Digital Health and Patient Safety

By Dr Yasir Khan, Lead Physician Executive at Cerner in Middle East & Africa

'Do no harm' – an undertaking that every clinician takes when they enter the world of healthcare provision. It is one of the oldest guiding principles of medical service that has existed since the Hippocratic Oath was first uttered. This principle reflects on a huge responsibility that lies on the shoulders of healthcare providers and organizations across the entire spectrum of healthcare.

TECHNOLOGY HAS SWIFTLY TRANSITIONED FAR-FETCHED IDEAS TO EVERYDAY COMMODITIES FOR ALL.

Patient safety is a healthcare discipline that has emerged out of a similar concept of avoiding harm to the patient. The application of patient safety isn't limited to therapeutic care, but it also applies to preventive care, as well as healthcare research, to ensure best ethics are practiced. Creating a culture of safety is a core pillar of the patient safety concept – it has been derived from practice outside the medical sphere, where it was found that reducing undesirable events on a sustained level contributes heavily towards an increased performance and quality of service in such organizations.

Over the past century, we have made remarkable advances in the science and technology space. Technology has swiftly transitioned far-fetched ideas to everyday commodities for all. In the technology space for healthcare, digital health tools were conceived in the early 1960s as an idea of replacing manual documentation with electronic files for an improved care process that would be consistent and reliable. The initial efforts were perceived as an advanced yet unaffordable invention for the majority of healthcare organizations. Ever since then, continuous work has gone into this field to make health information technology (HIT) more accessible and more relevant to the service requirements. With the passage of time, the value of HIT has also increased manifold – from provision of vital documentation platform to becoming a core pillar for modernization of entire health systems.

The infamous 1999 Institute of Medicine report To Err is Human presented compelling evidence that errors and adverse events occur widely in healthcare. It was widely expected that adoption of HIT would substantially ameliorate threats to patient safety. More recent evidence posits that to truly benefit from HIT, organizations need to maintain a sustained focus on the following three dimensions:

- Clinically relevant system design
- User-focused implementation
- Effective utilization

When done correctly, HIT can address key areas of patient safety concern, particularly those relating to medication safety, diagnostic errors, and communication issues. Computerized physician order entry (CPOE) has been shown to reduce medication-related errors. Health information exchanges (HIE) can enhance patient safety by establishing more effective communication methods. EHRs can also enhance patient safety by detecting missed diagnoses, producing diagnostic error alerts to prevent misdiagnosis, and assisting the practitioner in gathering and synthesizing patient information.

INFORMATION STORAGE AND ITS PRESENTATION SHOULD BE CONSIDERED A BASIC FUNCTION FOR ANY HIT SOLUTION. INFORMATION SHARING ACROSS CLINICAL SPECIALTIES AND ITS HIGH AVAILABILITY IS AN ELEMENTARY EXPECTATION. ANOTHER ASPECT IS CLINICALLY RELEVANT SUMMARIES OF THE EXTENSIVE CLINICAL INFORMATION THAT A SOLUTION MAY HOLD ON AN INDIVIDUAL.

Following are some of the important design considerations for development and implementation of clinical workflows for digital health. Research has shown that when done well, these significantly contribute to end-user ownership and meaningful utilization of digital solutions.

Right information at the right time

Healthcare provision is an extremely information-dependent modality. For effective diagnostic and therapeutic decision-making clinicians require access to not only a patient's previous issues, but what treatments have been undertaken and extent to which they were effective. A clinician's own medical notes are not the only ones requiring consideration, but also those contributed by other disciplines and investigations. With added complexity of an individual's care being spread out across multiple geographically distant facilities, it is easy to see how a critical information can be missed leading to harm.

Information storage and its presentation should be considered a basic function for any HIT solution. Information sharing across clinical specialties and its high availability is an elementary expectation. Another aspect is clinically relevant summaries of the extensive clinical information that a solution may hold on an individual. Highlighting abnormalities in lab results and captured vital signs upfront makes it difficult for these to be missed.

Care standardization

Standardization of care has long been known to be an effective strategy for care quality, especially when it is evidence based. Care practice guidelines and care pathways make entire care processes predictable and safe.

HIT builds on the same concept by not only digitizing approved care pathways, but also digitally transforming workflows. Care pathways are baked into a well-designed solution, providing step-by-step guidance to ensure maximum compliance.

Additionally, approved abbreviations and data elements, common formulary items across facilities within a single enterprise, approved practice guidelines for core measure reporting and defined structure during the ordering process reduce the chances for unintentional practice variation.

