Technology and AI
as tools to increase patient safety

Generated with AI
By jakir

Patient safety is a subset of healthcare and is defined as the avoidance, prevention and amelioration of adverse outcomes or injuries stemming from the processes of healthcare.
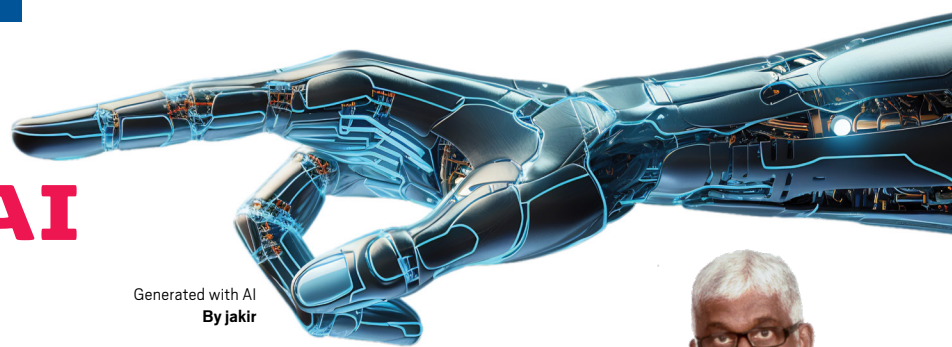
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PATIENT SAFETY ALWAYS comes first for healthcare providers. It is difficult to keep all patients safe.

Medical error is the third leading cause of death in the United States, leading to over 250 000 deaths each year. Sentinel events associated with medical errors are preventable through technology.

The challenge isn't in creating best practices for patient safety, but rather in implementing with consistency.

Technology consistently certifies a reduction in errors, a decrease in miscommunications, and an assurance in provider compliance.

In 1999, the Institute of Medicine [IOM] report To err is human called for developing and testing new technologies to reduce medical errors and in 2001 the report Crossing the Quality Chasm called for information use.

The 1999 IOM report dramatically increased public awareness of medical error. It is estimated that each year 44 000 to 98 000 people die of an iatrogenic injury, either as a main or a contributing cause, and that 1.3 million are injured by medical treatment.

The mortality estimates were extrapolated primarily from two large studies, one in New York State (The Harvard Medical Practice Study) and the other in Colorado and Utah.

Even though some controversy surrounds the accuracy of these mortality estimates, all agree that the number of deaths attributed to iatrogenic injury is too high. In 1984 Harvard Medical Practice Study showed an overall adverse event rate of 3.7 per 100 admissions for inpatients, and 0.6 and 2.1 per 100 admissions for newborns and children aged 15 years or younger, respectively.

Most common adverse events in this study were complications of medicine use (19.4%), followed by wound infections, operative complications, and diagnostic mishaps. Of these adverse events, 71% resulted in a disability that lasted less than six months, 3% caused permanent disability and 14% led to death.

Technology as a key first step in transforming the healthcare environment to achieve better and safer care. In the past several decades, technology advances have opened new possibilities for improving patient safety. Using technology to digitise healthcare processes has the potential to increase standardisation and efficiency of clinical workflows and to reduce errors and cost across all healthcare settings.

However, technology approaches and applications must be used appropriately, following standardised evidence-based guidelines and domains. The adoption of Generative AI and technology in healthcare ecosystems has just begun.

Providers rightfully are still cautious about use of AI, yet generative AI is a transformative technology that cannot be ignored. Generative AI / Technology support can improve patient care, safety, and better outcomes. If implemented appropriately :
- Digital solutions will become common in all aspects of healthcareImprove patient care and safety
- Improve certain experiences of care
- Make interactions quicker
- Quicker completion of pre-authorisation processes with digital scribe
- Improve record keeping
- Bridging the gap between provider and patients.

The benefits and use in hospitals and facilities also show enormous benefits and promote safety. AI is used to help optimise hospital workflows, inventory control, ensure proper staffing, due to application of data and use of scientific algorithms.

SOME TECHNOLOGICAL APPLICATIONS
Clinical Decision Support [CDS]
CDS provides clinicians, patients, and other individuals with relevant data (patient specific information), purposefully filtered, and delivered through a variety of formats and channels to improve and enhance care.

