

Refereed paper

End-user support for a primary care electronic medical record: a qualitative case study of a vendor's perspective

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ABSTRACT

Background In primary care settings, users often rely on vendors to provide support for health information technology (HIT). Yet, little is known about the vendors' perspectives on the support they provide, how support personnel perceive their roles, the challenges they face and the ways they deal with them.

Objective To provide in-depth insight into an electronic medical record (EMR) vendor's perspective on end-user support.

Methods As part of a larger case study research, we conducted nine semi-structured interviews with help desk staff, trainers and service managers of an EMR vendor, and observed two training sessions of a new client.

Results With a growing client base, the vendor faced challenges of support staff shortage and high variance in users' technical knowledge. Additionally, users sometimes needed assistance with infrastructure, and not just software problems. These

challenges sometimes hindered the provision of timely support and required supporters to possess good interpersonal skills and adapt to diverse client population.

Conclusion This study highlights the complexity of providing end-user support for HIT. With increased adoption, other vendors are likely to face similar challenges. To deal with these issues, supporters need not only strong technical knowledge of the systems, but also good interpersonal communication skills. Some responsibilities may be delegated to super-users. Users may find it useful to hire local IT staff, at least on an on-call basis, to provide assistance with infrastructure problems, which are not supported by the software vendor. Vendors may consider expanding their service packages to cover these elements.

Keywords: electronic medical record, end-user support, qualitative research, vendor

What is known about the topic

- In primary care settings, support from **health information technology (HIT) software vendors is often the main, or only, source of formal support available to users.**
- There is currently a dearth of research on end-user support for HIT in general, and in primary care settings in particular. The vendors' perspective is under-represented in the literature.

What this study adds

- To address these gaps, this study investigated how support personnel from an electronic medical record (EMR) vendor perceive their roles, the challenges they are facing and the ways they are dealing with them.
- The study highlights the complexity of providing end-user support for HIT and the challenges associated with increased EMR adoption rates: support staff shortage and high variance in users' technical knowledge and skills, and requests for support for infrastructure and other types of software.
- The study underscores the importance of interpersonal communication skills, endorsement of on-site super-users and, optionally, hiring local information technology staff for mitigating the negative impact of these challenges on the provision of EMR support services.

Introduction

The implementation of health information technology (HIT) in general, and electronic health and medical records (EHRs and EMRs) in particular, has been an on-going challenge.^{1,2} Despite large investments aimed at facilitating adoption and benefits realisation,³ there is a consensus that the potential of HIT for improving the quality, safety and efficiency of the healthcare system is not fully realised.^{4,5}

Support is often considered an important factor for successful implementation and benefit realisation of HIT.⁶⁻⁸ However, there is a dearth of research on support in general, and especially in community based primary care settings. Only a few studies provide comprehensive and detailed analyses of support for HIT, and they were conducted in hospital settings where there is usually a strong central support from specialised information technology (IT) units.^{9,10}

In community based primary care settings, such as physician offices, this kind of support is often missing. Rather, in these settings, HIT vendors play a greater role in providing training and on-going support to the end-users. Little research, however, has explored the vendors' perspectives on the support they provide, how support personnel perceive their roles, the challenges they are facing and the ways they are dealing with them. The purpose of this preliminary study is to provide an in-depth look into these issues based on a case study of one primary care EMR vendor in Ontario, Canada. Implications for vendors and clients are discussed.

Background

Studies of HIT implementation often briefly mention support as a critical success factor, without fully defining and explaining how it contributed to the process. In a recent systematic review, Lluch⁷ identified two types of support discussed in the literature: support from managers and colleagues, and technical support. In this study, we do not address aspects of managerial support. However, we do not limit support to technical aspects only, but try to provide a more holistic view with the end-user at the centre. For this purpose, we use the term end-user support, defined as 'any information or activity that is intended to help users solve problems with, and better utilise, the system'.¹¹ Recently, we proposed a framework for analysing and characterising end-user support for HIT, comprised of the following four facets:¹¹

- source of support, which can be formal or informal and personal or impersonal¹²
- location of support: on-site or remote
- support activities, including training and education, infrastructure support, software support, functional support, data support
- characteristics of support and support personnel including timeliness, knowledge, and communication and counselling skills.

