

# Critical incident monitoring in paediatric and adult critical care: from reporting to improved patient outcomes?

Bernhard Frey<sup>a</sup> and David Schwappach<sup>b,c</sup>

<sup>a</sup>Department of Intensive Care and Neonatology, University Children's Hospital, <sup>b</sup>Patient Safety Foundation, Zurich and <sup>c</sup>Institute of Social and Preventive Medicine (ISPM), University of Bern, Bern, Switzerland

Correspondence to Bernhard Frey, Department of Intensive Care and Neonatology, University Children's Hospital, CH-8032 Zurich, Switzerland  
Tel: +41 44 266 73 59; fax: +41 44 266 71 68;  
e-mail: bernhard.frey@kispi.uzh.ch

**Current Opinion in Critical Care** 2010, 16:000–000

## Purpose of review

Critical incident reporting alone does not necessarily improve patient safety or even patient outcomes. Substantial improvement has been made by focusing on the further two steps of critical incident monitoring, that is, the analysis of critical incidents and implementation of system changes. The system approach to patient safety had an impact on the view about the patient's role in safety. This review aims to analyse recent advances in the technique of reporting, the analysis of reported incidents, and the implementation of actual system improvements. It also explores how families should be approached about safety issues.

## Recent findings

It is essential to make as many critical incidents as possible known to the intensive care team. Several factors have been shown to increase the reporting rate: anonymity, regular feedback about the errors reported, and the existence of a safety climate. Risk scoring of critical incident reports and root cause analysis may help in the analysis of incidents. Research suggests that patients can be successfully involved in safety.

## Summary

A persisting high number of reported incidents is anticipated and regarded as continuing good safety culture. However, only the implementation of system changes, based on incident reports, and also involving the expertise of patients and their families, has the potential to improve patient outcome. Hard outcome criteria, such as standardized mortality ratio, have not yet been shown to improve as a result of critical incident monitoring.

## Keywords

critical incident, patient involvement, patient outcome, safety

Curr Opin Crit Care 16:000–000  
© 2010 Wolters Kluwer Health | Lippincott Williams & Wilkins  
1070-5295

---

## Introduction

The first reports on monitoring adverse events and/or near misses in adult and paediatric intensive care were published in the 1980s [1,2]. The Australian incident monitoring study in intensive care unit (AIMS-ICU) [3] introduced the methodology of anonymous, voluntary, nonpunitive reporting of critical incidents in adult intensive care. A critical incident has been defined as any event that could have reduced, or did reduce, the safety margin for the patient, therefore comprising actual patient injury (adverse events) and near misses. Intensivists became aware of the dimension of safety problems in the ICU by these first reports. Numerous subsequent studies on critical incident monitoring (CIM) confirmed the safety problems in the complex ICU environment [4,5,6,7,8,9]. It was the adoption of the system approach, which made it possible that ICU personnel actually reported safety incidents. The system approach regards errors and deviations not as individual human failures, but as opportunities to improve

the system [10]. A cultural change from attributing blame to incident precipitators away to how work is best organized, took place [11]. However, it became obvious that reporting alone does not necessarily improve patient safety or even patient outcomes and in recent years substantial improvement has been made by focusing on the further two steps of CIM, that is, the analysis of critical incidents and implementation of system changes. Furthermore, the system approach to patient safety had an impact on the view about the patient's role in safety and how families should be approached about safety issues.

---

## Step 1: collection of critical incidents – the technique of reporting

Critical incidents are reported to spot patient safety problems. Therefore, it is essential to make as many critical incidents as possible known to the intensive care team. Several factors have been shown to increase the reporting rate: anonymity, regular feedback about the

