Automated surveillance for adverse events

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Automated surveillance for adverse events in hospitalized patients: back to the future

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Only by studying the true nature and frequency of adverse events through effective surveillance approaches can patient safety interventions be formulated, implemented, and properly evaluated for efficacy

The goal of patient safety efforts is to reduce the harm we do to our patients while providing them with the care they need, and recognizing the true nature and sources of harm is critical to this endeavor. The paper by Szekendi et al[1] in this issue of *QSHC* describes a return to automated methods for detecting adverse events, and provides an opportunity to review the evolution of adverse event detection as well as the challenges associated with different models.

First, however, we must emphasize why some form of surveillance for detection of harm to patients is indispensable to modern patient safety practices: it allows us to overcome the serious defects associated with dependence upon spontaneous reporting as a method for detecting adverse events. While such reporting can play an important role in supporting a culture of safety—for example, encouraging the candid discussion of errors—it is by its nature anecdotal and superficial. In addition to the obvious barriers to reporting (time constraints, fear of retribution, liability concerns), we know that most events causing harm to patients are not even recognized as such by clinicians at the time they occur.[2] Thus, voluntary reporting describes a small—and by no means representative—minority of the universe of harm to our patients. It is useless for the quantitative study of adverse events, and is not reliable either as an indicator of the principle sources of harm or as a measure by which to assess improvement.

Automated surveillance for adverse drug events was first demonstrated on a large scale in the early 1990s by Classen et al at LDS Hospital;[3] this methodology was refined and extended by investigators at Harvard[4] and Duke.[5] These groups used rules based computer systems to identify combinations of clinical data (antidotes, toxic drug levels, drug-laboratory combinations, etc) that suggest that a patient has suffered or is suffering an adverse drug event. Each computer alert is then evaluated within 24 hours by a medication safety pharmacist to determine whether it represents a true adverse drug event or an event in progress; the latter provides an opportunity to intervene and ameliorate harm to the patient. These investigators used proven scoring methodologies for determining event causality, and demonstrated the ability to detect adverse drug events reliably and reproducibly at rates 4–10 times that of voluntary reporting. In recent years others have applied the principles of automated surveillance to events beyond adverse drug events—for example, using various technologies to search text documents such as discharge summaries for key words suggestive of adverse events.[6][7]

Automated surveillance using this model has three significant difficulties that have limited its usefulness and broad adoption. Firstly, many hospitals lack the technical knowledge and resources to build the sophisticated, rules based computer systems needed to operate comprehensive surveillance; as yet, these capabilities are not available in most commercial systems. Secondly, automated surveillance depends upon the availability in electronic form of data suggestive of an adverse event. The general availability of inpatient pharmacy and laboratory data in electronic form made possible the early work in surveillance of adverse drug events in hospitalized patients. While these systems detect certain types of adverse events very effectively, other event types for which electronic trigger data do not exist are not detected. Finally, perhaps the greatest limitation of comprehensive surveillance is the significant investment in resources required to evaluate the computer alerts.

While the time requirements described by Szekendi et al[1] (35–45 minutes each) are extraordinary (at Duke our investigators evaluate each alert in less than 5 minutes on average), there is no question that alert evaluation is time consuming and requires an ongoing resource commitment.

Recognizing these limitations as well as the value of the surveillance approach, a number of investigators have in recent years developed modified "trigger" methodologies based on the data types and methods of automated surveillance.[8][9] These tools permit any hospital to conduct a focused explicit chart review based evaluation of safety in a small sample of their patient population. While losing the ability to perform comprehensive surveillance of all hospitalized patients and the opportunity to intervene to prevent harm outside the small population sampled, one gains the ability to use data types (such as hand written progress notes) that are not easily adopted for computerized detection. These tools can therefore increase the sensitivity of event detection relative to automated systems. Szekendi et al[1] have "reverse engineered" these trigger methodologies—automating the easily computerized manual triggers—showing once again that the use of electronically available flags suggestive of adverse events can effectively identify them.

Clearly, more study and innovation are required in this area, but we can speculate on what the future might hold. Certainly no one strategy will fit all environments. Some hospitals will be able to afford the investment needed to build and operate automated surveillance systems; some will restrict their efforts to chart based methods; others may apply hybrid strategies using automation for some event types or environments and chart review for others. In the area of manual methodologies, investigators with the Institute for Healthcare Improvement are building a series of chart review based trigger tools for detection of adverse events in various care settings including the intensive care unit, labor and delivery, the emergency room, and surgical environments. This work has culminated in the development of a more comprehensive method for detecting adverse events called the global trigger tool. Increasing computerization of care processes—for example, the growing use of systems for electronic clinical documentation, medication administration documentation, and others—should improve the yield of automated surveillance by offering new data sources for event detection. Vendors of electronic medical record systems are under pressure to build

systems with better decision support mechanisms,[10] which should lower the barriers to implementation of rules based detection systems. As hospitals learn more about the costs and risks associated with adverse events, and as regulators and other groups demand greater accountability for patient safety, we may see an increased willingness on the part of hospitals to invest in the resources needed to take full advantage of our increasingly sophisticated clinical information systems.

Indeed, in the end, implementing and maintaining adverse event surveillance systems is only useful if there exists an interested and motivated executive audience for the data, and many in healthcare delivery organizations are not interested in knowing their rates of adverse events, at least unless one is immediately able to offer a definitive strategy for their reduction. While this may be understandable, it is only by studying the nature and frequency of these events that effective improvement strategies can be formulated, implemented, and evaluated. Otherwise, hospitals will continue to be limited to the implementation of various generic improvement strategies with which to focus on what we can only guess are the most pressing problems, and with no hope of ever really knowing whether the time and resources committed have made a difference to patient safety.

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