

Emerging Health IT Technologies for Patient Safety Measurement

Moving Measurement into Action: Designing Global Principles for Measuring Patient Safety | Pre-Seminar Briefing Document on Emerging Technologies

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BACKGROUND AND CURRENT LANDSCAPE

Patient safety is a complex and multi-faceted issue. Understanding the nature and frequency of patient harms requires obtaining and integrating information from many sources, using a variety of measurement methods. Common methods of patient safety process and outcomes measurement include retrospective chart review, voluntary error or adverse event reporting systems, administrative/claims data analysis, patient reports, and root cause analysis. Hospital accreditation and regulatory audits add to these methods a review of safety structural issues.

Each of these methods has its own drawbacks. For example, retrospective chart review is felt to be too resource intensive, while voluntary self-reporting catches a small and biased proportion of errors and events. In general, these methods are manual, ad-hoc and “siloed” or limited in scope – it is not common to integrate data from multiple methods into a more complete view of patient safety for an institution or care setting. Currently patient safety measurement efforts are focused primarily on hospital inpatients, where serious safety risks and adverse outcomes are more common. The lowest common denominator is meeting regulatory requirements, which includes standardized reporting of some serious events, along with some other outcome and process metrics. More proactive organizations use more advanced methods, such as trigger tools (two-stage structured chart review with expert judgment), automated surveillance and alerting, and more detailed root cause analysis, and more sophisticated approaches (e.g., Lean) to fix safety problems.

EMERGING HEALTH IT OFFERS NEW METHODS TO MEASURE SAFETY

The broad adoption of electronic health record (EHR) systems, Clinical Data Warehouses and other health information technology (Health IT) has the potential to supplement human labor with streamlined, automated workflows; human memory with structured data storage; human attention with 24-7 always-on surveillance of massive data sets; human understanding with smart algorithms and artificial intelligence; and human communication with automated, electronic, mass/customized communications. These many new health IT-enabled tools and techniques can help identify actual or potential safety events and risks earlier in the course of care, and in much larger numbers. They can increase measurement sensitivity and specificity. They can efficiently alert providers to intervene more rapidly. They can add insight and understanding about the incidence, causes, variability and preventability of safety events, and help identify new strategies to improve safety across a broader scope of care. Taken together they have the potential to greatly improve patient safety, but these many options must be prioritized, integrated, and understood in the context of local strategic priorities, operating and clinical processes, and clinical needs.

These new tools and techniques also promise to better integrate diverse safety measures to give a more complete, holistic view of safety, and to enhance measurement outside of hospitals across the continuum of care and throughout a patient’s lifetime. These new methods have proven to be a major disruption in health care organizations that use them as they lead to much greater detection of safety events, in real time, which can overwhelm the current safety infrastructure.

New methods and tools are primarily found at the detection stage of the patient safety continuum shown in Table 1, below, but there are some examples that support measurement, improvement and transformation as well.

Table 1, Patient Safety Methods and Tools – Traditional, Emerging and Futuristic

		Example Methods and Tools		
		Traditional	Emerging	Futuristic
Patient Safety Continuum	Detection	<ul style="list-style-type: none"> • Chart Review • Manual screening/tracking 	<ul style="list-style-type: none"> • Trigger Tool • Surveillance 	<ul style="list-style-type: none"> • Automated Trigger Tool
	Measurement	<ul style="list-style-type: none"> • Voluntary reporting • Descriptive analytics 	<ul style="list-style-type: none"> • Advanced analytics 	<ul style="list-style-type: none"> • Automated measurement and real-time prediction
	Improvement	<ul style="list-style-type: none"> • Root cause analysis • Toyota method (Lean) • PDCA cycles • Electronic order entry • Basic drug CDS 	<ul style="list-style-type: none"> • Standard electronic order sets • Care pathways w integrated CDS • Advanced drug CDS • High reliability methods 	<ul style="list-style-type: none"> • Prescriptive analytics • AI-based CDS
	Transformation	<ul style="list-style-type: none"> • Regulatory, e.g., JCAHO patient safety goals 	<ul style="list-style-type: none"> • Design thinking • Introduction of real-time monitoring 	<ul style="list-style-type: none"> • Real-time monitoring, prediction and prescription

A second view of the patient safety continuum, shown in Table 2, below, categorizes methods and tools by function – specific examples are listed below the table.

