

Baird, Shawn and Boak, George (2016) Leading change: introducing an electronic medical record system to a paramedic service. *Leadership in Health Services*, 29 (2). pp. 136-150.

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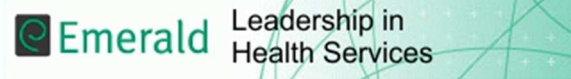
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Leading change: introducing an electronic medical record system to a paramedic service

Journal:	<i>Leadership in Health Services</i>
Manuscript ID	LHS-04-2015-0012.R1
Manuscript Type:	Original Article
Keywords:	Health care, Leading change, Information systems, Emergency care, Electronic medical records
Note: The following files were submitted by the author for peer review, but cannot be converted to PDF. You must view these files (e.g. movies) online.	
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“Leading change: introducing an electronic medical record system to a paramedic service”

For Peer Review

Abstract

Purpose

Leaders in healthcare organisations introducing Electronic Medical Records (EMR) face implementation challenges. The adoption use of EMR by in the emergency medical and ambulance setting is expected to provide across the health sector is a significant innovation providing wide-ranging benefits, but there is little research into processes of adoption in this sector. it remains little studied especially in the emergency medical and ambulance setting. This study examines the introduction of EMR in a small emergency care organization, and identifies factors that aided adoption.

Design/methodology/approach

Semi-structured interviews with selected paramedics were followed up with a survey issued to all paramedics in the company.

Findings

The user interface with the EMR, and perceived ease of use, were important factors affecting adoption. Additionally, Individual paramedics were found to have strong and varied preferences about how and when they integrated the EMR into their practice. As company leadership introduced multiple modes of access, resistance to the system decreased. Permitting flexibility of use, this enhanced both individual and collective ability to make sense of the significant technology change and removed barriers to acceptance.

Research limitations/implications

This is a case study of one small organization. However, there may be useful lessons for other emergency care organizations adopting EMR.

Practical implications

Practical lessons are indicated for Leaders introducing EMR in similar situations may benefit from considering a sensemaking perspective, and responding promptly to feedback.

Originality/value

The study's findings were supportive of findings in a review of relevant, but limited, literature on the mandatory use of electronic medical records. By extending into a novel setting, that of paramedics out-of-hospital, The study contributes to a wider understanding of issues facing leaders those who seek to implement electronic

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medical records in emergency medical services, a sector in which there has been to date very little research on this issue.

Research paper

Keywords: Health care, leading change, information systems, emergency care, electronic medical records.

For Peer Review

Introduction

Leaders in healthcare are currently facing difficult decisions about how to introduce new information technology systems into their organizations. Innovative new electronic medical record (EMR) systems ~~may have been shown to have~~ a positive impact on health outcomes (Car *et al.*, 2008) ~~although a recent systematic review found that the empirical evidence for this is not strong~~ (Black *et al.*, 2011). However, medical errors are the cause of tens of thousands of deaths in the US each year (Kohn, 2000) and calls for adoption of EMR as a tool to reduce medical errors have been heard from patient safety advocates and regulators (IOM, 2007, Martinez, 1996). In 2008 the Affordable Care Act effectively mandated EMR throughout the US health system. Reduction of medical errors, accurate documentation of patient condition and treatment, as well as the potential for data collection to make substantial contributions to medical research are all driving adoption of ~~EMR electronic medical records~~ throughout the health care system (Car *et al.*, 2008).

Emergency medical service and advanced care provided out-of-hospital by paramedics are relatively new components of the US health care system. Only in recent years have health systems recognized that care delivered by paramedics staffing ambulances makes a critical difference to patient morbidity and mortality (Bjorklund *et al.*, 2007). ~~Paramedics provide medical care in the ambulance response setting similar to that of physicians and nurses. They respond to calls for medical help, perform physical examinations and initiate treatment, and they are expected to thoroughly document their patient encounters (Landman *et al.*, 2012). Until very recently they have used traditional paper documents, written in the hospital immediately following the delivery hand-off of a patient. A copy of the written report was then left with the receiving physician and the paramedics subsequently departed the hospital, available to respond to the next emergency call.~~

~~There is a positive impact on the health system when ambulance services adopt EMR (Newgard *et al.*, 2012). Eighty-nine percent of hospital emergency department physicians surveyed in the United States reported that the paramedics' written medical chart was important or very important to their emergency department medical practice; those same physicians overwhelmingly preferred an electronic record to a hand written chart, 52% vs. 17% (Bledsoe *et al.*, 2013). Within the emergency medical services field there is thus evidence to support the benefits of adopting EMR systems, but there is little research on processes that leaders can use to support adoption.~~

~~Although the benefits to the health care system if paramedics adopt EMR systems are clear, interviews with emergency medical services leaders reveal disparate views on the success of EMR implementation change initiatives, for a range of reasons including leadership, organizational structure, and technical barriers (Landman *et al.*, 2012).~~

