Quality, Efficiency and Cost at American Hospitals: An Empirical Analysis of the Role of Information Technology

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Abstract

This paper examines the impact of information technology (IT) investments and use on quality, efficiency and cost of health care delivery in American hospitals. We employ both, general and disease specific quality indicators in this study to examine the clinical impacts of IT. Further, we use multiple efficiency and cost indicators to examine the economic impacts of IT. Quality, efficiency and cost impacts of IT may differ for chronic and acute health conditions, thus in this paper, we examine these effects separately and provide a comparative analysis. We analyze hospital discharge data from the Healthcare Cost and Utilization Project (HCUP-SID) of AHRQ for nine states. The discharge information obtained from HCUP is linked to the American Hospital Association (AHA)'s survey files that include the Information Technology Supplement files. Our data consists of discharges across 1,663 hospitals over the observation period of five years ranging from 2007 to 2011. This research aims to contribute to the literature by investigating the role of IT on hospital performance within and across chronic and acute health conditions by considering multiple quality of care, cost and efficiency indicators. Additionally, this research aims to provide recommendations to hospital managers and policy makers for designing and enforcing adequate measures to improve the quality of care and cost-efficient IT implementation.
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Introduction

Hospitals constitute the bedrock of the health care system in the United States. Hospitals provide a wide variety of inpatient and outpatient services to patients with acute and/or chronic conditions, and offer a multitude of public services to promote the health and well-being of community members. The economic and medical importance of hospitals is evident considering that in 2011, hospitals handled 129.5 million emergency visits, 34.8 million inpatient admissions, and 656 million outpatient visits (American Hospital Association 2013). Furthermore, hospital care accounted for 32.1 percent of the $2.92 trillion spent in the U.S. in 2013 to provide care to patients, representing the largest single item of expense in the industry (Burwell et al. 2015). It is thus important to examine how American hospitals can enhance their performance on quality, efficiency and cost fronts for chronic and acute conditions (Aron et al. 2011; Lee et al. 2013; Menon and Kohli 2013).

Because of the pivotal role hospitals occupy in the delivery of care in the United States, they afford a significant opportunity to impact the quality and efficiency of healthcare. Recognizing this, there has been a significant push in recent years in the U.S. to examine how hospitals can improve the patient experience of care, including quality and satisfaction, improve the health of populations, and reduce the per capita cost of health care (American Hospital Association 2015). Regulators have also initiated several policies to make hospitals more responsible for the quality of care provided to patients and to provide incentives to deliver care more efficiently via the creation of accountable care organizations (ACOs). The availability and use of advanced informatics and analytics solutions can potentially play an important role in this endeavor (McCullough et al. 2010; Agha 2012). Achieving cost and quality outcomes are critical for policy makers and comprise some of the foundational aspects of patient-centered care (Davis et al. 2005; Epstein et al. 2009).

Taking our cue from these efforts, in this paper, we examine how information technology (IT) investments and use among hospitals are related to the quality, cost and efficiency of care in hospitals for chronic and acute conditions. We employ both, general and
disease specific quality indicators. Further, we employ multiple hospital efficiency measures to examine how efficiently care is provided to patients. This research aims to contribute to the literature by investigating hospital performance within and across chronic and acute health conditions by considering multiple quality of care, cost and efficiency indicators. More specifically, this paper examines the role IT investment and use can play in impacting these outcomes. Studies that examine quality and cost efficiencies of health care delivery from multiple perspectives are relatively rare in the literature. Additionally, studies that examine how and why IT can impact hospital performances on chronic and acute conditions are sparse in the literature (Menon and Kohli 2013). This research aims to fill this gap in the literature and provide recommendations to hospital managers and policy makers for designing and enforcing adequate measures to improve the quality of care and cost-efficient IT implementation.

