Research

Primary care physicians' experiences with electronic medical records

Implementation experience in community, urban, hospital, and academic family medicine

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ABSTRACT

OBJECTIVE To understand how remuneration and care setting affect the implementation of electronic medical records (EMRs).

DESIGN Semistructured interviews were used to illicit descriptions from community-based family physicians (paid on a fee-for-service basis) and from urban, hospital, and academic family physicians (remunerated via alternative payment models or sessional pay for activities pertaining to EMR implementation).

SETTING Small suburban community and large urban-, hospital-, and academic-based family medicine clinics in Alberta. All participants were supported by a jurisdictional EMR certification funding mechanism.

PARTICIPANTS Physicians who practised in 1 or a combination of the above settings and had experience implementing and using EMRs.

METHODS Purposive and maximum variation sampling was used to obtain descriptive data from key informants through individually conducted semistructured interviews. The interview guide, which was developed from key findings of our previous literature review, was used in a previous study of community-based family physicians on this same topic. Field notes were analyzed to generate themes through a comparative immersion approach.

MAIN FINDINGS Physicians in urban, hospital, and academic settings leverage professional working relationships to investigate EMRs, a resource not available to community physicians. Physicians in urban, hospital, and academic settings work in larger interdisciplinary teams with a greater need for interdisciplinary care coordination, EMR training, and technical support. These practices were able to support the cost of project management or technical support resources. These physicians followed a planned system rollout approach compared with community physicians who installed their systems quickly and required users to transition to the new system immediately. Electronic medical records did not increase, or decrease, patient throughput. Physicians developed ways of including patients in the note-taking process.

CONCLUSION We studied physicians' procurement approaches under various payment models. Our findings do not suggest that one remuneration approach supports EMR adoption any more than another. Rather, this study suggests that stronger physician professional networks used in information gathering, more complete training, and in-house technical support might be more influential than remuneration in facilitating the EMR adoption experience.

EDITOR'S KEY POINTS

- The goal of this study was to learn more about the factors that affect the adoption of health information technology in primary care.
- In order to understand how remuneration and care setting affected evaluation, selection, implementation, and adoption of electronic medical records, family physicians who practised in urban, hospital, and academic settings and who were paid through alternatives to fee-for-service payment models were interviewed. Findings were compared with the finding of previous interviews with community-based family physicians.
- This study suggests that stronger physician professional networks, more complete training, and in-house technical support might be more influential than remuneration approach in facilitating the adoption of electronic medical records.

Expériences des médecins de première ligne relatives au dossier médical informatisé

Expérience de la mise en place en médecine familiale communautaire, urbaine, hospitalière et universitaire

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RÉSUMÉ

OBJECTIF Comprendre de quelle façon la rémunération et le contexte clinique affectent l'instauration des dossiers médicaux électroniques (DMÉ).

TYPE D'ÉTUDE On a utilisé des entrevues semi-structurées pour susciter des descriptions de la part de médecins de famille exerçant dans la communauté (paiement à l'acte) et de médecins de famille en milieux urbain, hospitalier et universitaire (rémunérés selon d'autres modes de paiement ou par séance de formation pour des activités en lien avec l'instauration des DMÉ).

CONTEXTE Cliniques albertaines de médecine familiale de petites communautés suburbaines et cliniques urbaines (grandes villes), hospitalières et universitaires. Tous les participants recevaient une subvention pour l'obtention d'un certificat de compétence en DMÉ.

PARTICIPANTS Médecins exerçant dans un ou plusieurs des contextes mentionnés et ayant de l'expérience dans l'instauration et l'utilisation des DMÉ.

MÉTHODES On a utilisé un échantillonnage raisonné à variation maximale pour obtenir les données descriptives des participants-clés grâce à des entrevues individuelles semi-structurées. Le guide d'entrevue, qui a été élaboré à partir d'observations-clés tirées de notre revue préalable de la littérature, avait été utilisé dans une étude antérieure sur le même sujet auprès de médecins de famille communautaires. Pour extraire les thèmes, les notes obtenues ont été analysées par une méthode d'immersion comparative.