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4 This paper concerns research into the introduction of an EMR system within a small,
5 privately-owned emergency medical services and ambulance firm in the north-west
6 of the USA. AMB Company (note: a pseudonym is used to protect confidentiality)
7 made the use of a new EMR system mandatory for all its 34 paramedics. The EMR
8 system comprised innovative electronic charting; the organization and its
9 paramedics had been using a paper charting system for over 20 years prior to the
10 change.
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12
13 The leadership at AMB introduced the new system with clear **policies and**
14 **procedures** ~~expectations~~ about when, where, and how the system was to be used.
15 The change encountered resistance from paramedics, who reported a range of
16 problems including, but not limited to, difficulties with the software, hardware, and
17 practical issues around timing of use. The company leadership was initially rigid in
18 its expectation of how the system would be used, particularly in regard to the timing
19 and hardware, or mode, of use. As the implementation period progressed, however,
20 significant flexibility was added to the system allowing for different individual
21 patterns of access and use to develop.
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25 This study was designed to answer the research question: how does permitting
26 flexibility with timing and mode of use impact acceptance of the adoption of an
27 electronic medical record system by paramedics? It is a case study of one small
28 organization, but with potential for learning for other paramedic services.
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31 The study was carried out 20 months after the EMR system was first introduced. A
32 mixed methods approach obtained both qualitative and quantitative data from the
33 paramedics employed at the **company** ~~case organization~~, using semi-structured
34 interviews and an electronic survey.
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37 38 **Changing systems and processes**

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40 ~~The activity of introducing change into the systems and processes of an organization~~
41 ~~is acknowledged to be at one and the same time fraught with difficulties and an~~
42 ~~essential part of the role of leaders. As Pfeffer and Sutton (2006, p. 161) say, the only~~
43 ~~thing more dangerous than doing organizational change is never doing~~
44 ~~organizational change.~~
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48 Academic research and practitioner advice on how to bring about organizational
49 change is extensive, and ranges from theories that put forward a series of stages
50 that leaders of change should follow, through inspirational approaches (Kotter,
51 1996, 2012; Appelbaum *et al.*, 2012) or through project management phases (Hayes,
52 2014), to theories that regard the leadership of change as a matter too complex to
53 be represented by linear stages, and which advocate individualized context-
54 sensitive approaches (Balogun and Hope Hailey, 2008; Balogun and Johnson, 2005).
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It may be that the most effective approach to leading change depends on the specific situation, including the kind of change required, and the circumstances of those who are required to change their behaviour. A sudden change calls for a different approach than an incremental one (Balogun and Hope Hailey, 2008), **a simple change may be successfully implemented by different methods than a complex change (Aitken and Higgs, 2010)**, a culture change requires a different approach from a change to processes and procedures (Christensen *et al.*, 2006). Changes have been described in terms of 'hard' and 'soft' changes (Paton and McAlman, 2007) where hard changes are specific technical changes and soft changes are more diffuse, organizational and cultural changes. Success in hard changes may be achieved by project planning and management; success in soft changes requires discussion and achieving agreement across different perspectives on the change (Senior and Swales, 2010). However, some changes, such as medical innovations, may have at their core a change in technology – a 'hard' change characteristic – but a 'soft' periphery (Denis *et al.*, 2002).

It is widely recognized that a key task of leadership in introducing and implementing change is handling the reactions of other members of the organization, who may be reluctant to adopt the change. Leaders need to deal with lack of commitment or opposition (Hayes, 2014). However, resistance can play a constructive role in improving both the process and result of a change (Burchell, 2011). Leaders of change may view resistance as a form of feedback and accept the challenge of putting that feedback to work constructively (Ford and Ford, 2009).

~~Just as Denis *et al.* (2002) found that many medical innovations had a hard core, but a soft periphery, EMR implementation change initiatives have at their core a change in technology – a 'hard' change characteristic – but they also have 'soft' change implications (Hennington *et al.*, 2009). Legislative and economic conditions may drive the change and indicate the appropriateness of directive, 'hard' change implementation strategies, at the same time health practitioners at all levels are beginning to recognize the benefits of EMR and this indicates the appropriateness of a more organic, soft change approach (Landman *et al.*, 2012; Joshi, 1991).~~

~~Leadership, then, may be more about fostering a deep understanding of the change, attending to issues of resistance, encouraging the cycle of learning, and empowering capacity for influence among peers (Aitken and Higgs, 2010).~~

The term 'electronic medical records' may be used to describe a wide variety of information technology applications, from files on single patients to national databases (Greenhalgh *et al.*, 2009). An EMR may be cross-organizational, designed to be implemented across a whole healthcare system, or it may be more fragmented, bottom-up, introduced within a single organization (Coiera, 2009). Issues concerning leading implementation may, realistically, be expected to vary, depending on the scale and scope of the proposed system. The example studied in this research was a relatively modest application, comprising reports on individual patients, introduced within a single organization.

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Conceptual frameworks frequently used for analysing the introduction of information technology into healthcare settings are the Technology Adoption Model (TAM) and the related UTAUT – the Universal Theory of Acceptance and Use of Technology (Holden and Karsh, 2010). In the TAM, individuals' intention to use a new technology is thought to be primarily influenced by their perception of the usefulness of the technology, and their perception of the ease of use (Davis, 1989). Bagozzi (2010) criticises the omission in TAM of social variables (such as social norms) and this is remedied in the UTAUT, which includes perceived social attitudes to the technology, along with perceptions of usefulness, perceptions of ease of use, and perceived facilitating conditions (Venkatesh *et al.*, 2003).