errors reported [12–14], and the existence of a safety climate [15,16,17\*]. It is not clear, whether an electronic format or a paper-based system yields more reports [13,18]. This may depend on individual local conditions. It has been shown repeatedly that nurses are more likely to report incidents and errors as compared to doctors [12,13,18–20]. This is of major concern as critical incidents related to misdiagnosis or delayed therapy are rarely reported in the absence of physician participation [20]. There are some more fields of controversy. Should incident reports focus on actual harm, near misses, or both of them? We believe that both events should be monitored in order to spot a wide range of patient safety problems. (Major) complications are rare and usually they are made known to all staff whereas unspectacular incidents might go unrecognized by the team. However, it is these incidents which allow us to find system failures and improve patient safety [4]. Should CIM be locally based or should multicentre (national, international) reporting systems be preferred? Healthcare institutions vary widely in the type of patients they see and the way they are organized. Therefore, local expertise is very important to allocate corrective resources to local priorities [5,21]. On the other hand, reporting systems that include multiple hospitals may provide a greater opportunity to identify higher level system factors and sentinel events [11,22,23]. An example of a multicentre CIM system is the Intensive Care Unit Safety Reporting System (ICUSRS) in the USA [6\*,7].

mechanical ventilation incident, but it is categorized in some places as a communication incident. In practice, however, categorization is not crucial for the success of CIM. Although there are different categorization approaches, it is consistently found that medication errors are the most common type of ICU incidents [4,5,6\*,7]. For further analysis, risk scoring of critical incident reports may be of value. For each incident, a score of actual/potential severity (1–5, negligible to catastrophic) is multiplied by a score of likelihood (1–5, rare to frequent) [24]. The product gives the patient safety index, which can be divided into low (1–5 points), medium (6–14), and high (15–25) (Table 1). Critical incidents with a high index may then undergo an in-depth analysis. The ‘London-Protocol’ is an excellent means for this kind of analysis (root cause analysis) [25]. In brief, such analysis covers the following steps: the chronological course of events leading to the incident is evaluated; faulty events are identified (e.g. prescription of wrong dose of drug); and contributing factors are identified (seven major categories: patient characteristics, task, provider, training/education, team, managerial, and organizational environment). Skapik *et al.* [6\*] describe a CIM system where reporters can select one or more contributing factors for each incident, thus easing further incident analysis; and four specific measures are developed. The critical incident group then presents the categorized list of reported incidents with the proposed measures to prevent the recurrence of individual incidents, to the whole ICU team. This is a very important step. The whole intensive care team must be actively involved in the work-up and discussion of critical incidents [4]. It is only by this means that frontline personnel is actively involved in reporting incidents and is keen to follow organizational changes decided on and will be motivated to continuous reporting. The whole team must be the owner of the CIM. Analyses and subsequent team discussions may be performed every second or third month. Selected incidents may be discussed on the occasion of a morbidity mortality conference [26]. When analysing critical incidents in paediatric ICUs, the role of the parents has to be kept in mind. Because of their presence at the bedside, parents are inevitably involved in safety issues. It has been shown that parents are involved as contributors or detectors of critical incidents and that they are affected by critical incidents [27\*].

**Step 2: analysis of reported incidents**

It is most important that the incident reports are analysed by an interdisciplinary group (critical incident group), comprising nurses, doctors, technicians and pharmacists, senior and junior professionals. First, incidents are categorized. There are many different approaches to categorization in intensive care, for example, mechanical ventilation, intravascular lines, other material/equipment, medication/nutrition/blood products, diagnostic procedures, and others [5]. Some of the proposed categorizations mix up event types and contributing factors [9], for example, a nurse fails to communicate at the hand over that the peak inspiratory pressure of the ventilator has to be decreased; this incident may be categorized as a

**Table 1 Risk scoring system**

	1 Rare (~1×/10 years)	2 Unlikely (1×/3 years)	3 Possible (1×/year)	4 Likely (1×/3 months)	5 Frequent (1×/month)
Likelihood score					
Consequence score					
5 Catastrophic (death or permanent disability)	5	10	15	20	25
4 Major (long-term disability)	4	8	12	16	20
3 Moderate (injury requiring intervention in ICU)	3	6	9	12	15
2 Minor (injury requiring intervention not bound to ICU)	2	4	6	8	10
1 Negligible (no intervention needed)	1	2	3	4	5

Adapted from [24].