Prior Literature

Prior literature has found mixed impact of IT on quality and efficiency. For instance, a stream of research suggests that hospitals with more advanced IT have fewer complications and lower mortality rates (Amarasingham et al. 2009, Buntin et al. 2011, Lee et al. 2013), while other researchers suggest mixed impact with lower mortality rates, but higher complications (Furukawa et al. 2010), little or no significant impact (Agha 2011, Parente and McCullough 2009), and adverse impact (Ash et al. 2004, Nebecker et al. 2005). These results may be a manifestation of a wide variety of quality measures used in extant literature. For example, quality indicators developed by the Agency for Healthcare Research and Quality (AHRQ) are mostly disease-specific measures and are commonly used as hospital performance metrics by researchers (Mutter et al. 2008, Encinosa et al. 2005, Farquhar 2008, Greenberg 2009). On the other hand, patient mortality rates and readmission rates are general quality measures and are also widely adopted by researchers (Agha 2014). We propose to use both general purpose and disease specific quality indicators in this study to examine quality of care comprehensively.

The impact of IT on cost and efficiency arises mostly from decreased utilization of care, including reducing hospital lengths-of-stay and the nurses' administrative time (Hillestad et al. 2005; Chaudhry et al. 2006). Utility of care and provider time are two commonly used efficiency measures. Most of the prior research suggests a positive correlation between utility of care and
IT adoption, but a mixed effect of IT adoption on provider time (Chaudhry et al. 2006). Extant research has also examined the relationship between IT and cost efficiencies of health care delivery. Agha (2014) has found that IT is associated with a 1.3% increase in billed charges, and has no evidence of cost savings after five years of IT adoption (Agha 2014). There is still a lack of research that examines the quality and efficiency measures across different types of IT systematically.

Prior literature also suggests that the impact of IT on quality and efficiency of care is context-dependent (McCullough et al. 2010). By displaying disease status trends and tracking compliance, IT provides longitudinal views of patient disease history for chronic disease care. Thus, because of information availability, patients with chronic conditions may be less likely to have adverse drug events than those with the acute conditions. Patients with chronic diseases are more likely to have health data in their file that is relevant to their disease, which may impact their treatment due to higher visit frequency than acute patients (Chaudhry 2006). These records can be used to check all orders for a number of problems including allergies, drug interactions, overly high doses, and drug-laboratory problems (Rao et al. 2012, Unertl et al. 2009). These records can also be used to make drug-specific treatment suggestions based on each patient’s current treatment.

Data and Analysis

We analyze hospital discharge data from the Healthcare Cost and Utilization Project (HCUP-SID) of AHRQ for nine states that include Arkansas, California, Florida, Maryland, Michigan, New Jersey, New York, North Carolina and Washington. The discharge information is linked to the American Hospital Association (AHA)’s survey files that include the Information Technology Supplement files. Our data consists of discharges across 1,663 hospitals over the observation period of five years ranging from year 2007 to year 2011. We exclude pediatric and delivery-related discharges and focus on chronic and other acute conditions.

HCUP-SID database include patients demographics, cost, and clinical information such as diagnoses, procedures, chronic indicators, and severities related to each inpatient discharge case. Using these clinical information we can construct quality and efficiency measures. For
example, health failure mortality rate, one of the Inpatient Quality Indicators defined by AHRQ, utilizes the primary diagnosis codes (ICD-9) for heart failure and the matching patient dispositions that can be specified from the HCUP-SID discharge database to determine the ratio between the number of diagnosis-related admissions to a hospital and the number of in-hospital deaths.¹ From the AHA IT supplement files, we construct the health IT implementation levels that are either task-execution-centric or decision support-centric. We create a panel across five years and analyze the data within this panel structure. We aim to explore the link between health IT implementations and their impact on the hospitals’ performance on patient care, which is captured by the quality and efficiency indicators. Our focus is to investigate how the implementations of different health IT applications affect patient care across multiple chronic and acute diseases.

Discussion

We have some exploratory results, but if given a chance, we plan to present the complete results at the workshop.

References

American Hospital Association. 2015. Hospitals are Leading the Way on Improving Care, Enhancing Health and Reducing Costs. [http://www.aha.org/content/15/rpt-3aimseveryn.pdf](http://www.aha.org/content/15/rpt-3aimseveryn.pdf) (last accessed June 22, 2015).