These four facets are not mutually exclusive but can be linked or triangulated to provide rich view of end-user support.

There are few comprehensive studies on support for HIT, and the majority were conducted in acute care settings. For example, Fernando studied the experience of technical support staff in three Australian hospitals with a focus on privacy and security. She reported that

support tasks were often fragmented and work responsibilities hindered by resource shortages. Support staff often perceived clinicians as compromising privacy and security, whereas clinicians believed that IT staff did not provide adequate support for eHealth security.¹⁰ In a study of technical support in Danish hospitals, Petersen described the structure of support services, the multiple roles and skills of support staff, which are consistent with the above framework, and the tools they used in their everyday work (e.g. computers with multiple screens, system for remote access to the users' computer and mobile phones). The study highlighted the complexity of support work and its importance for maintaining the hospital's IT in working order.⁹

Primary care settings are diverse, and vary in their ability to provide strong local support to end-users. While some primary care clinics are hospital-based or part of larger organisations (e.g. health maintenance organisations), others are small independent physician offices. Although support from the HIT vendor may be important in many settings including hospitals, in primary care settings it is often the main, and sometimes the only, formal source of support to the end-users. Therefore, understanding the vendors' perspective is critical for improving support services for primary care HIT. However, we were unable to find any studies which provide in-depth exploration into the support provided by primary care HIT vendors. Users' perceptions are, to some extent, captured in studies of HIT implementation but the vendors' perspective is often missing. Using the above-mentioned framework, we attempt to fill this gap by looking at one EMR vendor's support personnel perceptions of the sources of support available to users, their activities, the desired and actual characteristics of support and support personnel, as well as the challenges they face and the ways they deal with them.

Methods

Design and participants' recruitment process

We conducted a qualitative case study in 2010–2011 using semi-structured interviews, document analysis and non-participant observation of training sessions. Ethics approval for the study was obtained from the research ethics board of the University of Toronto.

For the purpose of this study, we selected one commercial EMR, which is one of the twelve certified primary care systems eligible for provincial funding in

Ontario, Canada and is one of the three market-leading systems in the province. The vendor was selected based on convenience and the fact that its EMR system was used by four of five family health teams and organisations which participate in a larger case study we are conducting on end-user support for primary care EMRs. After obtaining managerial agreement from the vendor to participate in the study, consent forms were sent to a representative of the training and technical support personnel who distributed them to all support and training staff. Those who agreed to be interviewed returned their signed consents by mail or fax directly to the study team and were contacted to arrange an interview time. Consent for observation of training sessions was obtained from the trainer and all participating trainees. A generic service agreement, training materials and the EMR user manual were provided by the vendor for our review.

Interviews

A total of nine participants (convenience sample) were recruited and interviewed. Interviews were held face to face at the vendor's support centre offices and lasted 30–60 minutes. Three of the interviews were conducted by two researchers together in order to reflect on and revise the interview protocol and provide feedback on the interviewing technique. The remaining interviews were completed by one of these two researchers (CM). A newly developed semi-structured interview protocol (Appendix) was employed in all interviews. This protocol was used as a general guide with additional questions to follow-up on leads from participants. All interviews were audio-recorded and transcribed verbatim by a professional transcriptionist. The transcribed interviews were then reviewed by the research coordinator (CM) to ensure their accuracy.

Observation of training sessions

Two training sessions for a new client – a small solo specialist practice with three EMR users in a small town – were observed. Both training sessions were delivered on site by the same trainer with a one week interval between them. During observations, researchers took notes to describe the various training activities, their delivery methods, scope and the time dedicated to each training activity. Characteristics of the trainer and trainees were also noted. Each of the training sessions was observed by a different researcher (AS, CM) and the two then met to compare their notes and discuss their interpretations.

Data analysis

Researchers first read interview transcriptions and observation notes to familiarise themselves with their contents and annotate them. We drew on the framework analysis approach.^{13,14} Using the theoretical framework described above and the initial interpretation of the data, we developed a coding and categorisation scheme which was employed to map specific data elements to corresponding theoretical concepts. Additional codes were added during data analysis to capture emergent themes. The final coding scheme is presented in Table 1.

All interviews and observation notes were coded by one researcher (CM) using NVivo 8 qualitative data analysis software. To ensure trustworthiness, 60% of the interviews were also coded by at least one other member of the study team (AS or RD). Coding disagreements > 5% (as calculated by the software) were discussed among team members to reach consensus and revise the coding scheme.

