

Patient Safety Literature Update

Latest patient safety evidence base in one place

Issue 21, September 18th 2007

Patient safety literature updates are a monthly round up of research papers on patient safety topics. Papers were identified from a 'hand search' of contents of the latest issue(s) of 28 medical, nursing and pharmaceutical related peer reviewed journals and a search of Medline, the largest medical citation database.

Details on the search strategy can be found in Appendix 1, page 19

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Patients: patient involvement

1. Davis-Rachel-E, Jacklin-Rosamond, Sevdalis-Nick, Vincent-Charles-A.

Patient involvement in patient safety: what factors influence patient participation and engagement?

Health expectations : an international journal of public participation in health care and health policy, {Health-Expect}, Sep 2007, vol. 10, no. 3, p. 259-67, ISSN: 1369-6513.

BACKGROUND: Patients can play an important role in improving patient safety by becoming actively involved in their health care. However, there is a paucity of empirical data on the extent to which patients take on such a role. In order to encourage patient participation in patient safety we first need to assess the full range of factors that may be implicated in such involvement. **OBJECTIVE:** To delineate factors that could affect the participation of the patient in quality and safety issues in their health care. **METHOD:** Literature review of patient involvement in health care, drawing from direct evidence (specifically from the safety context) and indirect evidence (extrapolated from treatment decision-making research and the wider patient involvement in health care literature); synthesis and conceptual framework developed, illustrating the known and putative factors that could affect the participation of the patient in safety issues in their health care. **MAIN RESULTS:** Five categories of factors emerged that could affect patient involvement in safety: patient- related (e.g. patients' demographic characteristics), illness-related (e.g. illness severity), health-care professional-related (e.g. health care professionals' knowledge and beliefs), health care setting- related (e.g. primary or secondary care), and task-related (e.g. whether the required patient safety behaviour challenges clinicians' clinical abilities). **CONCLUSION:** The potential for engaging patients in patient safety is considerable but further research is needed to examine the influences on patient involvement, the limits and the possible dangers. Patients can act as 'safety buffers' during their care but the responsibility for their safety must remain with the health care professionals.

Patients: patient involvement: equipment design

2. Patricia Grocott, Heather Weir, Mala Bridgelal Ram

A model of user engagement in medical device development

Journal: International Journal of Health Care Quality Assurance

Year: 2007 Volume: 20 Issue: 6 Page: 484 - 493

Abstract: Purpose – The purpose of this paper is to address three topical themes: user involvement in health services research; determining the value of new medical technologies in patient care pathways, furthering knowledge related to quality in health and social care; and knowledge exchange between manufacturers, health service supply chain networks and device users. The model is being validated in a case study in progress. The latter is a “proving ground” study for a translational research company. Medical devices play a pivotal role in the management of chronic diseases, across all care settings. Failure to engage users in device development inevitably affects the quality of clinical outcomes. A model of user engagement is presented, turning unmet needs for medical devices into viable commercial propositions.

Design/methodology/approach – A case study investigating the perceptions of individuals with Epidermolysis Bullosa (EB), their lay and professional carers into unmet needs. EB is an inherited condition affecting the skin and mucosal linings that leads to blistering and wounds.

Findings – Qualitative data are being collected to generate understanding of unmet needs and wound care products. These needs are being translated into new design concepts and prototypes. Prototypes will be evaluated in an n=1 experimental design, generating quantitative outcomes data.

Patients: patient involvement: evaluation

3. Development of an instrument to measure seniors' patient safety health beliefs: The Seniors Empowerment and Advocacy in Patient Safety (SEAPS) survey.

Elder-Nancy-C, Regan-Saundra-L, Pallerla-Harini, Levin-Linda, Post-Douglas, Cegela-Donald-J.

Patient education and counseling, {Patient-Educ-Couns}, 10 Sep 2007 (epub: 10 9 2007), ISSN: 0738-3991.

OBJECTIVE: To develop a survey to measure seniors' embracement of ambulatory patient safety self-advocacy behaviors, the Senior Empowerment and Advocacy in Patient Safety (SEAPS) survey. **METHODS:** Content was developed by review of published recommendations combined with interviews and focus groups with community members; items were generated for subscales based on the health belief model (HBM). Psychometric characteristics were assessed by cluster and correlation analyses on a pilot test of 143 community dwelling seniors; the ability of the subscales and demographic variables to predict reported behavior was investigated by multiple regression. **RESULTS:** The four subscales of the SEAPS were outcome efficacy (OE), attitudes (ATT), self-efficacy (SE) and behaviors (BEH). Cronbach alphas were 0.74 for ATT, 0.79 for BEH, and 0.91 for OE and SE. Analysis of variance showed that there were no differences in any subscale score by race, education level or frequency of doctor visits, but women were noted to have significantly higher scores ($p < .01$) on the ATT and SE subscales and for the total of all the scales. Multiple regressions showed that SE significantly predicted self-reported behavior ($p < .001$). OE was a significant

predictor for whites ($p < .001$) but not for African-Americans ($p = .24$). **CONCLUSIONS:** We have developed a short, 21-item self-administered survey to assess seniors' views about their participation in safety tasks. **PRACTICE IMPLICATIONS:** We believe the SEAPS shows promise to be a tool for evaluating interventions and training programs aimed at improving seniors' self-advocacy skills. Effective interventions may improve the involvement of patients in their own safety in the clinical setting.

Personal and Professional: decision making

4. Young-Jeffrey-S, Smith-Robert-L, Guerlain-Stephanie, Nolley-Barbara.

How residents think and make medical decisions: implications for education and patient safety.

The American surgeon, {Am-Surg}, Jun 2007, vol. 73, no. 6, p. 548-53; discussion 553-4, ISSN: 0003-1348.