There is evidence from studies that use the TAM or UTAUT (e.g. Maillet *et al.*, 2015; Money *et al.*, 2015), as well as from studies that do not (e.g. Boddy *et al.*, 2009; Lapointe and Rivard, 2005), that the introduction of EMR is better accepted when there is a strong perceived usefulness and no loss of clinician autonomy. Resistance, on the other hand, can take root where there are strong feelings that the EMR complicates the clinicians' work and makes workflow more difficult to manage (Hamid and Cline, 2013). When the change results in a net benefit for the clinician, such as through improved workflow, barriers will be diminished (Joshi, 1991).

In a systematic literature review of research into EMR implementation, McGinn *et al.*, (2011) found that significant factors for health professionals other than physicians included not only perceived usefulness and perceived ease of use, but also potential barriers in the form of workload pressures, and design or technical concerns relating to the software or hardware. Hamid and Cline (2013) found a correlation with increasing age of users as a factor in resistance to acceptance of EMR by physicians. However the same study failed to find such a correlation in the advanced nurse practitioner community, and it was not considered a major factor as compared with other findings noted above.

Resistance to adoption of information technology initiatives, including EMR, has been well documented in the physician community. The culture of the healthcare sector has led to physician practice being independent of hospital administration and paraprofessionals. As healthcare systems adopt EMR it has been possible to mandate nearly everyone to use it except physicians, thus much of the research concerns factors influencing physicians' decisions about adoption has been devoted to finding out how to get physicians 'on board' (e.g. Audet *et al.*, 2014; Hamid and Cline, 2013; Hsieh, 2015). In these situations, models of the spread of innovations are applied to analyse how to gain willing adoption (Berwick, 2003; Rogers 1995). However, it is questionable whether much of this research and is not directly applicable to situations where EMR use is mandatory (Lapointe and Rivard, 2005; Rivard and Lapointe, 2012). However, some findings from research into voluntary use of EMR may be relevant in the mandatory setting.

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3 Management reaction to resistance is also likely to have an impact on the success of
4 implementation. Lapointe and Rivard (2005) concluded that in the initial stages of
5 EMR implementation, resistance is mainly aimed at the system itself and specific
6 features of it. Their data suggests that if managers are quick to recognize the
7 resistance and seek to find workable solutions, barriers to acceptance may be
8 overcome. Conversely if managers themselves fail to respond quickly to resistance,
9 obstructive behaviour can become deeply entrenched (Rivard and Lapointe, 2012).
10 Hamid and Cline (2013) also found that clinician acceptance was directly related to
11 the degree of management support for issues such as engaging clinicians during all
12 stages of the change process and management resolving technical problems as
13 promptly as possible. It is not only management the leader, however, who can put
14 feedback to good use. The process of disseminating innovation in a nonlinear
15 fashion by participant stakeholders at all levels may influence adoption. As various
16 stakeholders individually and collectively assess new practices they also accelerate
17 or impede diffusion of innovations (Denis *et al.*, 2002). Encouraging early adopters
18 to experiment and try local adaptation of health care innovation can enhance
19 dissemination and reduce resistance (Berwick, 2003).
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25 Given the emphasis on user perception in the TAM, the UTAUT, and other research
26 approaches, a sensemaking perspective may be a useful framework for approach to
27 interpreting reactions to the introduction of technological change (Jensen and
28 Aanestad, 2007). Sensemaking involves an on-going effort to interpret actions,
29 events and disruptions into a contextualised order that the individual or
30 organization members find comprehensible (Weick, 1995; Weick *et al.*, 2005).
31 Clinicians are not simply the 'passive receivers' of an EMR system. Through
32 contextualization of use and communication with peers, the clinicians are
33 themselves define defining what the system will be (Hennington *et al.*, 2009).
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37 Two studies are particularly relevant in examining this. Wagner and Newall (2007)
38 found that the use of off-the-shelf rather than custom software solutions provided a
39 false promise of straightforward follow-the-recipe implementation. In reality the
40 process involved an on-going cycle of configuration, customization, and
41 implementation based on user input. This is congruent with Berwick's (2003) more
42 general observation that innovations in healthcare are more often adapted than
43 adopted.
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46 Hennington *et al.* (2009) found the implementation and acceptance of mandatory
47 EMR use by a group of hospital nurses led to a new multidimensional view of
48 nurses' use of EMR technology. Hennington and colleagues discovered that although
49 the use of EMR was made mandatory by management, there was considerable
50 variability in the mode of use, even within the same institution. While the use of the
51 system was mandatory, the study found that in practice the nurses engaged with the
52 system in many individualized ways, in relation to timing and mode of use. Factors
53 such as case load, work flow, and social influences of others impacted choice of
54 mode of use.
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3 There is a paucity of research on EMR use in the emergency medical services and
4 ambulance sector. Studies that have been undertaken focus on quantifiable specific
5 ~~effects~~ ~~impacts~~ such as impact on the duration of ambulance calls (Kuisma *et al.*,
6 2009) and an increase in the total quantity of exam information documented
7 (Katzner *et al.*, 2012). ~~However, one small~~ qualitative study of emergency medical
8 service agency directors ~~explored drivers and challenges of~~ ~~found a common set of~~
9 ~~management concerns about the potential negative impacts on agencies and service~~
10 ~~delivery, yet concluded there is still a high degree of support for EMR~~
11 ~~implementation in the sector (Landman *et al.*, 2012).~~