The benefits of standardization far exceed the challenges, the design/build once and implement/use many times is the foundation of good standardization.

Automated flags and alerts

HIT designed to improve clinical decision making is particularly attractive for its ability to address the growing information overload clinicians face and to provide a platform for integrating evidence-based knowledge into care delivery.

With the extensive clinical information captured for every patient visit, critical clinical information can become difficult to identify, especially in highly charged and busy clinical environments like the emergency department. HIT solutions contain smart algorithms that utilize complex logics and rules to understand the clinical context of information and bring it within the clinician's workflow. One such example is detection of abnormal kidney functions from laboratory investigations and highlighting more 'kidney-friendly' alternatives to the clinician during prescription.

For more clinically critical scenarios, more restrictive approaches are employed. In such cases, certain intervention is either not allowed by the system or will have a 'break glass' step implemented where the user has to acknowledge a system highlighted clinical risk and submit for approval.

Automation of workflows

To make workflows efficient, standardized and effective, workflow automation has been applied to many protocols. It can utilize smart rules to identify cues and prompt automated tasks for patient management.

MODERN HIT SOLUTIONS ARE EQUIPPED WITH A UNIVERSE OF SUCH CLINICAL DECISION SUPPORT TOOLS. FROM MEDICAL CALCULATORS THAT CAN INTERPRET PATIENT DOCUMENTATION INTO CLINICALLY RELEVANT INTERPRETATIONS THAT AID CLINICIANS IN DEFINING THE COURSE OF PATIENT MANAGEMENT.

Such automation reduces cognitive load on the clinician by programming certain crucial steps according to the agreed clinical protocol. These represents an extremely potent approach to utilize HIT for patient safety and quality.

A good example is monitoring certain medications that are necessary for treatment but known to have adverse effect for some individuals. These medications are prescribed under a monitoring protocol that usually involves a laboratory test after a month of starting the medication. In this case, automated scripts schedule the right investigation within the most appropriate duration after starting the treatment, with no additional human intervention. Once results become available, they are only highlighted to the prescribing physician. If they are abnormal, the physician can then ether alter the dose or stop the medication.

Clinical decision support

Any digital system that helps a clinician to make prompt, timely and accurate decision is classified as clinical decision support. Some of the aspects described above certainly fall under it. However, some additional dimensions of clinical decision support are worth mentioning and only became possible with the advent of HIT.

One such dimension is automatic risk stratification and escalation. Longitudinal medical records hold extensive clinical data on every patient. This is then utilized to create a risk profile of every individual and stratify the resulting cohort from low to high risk of an adverse outcome. The clinician can use this information to plan proactive care for patients at higher risk. A practical application of risk stratification is for maternity care. At the time of first antenatal visit, the system can look back at historic data (e.g. previous pregnancies, miscarriages, patients age, existing conditions, medications, and historic results of laboratory tests) and combine it with current presentation data to create a risk profile through an intelligent algorithm.

Modern HIT solutions are equipped with a universe of such clinical decision support tools. From medical calculators that can interpret patient documentation into clinically relevant interpretations that aid clinicians in defining the course of patient management.

Artificial intelligence

Data captured in the EHR is widely utilized for not just monitoring and management, but now mature EHRs have the capability to convert available data into predictive models to forecast a patient's risk of deterioration in future. This can be utilized to prevent any adverse events and improve health outcomes.

Conclusions

While HIT solutions (EHRs, HIEs, data acquisition and analysis tools, and clinical decision support systems among others) are extremely effective instruments for patient safety, it is important to note that they aren't configured to work out of the box. Organizations need to invest into clinical decision support governance and capable implementation teams to take full advantage of their investment. Lastly and certainly not least, this is an iterative and continuous process.

THE BENEFITS OF STANDARDIZATION FAR EXCEED THE CHALLENGES, THE DESIGN/BUILD ONCE AND IMPLEMENT/ USE MANY TIMES IS THE FOUNDATION OF GOOD STANDARDIZATION.

Organizations need to focus on entire ecosystem i.e. system design, intended uses, and how it is actually utilized. Implementation of newer intelligent patient safety solutions into an existing environment with individuals resistant to change is destined to failure. Research has clearly shown that if digital solutions are not properly embedded through end user testing and ownership, they may become a patient safety concern themselves. Delivering safe and effective user experience requires co-design and co-production by developers, clinicians and patients.