PRINCIPALES OBSERVATIONS Les médecins des milieux urbain, hospitalier et universitaire profitaient de relations de travail professionnelles, une ressource non accessible aux médecins communautaires. Les médecins des milieux urbain, hospitalier et universitaire travaillent dans des équipes interdisciplinaires plus larges, avec un plus grand besoin de coordination des soins interdisciplinaires, une formation en DMÉ et un support technique. Ces milieux de pratique étaient en mesure de supporter les coûts de la gestion du projet et du support technique. Ces médecins ont planifié une instauration progressive, contrairement aux médecins communautaires, qui ont installé leur système rapidement, les usagers devant s'adapter immédiatement au nouveau système. Les dossiers médicaux électroniques n'ont pas eu d'effet sur le nombre de patients traités. Les médecins ont trouvé des moyens de faire participer les patients à l'inscription des notes médicales.

CONCLUSION Nous avons comparé la performance des médecins sous divers mode de rémunération. Nos observations suggèrent qu'aucun mode de paiement n'est supérieur aux autres pour favoriser l'adoption des DMÉ. Elles suggèrent plutôt que les réseaux professionnels de médecins, plus solides, habitués à la cueillette d'information, ayant une formation plus poussée et un support technique sur place pourraient avoir plus d'influence que la rémunération pour favoriser l'adoption des DMÉ.

POINTS DE REPÈRE DU RÉDACTEUR

- Cette étude avait pour but de mieux connaître les facteurs qui affectent l'adoption de la technologie de l'information au niveau des soins primaires.
- Afin de comprendre comment la rémunération et le milieu de soins affectent l'évaluation, le choix, la mise en place et l'adoption des dossiers médicaux informatisés, des médecins de famille exerçant en milieux urbain, hospitalier et universitaire, et rémunérés selon un mode différent du paiement à l'acte, ont été interviewés. On a comparé les observations obtenues à celles provenant d'entrevues antérieures avec des médecins de famille de milieux communautaires.
- L'étude donne à croire que des réseaux professionnels de médecins, plus solides, une formation plus complète et un support technique local pourraient être plus importants que le mode de rémunération pour faciliter l'adoption des dossiers médicaux informatisés.

The growing incidence of chronic disease and the aging population have precipitated a number of primary care reform strategies. Interdisciplinary teams are a key element of primary care reform.[1-4] The extra hands help make light work of heavy loads but require communication and coordination to be effective. Electronic medical records (EMRs) are one way to increase efficiency in physicians' offices and improve the quality of care.[5-7]

In a previous international literature review,[8] we found a number of risk and insulating factors that affect the implementation of health information technology (HIT). New HIT systems must fit within organizational culture and processes if adoption is to be successful long-term.[9-12] Privacy,[13] patient safety, provider or patient relations, staff anxiety,[11] time needed to implement,[14-18] quality of care, and financial,[19-21] efficiency, and liability[22] factors are risks that must be managed for implementation success. Strong physician leadership,[16,23-29] project management,[25,26,30-36] and clinical data standards and staff training[7,14-18,23,27,29,33,37-41] lead to long-term EMR adoption.

Previously, we evaluated the above review among community-based family physicians in small practices. We found that physicians did not have the time, experience, or knowledge to evaluate, select, and implement EMRs.[42] Furthermore, the combination of antiquated examination room design, complex HIT user interfaces, insufficient physician computer skills, and the urgency in patient encounters precipitated by a fee-for-service remuneration model and long wait lists compromised the quantity, if not the quality, of the information exchanged in the patient encounter.[42] Our previous study[42] concluded that remuneration models for community-based physicians affected the procurement process.

The purpose of this study was to reconsider the findings of the 2 previous papers[8,42] in order to understand more about the drivers of EMR adoption. We evaluated the adoption experience of urban, hospital-based, and academic family physicians against our 2 previous studies to understand how remuneration and care setting affected evaluation, selection, implementation, and adoption of EMRs.