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15 Landman and colleagues interviewed 23 agency leaders from 20 emergency
16 services organizations in the USA and Canada. Respondents reported that key
17 drivers of using EMR were improved quality assurance, improved legibility of
18 charts, and improved systems for billing for work carried out. Challenges included
19 financial factors (high cost of start-up), technical factors (user interface designs)
20 organizational factors (complex structures and lack of leadership) and concerns
21 over information security and patient privacy. Challenges specific to emergency
22 services reported to Landman *et al.* (2012) were concerns about the amount of time
23 it would take paramedics to complete electronic charts, and the impact of this on
24 ambulance response times. Respondents also reported frustration over difficulties
25 integrating the EMR systems with those of the hospitals.

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30 McLeod Jr *et al.* (2008) found that different cognitive learning styles of paramedics
31 adopting a new EMR had a significant impact on the learning processes they
32 adopted, but surprisingly, no impact on the length of time it took them achieve
33 competent performance with the system.

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36 There is a positive impact on the health system when ambulance services adopt
37 EMR (Newgard *et al.*, 2012). Eighty-nine percent of hospital emergency department
38 physicians surveyed in the United States reported that the paramedics' written
39 medical chart was important or very important to their emergency department
40 medical practice. Those same physicians overwhelmingly preferred an electronic
41 record to a hand written chart, 52% vs. 17% (Bledsoe *et al.*, 2013).

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44 In summary, the literature indicates that the ~~introduction of EMR into health care~~
45 ~~organizations may face~~ ~~implementation of information technology, specifically~~
46 ~~electronic medical records, is complex, with technical, organizational and individual~~
47 ~~barriers to success. Leaders planning change initiatives to implement mandatory~~
48 ~~EMR use would benefit from a~~ ~~good~~ ~~better~~ understanding of how users make sense
49 of the system (Jensen and Aanestad, 2007, Hennington *et al.*, 2009). ~~As people take~~
50 ~~in, share, and process information they ultimately act in such a way as to bring a~~
51 ~~sense of personal order to events.~~

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55 Within the emergency medical services field there is evidence to support the
56 benefits of adopting electronic medical record systems, but there is little research
57 on processes that that leaders can use to support adoption.

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There is little research on the processes of introducing EMR into emergency services organizations. The qualitative study by Landman *et al.* (2012) indicated some specific challenges to adoption in this setting, including issues that relate to leadership, to the technical interface, and perceived ease of use. This study aims to further explore these issues in one organization. contribute to an understanding of the impact of decisions about timing and mode of use of EMR systems in the emergency medical services field.

Methodology

The research followed a pragmatic, multi-strategy, inductive approach (Gray, 2014; Robson, 2011), gathering and analysing both qualitative and quantitative information. The research design was approved as compliant with the research ethics procedure of the university with which the researchers were associated.

In phase one, a qualitative semi-structured interview sought a deep view into interpretation of and adaptation to the change process itself. In phase two, a quantitative survey administered to all 34 paramedics employed by AMB Company elicited detail about specific dimensions of use identified in the first phase of semi-structured interviews.

This approach provided opportunities for new information to emerge throughout the study, minimizing the risks of following too narrow a preconceived theory on how the subjects have made sense of the change (Gray, 2014; Robson, 2011).

Semi-structured interviews of 30 to 45 minutes' duration were conducted face to face during January and February of 2014 with four paramedics who had been involved in the EMR implementation project at AMB Company. Interviewees represented leadership, mid-management, trainers, and junior paramedics. All were licensed paramedics and had experience as end users of the new system.

Interview questions were drafted building upon previous research into the area of mandatory EMR use in healthcare and sensemaking in EMR implementation (Jensen and Aanestad, 2007). A pilot interview was conducted with a paramedic from another ambulance company in order to test the relevance and effectiveness of the questions. Following the pilot interview, the questions were revised for clarity. Question began with reflection on the transition period to EMR with subjects asked to describe how they initially used the system. The interviews then moved to current use and concluded with discussion of leadership performance during the change process. The use of a semi-structured format assured that interviewees had opportunities to introduce new concepts about the change.