Medical errors are a major cause of morbidity and mortality, and cognitive errors account for many of these events. This study examined the basic science of the cognitive performance of trainees. We created a low-intensity medical simulator to perform a preliminary study of the ability of residents to recall and process patient information presented verbally. The subjects were separated into three categories based on critical care experience: novice (< or =8 weeks of critical care experience), intermediate (8-16 weeks of critical care experience), and expert (>16 weeks of critical care experience). The subjects were presented with three clinical cases. In the first case, the presentation contained 55 separate data points and subject recall was analyzed. In the second and third cases, a patient report was given, and the subjects were asked by a medical student to outline and explain their treatment decisions. Fifteen subjects completed the experiment (five novices, six intermediates, and four experts). Case 1 (recall): No significant differences among groups with regard to errors or total data points recalled (however, subjects who chose not to take notes had significantly poorer recall and committed more errors). Cases 2 and 3 (cognition and decision making): Intermediates and experts made significantly fewer errors. More importantly, the reasoning process (forward hypothesis based) of the more experienced residents differed from novices. This preliminary study demonstrates that the cognitive processes used by residents experienced in critical care are quantitatively and qualitatively different from those used by novices. These processes were also associated with far fewer cognitive errors in clinical decision making.

Personal and Professional: education: safety curriculum

5. Case Study: An Innovative Curriculum in Patient Safety and Quality Improvement

Source: Joint Commission Perspectives on Patient Safety, Volume 7, Number 9, September 2007, pp. 9-10(2)

Veteran's Affairs Health Care System, Boston, has created a program that integrates safety and quality into the residency education program. This article describes how the program was developed. The organization learned that even a two-week rotation can make a significant difference in residents' perspectives on patient safety and quality improvement. Residents embraced the program and felt it was valuable in helping them shape their practice patterns.

Personal and Professional: education: simulation see 12

Personal and Professional: errors: emotional impact

6. Waterman-Amy-D, Garbutt-Jane, Hazel-Erik, Dunagan-William-Claiborne, Levinson-Wendy, Fraser-Victoria-J, Gallagher-Thomas-H.

The emotional impact of medical errors on practicing physicians in the United States and Canada.

Joint Commission journal on quality and patient safety / Joint Commission Resources, {Jt-Comm-J-Qual-Patient-Saf}, Aug 2007, vol. 33, no. 8, p. 467-76, ISSN: 1553-7250.

BACKGROUND: Being involved in medical errors can compound the job-related stress many physicians experience. The impact of errors on physicians was examined. **METHODS:** A survey completed by 3,171 of the 4,990 eligible physicians in internal medicine, pediatrics, family medicine, and surgery (64% response rate) examined how errors affected five work and life domains. **RESULTS:** Physicians reported increased anxiety about future errors (61%), loss of confidence (44%), sleeping difficulties (42%), reduced job satisfaction (42%), and harm to their reputation (13%) following errors. Physicians' job-related stress increased when they had been involved with a serious error. However, one third of physicians only involved with near misses also reported increased stress. Physicians were more likely to be distressed after serious errors when they were dissatisfied with error disclosure to patients (odds ratio (OR) = 3.86, confidence interval (CI) = 1.66, 9.00), perceived a greater risk of being sued (OR = .28, CI = 1.50, 3.48), spent greater than 75% time in clinical practice (OR = 2.20, CI = 1.60, 3.01), or were female (OR = 1.91, CI = 1.21, 3.02). Only 10% agreed that health care organizations adequately supported them in coping with error-related stress. **DISCUSSION:** Many physicians experience significant emotional distress and job-related stress following serious errors and near misses. Organizational resources to support physicians after errors should be improved.

Personal and Professional: error reduction

7. Warner, Bruce¹; Gerrett, David

Reducing medication errors: perceived information needs of healthcare practitioners

International Journal of Pharmacy Practice, Volume 15, Number 3, September 2007, pp. 219-228(10)

Objective The aim of this study was to determine the perceived information needs of healthcare practitioners (HCPs) in relation to reducing medication error.

The objectives were to gather, identify and list relevant perceptions from medical and pharmaceutical HCPs in primary and secondary settings. Progressive data reduction and refining techniques were used to identify the key perceived issues for consideration in information transfer so as to minimise medication error.

Setting One acute NHS foundation trust in Southern Derbyshire, one acute NHS foundation trust in Sheffield and one primary care trust in Sheffield.

Method Following ethical and managerial approval, 30 semi-structured interviews guided by hypothetical case-based scenarios were undertaken with: medical prescribers in secondary care general medicine and care of the elderly; medical prescribers in primary care; hospital pharmacists; and, community pharmacists. Following a thematic analysis of transcripts using NUDist software, a series of summary statements was established. These were ranked by HCPs according to their perceptions of the relative importance to the research objective. Key statements, as determined by the kappa test of agreement, were identified and further refined to produce questions that were explored at a multidisciplinary focus group in July 2005.

Key findings Data analysis identified that it was of paramount importance there should be a minimum dataset, including diagnosis, medication and rationale behind medication changes, which should be available to all HCPs involved in the medication aspects of a patient's care. This core information should be overseen by a multidisciplinary working party. Access to additional information should be determined on an individual basis. Further it was important that the gatekeeper of patient-specific information should normally be the general practitioner, in conjunction with properly informed and counselled patients wherever possible.

Conclusion Medical and pharmaceutical HCPs have a clear understanding of the complex issues concerning availability of patient information, and critically agree the need to share information. If HCPs are able to share relevant patient information then there is an understanding that medication error will be minimised.

Personal and Professional: surgery: errors

8. Dagi-T-Forcht, Berguer-Ramon, Moore-Stephen, Reines-H-David.

Preventable errors in the operating room--part 2: retained foreign objects, sharps injuries, and wrong site surgery.