Next, three researchers (AS, CM, RD) individually reviewed and interpreted the data, looking for overarching themes. Initial agreement on themes was high (90%), and the researchers discussed their interpretations to further refine concepts and reach consensus. Finally, we reviewed and annotated documents and triangulated this information with the themes identified in interviews and observations.

Results

Characteristics of interviewees

Of the nine people we interviewed, three were technical support (help desk) staff, two were trainers and four had administrative roles including supervisor of service team, supervisor of training services, product support analyst and provincial manager of support services. Descriptive statistics of interviewee characteristics are presented in Table 2.

The main identified themes related to support activities and sources, perceived characteristics of support personnel, and challenges faced by the vendor are discussed in detail below.

Support activities and sources

The vendor provided users with various types and sources of support including initial training, a telephone help line, a website, a user manual and an annual users' conference. From the vendor's perspective training is essential:

Training is without any doubt in my mind the single most important aspect that will determine whether an implementation is successful or a failure. To spend an hour of training to get even two minutes a week of improved productivity out of a doctor is huge. (Interviewee E.1.2)

Training starts with an initial phone call, in which the trainer identifies the setting and number of participants and gives the users an idea of the training programme. It is followed by three training sessions at the client's site. The first of these sessions provides training on the functions that are required to begin entering patient data. Approximately one week later, a second session is scheduled with instruction on special functions. Finally, a third session covers advanced functions such as conducting practice-wide searches.

Day 1 of training is setting up patients' appointments for the admin staff and in the afternoon we do a first lesson of electronic medical records with the doctors, to do notes and prescriptions and letters. Then usually we let them use those skills for around a week and there's a second visit where we show them billing, and then more advanced features for the doctors and messaging for the whole office and scanning and get their labs working. We usually let them have a break of two weeks, maybe three weeks and then we have a last one-day lesson where we show them how to reconcile their books with the Ministry as well as advanced things like in our software, searches and reminders which let them ... just know how to practically deal with the patients in a variety of ways. (Interviewee E.3.3)

In addition to this initial training, the vendor also provides training on new features after major updates to the system, or upon the client's request when an office has a large number of new staff who have not been trained on the system. A users' conference is held once a year and provides users with an opportunity to exchange knowledge and learn more about using the EMR.

On-going support is provided mainly through a telephone help desk, which is available during business hours. The vendor's operational model has changed over the past year. Currently, all calls go to the first level of support and interviewees reported that 70–75% of requests for assistance are answered at this level. More serious issues that cannot be resolved at the tier 1 level are escalated to a second level of support. Finally, problems that require changes to the software (e.g. bugs or requests for additional features) are forwarded to the research and development team.

In addition to these personal sources, the vendor provides users with a variety of impersonal resources including a training workbook, help menu within the system, a website with information and a user manual which is provided as a printed document as well as a PDF file. A separate analysis of this user manual

Table 1 Final coding scheme

Attribute	Definition
<i>Support source</i>	<i>These codes deal with characteristics of support for use of the EMR</i>
Formal	Support provided by an official source such as manuals created by the vendor, help desk staff or other personnel from the vendor. Staff from the user site whose job includes at least some component of IT-related duties are considered to be formal sources of support. Use this code for negative as well as positive comments
Informal	Support provided from peers whose job is not IT related; can include a local champion or local super-user. Manuals created internally by the user organisation are considered informal sources
Personal	Support provided directly by a person either on site or by telephone. A help desk is an example of a formal/personal source of support
Impersonal	Support provided by documents or websites. No direct contact with a person is involved
On-site	Refers to support provided on-site regardless of who is providing it
Off-site	Refers to support provided from an offsite location
<i>Support activities</i>	<i>Actions provided to help those using the EMR</i>
Infrastructure support	Assistance (or lack of it) with the acquisition, maintenance or use of EMR infrastructure including items usually thought of as hardware (e.g. computers, printers and other ancillary devices) and items such as network connections, connectivity with external providers such as a hospital-based system
Data support	Activities undertaken to ensure data is entered consistently and completely. This code is used to refer to <i>activities</i> related to data, not the quality of the data itself
Functional support	Assistance provided (or not provided) to use or solve problems related to the EMR program itself and with learning the software's various functions
Training and education	Refers to teaching users how to use the program initially when the organisation is converting to EMR and also the training that is required on an on-going basis or when new staff are hired
Project management support	Refers to the overall activities and efforts the organisation must take in order to ensure the successful operation of the EHR. Use this code to code comments that interviewees from the vendor use to describe things that need to happen to ensure successful training and adoption of the EHR
<i>Support characteristics</i>	<i>Describe the attributes of the support provided to users of the EMR</i>
Counselling skills	The ability of the person providing support to listen, to reinforce training or usage, to communicate patiently and in an empathetic manner, and with willingness to try various alternatives
Knowledge	Includes technical knowledge and the ability of those providing support to understand the problem being described and provide an appropriate answer
Homophily/heterophily	Refers to comments that indicate there is, or is not, a gap between the support person and the user. In technical knowledge, understanding of clinical workflow, etc.
Service quality	Comments related to the overall quality of the support provided including timeliness, responsiveness and accessibility
Operational model	Refers to comments from the vendor about the way they organise support

