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Electronic health record usage behaviors in primary care medical practices: A survey of family physicians in Canada

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ABSTRACT

Objective: The importance and potential value of office-based electronic health record (EHR) systems is being recognized internationally. We thus sought to better understand how EHRs are actually being used by family physicians and what they perceive to be the main performance outcomes for themselves and their medical practices.
Methods: We conducted a survey of family physicians practicing in medical practices in Quebec, Canada (n = 331). Bivariate and multivariate statistical analyses were conducted to characterize EHR usage behaviors and assess the perceived performance outcomes of these systems.
Results: EHR systems "as-used" vary substantively from one family physician to another in terms of the capabilities that are actually mobilized by them. Significant differences between "basic" and "advanced" users were observed in terms of the EHR system's characteristics and perceived performance outcomes. Physicians were also clustered under three profiles that could be clearly distinguished from one another, in terms of the extent to which their performance and their practice's performance was impacted by their EHR usage. Physicians that are "highly impacted" by their EHR system are those who have the longest usage experience and make the most extended use of their system's capabilities.
Conclusions: Our study indicates that only a minority of family physicians in our sample use most of the features available in their EHR system. Consequently, few physicians perceive gaining significant performance improvements from such systems. Future research must identify the factors that motivate primary care physicians to assimilate EHR systems in a more extensive manner.

1. Introduction

The importance and potential value of office-based electronic health record (EHR) systems is being recognized internationally [1]. For instance, as early as 1998, health care authorities in New Zealand gave many general medical practices a one-time grant of approximately US$3,600 per family physician to purchase computers. A further catalyst for the EHR movement in that country was the government's requirement to submit patient disease information to registers and to file fee-for-service claims electronically in order to receive subsidies, combined with financial incentives for primary care [2]. Today, virtually all of the country's family physicians use an EHR system [3]. As another example, the HITECH (Health Information Technology for Economic and Clinical Health) Act of 2009 in the United States supported several programs including "Meaningful EHR use" incentives [4]. As a direct consequence, primary care physicians' adoption of EHR systems rose 50% between 2009 and 2012, that is, from 46 to 69%. Lastly, Canada Health Infoway has recently launched a CDN$380 million investment program to support the use of EHRs to help clinicians achieve increased clinical value [5] and physician office EHR funding support programs are now in place in most Canadian provinces [6,7]. As a result of these incentive programs, the adoption rate in Canada has increased from 37% in 2009 to 75% in 2014 [3,8].

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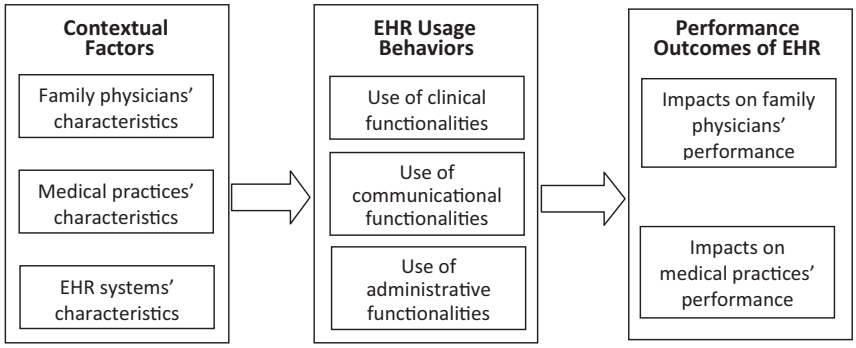

Fig. 1. Conceptual framework.