Current problems in surgery, {Curr-Probl-Surg}, Jun 2007, vol. 44, no. 6, p. 352-81, 95 refs, ISSN: 0011-3840.

Equipment and Tasks: anaesthetics: epidurals

9. Bell-D-N, Leslie-K.

Detection of intravascular epidural catheter placement: a review.

Anaesthesia and intensive care, {Anaesth-Intensive-Care}, Jun 2007, vol. 35, no. 3, p. 335-41, 65 refs, ISSN: 0310-057X.

Intravascular placement of an epidural catheter is recognised as a potentially fatal complication of epidural anaesthesia and analgesia. Up to 10% of epidural catheters may be inserted into an epidural vessel, the majority of which will be recognised; however, a proportion (1% of all epidural catheters inserted) may not be identified as lying intravascularly. Opinions differ on the optimal method for identifying intravascular catheters and no perfect method exists. Some debate the need for a test of correct location, as a lack of specificity may mean that a proportion of correctly located catheters are withdrawn and resited. This review outlines the incidence and risk factors associated with intravascular placement and aims to evaluate the detection methods that have been described, in an attempt to answer the question: What is the optimal way of detecting intravascular placement of an epidural catheter?

Equipment and Tasks: anaesthetics: extubation

10. Marcin-James-P.

Unplanned extubations: they're not accidental.

Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies, {Pediatr-Crit-Care-Med}, Jul 2007, vol. 8, no. 4, p. 406-7, ISSN: 1529-7535.

11. Ream-Robert-S, Mackey-Kevin, Leet-Terry, Green-M-Christine, Andreone-Teresa-L, Loftis-Laura-L, Lynch-Robert-E.

Association of nursing workload and unplanned extubations in a pediatric intensive care unit.

Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies, {Pediatr-Crit-Care-Med}, Jul 2007, vol. 8, no. 4, p. 366-71, ISSN: 1529-7535.

OBJECTIVE: To estimate nursing workload from the patient acuity level (PAL) assigned to patients in a pediatric intensive care unit (PICU) and to determine its influence on unplanned extubations. **DESIGN:** Prospective cohort study. **SETTING:** The 19-bed PICU of an urban, university-affiliated, tertiary children's hospital. **PATIENTS:** All patients admitted to the PICU. **INTERVENTIONS:** None. **MEASUREMENTS AND MAIN RESULTS:** The study encompassed 2,193 nursing shifts and 1,919 admissions to the PICU over 24 months. The shift census averaged 12.0 patients (range 5-18) and was staffed by 9.4 nurses (range 4-16) for an average patient/nurse ratio of 1.3 +/- 0.2. Patients were assigned a PAL of 1-7 based on a classification system derived from time studies of 12 general nursing tasks. The total PALs per shift divided by the number of nursing staff yielded an average assignment of 5.8 +/- 0.7 PALs. Forty unplanned extubations (0.76 unplanned extubations /100 ventilator days) were observed during the study period. Logistic regression revealed positive associations between unplanned extubations and patient/nurse ratio ($p = .03$) and the shift PAL/nurse ratio ($p = .01$). The likelihood of an unplanned extubation when nurses covered >6.3 PALs was 3.8 times higher than during those shifts when they covered <5.3 PALs. **CONCLUSIONS:** The likelihood of an unplanned extubation increased with higher patient/nurse and patient acuity /nurse ratios. Successful interventions to reduce the frequency of this medical error may need to address both nurse demand methodology and workload.

Equipment and tasks: anaesthetics: sedation

12. Shavit-Itai, Keidan-Ilan, Hoffmann-Yoav, Mishuk-Lena, Rubin-Orit, Ziv-Amitai, Steiner-Ivan-P.

Enhancing patient safety during pediatric sedation: the impact of simulation-based training of nonanesthesiologists.

Archives of pediatrics & adolescent medicine, {Arch-Pediatr-Adolesc-Med}, Aug 2007, vol. 161, no. 8, p. 740-3, ISSN: 1072-4710.

OBJECTIVE: To evaluate the impact of simulation-based education on patient safety during pediatric procedural sedation. **DESIGN:** A prospective, observational, single-

blind, controlled study of pediatric procedural sedation outside the operating room. **SETTING:** Two university teaching hospitals in Israel. **PARTICIPANTS:** Nonanesthesiologists, with or without training in simulation-based education on patient safety, who routinely perform procedural sedation outside the operating room. These comprise full-time pediatricians practicing emergency medicine and a cohort of pediatric gastroenterologists. **INTERVENTION:** The study investigators used the internally developed, 9-criteria Sedation Safety Tool to observe and evaluate nonanesthesiologists who were trained in sedation safety and compared their performance with that of colleagues who did not receive similar training. **OUTCOME MEASURE:** For each of the 9 criteria on the evaluation form, odds ratios and 95% confidence intervals were calculated to compare the actions of the individuals in the 2 study groups. **RESULTS:** Thirty-two clinicians were evaluated. Half of the physicians were graduates of the simulation-based sedation safety course. Significant differences in performance pertaining to patient safety were found between those physicians who did and those who did not complete simulation-based training. **CONCLUSIONS:** Pediatric procedural sedations conducted by simulator-trained nonanesthesiologists were safer. The simulation-based sedation safety course enhanced physician performance during pediatric procedural sedation.

Equipment and Tasks: blood products administration: error prevention

13. **UK** Murphy-Michael-F, Casbard-Angela-C, Ballard-Sally, Shulman-Ira-A, Heddle-Nancy, Aubuchon-James-P, Wendel-Silvano, Thomson-Amanda, Hervig-Tor, Downes-Katharine, Carey-Patricia-M, Dzik-Walter-H.