An issue of ongoing debate is the relevance of the number of reported incidents [28]. Pronovost *et al.* [11] clearly state that CIM should be viewed as a screening tool that does not provide measures of performance in patient safety as it lacks a denominator. There is also bias in what factors are reported and identified. It has been questioned whether the number of reported incidents reflects quality of care (that is the true number of incidents and patient outcome) or whether the number reflects the safety culture in a healthcare institution [22,29]. A decreasing number of reported incidents indicates improving quality in the former case, whereas a persisting high number of reported incidents is anticipated and regarded as continuing good safety culture in the latter case. In accordance with this latter concept, we even observed an increase in reports of breast milk administration errors in our neonatal ICU after introducing a system change (improved labelling of milk bottles) [30]. This may be due to a more attentive monitoring as nurses became more aware of the specific problem and were consistently encouraged to report breast milk administration errors. Conversely, Ligi *et al.* [5] calculated rates of critical incidents per 1000 patient days in a neonatal ICU and claim that this prospective method will allow the effect of prevention strategies to be assessed. We doubt that this works with a voluntary reporting system. However, one or two clearly defined events may be monitored as quality indicators by means of a CIM system. Their reporting is compulsory. We do that successfully for accidental extubations. Each year we calculate the rate of accidental extubations (per 100 intubation days) and are able to compare this figure with our previous numbers and with numbers in the literature.

**Step 3: implementation of system changes**

This is the most difficult step. Once specific system changes have been decided on, tasks must be allocated to named individuals, times must be set for review of these actions, and the progress of implementation should be recorded (Table 2) [31]. It has to be kept in mind that there are strong and weak measures (e.g. strong measures: new equipment, elimination of unnecessary steps, standardizing processes; weak measures: double checks,

warnings, training, additional analyses) [32]. Is there any evidence that critical incident monitoring does improve patient outcomes? Valentin *et al.* [33] found that an existing critical incident reporting system was an independent predictor for a lower risk of parenteral drug administration errors with respect to all types of error. However, to date there is no study that showed that critical incident monitoring in ICU independently decreased the standardized mortality ratio (observed mortality/expected mortality).

**How should families be approached about safety issues?**

Safety of medical care is a major concern for patients and their families in the hospital environment [34,35,36]. Burroughs *et al.* [37] report that 39% of surveyed patients experienced at least one error-related concern, most commonly medication errors and nursing mistakes. As members of the healthcare team, patients and their families can make important and active contributions to reporting and prevention of safety-related incidents and medical errors [38].

**Patients and families as observers of unsafe practices and errors**

Patients are sensitive observers of the care they receive [39,40], though their concepts of ‘safety’, ‘adverse events’, and ‘medical errors’ often differ from professional definitions, and are usually broader [37,41]. Survey studies suggest, however, that patients can accurately identify adverse events and medical errors [42,43]. The incidence rate for adverse events reported by patients varies considerably (0.1–5.8/patient), depending on populations studied, time frame, survey technique, and definitions [42]. In a survey study among patients discharged from a Swiss university hospital, 8.2% reported that they acquired a nosocomial infection, 2.2% reported an injury resulting from a fall during their stay, and 1.9% believed they had been confused with other patients [43]. Fifty percent reported at least one event. In a US sample, 25% of patients reported at least one unexpected ‘negative’ event during their hospitalization that was confirmed in physician review [44]. Reactions to newly prescribed drugs were the most common reported events (40%). Eighteen percent of events were coded as ‘serious’ or ‘life-threatening’ and 57% were regarded ‘significant’ by physician reviewers. Thirty-one percent of the reported adverse events were deemed as likely to be preventable. There is evidence that many of the events reported by patients go undetected in other methods of adverse incident monitoring [45]. For example, Weingart *et al.* [46] report that only 55% of patient-identified and clinician-validated adverse events were documented in the medical record, and none were found in the hospital incident reporting system. Thus,