Table 1 Continued

Attribute	Definition
<i>User characteristics</i>	This node is used for coding characteristics of the users of vendor provided support and training
Age	Comments related to the age of those seeking support or training
Practice characteristics	Code comments relating to the number of physicians in the practice or the geographic location, i.e. rural vs. urban practices
User role	Use to identify the role of those who participate in training programmes or who call for support; could include doctors, admin staff or super users
Computer experience	Use to code comments related to the expertise, or lack of computer expertise, of those participating in training or requesting support
Resistance	Use to code comments related to computer fear or other comments that might indicate resistance to working with computers

Table 2 Descriptive statistics of interviewee characteristics

		Number of interviewees
Role	Technical support (help desk)	3
	Training	2
	Administrative	4
Gender	Male	4
	Female	5
Age (years)	30–39	3
	40–49	4
	50–59	2
Time with the vendor (years)	< 1	1
	1–2	4
	3–5	2
	6–8	2
Total		9

showed that it employs best practices of technical communication such as information mapping, use of screen captures, and support for error recognition and recovery. However, it is generic in nature and is not adaptable to various practice contexts; it contains both procedural and declarative information, which makes it less task oriented; and screen captures are used mainly to support verification of screen states but not identifying specific window elements (unpublished).

Finally, the vendor encourages clients to appoint super-users. These super-users provide on-site assistance to other users, and are also a key contact for the vendor:

We really would like to have one principal or key contact for any kind of technical issues within a clinic and that everything should actually go to that person. So it's kind of an element of train the trainer and really having somebody who is the sort of 'super-user' and that they become the first line of support for their staff. (Interviewee E.1.2)

Furthermore, the vendor recognised the importance of having on-site technical staff for dealing with issues that are not directly related to the EMR software:

In a larger clinic, having IT people there to deal with issues that are not software is very important and I think that they really should spend that money in having that – we

may have sold them the hardware and we can certainly help with the troubleshooting, but you know, in terms of taking care of their networks and stuff like that, I really do think that having a local IT person who's technically able to even speak to us is beneficial to them. (Interviewee E.2.1)

Characteristics of support personnel

Interviewees described a number of characteristics that are important for support personnel. These characteristics include good knowledge of the software and technology, problem-solving capability, ability to deal with stress and being organised. Most importantly, however, they stressed the need for good communication and counselling skills such as patience and ability to listen and adapt to various users:

Patience, understanding and teaching I think, because you really, – when you're talking to someone you really have to be a teacher or ... a very good listener because you have to listen to what they're saying and try and – okay, so ask this question and then you get this answer. (Interviewee E.2.1)

Part of these counselling skills often involved reassuring the users that they were doing the right thing: They just want somebody to confirm 'Yes, you're doing it exactly the right way. That's exactly how you're supposed to do it' ... (Interviewee E.1.3)

In addition, participants in general, and trainers in particular, emphasised the importance of understanding the users' workflow:

really what it's narrowed down to is just more workflow rather than medical knowledge. So you need to know what sort of items they need to be able to work with. (Interviewee E.3.2)

During the training sessions we observed, there was a focus on existing workflows and how best to use the EMR to accommodate office routines. However, the vendor also reinforced to users that making some changes to the way they conduct their work will enhance the effectiveness of the EMR and the efficiency of their practices:

In some ways (workflow is) very much the same as what they're used to, but in other ways it's RADICALLY different from what they're used to – so we talk about the kinds of changes that they can anticipate. I try to give them kind of general instruction on how to deal with these changes. – I teach them, okay, because I'm adding a computer, these types of changes are going to happen, so I want you to be ready for these types of changes. (Interviewee E.3.3)

Challenges

Participants identified several challenges for support providers. First, the vendor is a fast-growing company and at the time we conducted the interviews did not have enough support staff. This sometimes caused delays in support and clients having to wait to have their questions answered. The vendor has hired new people, but it takes time for these people to get familiar with all of the software features. Moreover, interviewees reported that increased adoption also meant a change in the users' profile: while early adopters tend to be more technologically savvy, later adopters have varying levels of computer experience to which support and training staff had to adapt: 'I think we're long past the point where it's people who are enthusiastic about technology' (Interviewee E.1.1.); 'we're past the early adopters and we're just into the mainstream adoption, right, and that's the crew we're starting to bring on. Their needs are going to be very different' (Interviewee E.2.4). Lack of computer experience, which they often associated with an older age group, is another challenge for training and support staff:

I had to teach one person how to use our software and they had never used a mouse before and it just – you just don't have the time to teach the basic computer stuff at the same time. (Interviewee E.3.3)

There's such a wide variety of skill levels on the part of the callers that ... you really do need to be patient and you need to ask the kind of probing questions to really be sure that you can satisfy them with the right response. (Interviewee E.1.2)

Another challenge is dealing with requests for support which are not related to the EMR software but for infrastructure (hardware, network and ancillary devices) or other applications (e.g. email, Microsoft software packages) that are not covered by the service agreement. While they tried to assist users with these problems, it seemed to be a source of frustration for support personnel:

There are a few areas that are kind of a challenge when it comes to providing support and that is really the division of, you know, who is responsible for what. I've often felt that, you know, a client will call because they have some challenge using some other aspect of the software. It's not directly related to our product, but may be related to their Microsoft Word or their Excel or Filemaker or something like that. So we do get a lot of calls that really are not our software. (Interviewee E.1.2)

Discussion

Principal findings

This paper provides an in-depth description from an EMR vendor's perspective of the various sources and activities of end-user support, including training, technical support, impersonal resources such as the user manual, as well as informal sources of support such as super-users. As a fast-growing company, the vendor faced challenges of support personnel shortage, a changing profile of its client population, and dealing with requests for support for infrastructure and other software. Trainers and support personnel emphasised the importance of understanding the client's workflow and interpersonal communication skills. Finally, the vendor endorsed the appointment of super-user at client sites to help mitigate some of these challenges.

Comparison with the literature

Numerous studies suggest that successful implementation and benefit realisation of EMRs require 'special people' such as local champions, super-users and 'bridgers' to promote the idea, solve day-to-day problems of using the EMR, provide on-site training, and act as liaison between developers and users.^{2,15,16} The fact that the vendor endorsed and recommended the appointment of super-users, not only during initial phases of implementation, but also for assistance with the on-going support needs of clients, demonstrates the translation of this important lesson into practice. Super-users, who are trained more extensively in using the system and provide the first point of support, can somewhat reduce the burden on the front-line help desk staff and mitigate the negative impact of the vendor's personnel shortage on the timeliness of support.

The growth of its clientele created another challenge for support and training personnel. As Rogers indicates, individuals who adopt new technologies at various points in the innovation diffusion process differ in a number of social and psychological attributes.¹⁷ As our study participants found out, early adopters were more technologically savvy, whereas later adopters had varying levels of computer skills. Supporting the needs of diverse user types with different levels of technological competence required that support personnel know the system well and possess good interpersonal communication and counselling skills. This, too, is consistent with previous research. Both Petersen and Fernando underscore the roles of technical support staff in hospital settings in users' education and counselling.^{9,10} Haggerty

and Compeau¹⁸ proposed that support personnel's problem-solving capability, quality of verbal modelling and service quality affect problem resolution, user learning and self-efficacy (defined as 'judgments of how well one can execute courses of action required to deal with prospective situations'¹⁹). This last role of supporters' communication skills is demonstrated in our study by participants' reports that users sometimes call the help desk to get reassurance that they are working properly with the EMR.