Prevention of bedside errors in transfusion medicine (PROBE-TM) study: a cluster-randomized, matched-paired clinical areas trial of a simple intervention to reduce errors in the pretransfusion bedside check.

Transfusion, {Transfusion}, May 2007, vol. 47, no. 5, p. 771-80, ISSN: 0041-1132.

BACKGROUND: Transfusion of the incorrect blood component is a frequent serious incident associated with transfusion and often involves misidentification of the patient and/or the unit of blood. The objective of this study was to assess the effect of a simple intervention designed to improve performance of the bedside check and to observe the durability of any effect. The intervention was a tag on blood bags reminding staff to check the patient's wristband. The tag was positioned in such a way that the transfusionist was required to remove the tag to spike the unit. **STUDY DESIGN AND METHODS:** The intervention was tested in a multicenter cluster-randomized controlled trial incorporating short-term and long-term follow-up periods. The primary endpoint was the proportion of patients transfused with red cell units for whom the key elements of the bedside check were all correctly completed. **RESULTS:** Fifteen matched-paired clinical areas at 12 participating hospitals in six countries were included in the trial. Combining data from all participating hospitals, the bedside check was correctly performed in 37 percent of transfusions during the baseline audit period. There was no evidence of a favorable effect of the intervention immediately after its introduction (pooled odds ratio, 1.09; 95% confidence interval, 0.54-2.17). There was similarly no evidence of a favorable effect after continued use of the intervention for an additional 8 weeks. **CONCLUSIONS:** A simple intervention in the form of a barrier warning label on blood bags reminding staff to check the patient's wristband failed to improve bedside

transfusion practice. The robust study design developed for this study could be applied to investigate other interventions to improve the safety of bedside transfusion practice.

Equipment and Tasks: care settings: community care

14. Masotti-Paul, Green-Michael, Shortt-Sam, Hunter-Duncan, Szala-Meneok-Karen.
Adverse events in community care: developing a research agenda.
 Healthcare quarterly (Toronto Ont.), {Healthc-Q}, 2007, vol. 10, no. 3, p. 63-9, ISSN:
 1710-2774.

Little is known about the extent to which adverse events compromise the quality of community care. This article describes the results of a consensus workshop in which 31 healthcare professionals were asked to identify and rank common adverse events and important research questions relating to community care. Workshop participants were decision-makers and healthcare providers with areas of expertise that included community and home care; acute and primary care; patient safety; medical errors; and health services policy, administration and research. Results include prioritized lists of adverse events, research questions and contributing factors associated with adverse events. Further study should be aimed at defining and implementing research priorities and developing standardized definitions of common adverse events associated with community care.

Equipment and Tasks: care settings: deterioration

15. Whittington J, White R, Haig KM, Slock M. **Using an automated risk assessment report to identify patients at risk for clinical deterioration.**
 Jt Comm J Qual Patient Saf. 2007;33:569-574.

The authors describe development and testing of an electronic assessment tool to help clinicians determine early warning signs in patients and promptly call in a rapid response team.

Equipment and tasks: care settings: hospital falls

16. Oliver, David
Preventing falls and fall injuries in hospital: a major risk management challenge
 Clinical Risk, Volume 13, Number 5, September 2007 , pp. 173-178(6)

Accidental falls are the commonest patient safety incident in hospital and are especially common in older patients. They are associated with physical and psychological harm, functional impairment, prolonged hospital stay, cost and opportunity cost. Falls often cause concern and anger from patients' relatives, are a frequent cause of complaints and inquests, and may lead to claims in clinical negligence - albeit that the financial risk from these claims is low. As such, falls and related injuries should be a major concern in risk management and governance for institutions. In reality, falls are often a marker of patients' underlying medical illness and frailty and their occurrence does not necessarily mean that there has been a failure in the duty of care or that anyone or any system is to

blame. Falls rates are also dependent on the case-mix and frailty of patients on the unit, so that crude unadjusted comparison of falls rates should not be used in isolation as an indicator of care quality. Nonetheless, there appear to be large variations in falls rates. It may be that some falls are essentially inevitable or unpreventable, but that others are avoidable and unacceptable, especially as we must balance falls prevention against the duty to promote rehabilitation, respect patients' autonomy and avoid an excessively custodial, ageist or risk-averse approach to care. Even though all parties may feel that 'something should be done' to manage the risk, it is not always clear what the interventions should be. This in turn means that institutions may implement interventions or assessments which are neither effective nor evidence-based. The starting point for falls prevention programmes should always be a critical review of such evidence. In this review, we discuss the underlying causes of falls, the potential for learning from incident reporting and claims analysis and, in particular, the academic literature on falls risk assessment tools (for which the evidence base is limited) and on falls prevention interventions. Evidence from clinical trials has shown that it is possible to produce modest reductions in falls rates (if not the number of 'fallers') from whole systems interventions which incorporate a variety of approaches to falls prevention. These interventions are described in detail as well as the limitations of performing research in such a frail and unstable patient group.

Equipment and Tasks: ergonomics

17. Bills-Edwin.

Preventing bed entrapments: a report from the hospital bed safety workgroup.

