Why hospitals adopt patient engagement functionalities at different speeds? A moderated trend analysis

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ABSTRACT

Objective: To investigate acute care hospitals' adoption speed of patient engagement health information technology (HIT) functionalities from 2008 to 2013 and how this speed is contingent on environmental factors and hospital characteristics.

Methods: Data on non-government acute care hospitals located in the United States was obtained from merging three databases: the American Hospital Association's (AHA) annual survey information technology supplement, AHA annual survey, and the Area Health Resource File (AHRF). The variables obtained from these datasets were the amount of annually adopted patient engagement HIT functionalities and environmental and organizational characteristics. Environmental factors included were uncertainty, munificence, and complexity. Hospital characteristics included size, system membership, ownership, and teaching status.

Results: A regression analysis of 4176 hospital-year observations revealed a positive trend in the adoption of HIT functionalities for patient engagement ($\beta = 1.109$, $p < 0.05$). Moreover, the study showed that large, system-affiliated, not-for-profit, teaching hospitals adopt patient engagement HIT functionalities at a faster speed than their counterparts. Environmental munificence and uncertainty were also associated with an accelerating speed of adoption. Environmental complexity however did not show a significant impact on the speed of adoption.

Discussion: From 2008 to 2013, there was a significant acceleration in the speed of adopting patient engagement HIT functionalities. Further efforts should be made to ensure proper adoption and consistent use by patients in order to reap the benefits of these IT investments.

Conclusion: Hospitals adopted at least one HIT functionality for patient engagement per year. The adoption speed varied across hospitals, depending on both environmental and organizational factors.

1. Introduction

Patient engagement, defined as actions that promote and support active patient involvement in health and health care [1], has received much attention and is even considered the "blockbuster drug" of the 21st century [2]. The Department of Health and Human Services' National Quality Strategy views patient engagement as a key health care policy domain [3] and it has been engrained in new care delivery models to improve care quality and health outcomes [4]. As a result, strategies and tools that facilitate patient engagement, especially Health Information Technology (HIT), have garnered increased discussion in the health care literature [5–8]. Current research suggests that HIT has a significant role in promoting patient engagement. The use of HIT to

facilitate patient engagement (hereafter patient engagement HIT) can be beneficial in supporting information acquisition, decision making, patient-provider communication, and patient self-monitoring [9], offering a new means to incorporate patients in their care [10].

In addition, in order for health care providers to meet the federal government's meaningful use requirement, which emphasizes the use of technology to realize patient engagement as one of its core goals, certain functionalities that allow the patient to view, download, and transmit information must be offered through HIT. Examples of such HIT functionalities include: scheduling appointments, medication refills, communication with providers, peer support, and customized interventions [11–15]. Since the enactment of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009,

which emphasized the meaningful use of technology to facilitate the engagement of patients and their families, it is assumed that there has been a growth in the adoption of patient engagement HIT. A review of the current literature however showed that no study has examined the time-dependent nature of the adoption of patient engagement HIT functionalities, or investigated how organizational and environmental factors influence the speed at which hospital adopt these functionalities.

Here, adoption speed refers to how quickly hospitals are adopting patient engagement HIT functionalities. This study examines if external and internal factors moderate the adoption speed of acute care hospitals in the United States. This study is pertinent for several reasons. First, it is important for top managers and policy makers to understand the adoption trend given the amount of public and organizational resources invested to promote the adoption of HIT as a patient engagement strategy. Second, it is important to know if the resources devoted to patient engagement HIT adoption lead to a positive adoption trend. Third, it is necessary to understand how the adoption speed varied across hospitals so that resources can be efficiently allocated to reduce disparity in adoption.

The purpose of this study is to document acute care hospitals' adoption speeds of patient engagement HIT functionalities from 2008 to 2013. This study also investigates the degree to which environmental factors and hospital characteristics are associated with the adoption speed. We seek to answer the following two research questions: (1) Are acute care hospitals increasing the number of patient engagement HIT functionalities offered to their patients over time? (2) What organizational and environmental factors are associated with the speed of adopting patient engagement HIT functionalities?

