The Importance of Using Electronic Health Records to Mitigate Public Health Crises, Including COVID-19

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Abstract

The usage of electronic health records (EHRs) in the United States (US) has led to increased patient safety, an improved ability to leverage big data to analyze public health trends, and better accountability for medical practitioners. However, increasing usage of EHRs has also led to increased self-reported physician burnout, along with data privacy and confidentiality concerns. Nevertheless, the United States government has released policies incentivizing adoption and continued usage of EHRs by medical practitioners and hospitals. As the COVID-19 pandemic continues to impact society at large, it is important to utilize EMRs to both combat this present pandemic and prepare for future public health crises. This piece aims to briefly synthesize government policy, methods for improvement of EHRs, and the benefits of EHR usage in mitigating individual and public health issues, including COVID-19.

In 2009, the US government released the Health Information Technology for Economic and Clinical Health (HITECH) Act, which sought to encourage healthcare providers to adopt electronic health records (EHRs). The legislation also provided guidelines for privacy and security protections towards healthcare data. At the time the HITECH Act was introduced, only 10% of hospitals had adopted EHRs. As part of the Obama Administration's American Recovery and Reinvestment Act of 2009, the government resolved to spend $25.9 billion to promote and expand the adoption of health information technology. Of this, $20.6 billion went towards an incentive program to promote implementation of EHRs (United States Congress, 2009). Incentives from the legislation included $44,000 per physician under Medicare, and up to $65,000 over six years under Medicaid for EHR adoption. Also, the act decreased reimbursements for physicians who failed to use EHRs by 2015. Furthermore, the act outlined meaningful use of EHRs by providers to achieve significant improvements in care (Centers for Medicare & Medicaid Services, 2010).

As a result of the HITECH Act, adoption of EHRs significantly increased to about 86% in 2017 for office-based physicians in the United States, and about 96% for non-federal acute care hospitals (The Office of the National Coordinator for Health Information Technology (ONC), 2021). A systematic review in 2017 found that health information systems, along with information sharing (mandated by the 21st Century Cures Act in

2016), reduced staff errors and incidents, improved automated harm detection, improved monitoring of patients, and enhanced continuity of care during physician handoffs (Reis et al., 2017). The rise of machine learning applications to predict healthcare outcomes has provided an additional unique opportunity to leverage EHRs. Studies have utilized machine learning applications to interpret EHR data and predict type 2 diabetes, suicide risk, classify macular degeneration images, model hospital readmission rates, and more (Huang et al., 2019).

As the virtual environment we live in seems increasingly destined to outlast the COVID-19 pandemic, telehealth has become a focus of healthcare. The integration of EHRs with telehealth services has removed the need for duplicate data entry between telehealth and EHR services. This integration has resulted in a secure HIPAA-compliant platform, and a provider- and patient-friendly modality that can be easily navigated. A 2020 Stanford Children's Health study found that the integration between their EHR and their Health Information Management Services allowed for efficient, high-quality care in the wake of a 600% increase in telehealth utilization after the San Francisco shelter-in-place order (Carlson et al., 2020).

While EHRs have been associated with the aforementioned safety and care efficiency benefits, there are a number of shortcomings and pitfalls of EHR utilization in its current iteration. According to a 2014 survey of the American College of Physicians member sample, family practice physicians reported spending 48 minutes more per day when using EHRs. Two-thirds reported an increase in time spent writing notes, and a third reported an increase in time finding and reviewing medical record data, as well as reading other clinicians' notes (McDonald et al., 2014). Another large national study found that physicians using EHRs and computerized physician order entry (CPOE) had lower satisfaction with time spent on clerical tasks and higher rates of burnout. Additionally, 43.7% of physicians using EHRs were "dissatisfied" or "very dissatisfied" with EHRs (Shanafelt et al., 2016).

Another important concern surrounding EHR use is patient and data privacy. Edward Snowden's famous 2013 leak revealed that the NSA had successfully broken into encryption codes protecting electronic health records (Holmes, 2013). A 2015 data breach within the UCLA Health system affected as many as 4.5 million individuals (Calamur, 2015). Continued efforts must be made in order to prevent further breaches and leaks and to ensure health data privacy.

Despite the existing concerns with EHRs and patient data privacy, it is important to acknowledge the benefits of utilizing EHRs to leverage pooled data in order to combat public health crises. One of the recent prominent public health events in the US was the Flint Water Crisis, which began in 2014. In an effort to save money, the town of Flint, Michigan changed its water supply from Lake Huron to the Flint River as

a temporary measure in April 2014. Dr. Hanna-Attisha, a pediatrician in Flint, was informed by a local water engineer, Marc Edwards, that high levels of lead were found in Flint homes. She requested blood-lead-level data from county and state level health departments. Her request was quickly denied, and she was told her information was wrong and might cause mass hysteria. In response, she utilized Flint's Hurley Medical Center's EHR records to collect data for her study, reviewing blood levels for young children prior to and after the change in water source. She found that blood lead levels more than doubled after the change, prompting a state of emergency to finally be declared in Genesee County (where Flint is located) at the beginning of 2016 (Hanna-Attisha et al., 2016).

More recently, a study published in 2021 trained a computerized model to predict risk of mortality in those diagnosed with COVID-19. The model leveraged only demographic, diagnosis, and medication data from EHRs to generate results, and yet, it was able to perform similarly to prognostic models requiring symptoms, laboratory values, imaging, and other data during the course of patient illness. The study found age as the most important predictors of mortality, along with a history of pneumonia, diabetes, and cancer. The research team concluded that "the ability to compute precise individual-level risk scores exclusively based on the EHR is crucial for effectively allocating and distributing resources, such as prioritizing vaccination among the general population" (Estiri et al., 2021).

The preceding study was just one of many which leveraged health records either retrospectively, or through modeling, to derive epidemiological data related to the spread and mortality of COVID-19. Another study found that patients with substance use disorder (SUD) were at significantly increased risk for COVID-19 infection (an odds ratio of 8.699). Within that SUD subgroup, African Americans were 2.173 times more likely to be diagnosed with COVID-19 (Wang et al., 2021). A study in the United Kingdom leveraged health records of over 17 million patients to quantify and report risk factors, including Asian and Black race, income level (deprivation), and weight (OpenSAFELY Collaborative, 2020). These studies showcase the potential of EHRs to improve health outcomes at individual and population levels.

There is still much work to be done to improve EHR software and its integration with health systems and public records. Madhavan et al. pointed out that forecasting the need for ICU beds, ventilators, and other resources depends heavily on data generated at medical centers, and that the sharing of this data between EHRs and public health information systems is generally not complete and timely. Additionally, health data from small practices, county data, and care at nursing homes and prisons are often missing from healthcare provider organization records. This delineates some of the ways that the nationally-coordinated digital infrastructure for healthcare delivery and modernized patient care is still

inadequate at this time (Madhavan et al., 2021).

Weighing the potential opportunities and obstacles which are posed by extensive EHR integration and use, it is evident that the promise of improved health outcomes at individual and population levels requires efforts to mitigate privacy and provider burnout concerns. An interconnected network between EHRs, public health surveillance and reporting systems, disease registries and patient-reported data simply does not exist presently but will be increasingly necessary to combat future public health crises.

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