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3 The interviews were audio recorded and professionally transcribed to aid in coding.
4 Thematic analysis elicited patterns and major themes from the responses to the
5 questions (Braun and Clarke, 2006). A manual approach was taken to coding, rather
6 than using a software programme. With the small number of interviews, this was an
7 appropriate method to keep close to the context and meaning of the information
8 (Easterby-Smith *et al.*, 2012).
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12 Key coded phrases were grouped into themes. Themes were then formatted in a
13 side-by-side comparison table to evaluate the interviewee responses regarding
14 conditions at the beginning of the change process as contrasted to conditions at the
15 time of interview, 20 months after implementation.
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18 The interview process provided deep insight into how the system was being used,
19 and thus informed development of specific questions for the second phase of data
20 collection, a structured survey of all 34 paramedics at AMB Company. Survey
21 questions were primarily designed as closed response to allow for quantitative
22 analysis of identified elements of system use. Two open-ended questions were
23 included to provide those surveyed an opportunity to introduce new information
24 and generate qualitative data that may support or refute findings of the semi-
25 structured interviews.
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29 The electronic survey was developed using QuickSurveys by Toluna Analytics, Inc. A
30 pilot version of the survey was sent to two paramedics at firms other than AMB
31 Company who had been through a similar transition to using EMR. The **piloting**
32 **survey** identified several potential improvements, therefore **the survey** was
33 revised and sent out again. Following a second round of piloting the survey tool was
34 finalised. **The 17 questions in the survey focused on attitudes and preferences about**
35 **using the hardware and software during both the initial transition and later**
36 **following the introduction of multiple modalities of use.**
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40 A web link was emailed to the 34 paramedics employed at AMB Company in March
41 2014, along with a cover letter explaining the nature of the research, the topic, and a
42 statement of confidentiality. The initial emailing resulted in 14 completed surveys
43 returned within 10 days. A follow up email request was sent in April 2014 and the
44 survey closed after 5 weeks. In total, 30 responses were received. One response was
45 rejected as incomplete resulting in a total response of 29 or 85%.
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48 49 Findings

50 51 *The decision*

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54 The decision to adopt an EMR system was influenced by a desire to improve systems
55 for billing for work carried out and to improved quality assurance (as found in
56 Landman *et al.*, 2012). The particular EMR system was chosen as being compatible
57 with the company's billing system. Close electronic integration with hospital
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3 systems was not possible, as Landman and colleagues also found, and the new EMR
4 system transferred information to the hospitals by automated fax.
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7 *The implementation process*

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10 At the onset of the change, the mode of use was limited to a tablet computer with a
11 touch screen and stylus. Paramedics were told that they should begin their charting
12 in the ambulance as they responded to a call. They were expected to be able to
13 enter information such as incident location on the way, then hold the tablet and
14 chart at the patient's side throughout the contact, completing the chart in the
15 ambulance while returning back to their station. This is referred to as the 'initial
16 design' of the EMR system in the text that follows.
17

18
19 Initial training on the system was limited. Each paramedic was required to enter a
20 series of mock patients into the system in order to gain basic familiarity. Once those
21 were complete, the paramedics were required to use the EMR for all actual patient
22 encounters. They did have access at all times for help from a group of peer
23 volunteers who had undergone a day-long intensive training programme provided
24 by the software vendor.
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28 Paramedic concerns about the difficulties of implementing EMR in this way were
29 communicated to the company leadership a few weeks into the change process, and
30 the system was redesigned. New hardware devices and points of access were added
31 to the system enabling much greater flexibility in mode of access (see table 1) and
32 the protocol was revised to allow for the time of use to be determined by the
33 paramedic, at any time during their 24 hour shift. Subsequently, access from home
34 or other remote locations was added to further enhance flexibility. Software
35 configuration was also modified as the change progressed, in order to add flexibility
36 of use. This is referred to as the 'adjusted design' in the text that follows.
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39 **INSERT TABLE 1 HERE**

40 *Reactions*

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44 Three of the four interviewees were experienced paramedics, with leadership roles
45 in the company; the fourth had less than 5 years' experience. Of the 29 respondents
46 to the survey, 13 had less than 5 years' experience, seven had 5-10 years', and nine
47 had 11 years' experience or more.
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51 The interviewees indicated that there were difficulties using the system at first. The
52 process of actually using the tablet while on a call was problematic for some.
53 Interviewee KC said: "I hated it." However, interviewee EW said: "I'm a Millennial.
54 We live on computers. It's very easy for me to adopt this system."
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57 All interviewees said that during initial implementation the process of documenting
58 and completing a chart became much more complicated. Interviewee SF said: "I
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3 noticed that instead of doing patient care, I was too focused on trying to figure out
4 what to put where in the computer.” Some concerns that were raised were quite
5 surprising. It was revealed that many paramedics became car sick while attempting
6 to use the tablet computers, for example.
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10 In the survey, 10 respondents said they found the adoption of EMR difficult or very
11 difficult, while 11 said they found it easy or very easy. Of the 11 who found it to
12 some extent easy, seven had less than 5 years’ experience; only one respondent with
13 less than 5 years’ experience reported finding the change difficult or very difficult
14 (see Figure 1). During the initial design phase of EMR implementation, when
15 only the tablet computer and stylus were available, 20 respondents (67%) found the
16 system frustrating or very frustrating, and the same number reported that using the
17 system as initially designed by management was difficult or very difficult. All of the
18 paramedics with 11 years or more experience reported they had difficulty.
19
20

21 **INSERT FIGURE 1 HERE**

22
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24 As more hardware tools were added, 25 survey respondents (86%) said that the
25 system became easier or much easier to use (see Figure 2). After the different
26 modes of access were made available, individual paramedics were able to choose
27 how they used the system. Interviewee TG said: “Personally, I like to use the
28 desktop, my own computer in my office, because I am used to that. I’m not
29 comfortable using a stylus...it’s easier for me on a keyboard.” Interviewee SF said: “I
30 use my laptop... It’s just mine.” Interviewee KC preferred to “sit in the front
31 passenger seat and I try to type in as much as I can on the tablet...once we get to the
32 narrative I usually just leave it, and then we get back to the station I bring the [USB]
33 keyboard in and sit down and finish.” Interviewee EW, the self-described Millennial,
34 said: “I typically do everything except for the narrative...on the touch screen
35 [enroute back]. I upload it to the website where I am able to complete it with an
36 actual keyboard [on a desktop].”
37
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40 **INSERT FIGURE 2 HERE**