Finally, another challenge for primary care EMR vendor support staff is how to deal with requests for assistance with infrastructure and software that are not covered by the vendor's service agreement. While interviewees reported they were trying to assist users with these problems, it seemed to be a source of frustration for them. For users, it is important to be aware of the various elements which make up the EMR environment and know which of them are supported by whom. The vendor's recommendation to hire a local IT person, at least on an on-call basis, should be seriously considered. For vendors, on the other hand, it is important to recognise that users may not always make this distinction but rather view the hardware, network, ancillary devices and software as a single package. Primary care EMR vendors may consider providing an expanded service package to help users with these problems and generate additional revenue from service.

Limitations of the method

The main limitation of this study is the small sample size and that it was from one EMR vendor only. Although we employed a convenience sample, it included people in various roles from front-line help desk and training to managerial positions. However, theoretical saturation was barely reached at nine interviews. Thus, the findings may not be generalisable.

Call for future research

To address the limitations of this study, more research is required to (potentially) reveal additional themes and determine which of the findings apply to other vendors and which are more specific. Future research may also look at the EMR users' needs, expectations and perceptions of support in comparison to the vendor's perspectives described here. We are in the process of completing a multiple case study research with users from five family health teams and organisations in Ontario, Canada in which we explored these issues.

Conclusion

Similar to others,^{8–10} this study highlights the complexity of providing end-user support for HIT. With increased adoption, vendors are likely to face similar challenges of support staff shortage and increased variance in users' technical knowledge and skills. To deal with these challenges, supporters need not only strong technical knowledge of the systems, but also good interpersonal communication skills. Some responsibilities may be delegated to super-users. Both vendors and clients need to endorse this known best practice. Users may find it useful to hire local IT staff, at least on an on-call basis, to provide assistance with infrastructure problems, which are not supported by the software vendor. Vendors, however, should consider expanding their service packages to cover these elements, perhaps through local contractors.

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REFERENCES

- Kaplan B and Harris-Salamone KD. Health IT success and failure: recommendations from literature and an AMIA workshop. *Journal of the American Medical Informatics Association* 2009;16(3):291–9.
- Gagnon MP, Desmartis M, Labrecque M *et al.* Implementation of an electronic medical record in family practice: a case study. *Informatics in Primary Care* 2010;18(1):31–40.
- Lau F, Price M and Keshavjee K. From benefits evaluation to clinical adoption: making sense of health information system success in Canada. *Healthcare Quarterly* 2011;14(1):39–45.
- President's Council of Advisors on Science and Technology (PCAST). *Report to the president: realizing the full potential of health information technology to improve healthcare for Americans: the path forward*, 2010. www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-health-it-report.pdf
- Black AD, Car J, Pagliari C *et al.* The impact of eHealth on the quality and safety of health care: a systematic overview. *PLoS Medicine* 2011;8(1):e1000387.
- Ash JS, Gorman PN, Seshadri V and Hersh WR. Computerized physician order entry in U.S. hospitals: results of a 2002 survey. *Journal of the American Medical Informatics Association* 2004;11(2):95–9.
- Lluch M. Healthcare professionals' organisational barriers to health information technologies – a literature review. *International Journal of Medical Informatics* 2011;80(12):849–62.
- Bygholm A. End-user support: a necessary issue in the implementation and use of EPR systems. *Medinfo* 2001;10(1):604–8.
- Petersen LS. Complexities in securing sustainable IT infrastructures in hospitals: the many faces of local technical support. *Studies in Health Technology and Information* 2010;160(2):899–903.
- Fernando J. Clinicians, security and information technology support services in practice settings – a pilot study. *Studies in Health Technology and Information* 2010;160(1):228–32.
- Shachak A, Barnsley J, Tu K, Jadad AR and Lemieux-Charles L. Understanding end-user support for health information technology: a theoretical framework. *Informatics in Primary Care* 2012;19(3):169–72.
- Munkvold R. End-user support usage. In: Gordon S (ed) *Computing Information Technology: the human side*. Idea Group: Hershey, PA, 2003, pp. 146–60.
- Ritchie J and Spencer L. Qualitative data analysis for applied policy research. In: Bryman A and Burgess RG (eds) *Analysing Qualitative Data*. Taylor & Francis: London, 1994, pp. 173–94.
- Lacey A and Luff D. *Qualitative Research Analysis*. The NIHR RDS for the East Midlands/Yorkshire & the Humber, 2007.
- Ash JS, Stavri PZ, Dykstra R and Fournier L. Implementing computerized physician order entry: the importance of special people. *International Journal of Medical Informatics* 2003;69(2–3):235–50.
- Terry AL, Thorpe CF, Giles G *et al.* Implementing electronic health records: key factors in primary care. *Canadian Family Physician* 2008;54(5):730–6.
- Rogers EM. *Diffusion of Innovations* (5e). Free Press: New York, 2003.
- Haggerty N and Compeau D (eds). *A Social Cognitive View of Technical Support and Its Influence on User Learning*. Proceedings of the Twenty-Third International Conference on Information Systems (ICIS, 2002); 2002; Barcelona, Spain.
- Bandura A. Self-efficacy mechanism in human agency. *American Psychologist* 1982;37(2):122–47.