**Table 2 Controlling of system changes (plan–do–check–act circle)**

Date of incident	October 2009
Problem	Accidental extubation in 2-year-old girl, tape not sticky
Measure(s): plan	New tape
Start of implementation: do	November 2009
Evaluation: check	Tape is sticky, however fixation technique needs minor adaptation
Start of modified implementation: act	December 2009
Responsible person	Nurse X, Doctor Y

surveying patients about their experience of safety incidents seems a valuable resource that can supplement staff incident reporting. Beyond reporting, it is increasingly acknowledged that patients can be involved in incident prevention, at least theoretically [47,48]. Involvement of patients in safety management has recently been recommended by the Council of Europe and the World Alliance for Patient Safety [49,50].

#### Involvement of patients and families in prevention of errors

Waterman *et al.* [51] report that the vast majority of surveyed patients believe that patients can help to prevent errors (91%) and expect hospitals to educate them about error prevention (98%). However, patients' attitudes towards performing specific error prevention behaviours vary considerably. Positive attitudes are more common towards behaviours that conform to traditional patient roles, for example ensuring transmission of information from patients and families to providers, and *vice versa*. In contrast behaviours that require questioning of medical authority and are thus challenging, for example, asking staff to wash their hands, are less accepted [51,52]. There is also increasing evidence under which conditions patients are engaging for their safety. In a recent study among chemotherapy patients, we found that risk of error perceptions, affirmative attitudes toward patient preventability, and error experience were positively linked to safety-related behaviours, whereas higher levels of global trust in staff safety practices were inconsistently associated with lower frequency of engagement in safety strategies [53]. Research also suggests that patients are more likely to intervene against nurses than against physicians, in particular if challenging interactions are involved [52,54]. The perception of families and patients that their engagement for safety is expected, honestly welcomed, and rewarded by clinical staff is central for family involvement in safety. It is worth noting that the motivation and instruction by doctors, in particular, seems to be an important signal of norms that can facilitate patients' safety behaviours [52,55]. In other words, visible norms in hospital that invite and approve family engagement in safety are needed – a challenging cultural change, if taken seriously.

When being approached about safety issues, patients and their families prefer messages with an unambiguous directive tone that clearly addresses what information should be provided, which issues to monitor, and which actions to take, when, how, and toward whom [47,56]. Varying levels of health literacy and cultural diversity of patient populations need to be accounted for [57,58]. In recent years there has been some proliferation of materials that educate patients about safety. For example, the 'Speak Up' campaign of the Joint Commission presents several brochures for patients that include

instructions on how to participate in the prevention of medication errors or nosocomial infections [59]. However, analyses of safety advisory materials suggest that these are often not based on patients' perspectives, provide little practical support, and suffer from lack of cultural and practical integration into the healthcare setting [60,61\*].

#### Conclusion

First of all, it is essential to make as many critical incidents as possible known to the intensive care team. Several factors have been shown to increase the reporting rate: anonymity, regular feedback about the errors reported, and the existence of a safety climate. However, critical incident reporting alone does not necessarily improve patient safety or even patient outcomes. Substantial improvement has been made by focusing on the further two steps of critical incident monitoring, that is, the analysis of critical incidents and implementation of system changes. Risk scoring of critical incident reports and root cause analysis may help in the analysis of incidents.

Only the implementation of system changes, based on incident reports, has the potential to improve patient outcome. Safety of hospital care is also an issue of considerable concern to patients and their families. Research suggests that patients can be successfully involved in safety. To be effective, interventions need to be sensitively implemented in the clinical context and promote behavioural and normative change on the side of patients, healthcare workers, and institutions.