Biomedical instrumentation & technology / Association for the Advancement of Medical Instrumentation, {Biomed-Instrum-Technol}, May-Jun 2007, vol. 41, no. 3, p. 227-9,

Equipment and Tasks: medication: automated error detection

18. Seger, Andrew C.; Jha, Ashish K.; Bates, David W.

Adverse Drug Event Detection in a Community Hospital Utilising Computerised Medical and Laboratory Data

Drug Safety 2007; 30(9), 817-824

Objective: Computerised monitors can detect and, with clinical intervention, often prevent or ameliorate adverse drug events (ADEs). We evaluated whether a computer-based alerting system was useful in a community hospital setting. Methods: We evaluated 6 months of retrospectively collected medication and laboratory data from a 140-bed community hospital, and applied the rules from a computerised knowledge base to determine if the resulting alerts might have allowed a clinician to prevent or lessen harm related to medication toxicity. We randomly selected 11% (n = 58, of which 56 were available) of charts deemed to be high- or critical-priority alerts, based on the likelihood of the alerts being associated with injury, to determine the frequencies of ADEs and preventable ADEs.

Results: In 6 months, there were 8829 activations of the rule set, generating a total of 3547 alerts. Of these, 528 were of high or critical priority, 664 were of medium priority and 2355 were of low priority. Chart review among the sample (56 charts) of high- or

critical-priority alerts found five non-preventable and two preventable ADEs, suggesting that among the total high- or critical-priority alerts alone, there would be approximately 94 non-preventable ADEs and 37 preventable ADEs annually in this hospital that could be detected using this method. Conclusions: Computer-based rules engines have the potential to identify and, with clinical intervention, mitigate preventable ADEs, and implementation is feasible in community hospitals without an advanced information technology application.

Equipment and Tasks: medication: CPOE evaluation

19. Fitzhenry-Fern, Peterson-Josh-F, Arrieta-Mark, Waitman-Lemuel-R, Schildcrout-Jonathan-S, Miller-Randolph-A.

Medication Administration Discrepancies Persist Despite Electronic Ordering.

Journal of the American Medical Informatics Association, {J-Am-Med-Inform-Assoc}, 21 Aug 2007 (epub: 21 8 2007), ISSN: 1067-5027.

Background Up to 38% of inpatient medication errors occur at the administration stage. Although they reduce prescribing errors, computerized provider order entry (CPOE) systems do not prevent administration errors or timing discrepancies. This study determined the degree to which CPOE medication orders matched actual dose administration times. METHODS At a 658-bed academic hospital with CPOE but lacking electronic medication administration charting, authors randomly selected adult patients with eligible medication orders from historical 1999-2003 CPOE log files. Retrospective manual chart audits compared expected (from CPOE) and actual timing of medication administrations. Outcomes included: dose omissions, median lag times between ordered and charted administrations, unauthorized doses, wrong dose errors, and the rate of nurses' medication schedule shifting. RESULTS Dose omissions occurred in 756 of 6019 (12.6%) audited administration opportunities; only 313 of the omissions (5.2% of opportunities) were unexplained. Wrong doses and unexpected doses occurred for 0.1% and 0.7% of opportunities, respectively. Median lag from expected first dose to actual charted administration time was 27 minutes (IQR 0-127). Nursing staff shifted from ordered to alternate administration schedules for 10.7% of regularly scheduled recurring medication orders. Chart review identified reasons for dose omissions, delays, and dose shifting. CONCLUSION Inpatient CPOE orders are legible and conveyed electronically to nurses and the pharmacy. Nonetheless, ward-based medication administrations do not consistently occur as ordered. Medication administration discrepancies are likely to persist even after implementing CPOE and bar-coded medication administration unless recommended interventions are made to address issues such as determining the true urgency of medication administration, avoiding overlapping duplicative medication orders, and developing a safe means for shifting dosing schedules.

Equipment and Tasks: medication: drug dose calculations

20. Hilmer-S-N, Rangiah-C, Bajorek-B-V, Shenfield-G-M.

Failure to weigh patients in hospital: a medication safety risk.

Internal medicine journal, {Intern-Med-J}, Sep 2007, vol. 37, no. 9, p. 647-50, ISSN: 1445-5994.

Often patients are not weighed in hospital. Failure to weigh patients prescribed renally excreted drugs may correlate to adverse drug events. We carried out a cross-sectional study of patients prescribed common renally excreted drugs (heparin, enoxaparin and gentamicin), admitted to two wards at Royal North Shore Hospital, Sydney over 3 months. Of all patients surveyed, 28% (22/78) in the orthopaedic ward and 22% (27/124) in the medical ward were weighed. Among those prescribed therapeutic doses of the study drugs, 25% (3/12) in the orthopaedic ward and 27% (7/26) in the medical ward were weighed. Patients prescribed therapeutic anticoagulation who were not weighed experienced more haemorrhagic complications than patients who were weighed ($P = 0.03$). Patients prescribed renally excreted drugs in hospital are frequently not weighed. This is associated with reduced medication safety.

21. Preventing Pediatric Medication Errors

Joint Commission Perspectives on Patient Safety, Volume 7, Number 9, September 2007, pp. 5-6(2)

This article examines the factors that contribute to pediatric medication errors, including the increasing complexity of drug therapy, dosing issues, health care workplace issues and factors related to the child patient's growth and development. The article compares the safety of using of standardized concentrations versus the traditional "Rule of Six" (the number of milligrams of drug to be added to 100 mL of intravenous fluid is equal to the weight [in kilograms] of the child, multiplied by 6), and provides tips and strategies for medication error prevention.

Equipment and Tasks: medication: drug dilution

22. Baker-A-R, Rutherford-D-M, Myles-P-S.

Accuracy of dilution of morphine for intrathecal use.

Anaesthesia and intensive care, {Anaesth-Intensive-Care}, Jun 2007, vol. 35, no. 3, p. 378-81, ISSN: 0310-057X.