Background

The circumstances of care delivery can vary greatly between community-based family medicine and urban, hospital, or academic care. In community and urban family medicine, patients book appointments for specific complaints; however, physicians might manage an average of 3 problems per visit.[43] Historically, care notes come from and are maintained by the physician. The academic and hospital setting can be different. Patients come to the hospital with acute illness episodes for complex issues that can no longer be managed in an outpatient setting. Patients might stay for a relatively extended period (measured in hours, days, or weeks). Physician encounter notes tend to be shared with nursing and pharmacy staff as well as other clinicians to support care delivery down the pathway of care.

Care in community, hospital, and academic settings might also differ by payment models. **Table 1**[44-63] shows that Canadian family physicians are often paid on a fee-for-service basis. They and academic family physicians might also be paid under an alternative plan. Alternative payment models provide pooled funding to group practices on a contract basis (for delivery of a basket of services), sessional basis (payment based on an hourly basis to a maximum limit), or capitation basis (funding for a defined population of patients).[64,65] The alternate payment model establishes expected levels of performance for a set level of remuneration for the group practice. Physicians, in turn, are paid a share from the pool of funds. **Table 1**[44-63] summarizes the payment models for selected countries with high EMR adoption.

Our previous study hypothesized that the fee-for-service payment model did not provide physicians with incentive to take the time to follow a

Table 1. Remuneration methods and EMR adoption rates for primary care physicians in countries with high EMR adoption rates

REMUNERATION METHODS AND EMR ADOPTION RATES	COUNTRY, % OF GPs						
	CANADA	UNITED STATES	UNITED KINGDOM	AUSTRALIA	NEW ZEALAND	DENMARK	SWEDEN
GP payment*							
• Fee-for-service	90[44]	19[45,46]		100[47]	15-30[48,49]	70[50,51]	
• Salary or ARP		63[45,46]					70-90[52,53]
• Capitation		4[45,46]	50[54,55]		70-85[48,49]	30[50,51]	10-30[52,53]
• P4P or quality-based pay			20-25[56,57]				
Estimated GP EMR adoption	26[58]	24-28[59]	89[58]-99[59]	80[60]-90[59]	92[60]-98[59]	99[61]	90[62,63]

ARP—alternate relationship plan, EMR—electronic medical record, P4P—pay-for-performance.
*Sessional (hourly) and blended are other forms of GP payment; however, these methods are not used in all these countries.

complete procurement plan for their EMRs.[42] Instead, fee-for-service tends to provide incentive for performance that maximizes volume of patients seen.[66] Many jurisdictions have implemented EMR certification strategies to prequalify EMR systems, provide procurement advice, and reimburse physicians for lost revenue when investigating EMRs.[67] Despite solid procurement support and reimbursements offered by these organizations, physicians still do not have or take the time to properly procure a system, which leads to dissatisfaction with solutions.[42]

METHODS

A qualitative research approach was used to develop an understanding of how remuneration and care setting affected the adoption and implementation of EMRs. Two separate studies investigated the issue. The first study, reported separately,[42] used semistructured interviews to elicit descriptions from 9 community-based family physicians in small practices (paid on a fee-for-service basis). The second study, reported here, used purposive sampling to identify 16 urban, hospital-based, and academic physicians for interviews. The interviewer (D.L.) had no relationship with the physicians, could not affect their economic well-being, and did not assess their performance. Owing to our small sample size, the second study used maximum variation sampling based on sex, work location (hospital vs urban clinic vs academic setting), remuneration model (fee-for-service reimbursement vs an alternative relationship plan), and years of practice experience. Participation of informants was solicited through a recruitment letter sent by e-mail from one author with follow-up e-mails coming from another author. Snowball sampling was used to increase the number of identified and interviewed physicians.

