

Revised Prospectus

INST 421

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## Electronic Health Records (EHRs) and Health Information Exchange (HIE) and Their Impact on Healthcare System Efficiency

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### **Statement of Problem**

For quite some time, nations around the globe have been consumed by the idea of increased efficiency in their governmental systems. Over the last several decades, transportation systems move more people over longer distances in shorter amounts of time and food systems grow produce and livestock bigger and faster than ever--but how have healthcare systems been made more efficient over this same period? Many nations have made remarkable improvements to their healthcare systems of old, attaining higher standards of quality care and spending less money along the way. These improvements are absolutely necessary as the world's population

continues to grow older, more overweight and obese, and significantly more likely to be diagnosed with chronic conditions and diseases that require frequent visits to healthcare facilities. One might ask how these countries have managed to accomplish this challenging task of reforming their outdated healthcare systems, but the answer that continues to reappear in each of these situations is not quite as complex as one might think: technological innovation.

There have been numerous technological innovations as of late that have improved the efficiency of healthcare systems. Artificial intelligence, virtual reality simulations, and three-dimensional printers are just a handful of a seemingly endless number of innovations that have helped healthcare professionals improve their quality of care--but what impact have electronic health records (EHRs) and health information exchange (HIE) had on healthcare professionals and the systems in which they work? Electronic health records are defined as ““a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports”” (Menachemi, 2011, p. 48). Some of the basic benefits associated with the use of EHRs includes easy access of computerized records and the elimination of poor penmanship, but three functionalities that hold great promise in improving quality of care and reducing cost at the healthcare system level are clinical decision support (CDS) tools, computerized physician order entry (CPOE) systems, and health information exchange (HIE) capabilities (Menachemi, 2011).

In an era characterized by cloud computing breakthroughs and pressures to digitize patient data for increased coordination, it makes sense now more than ever that digital versions

of a patient's paper chart would be a tool that many healthcare systems would be willing to implement in order to improve their system efficiency--especially as global health trends illustrate an immense need for effective, interoperable, streamlined care. In fact, many countries have already taken the leap on this front and, although the implementation of a health information exchange (HIE) network is relatively new, this technology has emerged as a promising agent for improving the quality and reducing the cost of healthcare systems for many inquisitive nations aspiring for increased efficiency.

## **Theoretical Framework**

Defining efficiency within healthcare is a difficult and nuanced task because of the many complexities associated with the functions of each system. Healthcare systems change from country-to-country and year-to-year, and with those changes come challenges in understanding how they operate, how they are affected, and ultimately how they measure in terms of efficiency. Therefore, it is imperative to first establish a macro level framework for measuring and analyzing healthcare system effectiveness before taking a micro level approach to define indicators of efficiency and productivity within the context of EHRs and HIE. In order to fulfill this obligation, I plan to utilize a chapter from the European Observatory on Health Systems and Policies' (EOHSP) 2016 Health Policy Series titled: *A framework for thinking about health system efficiency*. This chapter provides a solid foundation for evaluating healthcare system efficiency because it represents the viewpoints of a respected regional branch of the World Health Organization that consistently supports and promotes evidence-based health policy-making through comprehensive and rigorous analysis of health systems in Europe. While

this branch of the World Health Organization may predominantly focus on Europe, its assessment of healthcare efficiency applies to countries of every economic status from all areas of the globe.

The EOHSP chapter on framework for health system efficiency is divided into multiple segments. The chapter first reiterates why an understanding of health care sector efficiency is important: because the pursuit of efficiency should be the central objective of policy makers and managers, and to that end better instruments for measuring and understanding efficiency in order to create tools to help these decision makers determine whether resources are allocated optimally. The chapter then explains what is meant by efficiency and explores in more depth the two fundamental concepts of allocative efficiency (AE) and technical efficiency (TE). As the chapter describes: “The concept of health system efficiency may seem beguilingly simple, represented at its simplest as a ratio of resources consumed (health system inputs) to some measure of the valued health system outputs that they create” (EOHSP, p. 2). The terms AE and TE refer to the strategic use of inputs in a system to produce desired outputs and strategically maximizing operational performance of a system, respectively. In doing so, the authors reiterate that many metrics of efficiency are partial and, if viewed in isolation, can be misleading. Finally, the chapter brings the discussion to a conclusion by presenting a framework for thinking about health efficiency metrics comprising five key issues: the entity to be scrutinized; the outputs; the inputs; the external influences on performance; and the impact of the entity on the broader health system.

The first half of the chapter will provide useful information for gathering an economic understanding of inefficiency within the healthcare system through the concepts of AE and TE.

Similarly, it will broaden the horizons of my research by demonstrating the far-reaching consequences that health system inefficiency can have upon a country, its economy, and its citizens. The second half of the chapter will prove more invaluable as it paves the way for my conceptualization of healthcare efficiency in the context of EHR and HIE use. The following illustrates how I have adopted that framework and plan to use it in my research: the healthcare system serves as the entity to scrutinized; determinants such as current health expenditure as a percentage of GDP (CHE%GDP) and health expenditure per capita (HEpc) serve as the outputs; traditional healthcare actions like hospital visits, surgical procedures, and other healthcare services serve as the inputs; external or environmental determinants of performance for each of the observed countries serve as external influences on performance; the ability to do more with less--using EHR and HIE within a healthcare system to achieve greater health outcomes at lower costs--serves as the impact of the entity on the broader health system.