Morphine is administered intrathecally alone or in combination with other drugs to provide spinal analgesia. Dose-finding studies have recommended 100 microg be used intrathecally to optimise analgesia and minimise side-effects for caesarean section and hip replacement surgery. Dilute solutions of morphine are generally not available, mandating preparation from a 10 mg/ml ampoule. We postulated that diluting morphine would be inaccurate and imprecise, contributing to the variability in patient response often reported. Twenty consultant and trainee anaesthetists were recruited and asked to prepare 100 microg of morphine from 10 mg/ml vials and from a hypothetical prediluted 500 microg/ml solution. The resultant samples were analysed using liquid chromatography. Prepared morphine doses ranged from 25 microg to 289 microg. Dilution of morphine was less accurate ($P = 0.001$) and more imprecise ($P = 0.001$) compared with using a prediluted solution. A single-step dilution technique using 0.1 ml of a solution diluted to 1.0 mg/ml was more accurate than when a double-dilution technique was used ($P = 0.047$). Given that dose-finding studies suggest that analgesia and side-effects vary at the dose range found in this study, we advocate the use of prediluted solutions. If dilution is to be performed a single-step dilution technique should be used.

Equipment and tasks: medication: psychiatric care

23. Mann-Klaus, Rothschild-Jeffrey-M, Keohane-Carol-A, Chu-James-A, Bates-David-W. **Adverse drug events and medication errors in psychiatry: Methodological issues regarding identification and classification.**

World Journal of Biological Psychiatry The, {World-J-Biol-Psychiatry}, 8 Mar 2007 (epub: 08 3 2007), p. 1-10, ISSN: 1562-2975.

Adverse drug events and medication errors have received extensive study recently in a variety of clinical populations, though compared to many other areas relatively little work has focused on this area in psychiatry, especially with respect to the contribution of error to harm. The goal of this paper is to discuss methodological issues around measurement of medication safety in psychiatric patients. Against the background of a systems approach, a modern perspective of error management is discussed, and a multidimensional procedure for detection and classification of incidents related to the medication process is presented. This method has proven successful in non-psychiatric settings yielding the current best estimate of error rates and providing insight into the underlying causes. While this general approach can be adapted to the psychiatric setting, a number of issues make measurement especially challenging in psychiatry. These include the fluctuating course of psychiatric disorders, reduced patient adherence to the medication process, adverse effects which are often similar to symptoms of the underlying disorder, the frequent use of wide dose intervals depending on the clinical situation, and the presence of many drug-drug interactions. Data collected by means of the presented approach provide a basis for the development of effective strategies to reduce the risk of medication errors and thus improve patient safety in psychiatric care.

Teamwork

24. Maintaining Expert Teams

Joint Commission Perspectives on Patient Safety, Volume 7, Number 9, September 2007 , pp. 1-13(13)

Part II of a two-part series on team work, this article discusses the benefits of improving teamwork and how effective teamwork enhances patient safety. Health care teams are different from I teams in other venues because health care is such a high-risk industry. The TeamSTEPPS initiative created by the U.S. Agency for Healthcare Research and Quality is a good example of effective teamwork within an organization. Strategies for improving teamwork in health care organizations are provided, including the following: consensus building, creating an environment of trust, providing constructive feedback and promoting situational awareness.

Teamwork: surgical teams

25. **UK Improving patient safety by identifying latent failures in successful operations.** Surgery, {Surgery}, Jul 2007, vol. 142, no. 1, p. 102-10, ISSN: 0039-6060. Catchpole-Ken-R, Giddings-Anthony-E-B, Wilkinson-Michael, Hirst-Guy, Dale-Trevor, de-Leval-Marc-R.

BACKGROUND: The risk of technical failure during operations is recognized, but there is evidence that further improvements in safety depend on systems factors, in particular, effective team skills. The hypotheses that small problems can escalate to more serious situations and that effective teamwork can prevent the development of serious situations, were examined to develop a method to assess these skills and to provide evidence for improvements in training and systems. **METHOD(S):** Observations were made during 24 pediatric cardiac and 18 orthopedic operations. Operations were classified by accepted indicators of risk and the observations used to generate indicators of performance. Negative events were recorded and organized into 3 levels of clinical importance (minor problems, those negative events that were seemingly innocuous; intraoperative performance, the proportion of key operating tasks that were disrupted; and major problems, events that compromised directly the safety of the patient or the quality of the treatment). The ability of the team to work together safely was classified using a validated scale adapted from research in aviation. Operative duration was also recorded. **RESULT(S):** Both escalation and teamwork hypotheses were supported. Multiple linear regression suggests that for every 3 minor problems above the 9.9 expected per operation ($P < .001$), intraoperative performance reduces by 1% ($P = .005$), and operative duration increases by 10 minutes ($P = .032$). Effective teams have fewer minor problems per operation ($P = .035$) and consequently higher intraoperative performance and shorter operating times. Operative risk affected intraoperative performance ($P = .004$) and duration ($P < .001$), with the type of operation affecting only duration ($P < .001$). Eight major problems were observed; these showed a strong association with risk, intraoperative performance, teamwork, and the number of minor problems. **CONCLUSION(S):** Structured observation of effective teamwork in the operating room can identify substantive deficiencies in the system, even in otherwise successful operations. Decreasing the number of minor problems can lead to a smoother, safer, and shorter operation. Effective teamwork can help decrease the number of small problems and prevent them from escalating to more serious situations. The most effective and sustainable route to improved safety is in capturing these minor problems and identifying related system improvements, combined with training in safe team working. This method is a validated and practical way to improve performance during otherwise successful operations.

Organisations: campaigns

26. Federico, Frank Preventing Harm from High-Alert Medications

Joint Commission Journal on Quality and Patient Safety, Volume 33, Number 9, September 2007 , pp. 537-542(6)

Background: One of the 12 interventions that the Institute for Healthcare Improvement (IHI) recommends for its 5 Million Lives Campaign is "Prevent Harm from High-Alert Medications... starting with a focus on anticoagulants, sedatives, narcotics, and insulin."