Physicians with recent EMR implementation experience were considered key informants. Inclusion criteria (confirmed during interviews) required physicians to be practising in one or a combination of the above settings and to be lead physicians or have influential roles in clinic decision making. The researcher used 1-hour, individually conducted semistructured interviews (conducted at physicians' offices during November and December 2008) to acquire descriptive data from key informants. Physicians were paid honoraria to acknowledge their experience. An interview guide (**Figure 1**),* consisting of open-ended and closed-ended questions, was developed to stimulate a qualitative description of the experience. This interview guide was developed

Figure 1 is available at **www.cfp.ca**. Go to the full text of this article on-line, then click on **CFPlus** in the menu at the top right-hand side of the page.

from key findings of our previous literature review[8] and used in our previous community-based study.[42] It was then tested with a physician interviewee and modified before starting this study. The researcher recorded detailed notes on interview sheets. After all interviews were complete, field notes were reviewed for completeness. Data were synthesized and analyzed using a comparative method for key concepts and patterns. A modified immersion and crystallization approach[68,69] was used to review concepts against findings from our previous literature review and community-based study. Theme saturation was achieved in the final interview. This study received ethics approval from the University of Alberta in Edmonton on September 29, 2008. All informants consented to be interviewed.

RESULTS

Key informants were short-listed based on their recent experience implementing HIT and their leadership role in the projects. Seven of 16 physicians agreed to participate in this study. Two interviewees primarily practised in urban family medicine centres, 3 primarily represented hospital-based primary care teams, and 2 primarily practised in academic settings; however, all physicians practised in at least 2 of these settings. Three city hospitals were represented. Six physicians had more than 20 years of experience in practice. Two physicians were women. The smallest clinic represented in this study consisted of 7 physicians and 10 nonphysician clinicians and administrative staff. Clinics had an average of 10 physicians. All interviewees considered themselves to be influential in the product selection process. Of our 7 interviewees, 4 practitioners were paid according to an alternative payment model. Three interviewees were paid via fee-for-service, 2 of whom had access to sessional-based pay for time spent on activities pertaining to the selection, procurement, and implementation of their systems. Six of our physicians booked 4 patients per hour and the remainder booked 6 patients per hour. (This result is similar to the patient volumes reported in our previous study of small community practices in which physicians reported seeing 30 patients per day.[42]) For each hour of seeing patients, physicians said they needed 20 to 30 minutes of extra time to process paperwork (eg, complete billing, write consultation letters, review laboratory results). Our physicians had been using their EMRs for 4 years on average (range 2 to 6 years). Only 1 physician reported that she was now using her second EMR.

Findings

All physicians emphasized that their colleagues' previous EMR experience affected their decisions about product selection. Physicians' amicable working

relationships gave them the opportunity to consult one another regarding their EMR usage experience. The conversations served as vendor reference checks and as a method for learning about product features. Other methods of data gathering were product presentations and market scans.

Physicians made their product selections based on a number of factors. Products were selected because they supported aggregated patient reporting to be used for identifying patients for recalls. Physicians selected systems based on their ability to support interdisciplinary team care. Physicians took note of EMRs that supported patient-based task management (ie, a feature that uses the messaging infrastructure of the EMR to delegate patient-related tasks to team members). Obviously some of our physicians selected products based on the EMR's ability to support academic research. Physicians were interested in offers of EMR vendors to include physician feedback in the product development process.

Six physicians used a team-oriented, integrative, and planned approach to implement their EMRs. Practices started by using billing and scheduling features while maintaining paper charts until the physicians became experienced with the new system. Problem lists and allergies, followed by encounter notes and drug order entry typified physicians' descriptions of their rollout approaches. Robust training was an important component of the transition. One physician even complained that the vendor, on instruction from the employer, did not allow him to use a new EMR module until he had completed the training for it. Our physicians reported using almost all EMR features. No interviewee reported using the drug-to-allergy or drug-to-drug contraindication management feature because they used a compendium or other software, or left the contraindication management to the pharmacy. Physicians used the reporting features of their EMRs to analyze practice performance and patient population health data.