41
42

43 Time of use also differed among all four interviewees. EW reported beginning his
44 chart on the tablet before even arriving at the scene of a call. Others varied in time of
45 use from on the way back to the station in the ambulance, to at the station but
46 immediately upon return, to even waiting until many calls were run then charting
47 several at the end of a shift.
48
49

50 Questionnaire responses indicated that 22 respondents (76%) had developed a
51 strong or very strong preference for how they accessed the system (see Figure 3).
52 Only three respondents said they still accessed the system as originally intended,
53 using the tablet and stylus. All the others used other hardware as well as the tablet
54 or, in three cases, without using the tablet at all. As well as new hardware, additional
55 choices about software were introduced, and 22 respondents said they had strong
56 or very strong preferences about the software they used.
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INSERT FIGURE 3 HERE

Commenting on the added flexibility provided in the adjusted design phase, interviewee EW summarized: “being flexible with your requirements in terms of how people do their charts, I think is important, as long as they’re [i.e. the recipients are] getting the information they need out of it.” Interviewee TG said: “If you can take hurdles down, easy ones like adding more licenses, more hardware access, things like that to make it easier, it will benefit you with very little cost.” The interviewees all commented on the range of preferences for use they observed. SF said: “We have all found our own way of doing it that we find successful.” EW commented that: “Everybody has their own different way of doing it.”

All four interviewees said that additional formal training might have helped early acceptance, and this comment was also offered by 11 survey respondents. **To supplement the minimal** ~~In the absence of~~ formal training, an informal system of peer-to-peer dialogue developed to provide mutual help. Some paramedics offered assistance to colleagues who were having difficulty with the new system. These paramedics, according to interviewee TG, would “sit down with crews on shift and go through the software with them one on one.” EW said: “I actually volunteered to be one of the trainers to spur the other staff as we upgraded...teaching the other team members how to correctly use the software...where the short cuts are.” In the survey, 14 respondents (48%) said that learning from peers had been very helpful and nine (31%) said it had been somewhat helpful.

This peer to peer dialogue extended beyond AMB Company employees. AMB Company paramedics frequently talk to paramedics from different agencies when they cross paths in the hospital emergency department. KC commented that: “If you would talk to another agency in the hospital, they were sitting there with their tablet learning how to use their system... [you could] see other people having the same frustrations.”

The importance of user feedback loops and an ability to make modifications to the system was noted by interviewees as a key to successful implementation. EW said: “I think the best thing for charting [EMR] is to continue to have feedback from the people who are using it. If you are consistently getting the same feedback...that we would be able to quickly address it and change it [i.e. the system].”

When asked if they found that there were any benefits to having undergone the change to an EMR system all four interviewees said that the quality of the chart was better under the EMR system. Comments included terms such as “more objective” and “significantly more accurate” as well as “it gives more opportunities to remember details and that sort of thing.” Interviewee SF supported that position in her comment: “The data that we get from these electronic charts is priceless.” Seven survey respondents (24%) suggested that the company should now contemplate adopting paperless systems.

Discussion

The paramedics interviewed as part of this study recognized the benefits the new EMR system brought to the service provided by the organization. These benefits correlate with the findings of others that use of EMR provides benefits in the emergency medical services setting for paramedics, ambulance services, and academia (Bledsoe *et al.*, 2013; Katzer *et al.*, 2012; Newgard *et al.*, 2012).

The research question for this study was: how does permitting flexibility with timing and mode of use impact acceptance of the adoption of an electronic medical record system by paramedics? The findings indicate that allowing individual flexibility of use, introduced in response to feedback, significantly aided the acceptance of the EMR system in this company.

Other studies have found that the perceived ease of use of information technology is a factor influencing successful adoption by healthcare professionals (Maillet *et al.*, 2015; Money *et al.*, 2015) and that the technology-user interface is an issue of concern (Landman *et al.* 2012; McGinn *et al.*, 2011). This was the case in this study, which highlighted the differences in preferences for use of individual paramedics (as was the case of the nurses in Hennington *et al.*, 2009). Ease of use and the resolution of the technical problems was achieved in different ways for different users, and therefore a key factor in successful implementation was arranging for flexibility of use. As Berwick (2003) said about implementing innovations generally, an effective leadership approach may be to allow for adaptation rather than insisting on 'absolute replication' (p. 1971).

The initial intention was for one process that all paramedics would follow, using a limited range of hardware and software, with everyone following one clear procedure. Many paramedics experienced difficulties with aspects of this initial design and, responding to their feedback, the company leadership introduced more hardware and software and flexibility of use. Individuals then developed their own approaches to creating EMRs (as in Hennington *et al.*, 2009).