Executing System-Level Changes: Three essential elements are needed to execute system-level changes in an organization: will, ideas, and execution. Will is developed by examining the status quo in an organization and agreeing that it is no longer acceptable. Ideas—changes that will make the system safer—can be found in the literature and in the experience of other hospitals and are the basis for the recommended general interventions to reduce errors and harm associated with high-alert medications. Execution, the process of making those changes real, requires commitment from senior

leaders and clinical leaders, along with the organizational capacity to improve. The steps in the medication system are so interrelated that a change in one area will affect others' ability to complete their work. In addition, senior leadership and clinical leadership must visibly support the effort, connecting the reduction in high-alert medication-related harm to the overall hospital goal of harm reduction is essential.

Conclusion: The campaign's goal is to achieve a 50% reduction in harm related to high-alert medications. Employing strategies such as standardization and simplification will provide the foundation for improved medication safety.

Organisations: culture

27. Williams-Eric-S, Manwell-Linda-Baier, Konrad-Thomas-R, Linzer-Mark.

The relationship of organizational culture, stress, satisfaction, and burnout with physician-reported error and suboptimal patient care: results from the MEMO study.

Health care management review, {Health-Care-Manage-Rev}, Jul-Sep 2007, vol. 32, no. 3, p. 203-12, ISSN: 0361-6274.

BACKGROUND: A report by the Institute of Medicine suggests that changing the culture of health care organizations may improve patient safety. Research in this area, however, is modest and inconclusive. Because culture powerfully affects providers, and providers are a key determinant of care quality, the MEMO study (Minimizing Error, Maximizing Outcome) introduces a new model explaining how physician work attitudes may mediate the relationship between culture and patient safety. **RESEARCH QUESTIONS:** (1) Which cultural conditions affect physician stress, dissatisfaction, and burnout? and (2) Do stressed, dissatisfied, and burned out physicians deliver poorer quality care? **METHODS:** A conceptual model incorporating the research questions was analyzed via structural equation modeling using a sample of 426 primary care physicians participating in MEMO. **FINDINGS:** Culture, overall, played a lesser role than hypothesized. However, a cultural emphasis on quality played a key role in both quality outcomes. Further, we found that stressed, burned out, and dissatisfied physicians do report a greater likelihood of making errors and more frequent instance of suboptimal patient care. **PRACTICE IMPLICATIONS:** Creating and sustaining a cultural emphasis on quality is not an easy task, but is worthwhile for patients, physicians, and health care organizations. Further, having clinicians who are satisfied and not burned out or stressed contributes substantially to the delivery of quality care.

Organisations: culture: measurement tools

28. Singer-Sara, Meterko-Mark, Baker-Laurence, Gaba-David, Falwell-Alyson, Rosen-Amy.

Workforce perceptions of hospital safety culture: development and validation of the patient safety climate in healthcare organizations survey.

Health services research, {Health-Serv-Res}, Oct 2007, vol. 42, no. 5, p. 1999-2021,

Objective. To describe the development of an instrument for assessing workforce perceptions of hospital safety culture and to assess its reliability and validity. Data

Sources/Study Setting. Primary data collected between March 2004 and May 2005. Personnel from 105 U.S. hospitals completed a 38-item paper and pencil survey. We received 21,496 completed questionnaires, representing a 51 percent response rate. Study Design. Based on review of existing safety climate surveys, we developed a list of key topics pertinent to maintaining a culture of safety in high-reliability organizations. We developed a draft questionnaire to address these topics and pilot tested it in four preliminary studies of hospital personnel. We modified the questionnaire based on experience and respondent feedback, and distributed the revised version to 42,249 hospital workers. Data Collection. We randomly divided respondents into derivation and validation samples. We applied exploratory factor analysis to responses in the derivation sample. We used those results to create scales in the validation sample, which we subjected to multitrait analysis (MTA). Principal Findings. We identified nine constructs, three organizational factors, two unit factors, three individual factors, and one additional factor. Constructs demonstrated substantial convergent and discriminant validity in the MTA. Cronbach's alpha coefficients ranged from 0.50 to 0.89. Conclusions. It is possible to measure key salient features of hospital safety climate using a valid and reliable 38-item survey and appropriate hospital sample sizes. This instrument may be used in further studies to better understand the impact of safety climate on patient safety outcomes.

Organisations: leadership

29. Clarke-John-R, Lerner-Jeffrey-C, Marella-William.

The role for leaders of health care organizations in patient safety.

American Journal of Medical Quality, {Am-J-Med-Qual}, 2007 Sep-Oct!JTI American journal of medical quality : the official journal of the American College of Medical Quality, vol. 22, no. 5, p. 311-8, ISSN: 1062-8606.

We review what leaders of health care systems, including chief executive officers and board members, need to know to have "patient safety literacy" and do to make their systems safe. High reliability organizations produce reliable results that are not dependent on providers being perfect. Their characteristics include the commitment of leadership to safety as a system responsibility, with a culture of safety that decreases variability with standardized care and does not condone "at-risk behavior." A business case can be made for investing resources into systems that produce good outcomes reliably. Leaders must see patient safety problems as problems with their system, not with their employees. Leaders need to give providers information to make and monitor system progress. All medical errors, including near misses, and processes associated with all adverse events may provide information for system improvement. Improving systems should produce better long-term results than educating workers to be more careful. (Am J Med Qual 2007; 22:311-318).