Transition to the EMR changed the way the physicians worked. Physicians had to change the way they made encounter notes. They had to learn to fit into the documentation approach dictated by the EMR. All interviewees made encounter notes on the fly during the encounters. Some made short 1- or 2-word notes and filled in details later. One physician made encounter notes and did billing and other paperwork during the encounter, so that his tasks were complete for the patients when they left. Another physician reviewed charts before entering the examination room. It helped make his patient visits more efficient because he already had previous history and laboratory results. Managing laboratory test results became easier, as well. Some laboratory results went directly into the EMR, so administrative staff did not need to handle them. Because EMRs file patients' laboratory test results, physicians' colleagues were able to access their patients' data when they were away from the office. On occasion though, scanning of paper reports was required. Administrative staff needed to be trained to produce good-quality scans and ensure they were filed in the proper patient files.

Initially, physicians were concerned about patient perception of computer note-taking. Our physicians reported that some patients complained that physician attention was focused on the computer. Interestingly, physicians purposefully developed ways of including patients in note-taking. Some physicians learned to type while making eye contact with patients. This approach necessitated strong typing skills and proper positioning of the computer desk, in which the physician's line of vision was at an acute angle to both the computer monitor and the patient.[42] Some physicians learned to make audible (ie, nonverbal) cues to patients to let them know they were still listening. Some physicians had their computer monitors facing patients; this allowed patients to see what was being typed. One physician listened to his patients first, then verbally repeated back what they said while typing at the same time, allowing patients to verify the accuracy of his interpretation of their condition. Some physicians printed out reports or flow sheets for patients to take home.

Physicians reported that the EMR did not affect the number of patients they could see in a day. Electronic medical records greatly improved communication between care providers about patient-related tasks. This consideration was very important to physicians, given the size of the teams they worked in and the interdisciplinary nature of their delivery of care. Electronic medical records helped ensure that tasks were not dropped; however, efficiencies in interdisciplinary workflow were compromised by typing skills and technical support challenges. Despite the tactics used by physicians to include patients in note-taking, physicians still struggled to efficiently make notes.

Our informants emphasized the value of technical support. Several interviewees reported that their clinics had tasked a nonclinical staff member to develop technical skills with the EMR and to act as a project intermediary with the vendor. Some physicians had not hired someone in this capacity, but expected that the implementation of their EMRs would be improved through such a resource.

DISCUSSION

The purpose of this study was to learn more about the factors that affect adoption of HIT in primary care. We interviewed family physicians practising in urban, hospital, and academic settings who were paid through alternatives to fee-for-service and compared their experience with previous reports of community-based physicians practising in small offices. Our previous study

found that community-based family physicians did not have or take the time to evaluate, select, and implement EMRs.[42] Examination room designs, complex software user interfaces, insufficient physician computer skills, remuneration models, and long wait lists contributed to poor-quality information exchange.[42] Our previous study hypothesized that remuneration models affected the procurement process and overall satisfaction of physicians.

This study validates several findings from our international literature review. Our findings support the need to train all team members to use HIT consistently.[8] Our findings also illustrate that a project resource is critical to the rollout approach. Project managers act as liaisons between the physician team and the vendor so that pre-implementation training is delivered successfully and postimplementation support concerns are addressed in a timely fashion. Community physicians from our previous study were dissatisfied with the insufficient EMR training programs provided by vendors. They indicated that they could not reliably access vendor technical support.[42] Our present study did not identify this problem. The larger urban, hospital, and academic practices absorb the cost of project resources to facilitate project support, whereas small community practices cannot.

This study also affirmed findings from our previous study with community physicians. Although our community physicians reported that they had strong computer skills, their complaints about basic computer functionality betrayed their confidence.[42] Our previous study hypothesized that HIT can disrupt the flow of information from patient to provider. Our urban, hospital-based, and academic physicians were more forthright about their challenges with the computer and keyboard. They also seemed to intuitively appreciate the potential for disruption caused by the EMR and were more willing to experiment with ways of including patients in note-taking. Urban physicians confirmed that patient volumes were not affected by technology adoption. They verified that physicians made encounter notes on the fly in the encounter but often needed time afterward to complete patient- or paper-related tasks.

