

Learning Health Systems for Patient Safety

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Despite an [observable decrease](#) in adverse events in health care over time, rates of patient harm remain high. According to the World Health Organization, the global rate of patient harm is about 1 in every 10 patients, and roughly 50% of patient harm is preventable.¹ There have been improvements in patient safety, but progress has been slow. Patient safety initiatives vary widely across healthcare organizations despite common identifiable risk factors, adverse events, and patient safety goals. [One clear challenge](#) in improving patient safety has been to disseminate knowledge and implement best practices consistently across the entire healthcare system.

In response to the slow reduction in rates of patient harm and siloed nature of the healthcare system, in 2018, the Institute for Healthcare Improvement convened the [National Steering Committee for Patient Safety](#) (NSC), an interdisciplinary collaboration of 27 organizations committed to achieving safer care and reducing harm to patients and caregivers.² Insights from the NSC informed [Safer Together: A National Action Plan to Advance Patient Safety](#), released by the Agency for Healthcare Research and Quality (AHRQ) in 2020. This call to action emphasizes that meaningful and lasting improvements in patient safety require a [total systems](#) approach, [defined as](#) “a coordinated, proactive strategy in which risks are anticipated and systemwide safety processes are applied across the entire healthcare continuum through robust collaboration among all stakeholders.” [The National Action Plan](#) specifies 17 recommendations centered on four priority areas to build the foundation needed to advance patient safety: culture, leadership, and governance; patient and family engagement; workforce safety; and learning systems.

Learning systems focus on fostering continuous learning across healthcare organizations and facilitating widespread sharing of information. Shared learning and improvements in patient safety happen when learning health systems with a strong [safety culture](#) make it possible to communicate openly, learn from what went well and what went wrong, and implement best practices within and across healthcare organizations.

Background

A [learning health system](#) is a [health system](#) (i.e., a group of one or more healthcare organizations, such as physician practices, hospitals, insurers, and skilled nursing facilities) that systematically leverages internal

data and experience together with external evidence to continuously learn, disseminate knowledge, and facilitate high quality, safe patient care.³ Key components for creating and sustaining a successful learning health system include a strong safety culture, support from leadership, and the infrastructure, systems, and resources that allow for data analysis to advance knowledge and practice.⁴

Key players in successful learning health systems include leaders, clinicians, patients/families, policymakers, and researchers. Learning health systems should be aligned around a common goal plus standards, processes, and infrastructure to support collaboration and a method for sharing information and resources to achieve that goal.⁵

Within a healthcare system, data are collected for different reasons and stored in systems with varying access policies, which means it can be difficult to identify the appropriate data for analysis to address specific patient safety issues. Because of this, researchers are another important component of learning health systems. When researchers are embedded within a health system, their unique perspective and access to data allow them to identify opportunities for improvement, share their findings, and create generalizable knowledge.³ AHRQ and the Patient-Centered Outcomes Research Institute fund [Learning Health System Embedded Scientist Training and Research \(LHS E-StaR\) Centers](#) to build a national learning health system infrastructure and work toward closing the gap between research and practice.

Impact on Patient Safety

Learning health systems can positively impact patient safety and reduce patient harm by enabling healthcare systems to more efficiently identify risks, mitigate errors, and implement evidence-based best practices and interventions. Preventable errors in health care often have common root causes. Although each event is different, there are often similarities in risk factors and potential interventions that may be missed without effective [reporting and analysis](#) in combination with dissemination of the lessons learned. The role of a learning health system is to foster this analysis and shared learning.

One potential impact of a learning health system is a reduction in adverse events, such as medication errors and diagnostic errors, through real-time data collection and analysis. Diagnostic errors are a leading cause of patient harm, accounting for [approximately 17%](#) of preventable errors in hospitalized patients. Implementation of a learning health system can lead to [increased decision support for clinicians](#) in making accurate diagnoses. Sharing data and knowledge related to patterns in diagnoses both within and across healthcare organizations can facilitate development of tools to help physicians make a timely and accurate diagnosis, particularly in patients with complex conditions.⁶

In addition to reducing patient harm, learning health systems can also improve patient outcomes. One example is ImproveCareNow, a learning health system for children with inflammatory bowel disease (IBD).^{7,8} ImproveCareNow engages young people with IBD to create toolkits and guides to educate other IBD patients about the experience, leading to an easier psychological adjustment post-operatively.⁹

Role of Technology

Information technology (IT) is integral to a successful learning health system, especially for collecting and analyzing data.¹⁰ IT, such as electronic health records (EHR), is critical in allowing learning health systems

to record, compare, and present information in real time to support patient safety goals.³ However, due to the fragmented nature of healthcare systems and varying data sources and access policies, it can be difficult to efficiently identify and leverage needed data for analysis and to facilitate shared learning and improve care.^{11,12}

An example of using the EHR as part of a learning health system is the “Learn from Every Patient Program,” which used a tool within the EHR to capture data and review outcomes for patients who received annual x-ray screenings for hip displacement. As a result of this analysis, the learning health system made an evidence-based change to limit hip X-rays for mildly affected patients with cerebral palsy, reducing costs to the patient and the healthcare system.¹³

The rapid proliferation of artificial intelligence (AI) in recent years has led researchers to explore the role of AI in health care. AI has the potential to streamline standard processes, such as notetaking, and to reduce the burden on healthcare staff. However, it is important to consider that AI should complement, not replace, existing processes within learning health systems.¹⁴

Future Directions

The journey to a successful learning health system, where data and evidence from internal and external sources are effectively leveraged, disseminated, and put into practice, is ongoing and iterative, not a straight line. In the future, there may be a movement toward learning health networks, where national and global organizations can operate as [one system](#) and learning environments share data and best practices to work toward the common goal of minimizing patient harm and delivering high quality care. While there is a bright future in the use of technology, such as electronic health records and artificial intelligence, barriers to adoption, such as the financial burden to implement such technology and a lack of standardization, need to be addressed.

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