COMPLEXITY
Structure
Knowledge
Patients

COSTS
“...a learning healthcare system that is designed to generate and apply the best evidence for the collaborative healthcare choices of each patient and provider; to drive the process of discovery as a natural outgrowth of patient care; and to ensure innovation, quality, safety, and value in health care”

Roundtable on Evidence-based Medicine 2006
Learning Health Care System in America 2012
National Academy of Medicine
Learning Health Systems—

• Have leaders who are committed to a culture of continuous learning and improvement.

• Systematically gather and apply evidence in real-time to guide care.

• Employ IT methods to share new evidence with clinicians to improve decision-making.

• Promote the inclusion of patients as vital members of the learning team.

• Capture and analyze data and care experiences to improve care.

• Continually assess outcomes refine processes and training to create a feedback cycle for learning and improvement.

Source: https://www.ahrq.gov/learning-health-systems/about.html
Care and Learn Model

Source: Montori et. Al; 2019
Learning Health Systems Solutions Model

- Implementation
- Digital Real-time Knowledge
- Identification of Opportunities/Gaps

Rapid Cycle Testing
Application to Opioid Prescribing

Wide Variation and Overprescription of Opioids After Elective Surgery

Results of a Prospective, Multicenter Initiative Aimed at Developing Opioid-prescribing Guidelines After Surgery

The 2018 Chitrnanjan S. Ranawat, MD Award: Developing and Implementing a Novel Institutional Guideline Strategy Reduced Postoperative Opioid Prescribing After TKA and THA
Rapid Cycle Testing

Goals: Better care
Provider efficiency
Satisfaction
Higher value

Development of Algorithm

Implementation / Diffusion

Testing with Patients and Providers

EHR "Innovation Sandbox"

Impact Measurement

Human Centered Design Principles (Visual / Workflow Design)
Prospective validation of a deep learning electrocardiogram algorithm for the detection of left ventricular systolic dysfunction

Zachi I. Attia MS, Francisco Lopez-Jimenez, Rickey E. Carter PhD, Peter A. Noseworthy MD

1Department of Cardiovascular Medicine, Mayo Clinic, Rochester, MN 55905.
2Division of Biomedical Statistics and Informatics

Background A deep learning algorithm to detect left ejection fraction (EF) using routine 12-lead electrocardiogram (ECG) has recently been developed and validated. The algorithm was incorporated into the electronic health record (EHR) to automatically screen for low EF, encouraging clinicians to obtain a confirmatory transthoracic echocardiogram (TTE) for previously undiagnosed patients, thereby facilitating early diagnosis and treatment.

Goals: Better care, Provider efficiency, Provider satisfaction

Reimbursable

Applying Rapid Cycle Testing to AI

ECG AI-Guided Screening for Low Ejection Fraction (EAGLE): Rationale and design of a pragmatic cluster randomized trial

Xiaoxi Yao, PhD, Rozalina G. McCoy, MD, MS, Paul A. Friedman, MD, Nila D. Shah, PhD, Barbara A. Barry, PhD, Emma M. Behnken, Jonathan W. Inselman, M.S., Zachi I. Attia, M.S., and Peter A. Noseworthy, MD

Background A deep learning algorithm to detect low ejection fraction (EF) using routine 12-lead electrocardiogram (ECG) has recently been developed and validated. The algorithm was incorporated into the electronic health record (EHR) to automatically screen for low EF, encouraging clinicians to obtain a confirmatory transthoracic echocardiogram (TTE) for previously undiagnosed patients, thereby facilitating early diagnosis and treatment.

Objectives To prospectively evaluate a novel artificial intelligence (AI) screening tool for detecting low EF in primary care practices.

Design The EAGLE trial is a pragmatic two-arm cluster randomized trial (NCT04000087) that will randomize >100 clinical teams (i.e., clusters) to either intervention (access to the new AI screening tool) or control (usual care) at 48 primary care practices across Minnesota and Wisconsin. The trial is expected to involve approximately 400 clinicians and 20,000 patients. The primary endpoint is newly discovered EF ≤50%. Eligible patients will include adults who undergo ECG for any reason and have not been previously diagnosed with low EF. Data will be pulled from the EHR, and no contact will be made with patients. A positive deviance qualitative study and a post-implementation survey will be conducted among select clinicians to identify facilitators and barriers to using the new screening report.

Summary This trial will examine the effectiveness of the AI-enabled ECG for detection of asymptomatic low EF in routine primary care practices and will be among the first to prospectively evaluate the value of AI in real-world practice. Its findings will inform future implementation strategies for the translation of other AI-enabled algorithms. (Am Heart J 2020;219:31-36.)