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Appendix

Interview protocol

A. Questions for personnel providing technical support

1. Please describe your role and responsibilities.
2. How long have you been supporting EMR users?
3. We define support very broadly as any information or activity that would help the users to solve problems with, and better use, the EMR system. It incorporates support from people, documents and other resources. It can be formal or informal and it includes a wide range of activities such as hardware and software maintenance, problem solving, consultation and training. Given that definition of support, can you provide an overview of the support provided to users by [vendor's name]?
4. What are the most common issues you are dealing with?
 - i. Are there differences between different types of users (Probe: New vs. more advanced users? Physicians, nurses, administrative assistants)?
 - ii. Are there differences between different settings?
5. Could you please describe the process of answering requests for support (Probes: Are calls triaged to specific personnel? Does the person taking the call deal with the caller directly? Do designated personnel deal with specific issues? Do you deal with the issues right away or get back to the caller later? If so, based on what criteria?)
6. What would you recommend an organisation do to improve users' experience with the EMR system?
7. What characteristics are important for a person providing the support?
8. How do you know if the support provided was successful?

B. Questions for personnel providing training

1. Please describe your role and responsibilities.
2. How long have you been supporting EMR users with implementation and/or training related to EMRs?
3. We define support very broadly as any information or activity that would help the users to solve problems with, and better use, the EMR system. It incorporates support from people, documents and other resources. It can be formal or informal and it includes a wide range of activities such as hardware and software maintenance, problem solving, consultation and training. Given that definition of support, can you provide an overview of the support provided to new users by [vendor's name]?
4. Please describe the initial training required for an organisation to convert from a paper record to an electronic health record.
5. What on-going support is required?
6. Please describe the differences in training required for clinical users (e.g. physicians and nurses) vs. non-clinical personnel such as administrative assistants and managers.
7. Are there specific issues with EMR use in primary care that are different from other settings (e.g. specialty practices or hospitals)?
8. What changes are required of EMR adopters in order to use the system efficiently/effectively? In what ways do you support this?
9. What would you recommend an organisation do to adequately support users of EMR systems?
10. What makes for a successful implementation and training in the use of EMR in primary care practices?
11. What makes for a successful trainer in this field?

C. Questions for managers

1. Please describe your role and responsibilities.
2. How long have you been supporting EMR users?
3. We define support very broadly as any information or activity that would help the users to solve problems with, and better use, the EMR system. It incorporates support from people, documents and other resources. It can be formal or informal and it includes a wide range of activities such as hardware and software maintenance, problem solving, consultation and training. Given that definition of support, can you provide an overview of the support provided to users by [vendor's name]?

4. What are the main challenges in providing training and support to primary care practices (Probes: Are there differences between new and more advanced users? Are there differences between different types of users? Different settings?)?
5. What advice would you give to an organisation regarding their training requirements? Regarding on-going support?
 - i. Would it be different for different organisations (Probes: New vs. advanced users; urban/rural settings?; distributed/co-located?)
6. How are contracts for support and training structured?
7. Can you describe the process of implementing upgrades/ software updates (Probe: How often does it happen?)?
8. What are the characteristics are you looking for when you hire someone to provide support to users?
9. How do you know if the support provided was successful?