There were some new unanticipated and ancillary findings of factors that also influenced adoption of EMRs. We noticed that urban physicians' selections were influenced by experience of colleagues. We hypothesize that urban physicians interact with one another more frequently and possibly have more amicable relationships, facilitating a sharing of experience. Conversely, community-based physicians did not seem to have the same network, were more isolated in their businesses, and perhaps even perceived their colleagues as competition.

Urban, hospital-based, and academic physicians had the opportunity to influence product development. There was no mention of contribution to product development by our community physicians. Physicians in

this study used a team-oriented and planned approach to implement their EMRs, as opposed to our community practices, where systems were installed quickly and users were required to transition to the new systems immediately. Urban practices either had project management resources to facilitate the adoption and postimplementation activities or were conscious of the need for such resources. Again, our community physicians did not discuss the importance of a project resource in our previous study. We hypothesize that the smaller community practices could not absorb such costs. (The largest community-based group practice from our previous study consisted of 6 physicians. In this study, the smallest clinic consisted of 7 physicians.)

We entered into this study because we expected that remuneration approach would make a difference in the time physicians could devote to product selection. Urban physicians did follow a more complete procurement approach than their community counterparts, but our interviews did not suggest that this was because alternative payment models permitted the time. Similar to our community physicians, physicians in this study used market scans and vendor demonstrations, consulted their professional associations, and networked with their colleagues because they saw the long-term value of these activities. We have now reviewed physicians' procurement approaches under various payment models. Our studies do not suggest that one remuneration approach supports adoption any more than another. This concept would seem to be confirmed in **Table 1**,[44-63] which shows high rates of EMR adoption in countries with widely varied remuneration approaches. Rather, this study suggests that stronger physician professional networks used in information gathering, more complete training, and in-house technical support might be more influential than remuneration approach in facilitating the EMR adoption experience.

Limitations

We now understand more about how EMR procurement is affected by care setting and remuneration models. We were fortunate to interview a group of key informants from several urban, hospital, and academic settings. Our informants had a range of experience, skills, and perspectives regarding the use of EMRs in a variety of family medicine care settings. The study's most obvious weakness is its narrow field of interviewees; only 7 physicians met our inclusion criteria and were available to be interviewed. The small sample means that the themes outlined above can only be considered directional. They are not conclusive or statistically significant. Bias might result from interviewee selection. Ideally, interviewees would have represented more clinics from more institutions. We interviewed physician leaders who influenced implementation decisions; however, the perceptions of physician leaders might not

reflect those of their associates. Interviewees rated their own computer skills highly; other findings might materialize from novice computer users. Theme saturation was only achieved in the final interview, with no opportunity for member checking. Further, this Alberta study was influenced by provincial matters, such as health policy, remuneration approaches, and physician office system funding models, which might prevent results from applying in other jurisdictions.

Conclusion

We have interviewed physicians remunerated by different payment models and cannot conclude that remuneration approach affects procurement effectiveness or long-term EMR adoption. We found that physicians were generally unprepared for the tasks of procurement. Thus, the EMR certification organizations created in some jurisdictions remain critical to the adoption of HIT in family medicine. We found that physicians in urban, hospital, and academic settings made better use of their professional networks for procurement advice and experiential feedback, whereas community physicians might not have developed such resources. Urban clinics are larger and have a greater need for the interdisciplinary communication features of EMRs, and larger clinics can support the cost of project managers or vendor liaisons. It also seems that if physicians' computer skills are inadequate, it can compromise the effectiveness of their EMR systems. Urban physicians innovate to include patients in note-taking and to compensate for computer skill weaknesses.

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Contributors
Dr Ludwick is the primary researcher and lead author for this study. Drs Manca and Doucette contributed to the design of the study, the design of data gathering instruments, and the interpretation of data. Dr Ludwick drafted the article, and Drs Manca and Doucette provided critical review. All 3 authors have provided their approval to publish the article.

Competing interests
None declared

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