Table 2, Patient Safety Methods and Tools – Functional Framework

		New Methods and Tools					
		Analytics	Surveillance	CDS	Alerting	Display	Integrated
Patient Safety Continuum	Detection						
	Measurement						
	Improvement						
	Transformation						

Analytics

- Descriptive: Data analysis tools and methods to describe the current state
- Predictive: Based on algorithms derived from past experience, predicts future results/events
- Prescriptive: Based on algorithms derived from experience, recommends specific action to improve results/prevent events

Surveillance

- Automated adverse event Trigger tools
- Automated clinical deterioration scores (e.g., Rothman)
- Automated sepsis surveillance “sniffers”

CDS (Clinical decision support algorithms and care standards) – Evidence-based rules and formulas, and care guidelines/protocols that identify risks or events, and promote safer care to avoid adverse events

- Drug dosing calculators
- Patient falls risk screening tool
- Electronic order sets and care pathways (for sepsis for example)

Alerting/Automated Workflows and Communications

- Drug prescribing alerts delivered on-screen during order entry
- Automated routing of process steps for sepsis screening
- Automated phone call or email to nurse to prompt adverse event investigation and prevention/amelioration

Enhanced Data Display – It is not necessary to have sophisticated algorithms to change clinician behavior and help prevent safety events or improve quality; sometimes showing useful data for clinicians to incorporate in their mental processes is highly effective

- Display of lab values on drug prescribing and dosing screens
- Ventilator bundle documentation status display on ICU screen saver

Integrated Solutions – The above methods and tools can be combined to provide greater ability to detect and measure safety risks and events, and improve performance

- More complex sepsis “sniffer” algorithms, fed by continuous electronic surveillance, with automated detection of provider inaction before automatically alerting first nurses, and after their review, doctors if necessary.
- Automated care pathways with integrated order sets and drug dosing decision support calculators.

EXISTING CHALLENGES

The adoption of these new approaches to safety remain limited, with less than 15% of hospitals currently actively using any of the new techniques outlined above. There are many barriers to adoption of these methods, the most important of which is that the most common platform to apply these methods is the Electronic Health Record (EHR), and currently no leading EHR vendor offers these approaches in their suite of applications. These vendors have responded that that this functionality is not being requested by clients and it is not included in any meaningful use requirements either. These methods are offered by several non EHR vendors, but adopting them requires purchasing a new vendor product and then interfacing this vendor to the existing suite of health IT applications which can be costly and risky for a health provider.

Most health provider organizations already have a safety risk management infrastructure in place, often with an incident reporting vendor system in place and an organizational structure built around it. Adding a new vendor and approach to the mix is often viewed as expensive and duplicative. The other major challenge is that the new methods will find many more safety problems, as many as tenfold more. This creates serious issues about adequately addressing all these newly detected safety problems leading some hospitals to turn on these systems and then turn them off. In addition, handling the real-time safety

issues these systems provide requires a change in workflow, and new models of care to address safety in real time. Finally, there is a challenge of the legal risk associated with detecting so many safety problems – will it harm the reputation of the organization, or increase the malpractice risk to the organization?

HOT ISSUES IN THE FIELD

The actual extent of safety problems in healthcare is still being hotly debated in the academic literature and therefore these new methods and their increased detection of harm have been challenged as overestimating the amount of harm, to wit, the huge debate over safety problems being the 3rd leading cause of death in US hospital patients. In addition, the leading US health care regulators such as the Joint Commission and Centers for Medicare and Medicaid Services (CMS) have not required or advocated for the use of these approaches to measure safety. This lack of regulatory requirement helps maintain the inertia impeding change on the part of providers, as well support the actions of the risk management community and associate vendors to maintain the status quo, by pointing to improvements in incident reporting systems and the potential for these systems to evolve into better detection systems

OPPORTUNITIES

These new approaches offer the opportunity to transform our approach to safety from a largely manual retrospective approach to a real time and predictive approach that can markedly reduce the occurrence of safety problems, and to create a pathway to true high reliability. Our recommendations highlight the need to move to this new prospective approach to safety measurement and management. CMS is already moving in this direction, as it has begun building its next generation automated safety measures for public reporting. Indeed, the National Quality Forum just approved two of these new electronic safety measures that it has developed using the new approaches that are described above. Newly emerging trends include sharing real-time information with patients as demonstrated in a new project funded by the Robert Wood Johnson Foundation that shared real time patient safety e-dashboards with patients and families as a part of their inpatient care, leading to more activated patients who had lower readmission rates and lower 30-day mortality rates.

UNANSWERED QUESTIONS

A major area of research interest is “how to feedback real-time safety information at the point of care”. Initial studies have shown that frontline nurses and physicians are too busy to handle this information and that other methods are needed to insert this information into care, with ongoing research in the use of 24/7-hour monitoring centers or operation centers like those the aviation industry uses. Another important question is “how to use this information to improve patient safety measurement in a consistent and standardized fashion that can be generalized across vendors and provider organizations and settings of care”, an area that would benefit from federally funded research. Finally, the use of advanced analytics and artificial intelligence to improve the prevention of safety problems is in its infancy, and would benefit from research and translational applications as it continues to mature.

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