



POSITION STATEMENT

PATIENT SAFETY AND THE ROLE OF INFORMATION TECHNOLOGY IN REDUCING MEDICAL ERRORS

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IEEE-USA believes that increased use of information technology will play an important role in improving patient safety and the quality of health care. The federal government, working collaboratively with health care providers and other interested parties should take proactive steps to enhance the utilization of information technology in health care delivery. To accomplish these goals, IEEE-USA recommends:

- 1) Implementing a nationwide health information network, statewide health information exchanges, and online Electronic Health Records (EHRs), with the potential to reduce the number of medical errors by providing quick access to patient history and medical guidelines.
- 2) Encouraging widespread and accelerated adoption of ePrescription systems, which offer promising new alternatives to reducing errors, such as illegible handwriting. Electronic prescriptions also offer immediate access to possible drug interactions, with closer monitoring of patient use of medications and/or duplicate prescriptions.
- 3) Improving patient identification to support interoperable, secure and private lifetime EHRs. In-patient errors due to misidentification should be further reduced by expanding the use of electronic data capture, such as barcoding, RFID and biometric technology, and applying new technologies as they are developed.
- 4) Creating an integrated national information database of medical errors, incident reports and project data that would be used to reduce errors. Also, we recommend providing funding and/or incentives to encourage innovative research efforts that use advanced information technology to improve accuracy in patient medical information management, and reduce risk from human error.

- 5) Promoting research funding for understanding causes of errors in outpatient, long-term care home-health agency and self-care settings. Unlike the hospital setting, very little research has been done in these settings. Research should be undertaken to explore the types, frequency and severity of medical errors in these settings, and the steps that can be taken to reduce the frequency and severity of such errors.
- 6) Implementing the principles of engineering and quality management, including:
 - Using standard quality control procedures, such as surgical checklists, to mitigate risk and ensure consistent outcomes
 - Using reliability/availability/disaster recovery/capacity planning concepts borrowed from telecommunications and enterprise network engineering
 - Developing user interfaces for medical devices that reflect the working environment in which clinical procedures are performed
 - Using advanced IT technologies, such as clinical decision support systems and data mining, to assist in diagnosis and reduce errors and unintended consequences
 - Anticipating errors introduced by new IT systems; and extensive, just-in-time training in new IT health-related systems.

This statement was developed by the IEEE-USA Medical Technology Policy Committee and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. IEEE-USA advances the public good and promotes the careers and public policy interests of the 210,000 engineers, scientists and allied professionals who are U.S. members of the IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE or its other organizational units.

BACKGROUND:

Medical errors resulting in serious injury or death are a serious concern and receive increased attention as the media reports surgical procedures performed on the wrong patient or body side, and other errors. Hospital orders and prescription errors due to illegible handwriting have resulted in some facilities applying stricter guidelines on abbreviations and numerical notations. Movement towards electronic prescriptions is on the rise. Information technology has advanced to the point that procedures for multiple checking, labeling and identifying the correct patient, body side, and laboratory specimens can be determined with a high degree of accuracy.

IT has the potential to identify the cause of hospital system failures, and provide better care to patients. For example, a paper by Dr. Abel Kho determined the likely cause of infection in a hospital by using a combination of electronic medical records and Geographic Information System (GIS) tracing of care providers. Hospital procedures

could then be changed to eliminate the behavior that caused the infections.¹ On the other hand, IT may increase the likelihood of errors as well. New IT systems may directly introduce errors due to flaws in the systems themselves. A health care institution may choose to decrease the skill level of providers, on the assumption that an IT system will catch the errors that a less-skilled person may make. The result may be increased errors, since the provider with greater skills may notice and react to conditions beyond the design limits of the IT system. New systems should be introduced only in environments where risk is limited and unforeseen consequences can be adequately and actively managed. Risk may be limited by a number of methods. More skilled, not less-skilled practitioners should be involved during the initial roll-out of the system, as they may notice gaps and flaws in the system design and implementation. Patients with intact cognition and less critical conditions might be the best candidates for initial trials. Adequate training is also critical, especially if less-skilled providers, including the patients themselves, are to be the eventual users of the system. Taking these steps follows the principles of resilience engineering, which relies on the active use of human capabilities to mitigate the potential unforeseen consequences of new systems.²

IT alone will not solve all the problems of the health care industry. Some problems in health care delivery can be solved by introducing engineering principles and quality management to clinical protocols. One such technique is the use of a checklist when performing common ICU procedures, such as inserting or removing a patient's intravenous line, an approach that was suggested by Dr. Peter Pronovost of Johns Hopkins Hospital. Dr. Pronovost's approach of using checklists for these and other procedures in ICUs was adopted by the Michigan Health and Hospital Association as the Keystone Initiative and implemented in numerous ICUs in Michigan in 2004. Results were published in the December 2006 issue of the *New England Journal of Medicine*. In the first three months of the project, infection rates in Michigan ICUs fell by 66%.³ In the Keystone Initiative's first 18 months, the hospitals saved an estimated hundred and seventy-five million dollars in costs and more than fifteen hundred lives.⁴ Documenting the use of such checklists as part of the EHR would provide verification that correct procedures were followed, and reduce the likelihood of medical errors and resulting malpractice claims.

Our American health care delivery systems contain a complex mix of stakeholders that play a role in delivering high quality and error-free care. These stakeholders include:

- Patient, family members and significant others
- Hands-on providers of care (doctors, dentists, nurses, therapists, etc.)
- Institutional providers (hospitals, clinics, nursing homes, etc.)
- Third-party payers (insurance plans, HMOs, Medicaid, Medicare, etc.)
- Quality assurance/patient safety staff and organizations (infection control, accreditation, etc.)
- Public health and homeland security
- Manufacturers and vendors of health care-related products and services
- The general public, as represented by elected public officials, boards, advisory committees and others.

Surveillance and response systems to detect and respond to individual and groups of medical errors, and programs put in place to reduce the frequency of such errors, will predictably cost money and require the active participation of each of the sets of stakeholders noted above.

All involved stakeholders will need to collaborate, if the organizational culture and working environment of the hands-on care providers is to change in ways that will prevent or detect errors as they occur, deal with them in open and non-punitive ways, and accept the idea that not all patient-safety related activities will necessarily reduce costs or enhance marketing or revenue flow.

END NOTES

¹ Kho A., "Tracking Inpatient Infections with GIS," 2007 ESRI Health GIS Conference, Northwestern University, October 10, 2007. On-line at: <http://gis.esri.com/library/userconf/health07/docs/closing/able.pdf>

² See, for example, Koppel et. al., "Role of Computerized Provider Order Entry Systems in Facilitating Medication Errors," *Journal of the American Medical Association*, Vol. 293, Nr. 10, 9 March 9 2005. On-line at: <http://jama.ama-assn.org/cgi/content/abstract/293/10/1197>

³ Pronovost et al, "An Intervention to Reduce Catheter-Related Bloodstream Infections in the ICU," *New England Journal of Medicine*, Vol. 355, Nr. 26, 28 December 2006. On-line at: <http://content.nejm.org/cgi/reprint/355/26/2725.pdf>

⁴ Atul Gawande, "The Checklist," *New Yorker*, 10 December 2007, 94.