



From the Editor in Chief...

Treating Health Care

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The numbers are staggering. In a chilling report, the U.S. Institute of Medicine (IOM) estimates that somewhere between 44,000 and 98,000 Americans die each year from “avoidable medical errors,” costing the nation about US\$17 billion to US\$29 billion annually.¹ Errors include failing to make timely and accurate diagnosis, selecting improper treatment, and following a treatment plan incorrectly. For example, hospital staff might give the wrong drug or dosage, or a surgeon might operate on the wrong body part. Errors in surgery or emergency treatment can be especially serious.

The root causes of these errors are inadequate training, poor processes, and information systems that don’t expose patient information at relevant times – sometimes leading to confusion about the patient’s identity or the intended procedures.

QuIC and the Dead

Several observations leap from the IOM numbers:

- As the IOM observes, even the low end of this range exceeds National Vital Statistics Report estimates for the number of deaths each year from automobile accidents (42,401 in 1999, www.cdc.gov/nchs/fastats/pdf/nvsr49_08t26.pdf) and breast cancer (41,528 in 1999, www.cdc.gov/nchs/fastats/pdf/nvsr49_08t9.pdf).
- The wide range between low and high estimates is due to the difficulty of gathering data in these cases.
- The numbers do not include the much larger number of medical errors that lead to sickness or injury but not death – the number of drug-related errors is about 770,000 per year (www.ahrq.gov/qual/aderia/aderia.htm), which is about a fifth of the total number of errors.²
- With about a million physicians in the US, 98,000 patient deaths means that one in 10 physicians is at least peripherally involved in

a grievous error each year.

- If this is the status in the US, the figures for some other countries must be truly dismal.

Motivated by the above report, medical professional societies, the government, and regulatory agencies have moved in earnest to address patient safety. In particular, the US government’s Quality Interagency Coordination task force has developed a list of actions the government should take to reduce medical errors (www.quic.gov/report/toc.htm). The task force’s recommendations include setting standards for patient care, training staff, and accrediting staff and health-care facilities, which involve determining and applying best practices for various medical procedures. The Agency for Healthcare Research and Quality also conducted extensive studies of medical practices to determine their impact on patients and to identify both best practices and research directions. Interestingly, but not surprisingly, AHRQ discovered that safety data is variable and, in general, quite limited (www.ahrq.gov/clinic/ptsafety/summary.htm).

Pressures on Health Care

To come up with a credible approach for improving patient safety, we need to understand several key pressures on health care.

- *Patient empowerment.* As health care becomes more patient-centric – that is, as patients become more knowledgeable and active in their care – physicians increasingly emphasize *outcomes*, which are high-level medical results patients can see. Prevention of heart disease is an outcome, for example, whereas lowering a patient’s cholesterol is not, although it might be valuable as a means to an outcome.
- *Chronic ailments.* Medical professionals must be able to actively engage *chronically ill* patients – those with long-term (three months

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or longer) ailments that have no identifiable end point – in their own care. Treating chronic ailments calls for long-running relationships, including in-home care, in contrast with shorter transactions, such as office visits or surgical procedures, which the health-care system is designed to handle. Further, chronically ill patients see an average of eight physicians over the course of their illness. Although it is safer for the patient if the physicians operate as a team, it is difficult for the physicians to do so. In the US, about 75 percent of medical resources are expended on chronic ailments,³ and, with an aging population, this number will increase. Although the percentage might be slightly smaller for some other countries, it would still be substantial.

- *Evidence-based medicine.* Under both regulatory and fiscal pressure, the health-care industry wants to identify and apply best practices to benefit all patients. This requires basing medical judgments on evidence of a procedure's efficacy rather than physicians' opinions. Accumulating reliable evidence is an arduous task, however, because processes cannot easily be accurately monitored.
- *Regulations.* Regulations have always played a role in health care, but their number and reach has increased due to concerns such as cost-containment, fraud and loss prevention, increased liability, and patient safety. Compliance is thus a bigger challenge than ever.

Taken together, these pressures suggest a great opportunity for Internet computing.

Stayin' Alive

From a computer science standpoint, what medicine needs is collaborative, long-lived activities that are precisely specified and executed in a distributed manner with appropriate access to information, monitored for compliance, and mined for best practices.

It is all but axiomatic that such activities will increasingly rely on more effective use of information technology – specifically, network-based applications. Solving the fundamental problems will require not only better access to information, but also improved process modeling, monitoring, and managing and more accurate semantic and pragmatic encodings (as I discussed in my last column⁴), all using mobile and pervasive technologies where appropriate. For example, flagging potential interactions among drugs prescribed by different physicians can avert several adverse events. Tracking treatments can help ensure compliance with required practices and can provide data for future best practices.

The sooner we begin developing the appropriate techniques, the better. Clearly, medicine is too important to be left to the physicians. □

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