



Methodological Review

Health Information Exchange (HIE): A literature review, assimilation pattern and a proposed classification for a new policy approach

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ABSTRACT

Objectives: Literature shows existence of barriers to Healthcare Information Exchange (HIE) assimilation process. A number of studies have considered assimilation of HIE as a whole phenomenon without regard to its multifaceted nature. Thus, the pattern of HIE assimilation in healthcare providers has not been clearly studied due to the effects of contingency factors on different assimilation phases. This study is aimed at defining HIE assimilation phases, recognizing assimilation pattern, and proposing a classification to highlight unique issues associated with HIE assimilation.

Methods: A literature review of existing studies related to HIE efforts from 2005 was undertaken. Four electronic research databases (PubMed, Web of Science, CINAHL, and Academic Search Premiere) were searched for articles addressing different phases of HIE assimilation process.

Results: Two hundred and fifty-four articles were initially selected. Out of 254, 44 studies met the inclusion criteria and were reviewed. The assimilation of HIE is a complicated and a multi-staged process. Our findings indicated that HIE assimilation process consisted of four main phases: initiation, organizational adoption decision, implementation and institutionalization. The data helped us recognize the assimilation pattern of HIE in healthcare organizations.

Conclusions: The results provide useful theoretical implications for research by defining HIE assimilation pattern. The findings of the study also have practical implications for policy makers. The findings show the importance of raising national awareness of HIE potential benefits, financial incentive programs, use of standard guidelines, implementation of certified technology, technical assistance, training programs and trust between healthcare providers. The study highlights deficiencies in the current policy using the literature and identifies the "pattern" as an indication for a new policy approach.

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1. Introduction

Health Information Exchange (HIE) is the electronic transfer of patient data and health information between healthcare providers. HIE, as a part of health care restructuring program, can be used to facilitate sharing of medical information between healthcare service providers. Evidence shows that the interest among healthcare service providers to share through HIE system is growing rapidly [1]. A few countries (England, Netherlands, Finland and the USA) are developing and advancing their regional and national HIE initiatives [2]. Sharing clinical data can potentially improve patient safety, care coordination, quality of care and efficiency [3], facilitate public health efforts [4] and reduce mortality and healthcare costs [5]. Multiple models of clinical data exchange are being used nationwide. The direct project model automates point-to-point processes in which a provider sends patient data to a known recipient [6]. In a non-directed exchange model, a central organization is considered as a hub that provides a lookup for providers [7]. In a query-based HIE, patient data are aggregated from multiple healthcare institutions [8]. Another model is patient-centered exchange in which patient data and laboratory results are delivered to the patient to share as required [7,9].

Consistent with the goals of the federal “Meaningful Use” program, the exchange of electronic data has been promoted among healthcare providers and institutions [10]. Although the financial incentives offered by the federal government are very encouraging, healthcare providers have not yet adopted and used HIE [11]. Evidence shows that healthcare providers are not likely to simply adopt HIE just due to healthcare cost reduction motivation or mandated adoption programs that support HIE initiatives [5]. More studies are needed to better define different phases which constitute HIE assimilation and more supportive policies are required to facilitate this process [12].

The success of both HIE adoption and implementation depends on factors beyond technical issues [13]. Other influential factors such as organizational, operational and social contexts that are relevant to the HIE adoption and implementation should be studied [11]. Previous studies mainly focus on the individual user and network levels of analysis and a few studies explain use of HIE at the organizational level of analysis [5]. The success of a HIE project and its potential benefits are not likely to be achieved without considering HIE at organizational level and examining organizational factors [3,10]. Therefore, organizational factors such as organizational value of HIE, organizational characteristics, organizational awareness and commitment, organizational adoption and implementation strategies, barriers to organizational adoption decision, resource allocation, organizational support, technical support, and training should be more critically highlighted.

Evidence shows that adoption efforts and implementation processes are different [11] and diverse determinants affect adoption and implementation phases [14]. Assimilation of HIE is a multifaceted process influenced by a series of interrelated phases rather than a single unified process [15]. Most of the HIE literature has analyzed HIE adoption as a single step regardless of the interconnected processes of investment, implementation, and institutionalization. Politi et al. [15] discuss that there are a limited number of studies that have analyzed patterns of HIE assimilation. The other

gap in the literature is the similarity of previous studies in characterizing HIE assimilation solely based on patterns such as no use, basic use and advanced use [16]. According to Rebugue and Ferreira [17], healthcare practice and the HIE system have a complex and variable nature. Frisse and Holmes [18] state that the benefits of HIE can only be reaped if it is well implemented and integrated into clinicians’ workflow. Deficits in the exchange of health information such as sharing incomplete information may result in a doctor’s delay in identifying health problems and also in diagnosing a wrong care planning that finally leads to injury or death [19,20]. A number of variables such as current policies, technical issues, market conditions, and hospital characteristics may still block hospitals from participating in HIE [21].

Two of the key words in the informatics literature are “adoption” and “assimilation” and they are used interchangeably. As noted by Brierley [22], there has been no general consensus on the definition of adoption. Since IT adoption is a complex and stage-based process, recent studies have described adoption process in terms of assimilation phases [23]. A large number of studies has been conducted in various settings to explain technology adoption process with regard to sequence of phases [24]. There is a dearth of research that presents a complete model to show HIE assimilation pattern in healthcare settings. It is argued that an aggregated measure resulting from assimilation phases can better explain adoption process [25]. Based on this reasoning, in this paper we use “assimilation” phases instead of “adoption” process to better articulate the complex nature of HIE and all related factors affecting HIE at various levels of analysis.

This study attempts to review the existing literature to define HIE assimilation phases. This research is aimed at recognizing the pattern of HIE assimilation by proposing a new classification comprising of evolutionary phases. We also categorize healthcare organizations based on their strategic decisions to assimilate HIE. Better understanding of assimilation phases and pattern can help policy makers recognize the reasons why so many healthcare providers have failed to fully integrate HIE into their day-to-day practices.

2. Methods

2.1. Eligibility criteria

We considered existing theoretical and empirical studies related to HIE assimilation process in various healthcare settings. All retrieved studies published in the refereed journals from the year 2005 and in English language, were included in the review. We limited our search to the last 11 years since we observed that many studies from 2005 onwards used the concept of HIE and interoperability and sufficiently discussed issues related to HIE assimilation process. Studies that were editorials, commentaries, opinion papers or articles without an abstract were excluded from further consideration.

2.2. Search strategy

The aim of this study was to undertake a literature review of existing studies relating to HIE assimilation process. To identify

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