## **Research Design**

### **Case Selection**

Before selecting certain countries for healthcare system comparison, I plan to utilize a literature review to identify the facilitators, barriers, and unknowns associated with general EHR implementation in order to understand scholar sentiment on the topic and determine the efficacy of EHR application in modern healthcare systems. Completion of this literature review determined that current scholar sentiment suggests that the main facilitators of EHR implementation are increases in productivity/efficiency, quality of data or care, and various aspects of data management; that the main barriers are missing data/data error, no standards, and

a loss of productivity; and that the main unknowns deal with continued research in the areas of international comparison and techno-optimism. Furthermore, current research supports the continued adoption of EHR and HIE within various healthcare systems; however, a continuation of current research with consistent and strengthened methodologies (with specific indicators of efficiency in mind) will help justify its use and application beyond theoretical implementation.

In coordination with this literature review, I plan to conduct a cross-country analysis between 17 different countries: Australia, Canada, China, Denmark, England, France, Germany, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland, and the United States. These countries were initially selected because they each possess sufficient data within their respective International Health Care Systems profiles located in the International Commonwealth Fund's database. This data describes--for each country--the role of government; how systems are organized and financed; who and what is covered; and what is being done to ensure quality of care, reduce disparities, and promote care coordination. These profiles were designed with the intent to stimulate innovative health care policies and practices in the United States and other industrialized companies. I believe both the number of countries I have selected and the countries themselves provide an accurate analysis because they vary from one another in the context of efficiency rankings while still remaining at least somewhat industrialized countries with a need for improved healthcare system efficiency. All of the countries rank differently in terms of Bloomberg Efficiency rating, Bloomberg Health Nation rating, and each have their own self-determined healthcare system organization. Together, they represent the majority of modern healthcare systems and thus can provide comprehensive data on

the nature of the relation between health information technology and its effect on public health expenditures and healthcare efficiency.

In this cross-country analysis, I will collect data from the World Health Organization on the health expenditure as a percentage of gross domestic product (CHE%GDP) and data from the International Commonwealth Fund on health expenditure per capita (HEpc), hospital spending per discharge, and problems experienced in care coordination. This data will be used in conjunction with the Bloomberg Efficiency Index rating and the Bloomberg Healthy Nation rating. Most importantly, I plan to compare the extent to which each country implements an electronic health record--or another form of a health information exchange system--to the aforementioned data. In doing so, I hope to deduce whether or not the implementation of an EHR- or HIE-linked system has an effect on public health expenditure and overall healthcare system efficiency.

### **Hypothesis**

In the context of this research project, I believe healthcare systems that employ electronic health records and other modes of technology that increase knowledge and communication have an effect on the efficiency of healthcare systems. Further, it seems to me that more centralized and shared exchanges of information could only lead to more streamlined interactions between patients, healthcare professionals, healthcare providers, and insurance companies. However, if this effect is not observed, it may have something to do with the high cost associated with the initial implementation of electronic health records. Not only is this technology expensive to implement in terms of financing, but also in terms of time allocation as new training must be

administered and health professionals must be given a window to adjust to new systems of exchanging information.

Nevertheless, I believe that electronically-connected approaches to healthcare such as health information exchanges and electronic health records are associated with increased efficiency within healthcare systems. These efficiencies can be measured in a variety of ways, with the most evident occurring in the form of decreased ratios of public health expenditure as a percentage of a country's gross domestic product. This expenditure can be affected by reduced costs in all phases of health care--from hospital to ambulatory to ancillary service settings--but generally arises as a result of increases in quality of care, communication, and productivity.

### **Data and Methods**

The methodology of my research project is centered primarily around the 2018 Bloomberg Health-Care Efficiency Index which ranks countries' healthcare efficiencies by average life spans and GDP per capita. While I have initially focused solely on the 2018 index, there are previous Bloomberg reports of healthcare indexes, efficiency scores, and efficiency assessments. For example, the 2017 Bloomberg Health-Care Efficiency Score also includes healthcare costs per capita. This score places the United States as 50 out of 55 countries in terms of efficiency, four spots higher than the following year's rankings. From there, I plan to extrapolate data from the World Health Organization's Health Expenditure Profiles. This database holds information from dozens of countries--including all of those I plan to compare--and primarily focuses on public health expenditure as a percentage of gross domestic product. Another data source I plan to rely on heavily in my research project is the International Commonwealth Fund's International Health Care System profiles. This interactive database



houses data on individual country profiles, health system features, health and system statistics, and survey data that will be particularly beneficial in my cross-country comparison analyzing the affects electronic health records have on public health expenditures and overall efficiency of healthcare systems.

### **Limitations**

As with any governmental system, healthcare systems are incredibly complex. There may be numerous external factors at play that affect the overall health care expenditures and efficiencies of each country within my research project. It will be important to recognize these external and environmental factors as I continue to research and adapt my research methods and analysis accordingly. Additionally, as with any new technology, electronic health records are still fairly new to many healthcare systems throughout the world. Even countries with the most established use of electronic health records still experience difficulties in implementation and not all of these nations entirely understand the effects they have on their respective systems. However, I believe analyzing a number of different countries and variables associated with electronic health record implementation will allow me to best control for these various factors and nuances.

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