#### References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (pp. 000–000).

- 1 Abramson NS, Silvasy Wald K, Grenvik AN, *et al.* Adverse occurrences in intensive care units. *JAMA* 1980; 244:1582–1584.
- 2 Raju TN, Kecskes S, Thornton JP, *et al.* Medication errors in neonatal and paediatric intensive-care units. *Lancet* 1989; 2:374–376.
- 3 Beckmann U, Baldwin I, Hart GK, Runciman WB. The Australian incident monitoring study in intensive care: AIMS-ICU. An analysis of the first year of reporting. *Anaesth Intensive Care* 1996; 24:320–329.
- 4 Frey B, Kehrer B, Losa M, *et al.* Comprehensive critical incident monitoring in a neonatal-pediatric intensive care unit: experience with the system approach. *Intensive Care Med* 2000; 26:69–74.
- 5 Ligi I, Arnaud F, Jouve E, *et al.* Iatrogenic events in admitted neonates: a prospective cohort study. *Lancet* 2008; 371:404–410.
- 6 Skapik JL, Pronovost PJ, Miller MR, *et al.* Pediatric safety incidents from an intensive care reporting system. *J Patient Saf* 2009; 5:95–101.
- Systematic inclusion of contributing factors in critical incident reports. Patient contributing factors were a strong predictor of harm.
- 7 Pronovost PJ, Thompson DA, Holzmueller CG, *et al.* Toward learning from patient safety reporting systems. *J Crit Care* 2006; 21:305–315.
- 8 Snijders C, van Lingen RA, Klip H, *et al.* Specialty-based, voluntary incident reporting in neonatal intensive care: description of 4846 incident reports. *Arch Dis Child Fetal Neonatal Ed* 2009; 94:F210–F215.
- Systematic application of a risk score in critical incident monitoring.