Organisations: safety management

30. A. L. Schutz a; M. A. Counte a; S. Meurer b **Assessment of patient safety research from an organizational ergonomics and structural perspective**
Ergonomics, Volume 50, Issue 9 September 2007 , pages 1451 - 1484

The aim of this study is to review patient safety improvement initiatives within a conceptual framework that builds upon principles of organizational ergonomics and emphasizes structural factors that influence patient safety. The literature review included 131 English language published studies of patient safety improvement strategies extracted using Medline, Ovid Healthstar, PubMed and CINAHL searches. Keywords for the search included: 'patient safety'; 'medical errors'; 'adverse event'; 'iatrogenic'; and truncated options for 'improve'. The multilevel, hierarchical framework offered in this paper integrates quality management principles and organizational ergonomics theory and organizes patient safety initiatives according to sociotechnical system elements within three structural levels: health policies and associated health care organizations; health care delivery organizations; and health care microsystems. Utilizing the conceptual framework, this review of patient safety improvement initiatives highlights the need for consideration of the impact of all improvement proposals on each structural component within health care systems. The review also supports the need for patient safety research to evolve from exploratory, 1-D reporting to multi-level, integrated research.

Organisations: safety management: lean systems

31. Joseph Conigliaro, Md, And Audrey Yates, Mse,
Bringing the Patient Safety Leadership Fellowship Home: Lean Systems Thinking Guides Process Improvements
Focus on patient safety VOL.10: ISSUE 1 2007

Organisations: safety management: red rules

32. William r. Scharf **Red Rules: An Error-Reduction Strategy in the Culture of Safety**
Focus on Patient Safety VOL.10: ISSUE 1 2007

Organisations: safety management: reporting systems

33. Choksi-Vaishali-R, Marn-Charles, Piotrowski-Marcia-M, Bell-Yvonne, Carlos-Ruth.
Illustrating the root-cause-analysis process: creation of a safety net with a semiautomated process for the notification of critical findings in diagnostic imaging.
Journal of the American College of Radiology : JACR, {J-Am-Coll-Radiol }, Sep 2005, vol. 2, no. 9, p. 768-76, 29 refs, ISSN: 1558-349X.

The ACR has set a standard for the communication of critical findings on imaging examinations. Despite this standard, for a variety of reasons, it remains possible that appropriate follow-up is not initiated. The authors review the theory and application of root-cause analysis to such a failure of communication within their institution, including the development and implementation of a semiautomated notification system for critical unexpected findings on imaging examinations.

National and Government: campaigns: USA

34. McCannon-C-Joseph, Hackbarth-Andrew-D, Griffin-Frances-A.

Miles to go: an introduction to the 5 Million Lives Campaign.

Joint Commission journal on quality and patient safety / Joint Commission Resources, {Jt-Comm-J-Qual-Patient-Saf}, Aug 2007, vol. 33, no. 8, p. 477-84, ISSN: 1553-7250.

BACKGROUND: The Institute for Healthcare Improvement (IHI)'s 5 Million Lives Campaign targets a reduction of five million instances of harm from December 2006 through December 2008. The campaign continues the six interventions of the 100,000 Lives Campaign and adds six more. **DEFINITION OF MEDICAL HARM AND SETTING THE GOAL:** The campaign's aim is to support the reduction of medical harm, so defined: Unintended physical injury resulting from or contributed to by medical care (including the absence of indicated medical treatment), that requires additional monitoring, treatment, or hospitalization, or that results in death. The goal of a reduction of five million incidents of harm in two years is based on an estimate that 40 to 50 incidents occur per 100 admissions, for a total of 15 million incidents of medical harm each year in the United States. **THE 5 MILLION LIVES CAMPAIGN'S PLATFORM:** This campaign's six new interventions address the prevention of pressure ulcers, reduction of methicillin-resistant *Staphylococcus aureus* (MRSA) infection, prevention of harm from high-alert medications, reduction of surgical complications, delivery of reliable and evidence-based care for congestive heart failure, and getting hospitals' boards of directors on board. **CONCLUSION:** Together with complementary partner initiatives, the 5 Million Lives Campaign is intended to act as a major driver of national improvement.

Appendix: Search strategy

1. Current contents* of the following peer-reviewed journals were searched for relevant articles:

American Journal of Epidemiology
 American Journal of Health-System Pharmacy
 Anaesthesia
 British Journal of General Practice
 British Medical Journal
 Canadian Medical Association Journal
 Drug Safety
 Ergonomics
 International Journal of Health Services
 International Journal of Health Care Quality Assurance
 International Journal of Medical Informatics
 International Journal of Nursing Studies
 International Journal of Pharmacy Practice
 International Nursing Review
 Joint Commission Perspectives on Patient Safety
 Joint Commission Journal on Quality and Patient Safety
 Journal for Healthcare Quality
 Journal of Advanced Nursing
 Journal of Hospital Infection
 Journal of Nursing Care Quality
 Journal of Nursing Management
 Journal of Laboratory Clinical Medicine
 Journal of The American Medical Association
 New England Journal of Medicine
 Pharmaceutical Journal
 Quality Management in Health Care
 Quality & Safety in Health Care
 The Lancet

*If journal published more frequently than monthly all issues published in last 30 days were searched.

2. A search of MEDLINE was undertaken using the search developed by **Stelfox et al. The 'To Err is**

Human' report and the patient safety literature. Quality and Safety in Healthcare 2006; 15:174-178. Limits:

The search was limited to English language only papers and published in last 30 days (as of the 18th of current month).

The following six searches were undertaken and combined: (1) MeSH terms "patients" and "safety"; (2)

MeSH term "risk management" and keyword "safe"; (3) MeSH term "quality assurance, health care" and

keyword "safe"; (4) keywords "patient" and "safety"; (5) keywords "medical" or "medications" or "nonmedical"

or "nonmedical" and "error" and (6) MeSH terms "medical errors", "medication errors", "iatrogenic disease" and "safety management".