Initially the leadership approach was as though this change was a 'hard' technological change (Paton and McAlman, 2007) calling for simple direction (Senior and Swales, 2010). However, responding to critical feedback from users, the leadership approach became more participative (Hayes, 2014), allowing emergent, organic modification to the initial design, which made sense to users while still achieving the over-arching goal (Balogun and Johnson, 2005). The approach became more as Aitken and Higgs (2010) describe is suitable for complex changes - fostering a deep understanding of the change, attending to issues of resistance, encouraging the cycle of learning, and empowering capacity for influence among peers.

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5 Problems with the initial design were signalled by feedback, and the leadership
6 responded by adjusting the design. The paramedics themselves strived to share and
7 develop their learning, to overcome perceived barriers and build a successful
8 system.
9

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11 An important factor was the constructive reaction of the company leaders to the
12 critical feedback from the paramedics. This is congruent with the findings of Hamid
13 and Cline (2013) regarding the importance of managers quickly resolving technical
14 problems experienced by clinicians, and with the recommendations of Lapointe and
15 Rivard (2005) that if managers find workable solutions to early EMR problems,
16 resistance can be overcome.
17

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19 Although in the initial stages the new technology was perceived to make the
20 paramedics' clinicians' work more complicated and the workflow more difficult to
21 manage (as in Hamid and Cline, 2013 and Landman *et al.*, 2012) these barriers were
22 overcome as more flexible options were made available and as each paramedic
23 learned how they could best use the system.
24

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26 The findings indicate individual paramedics engaged in a sensemaking process
27 during the implementation phase (as in Jensen and Aanestad, 2007). In so doing
28 they were able to comprehend and adapt to a disruptive change. This process was
29 aided by the social influences of more adept paramedics helping their colleagues
30 and by active learning between peers. The paramedics themselves strived to share
31 and develop their learning, to overcome perceived barriers and build a successful
32 system. It could have been aided further by more formal training at the outset.
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36 The change strategy adopted by the leadership of the company could best be
37 described as emergent (Hayes, 2014). Leadership allowed emergent, organic
38 modification to the initial design, which made sense to users while still achieving the
39 over-arching goal (Balogun and Johnson, 2008). Problems with the initial design
40 were signalled by feedback, and the leadership responded by adjusting the design.
41 The paramedics themselves strived to share and develop their learning, to
42 overcome perceived barriers and build a successful system.
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46 This study focused in particular on aspects of the ease of use of the new technology
47 in a situation where implementation of an EMR system was mandated. It has not,
48 therefore, uncovered the range of facilitators and challenges that have been
49 discussed in other studies. The research did not, for example, explore paramedic
50 perceptions of usefulness of the technology at the start of the implementation
51 process, so it is not possible to say whether this factor was influential in this case.
52 However, the paramedics interviewed 20 months after implementation as part of
53 this study recognized the benefits the new EMR system, which brought to the
54 service provided by the organization. These benefits correlate with the findings of
55 others that use of EMR provides benefits in the emergency medical services setting
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for paramedics, ambulance services, and academia (Katzner *et al.*, 2012; Landman *et al.*, 2012; Newgard *et al.*, 2012).

Conclusions

In this case, the successful implementation of an EMR system was achieved through the leaders of the emergency services company responding quickly to feedback about problems with the technological interface of the initial design, and enabling individual flexibility of use of the system, as long as the desired outcome was achieved. A significant role was played by paramedics who voluntarily aided the learning of colleagues.

The initial approach of the company leaders was in keeping with a simple, 'hard' (technological) change, but successful implementation was only achieved when a more responsive, supportive and flexible approach was adopted, which allowed individual users to adapt the change to their own preferences.

First, even with what appears to be a 'hard' change—the introduction of new technology—it has been important to recognise the 'soft' change elements (Denis *et al.*, 2002) of individual reactions. These reactions included different responses depending on years in the job, with more experienced clinicians finding more difficulty in making the change. As elsewhere (Hennington *et al.*, 2009) individuals had different preferences for using the system, and leadership gained acceptance by responding positively to feedback, and enabling more flexible use, as long as the desired outcome was achieved.

There is currently very little research into the adoption of EMR systems by emergency medical services; more inquiry into approaches that leaders have taken to achieve adoption would be valuable. It would be particularly interesting to see whether two findings of this study apply elsewhere: the variety of individual preferences for using the EMR system, and the relationship between years of experience as a paramedic and reluctance to change.

This is a case study of one small organization, and we must be very cautious about the extent to which findings can be taken as generalisable, or likely to occur elsewhere. However, the issue of how best to achieve the adoption of EMR systems is currently an important one for leaders in healthcare organizations large and small, and thus it appears pertinent to suggest some possible value of the lessons of this case for other adopters. However, it seems likely that, in such cases, it will benefit leaders to engage clinicians in a sensemaking discourse at the outset and create opportunities for them to identify improvements to the system as it is being implemented. As inevitable unexpected barriers develop, leadership and users who communicate well and often, while seeking to find tangible solutions to problems, are likely to find the most success by developing an emergent change strategy.