- 9 Sinopoli DJ, Needham DM, Thompson DA, *et al.* Intensive care unit safety incidents for medical versus surgical patients: a prospective multicenter study. *J Crit Care* 2007; 22:177–183.
- 10 Leape LL. Error in medicine. *JAMA* 1994; 272:1851–1857.
- 11 Pronovost PJ, Thompson DA, Holzmueller CG, *et al.* Defining and measuring safety. *Crit Care Clin* 2005; 21:1–19.
- 12 Vincent C, Stanhope N, Crowley-Murphy M. Reasons for not reporting adverse incidents: an empirical study. *J Eval Clin Pract* 1999; 5:13–21.
- 13 Taylor JA, Brownstein D, Christakis DA, *et al.* Use of incident reports by physicians and nurses to document medical errors in pediatric patients. *Pediatrics* 2004; 114:729–735.
- 14 Bocion C, Sennhauser FH, Frey B. Critical incident monitoring in Swiss intensive care units. *Schweizerische Ärztezeitung* 2006; 87:886–894.
- 15 Cohen MR. Why error reporting systems should be voluntary. *BMJ* 2000; 320:728–729.
- 16 Reason J. Human error: models and management. *BMJ* 2000; 320:768–770.
- 17 Snijders C, Kollen BJ, van Lingen RA, *et al.* Which aspects of safety culture predict incident reporting behaviour in neonatal intensive care units? A multilevel analysis. *Crit Care Med* 2009; 37:61–67.
- The number of self-reported incidents was positively associated with a nonpunitive response to error, indicating that the safety climate actually plays an important role in patient safety.
- 18 Schuerer DJ, Nast PA, Harris CB, *et al.* A new safety event reporting system improves physician reporting in the surgical intensive care unit. *J Am Coll Surg* 2006; 202:881–887.
- 19 Lawton R, Parker D. Barriers to incident reporting in a healthcare system. *Qual Saf Healthc* 2002; 11:15–18.
- 20 Dunn KL, Reddy P, Moulden A, Bowes G. Medical record review of deaths, unexpected intensive care unit admissions, and clinician referrals: detection of adverse events and insight into the system. *Arch Dis Child* 2006; 91:169–172.
- 21 Larsen G, Parker H. Patients' safety: think and act locally (editorial). *Lancet* 2008; 371:364–365.
- 22 Leape LL. Reporting of adverse events. *N Engl J Med* 2002; 347:1633–1638.
- 23 Subhedar NV, Parry HA. Critical incident reporting in neonatal practice. *Arch Dis Child Fetal Neonatal Ed* 2010; 95:F378–F382.
- 24 National Patient Safety Agency. A risk matrix for managers. <http://www.npsa.nhs.uk/nrls/improvingpatientsafety/patient-safety-tools-and-guidance/risk-assessment-guides/risk-matrix-for-risk-managers/>. [Accessed 29 May 2010]
- 25 Vincent C, Taylor-Adams S, Chapman EJ, *et al.* How to investigate and analyse clinical incidents: Clinical Risk Unit and Association of Litigation and Risk Management Protocol. *BMJ* 2000; 320:777–781.
- 26 Pierluissi E, Fischer MA, Campbell AR, Landefeld CS. Discussion of medical errors in morbidity and mortality conferences. *JAMA* 2003; 290:2838–2842.
- 27 Frey B, Ersch J, Bernet V, *et al.* Involvement of parents in critical incidents in a neonatal-paediatric intensive care unit. *Qual Saf Healthc* 2009; 18:446–449.
- Parents play an important role regarding the safety of their child hospitalized in the ICU.
- 28 Frey B. Is the number of reported critical incidents relevant? (editorial). *Crit Care Med* 2009; 37:334–335.
- 29 Cullen DJ, Bates DW, Small SD, *et al.* The incident reporting system does not detect adverse drug events: a problem for quality improvement. *Jt Comm J Qual Improv* 1995; 21:541–548.
- 30 Zeilhofer UB, Frey B, Zandee J, Bernet V. The role of critical incident monitoring in detection and prevention of human breast milk confusions. *Eur J Pediatr* 2009; 168:1277–1279.
- 31 Thomas AN, Pilkington CE, Greer R. Critical incident reporting in UK intensive care units: a postal survey. *J Eval Clin Pract* 2003; 9:59–68.
- 32 Department of Veterans Affairs, National Center for Patient Safety. [www.patientsafety.gov](http://www.patientsafety.gov). [Accessed 29 May 2010]
- 33 Valentin A, Capuzzo M, Guidet B, *et al.* Errors in administration of parenteral drugs in intensive care units: multinational prospective study. *BMJ* 2009; 338:b814.
- In this observational, 24 h study, with 1328 adult intensive care patients, it has been shown for the first time that critical incident monitoring is associated with improved patient safety: an existing critical incident reporting system was an independent predictor for a decreased risk of medication errors.
- 34 Massó Guijarro P, Aranaz Andres JM, Mira JJ, *et al.* Adverse events in hospitals: the patient's point of view. *Qual Saf Healthc* 2010; 19:144–147.
- An excellent overview of patients' perspectives on adverse events, including patients' abilities to detect errors.