2. Conceptual framework

The adoption of patient engagement HIT functionalities by hospitals reflects a strategy to improve quality of care and overall hospital performance. This strategy may be viewed through the lens of resource dependency theory (RDT) [16]. According to RDT, organizations are dependent on external resources critical to their success. Because of the uncertainty in the availability of these resources, organizations must be proactive in ensuring proper acquisition and management of these resources, thereby sustaining their competitiveness [17]. RDT takes an open system perspective suggesting that context, both internal and external, is necessary to understand the actions of an organization [18]. Given that organizations must exist within given environments [19], administrators of such organizations must continuously sense and adapt to environmental changes to achieve and preserve favorable positioning given their constraints and opportunities [19–21].

RDT is concerned with an organization's behavior given the resources in their environment, emphasizing an organization's ability to react quickly and exploit their environment. With monetary incentives and penalties attached to HIT adoption and meaningful use in the United States, hospitals may find it both attractive and coercive to adopt HIT to facilitate patient engagement. In addition, such adoption helps hospitals boost their reputation and attract more patients interested in using novel technologies in their health care. The patient engagement HIT functionalities have been suggested to help empower and engage patients in their care, thereby leading to better health outcomes [22]. If hospitals are able to improve efficiencies and quality outcomes as suggested, they may increase revenues and create more slack resources, thus making it easier for them to adopt more patient engagement HIT functionalities. Thus, we propose that:

H1. Over time hospitals will adopt more patient engagement HIT functionalities.

2.1. Environmental factors

RDT suggests that both environmental and organizational factors will affect the speed of adopting patient engagement HIT functionalities by hospitals. Three dimensions of the environment, i.e., uncertainty, munificence, and complexity, are relevant to RDT [23].

Environmental uncertainty refers to the instability of the environment due to changes or turbulence. It creates concern for organizations that their operations or profits may be negatively impacted. Organizations in uncertain environments would be more likely to cope with uncertainty and ensure more stability of resources than those in stable environments [24]. Healthcare researchers have operationalized environmental uncertainty as managed care penetration [25,26]. Environments with high managed care penetration are considered as highly uncertain since health plans will often pressure hospitals to promote increased quality and more cost-effective care [27–29].

Additionally, changes in Medicare reimbursement induce increased uncertainty for those hospitals highly dependent for revenues on Medicare [30,31]. Given the meaningful use requirement and the anticipation that adopting HIT for patient engagement will increase quality and reduce cost [32–39], it is expected that a greater Medicare managed care penetration in an area will increase the environmental pressure on local hospitals to adopt such technologies, and push them to provide more patient-oriented functions over time. Moreover, health plans urging compliance with the meaningful use criteria will invariably push continued increase in hospital adoption of patient engagement HIT. Hence:

H1a. As environmental uncertainty increases, hospitals adopt patient engagement HIT functionalities at a higher speed.

Environmental munificence refers to the level of abundance of critical resources available to an organization, reflecting how the environment can support the organization's activities. Organizations located in more resource-rich environments (high income and high population growth area) will have better access to resources. Urban areas compared to rural areas allow hospitals to acquire greater resources [40,41]. Access to such resources would provide revenues necessary to facilitate a faster speed of adoption of patient engagement HIT functionalities.

The inability of a hospital to acquire necessary resources may hinder a hospital's ability to adopt or increase its HIT capacity. For example, a rural hospital may not have the financial resources to acquire the necessary infrastructure or be able to attract skilled IT professionals to help manage an increased HIT capacity. Although these issues may be resolved by entering into strategic partnerships [42,43], finding the right fit (relationship, cost, and so on) may hinder the speed of adoption. On the other hand, urban hospitals that have more choices or easy access to financial resources and IT expertise may be more likely to act on their motivation by taking advantage of the environmental munificence. Therefore:

H1b. As environmental munificence increases, hospitals adopt patient engagement HIT functionalities at a higher speed.

Environmental complexity refers to the number and types of organizations existing in an organization's environment, as well as the nature of inter-organizational relationships. Since organizations must share a limited resource pool, their survival will depend on how resources are allocated across competitors [16]. Organizations typically compete with each other in their environment for resources critical to their operation. The competition for such resources (e.g., patients) will intensify as the number of similar organizations in the market increases. According to RDT, when there are insufficient resources there will be