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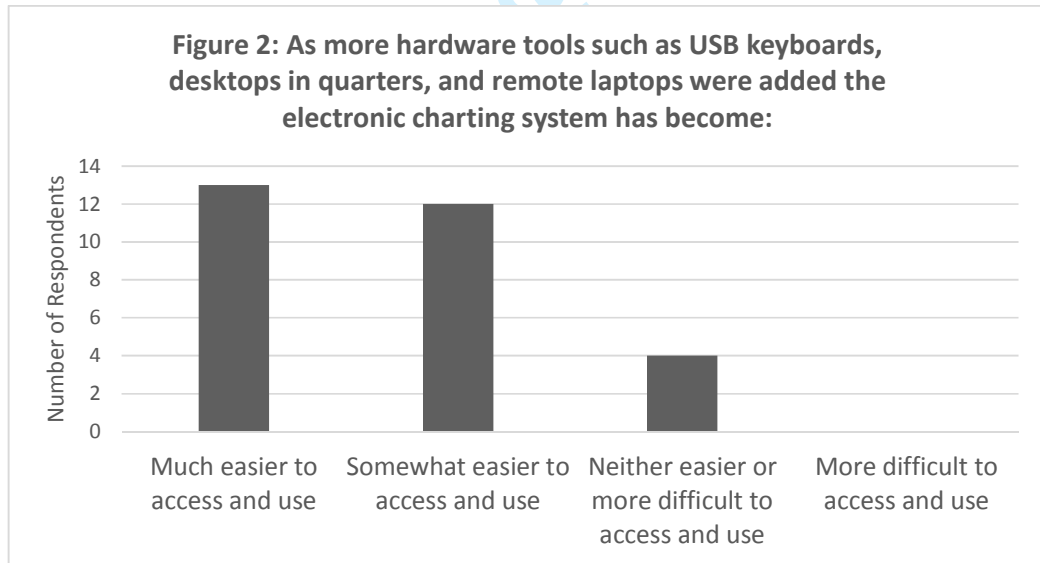
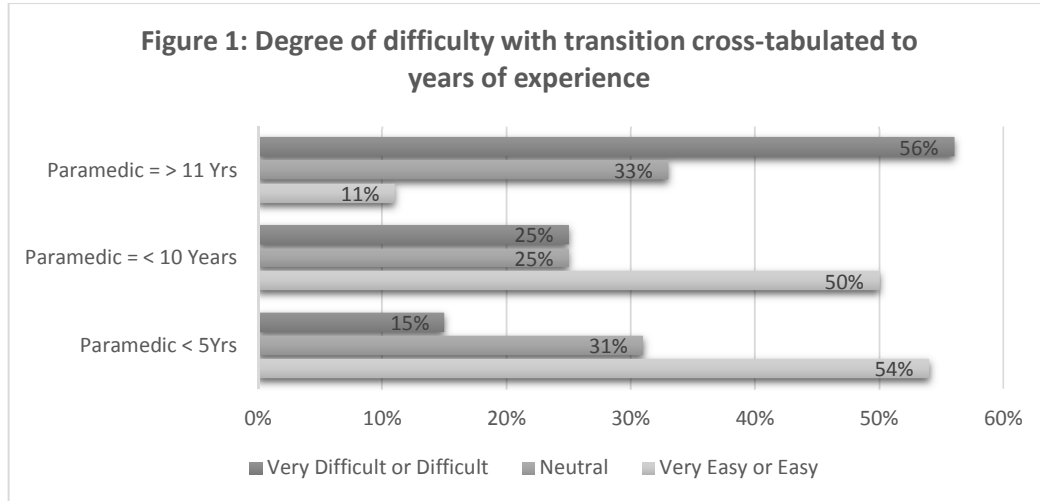
Modes of Access	Initial Design	Added Later	Removed later
Tablet	x		
Touch Screen	x		
Stylus	x		
Bluetooth Keyboard		x	x
USB Keyboard		x	
Desktop in Station		x	
Mouse		x	
Private Laptop		x	
Remote Web Access		x	

Table 1: Modes of access

For Peer Review

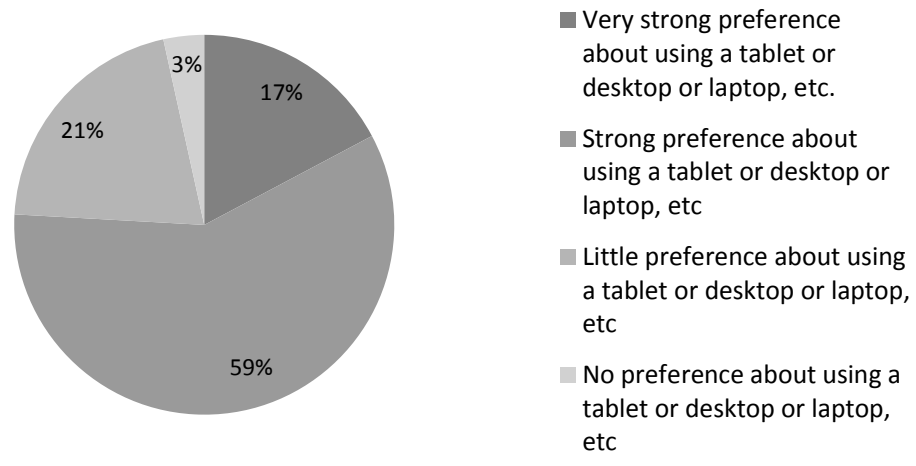
“Leading change: introducing an electronic medical record system to a paramedic service”

Figures



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Figure 3: I have personal preferences about when and where I log on and use the hardware tools available for electronic charting. For example I have:



Peer Review