Impact of Health Information Technologies on the Quality of Healthcare Deliveries

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ABSTRACT

Through a literary review of recent research, this paper examines the mixed impact of health information technology (HIT) on patient care, medical errors, and the quality of healthcare delivery in selected hospital settings such as emergency departments. Specific technologies examined include the electronic health record (EHR), medical devices, artificial intelligence, and robotics. The paper identifies that some healthcare technologies are increasingly valuable in reducing medical errors, improving healthcare quality, and in producing better patient-centered outcomes. It also determines that technologies have complicated the delivery of quality patient care, increased the incidences of clinician burnout, and made receiving quality healthcare in America's hospital systems possibly less sure. The paper concludes with some suggestions for improving HIT's implementations and confirms the need for further evaluation of the impact of HIT in increasing patient safety and clinician well-being.

KEYWORDS

Artificial Intelligence, Decision Support System, Electronic Health Record, Health Information Technology, Internet of Things, Medical Errors

INTRODUCTION

In 1991, the Institute of Medicine (IOM) (now the National Academy of Medicine) recommended the widespread adoption of the computer-based patient record to help ensure accuracy and privacy of patient information. This recommendation met with a lackluster response from healthcare providers and manufacturers until the 1996 Health Insurance Portability and Accountability Act (HIPAA). HIPPA required health plans, health care clearinghouses, and certain health care providers to ensure the privacy and security of patient records. So, these groups began relying on computer-based technologies to meet HIPPA requirements.

Near the dawning of the 21st Century, policymakers began to promote computerized patient records as a way to secure patient information. The idea was to guarantee patient "safety of care" (i.e., "freedom from accidental injury") using various medical devices and electronic record keeping. For example, it is estimated that in 2013 the number of deaths range between 210,000 and 440,000 per year (Craver et al., 2017). Death in EHR error is considered as the third leading cause of death after heart disease and cancer. The Institute of Medicine's (IOM) Committee on Quality Health Care in America, released the first of two studies on quality of care in America. The first one, "To Err is Human: Building a Safer Healthcare System," focused on patient safety, identifying it as a critical component of the measure of healthcare quality previously left under-examined (Hughes, 2008). The

study's findings made headlines revealing "at least 44,000 people, and perhaps as many as 98,000 people, die in hospitals each year" due to "medical errors," including those errors caused by lost and misinterpreted patient records (Institute of Medicine, 2001). Many of the recommendations from this report called for the standardized use of computer and information technology in healthcare settings. In response to the IOM document, President Bill Clinton signed the Health Research and Quality Act of 1999 authorized the Agency for Healthcare Research and Quality (AHRQ) to promote patient safety and reduce medical errors (106th Congress, 1999).

Two more major government actions secured technology's entrenchment into the U.S. healthcare system, particularly as it pertained to the adoption of electronic health records (EHRs). The first was in 2004 with the creation of the Office of the National Coordinator (ONC) for Health Information Technology. Secondly, in 2009, was the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act. This law provided enormous financial incentives for technology manufacturers, clinicians, and healthcare facilities to rapidly produce and implement electronic health records (EHR) and their supporting technologies. The incentives and penalties inherent in the HITECH Act created a headlong rush to manufacture and adopt EHR's and other technologies in such a fashion that in only a short while, they may be seen as much a part of the problem as the cure for medical errors and preventing patient injury.

In response to multiple societal and governmental demands to improve the quality of health delivery, health information technology (HIT) implementation in high-risk departments such as the emergency, surgical, and intensive care units was designed to reduce medical errors and adverse events. Another goal was to help prevent diagnostic errors, inadequate patient assessments and ignored severities in a medical emergency (Zhang et al., 2017). Patient groups, government agencies, insurance providers, and even clinician groups demanded new regulations ensuring patient safety in addition to the access to newer technologies. These demands forced the adoption of various types of health information technologies such as medical information systems and informatics, the electronic health record (EHR), and medical devices. The goal for the appropriation of these technologies was to for better patient-centered outcomes, better management of preventable adverse events, and measurable improvement in the quality of care.

The purpose of this paper is to conduct a systematic review of the literature published between 1999 and 2019 to determine if the introduction of health information technology met its goals. Specifically, the goal is to examine the impact health information technologies have had on patient care, medical errors, and the quality of healthcare delivery in selected hospital settings such as emergency departments, surgical, and intensive care units. The technologies examined include the electronic health record (EHR), medical devices, and artificial intelligence.

Our literature survey was based on prior published articles from Pubmed library (https://www.ncbi.nlm.nih.gov/pubmed/). We searched using the following keywords for published articles between 1999 and 2019 "Electronic Health Record", "Impact" and found 789 articles. These articles have been further refined by excluding survey papers, articles that focus on developing EHR system, application of EHR data. The focus was on the discussion of impact on overall healthcare system after adoption. This led to 75 articles selected in the survey.

The rest of the paper is organized as follows: The next section discusses EHR advantages and disadvantages. The next section provides an overview of Decision Support System followed by Internet of Things and Artificial Intelligence related work. Next, we discuss some suggestion followed by conclusion of the work.

ELECTRONIC HEALTH RECORD: ADVANTAGES AND DISADVANTAGES

Before the rapid adoption and implementation of health information technology (HIT), mainly electronic health records (EHRs), the management of patient information faced problems that affected workflow efficiency, clinician performance, and patient safety. Quick access to accurate and complete

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