# Patient Safety Leading Article Series, 2004

Dr David W Bates of Harvard Medical School, and Brigham and Women's Hospital, Boston, has for some years had a major interest in information technology in healthcare. Here, he continues our 'Patient Safety' series of leading articles, exploring how the tools of the modern era can help avoid harm in the surgical arena.

**Leading article**

# Using information technology to improve surgical safety

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A variety of studies have demonstrated that the rates of adverse events associated with surgery are substantial. For example, 48 per cent of adverse events in the Medical Practice Study were associated with an operation[1]. Of course, surgery inherently carries risk, and only 17 per cent of these adverse events were judged to be preventable. Nonetheless, this important proportion of surgical adverse events is preventable given what is known today, and with the introduction of new approaches many other complications that are not associated with an obvious error may be preventable in the future. For example, new approaches in technique have reduced nosocomial infection rates.

Information technology represents an especially valuable tool for reducing hazard through an array of approaches[2]. Many of the publications to date regarding its use in increasing surgical safety have been for domains such as operating room scheduling[3], computer-assisted surgery[4] and measurement of surgical outcomes[5]. All of these are valuable, but there are other ways in which information technology will be used in the future in this setting. These include approaches targeting communication, monitoring and decision support.

## Communication

Delivery of safe, high-quality surgical care depends inherently on excellent communication. Handovers are frequent in surgical care today. To provide good care, a covering provider must have good information. Yet too often a basic standard information set (medications, problems, allergies, surgical procedure) is not readily available to the surgeon. One study found that when one medical physician was cross-covering another, the odds of a preventable adverse event rose by a factor of 3·5[6]. An electronic sign-out application that automatically extracted much of the key information from the electronic record, with the remainder entered by the provider, was subsequently introduced. Implementation of this application, which gave the covering physicians a more complete snapshot of the patients they were treating, abolished the increase in risk associated with cross-coverage[7]. Such applications should be used more widely. In a broader context, this issue of making key information available to multiple providers of care is important in many areas, not least for consultations.

Another issue is identification and communication of key new abnormalities and results. These fall into two general categories: highly abnormal results that must be dealt with urgently (for example a very high plasma sodium level) and abnormal results that absolutely require follow-up, albeit with less urgency (such as an abnormal biopsy suggesting malignancy). Currently, there are issues with both. Too often delays occur in dealing with marked laboratory test abnormalities. In addition, a major cause of lawsuits is loss of abnormal results, such as abnormal radiographs and pathological specimens.

Regarding critical laboratory test abnormalities, one study found the first response to an abnormality took more than 5 h in 24 per cent of instances[8]. This was partly because the laboratory results were communicated by telephone to the clinical unit, where many of the calls were taken by the unit clerk who might or might not recognize the

importance of a markedly abnormal result (and in any event, could take no action). This finding resulted in the introduction of an application that recorded which physician was covering each patient at any given time and, when a highly abnormal result was identified, would page the covering provider. This intervention decreased the median time to first action by 38 per cent, and the median time with the patient in an abnormal condition by 6 per cent. Moreover, more than 95 per cent of physicians were pleased to have been paged about these abnormalities.

Information technology can also be helpful in ensuring follow-up of less urgent results that absolutely require to be addressed. A recent application has been built to track all of a provider's results, to aggregate them in one place and prioritize them, to allow the doctor to acknowledge receipt, and to ease communication of these results to the patient. This sort of tool is necessary but not sufficient; it is also essential to have 'fail-safe' mechanisms to ensure that no individual key result is lost or omitted.

## Monitoring

Monitoring is also extremely important in many areas of surgery. This is particularly so in the intensive care unit, where closer monitoring of patients, along with early intervention when problems are found, may reduce mortality rates[9].

## Decision support

Implementation of computerized decision support, especially during prescribing, can clearly improve safety. In one study, implementation of computerized physician order entry reduced the rate of serious medication error by 55 per cent[10]. Computerized decision support will undoubtedly improve safety in the surgical setting in other ways in the future.

In conclusion, information technology has great potential for improving the safety of surgical care in many ways. There are already a number of applications and technologies of demonstrated efficacy, such as computerization of prescribing; many others are on the near horizon. It must be recognized, however, that most of these applications and technologies have not been widely used so far. Surgeons should request that their organizations prioritize and begin to introduce these tools that have so much to offer in the improvement of safety. They should embrace their use.

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