow the lead.

Conflict of interest

Professor Ravi Mahajan is Chairman of Safe Anaesthesia Liaison Group at the Royal College of Anaesthetists.

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