- 35 Burroughs TE, Waterman AD, Gallagher TH, *et al.* Patient concerns about medical errors in emergency departments. *Acad Emerg Med* 2005; 12:57–64.
- 36 Schwappach DLB, Wernli M. Chemotherapy patients' perceptions of drug administration safety. *J Clin Oncol* 2010; 28:2896–2901.
- First study that investigates the relationship between patients' perceptions of staff safety practices and their own intentions to engage in error prevention strategies.
- 37 Burroughs TE, Waterman AD, Gallagher TH, *et al.* Patients' concerns about medical errors during hospitalization. *Jt Comm J Qual Saf* 2007; 33:5–14.
- 38 Davis RE, Jacklin R, Sevdalis N, Vincent CA. Patient involvement in patient safety: what factors influence patient participation and engagement? *Health Expect* 2007; 10:259–267.
- 39 Schwappach DLB, Wernli M. Am I (un)safe here? Chemotherapy patients' perspectives towards engaging in their safety. *Qual Saf Healthc* 2010; doi: 10.1136/qshc.2009.033118.
- 40 Schwappach DL. 'Against the silence': development and first results of a patient survey to assess experiences of safety-related events in hospital. *BMC Health Serv Res* 2008; 8:59.
- 41 Mazor KM, Goff SL, Dodd KS, *et al.* Parents' perceptions of medical errors. *J Patient Saf* 2010; 6:102–107.
- 42 King A, Daniels J, Lim J, *et al.* Time to listen: a review of methods to solicit patient reports of adverse events. *Qual Saf Healthc* 2010; 19:148–157.
- 43 Agoritsas T, Bovier PA, Perneger TV. Patient reports of undesirable events during hospitalization. *J Gen Intern Med* 2005; 20:922–928.
- 44 Fowler FJ, Epstein A, Weingart SN, *et al.* Adverse events during hospitalization: results of a patient survey. *Jt Comm J Qual Saf* 2008; 34:583–590.
- 45 Weissman JS, Schneider EC, Weingart SN, *et al.* Comparing patient-reported hospital adverse events with medical record review: do patients know something that hospitals do not? *Ann Intern Med* 2008; 149:100–108.
- 46 Weingart SN, Pagovich O, Sands DZ, *et al.* What can hospitalized patients tell us about adverse events? Learning from patient-reported incidents. *J Gen Intern Med* 2005; 20:830–836.
- 47 Schwappach DL. Review: engaging patients as vigilant partners in safety: a systematic review. *Med Care Res Rev* 2010; 67:119–148.
- 48 Koutantji M, Davis R, Vincent C, Coulter A. The patient's role in patient safety: engaging patients, their representatives, and health professionals. *Clin Risk* 2005; 11:99–104.
- 49 Perneger T. The Council of Europe recommendation Rec(2006)7 on management of patient safety and prevention of adverse events in healthcare. *Int J Qual Healthc* 2008; 20:305–307.
- 50 World Health Organization. World alliance for patient safety. Forward programme 2008–2009. 2008; WHO/IER/PSP/2008.04.
- 51 Waterman AD, Gallagher TH, Garbutt J, *et al.* Brief report: hospitalized patients' attitudes about and participation in error prevention. *J Gen Intern Med* 2006; 21:367–370.
- 52 Davis RE, Koutantji M, Vincent CA. How willing are patients to question healthcare staff on issues related to the quality and safety of their healthcare? An exploratory study. *Qual Saf Healthc* 2008; 17:90–96.
- 53 Schwappach DLB, Wernli M. Chemotherapy patients' perceptions of drug administration safety. *J Clin Oncol* 2010; doi: 10.1200/JCO.2009.27.6626.
- 54 Schwappach DLB, Wernli M. Barriers and facilitators to chemotherapy patients' engagement in medical error prevention. *Ann Oncol* (in press).
- 55 Schwappach DL, Hochreutener MA, Wernli M. Oncology nurses' perceptions about involving patients in the prevention of chemotherapy administration errors. *Oncol Nurs Forum* 2010; 37:E84–E91.
- 56 Swift EK, Koepke CP, Ferrer JA, Miranda D. Preventing medical errors: communicating a role for Medicare beneficiaries. *Healthc Financ Rev* 2001; 23:77–85.
- 57 Johnstone MJ, Kanitsaki O. Engaging patients as safety partners: Some considerations for ensuring a culturally and linguistically appropriate approach. *Health Policy* 2008.
- 58 Byrd J, Thompson L. 'It's Safe to Ask': promoting patient safety through health literacy. *Healthc Q* 2008; 11:91–94.
- 59 Joint Commission on Accreditation of Healthcare Organizations. Speak up initiatives. <http://www.jointcommission.org/PatientSafety/SpeakUp/>. [Accessed 4 June 2010]
- 60 Entwistle VA, Mello MM, Brennan TA. Advising patients about patient safety: current initiatives risk shifting responsibility. *Jt Comm J Qual Saf* 2005; 31:483–494.
- 61 Weingart SN, Morway L, Brouillard D, *et al.* Rating recommendations for consumers about patient safety: sense, common sense, or nonsense? *Jt Comm J Qual Saf* 2009; 35:206–215.
- Investigation into the quality of the various patient safety recommendations and their overlap.