Computerised Patient Order Entry [CPOE]
One of the main applications of CDS is Computerised Patient Order Entry (CPOE) is a process used by clinicians to enter and send treatment instructions via a computer application. The change from paper to electronic order entry itself can reduce errors (due to unclear handwriting or manual copy errors), research conducted in 2022 showed that there is still room for improvement in order entry systems, as well as some novel approaches. Two studies looked at the frequency of and reasons for medication errors in the absence of CDS and CPOE and showed that:
- Medication errors occurred during the ordering or prescribing stage
- Most common prescribing errors was incorrect dose.

Further research, such as the AHRQ Medication Safety Measure Development project aims to develop and validate measure specifications for wrong-patient, wrong dose, wrong medication, wrong route, and wrong frequency medication orders within EHR systems, to better understand and capture health IT safety events.

Errors of this type can be avoided or at least reduced using effective CPOE and CDS systems. However, with optimal application of CDS and CPOE tools, errors can still occur and even be caused by the systems themselves.

One study reviewed duplicate medication orders and found that 20% of duplicate orders resulted from technological issues, including alerts being overridden, alerts not firing and automation issues (prefilled fields). Studies have shown that a fully implemented CPOE systems significantly reduced specific serious and commonly occurring prescribing and procedural errors.

In 2022, a particular CPOE feature showed significant improvement: automatically discontinuing medication orders and relaying pertinent information to pharmacies. Deprescribing is a planned and supervised process of dose reduction or stopping of a medication that is no longer beneficial or could be causing harm. The study showed an immediate and sustained 78% increase in successful discontinuation after implementation of the software.

A second study on the same functionality found that currently only one third to one half of medications are e-prescribed, and the study proposed that e-prescribing should be expanded to increase the impact of the deprescribing software.

HOW ARE PROVIDERS USING TECHNOLOGY TO ENHANCE PATIENT CARE AND SAFETY
EHR
In the last decade, much of Health Information Technology started with adoption of EHR by medical facilities.

These records provide a central repository of the patient medical history, allowing for the sharing of information, including physician notes, test results and information on prescription of drugs and clinical decisions. EHR considers the impact of Human factors in healthcare, improving communication and providing 'one source of truth' on the patient's health and treatment for better coordination of the patient care process. The impact of information technology has expanded beyond just information visibility and sharing to utilising information for data informed patient care.

Health Information Technology has emerged as the most cost-efficient, cost-effective, and safe alternative to traditional methods in improvement of patient safety and quality of care.

BOOSTING DIAGNOSTIC ACCURACY
Errors can occur with diagnostic testing, such as lab work or imaging, especially with manual processes. It is easy to mislabel an Xray. Digitised diagnostic tools and communication systems enhance patient care and safety.

These assessments ensure patients are matched to the correct tests and providers have instant access to results.

AI AND MACHINE LEARNING
One of the largest areas of burgeoning technologies in healthcare has been AI.

AI and machine learning use algorithms that absorb large amounts of historical data, predict outcomes, recommend treatments, and are being integrated into EHR and CDS systems. Using machine learning to improve and filter CDS alerts can reduce alert volumes by 54% while maintaining high precision, potentially alleviating alert fatigue and habitual overriding. Another topic explored in a scoping review was the use of AI to reduce Adverse Drug Events.

IN HOSPITALS/FACILITIES
Data from devices, scans, and prior patient encounters can be incorporated into Electronic Medical Records.

Efforts are underway to anonymize or tokenize data for sharing across hospitals. Predictions suggest this will enhance operational tasks and support clinical decisions with AI.

RADIO FREQUENCY IDENTIFICATION TECHNOLOGY
This technology is used in operating and procedure rooms to count, locate, and detect swabs and sponges, with accuracy validated by research in AORN practice guidelines. It is crucial for preventing Retained Surgical Items (RSI).

AI and technology play an important role in improving population health and safety, enabling informed decision-making. The key dimensions of technology in healthcare focus on enhancing patient safety and the quality of care. MC