In this study, we define an EHR system as an "amalgam of data acquired and created during a patient's course through the health care system and stored in an electronic medium" [[9]:180]. According to Desroches et al. [10], EHR systems include a wide range of functionalities: patient demographics, patient problem lists, lists of medications taken by patients, clinical notes, orders for prescriptions, viewing test results, medical history and follow-up notes, orders for tests, prescriptions and orders sent electronically, warnings of drug interactions, highlighting of out-of-range test levels, and reminders for guideline-based interventions or screening. But not all EHR systems acquired by private medical practices provide the same functionalities [10], and once implemented, their capabilities "as-used" may also differ substantially from one practice to another, even if the same EHR software has been acquired [11,12]. Further, there is often a gap between EHR designers' expectations and users' behaviors and family physicians can also use EHR systems in ways not anticipated initially [13,14]. Keeping this in mind, we sought to better characterize how EHR systems are actually being used by physicians in primary care medical practices and investigate the extent to which these systems contribute to performance outcomes. More precisely, we attempt to provide answers to the following research questions: To what extent do family physicians actually use EHR functionalities? What are the contextual factors that are related to a more comprehensive use of EHR systems by these physicians? Most importantly, to what extent does their EHR system usage have positive impacts in terms of perceived performance improvements at both the physician and medical practice levels? The present study complements previous works in this area which have focused on factors influencing EHR acceptance or adoption by physicians [e.g., [1,15]].

In short, given the increasing rate of EHR adoption in several developed countries, the nature of the usage and impacts of such systems needs to be evaluated to ensure they are enabling family physicians and their medical practices to realize expected performance improvements. In this line of thought, this article presents the results of a survey of Canadian family physicians on their EHR usage behaviors and their perceptions of the performance improvements obtained from their EHR system both for themselves and for their medical practices. It must be noted here that most Canadian medical practices tend to be privately owned solo/group practices or interdisciplinary community-based clinics, using standalone EHR systems from small or medium size vendors that are not well integrated with other health information technologies [16,17].

2. Conceptual framework

In this section we introduce a conceptual framework (see Fig. 1) to explain family physicians' use of EHR systems as well as potential antecedents and performance outcomes of such use. First, we concur with Orlikowski [18] and with Burton-Jones and Grange [19] that information systems per se cannot increase individual and organizational performance, only effective use of these systems can. We thus expect that a "full" or "extended" use of EHR systems will positively affect both physician and medical practice performance outcomes [16,17] as well as physicians' perceptions of performance improvements gained from such systems.

Following Sykes et al. [20], we consider family physicians' use of EHR systems to be influenced by both individual and system characteristics. First, prior research in the field of psychology has used the demographic characteristics of individuals as predictors of human behavior [21,22]. Among others, gender and age have been shown to influence the use of several technological innovations [20,23]. In addition we explored the idea that physicians' prior experience with EHR systems might also be positively related to their actual system usage behaviors through a process of experiential learning [24].

Second, we draw on the information systems and medical informatics literature to identify two factors that should further predict physicians' EHR usage behaviors, namely, system ease of use (defined as the extent to which a physician perceives using an EHR system is free of effort) [25] and functional coverage (defined as the number of clinical, communicational, and administrative functionalities perceived to be available in an EHR system) [26].

In addition to individual and system factors, organizational characteristics have also been associated with IT usage in health care [27,28]. We identified four distinct organizational characteristics that may lead to higher levels of EHR usage among family physicians. First, organization size has been one of the most widely investigated antecedents of IT use in the health care sector [29,30]. According to the resource-based theory [31], larger medical practices are likely to have the capacity to better support physicians' adoption and use of EHR systems by exploiting their internal resources or by hiring external resources. Second, medical practices located in urban areas usually have greater access to financial and human resources than rural clinics by virtue of their greater proximity to technology vendors, funding agencies, and support organizations (e.g., EHR system integrators) [27]. We thus expect to observe higher levels of EHR usage in urban medical practices than in rural ones. Third, in terms of affiliation, we expect physicians working in family medicine group (FMG) practices in close collaboration with registered nurses and other healthcare professionals to show higher levels of EHR usage than those in solo/small practices due to greater coordination ability to perform administrative and clinical activities. Indeed, a FMG practice is a group of family physicians who work in close cooperation with registered nurses and other healthcare professionals to offer family medicine services to patients. Family physicians who are members of FMGs are also able to work closely with other healthcare professionals in hospitals, community-based centers, and pharmacies to complement the services they offer. Lastly, we posit that medical practices'