Baird, Shawn and Boak, George ORCID logoORCID: https://orcid.org/0000-0002-4489-3096 (2016) Leading change: introducing an electronic medical record system to a paramedic service. Leadership in Health Services, 29 (2). pp. 136-150.

Downloaded from: https://ray.yorksj.ac.uk/id/eprint/1097/

The version presented here may differ from the published version or version of record. If you intend to cite from the work you are advised to consult the publisher's version: http://www.emeraldinsight.com/doi/full/10.1108/LHS-04-2015-0012

Research at York St John (RaY) is an institutional repository. It supports the principles of open access by making the research outputs of the University available in digital form. Copyright of the items stored in RaY reside with the authors and/or other copyright owners. Users may access full text items free of charge, and may download a copy for private study or non-commercial research. For further reuse terms, see licence terms governing individual outputs. Institutional Repositories Policy Statement

RaY

Research at the University of York St John

For more information please contact RaY at ray@yorksj.ac.uk

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

Journal:	*Leadership in Health Services*
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.

Figures.docx

SCHOLARONE™
Manuscripts

"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

For Peer Review

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).~~

For Peer Review

This paper concerns research into the introduction of an EMR system within a small, privately-owned emergency medical services and ambulance firm in the north-west of the USA. AMB Company (note: a pseudonym is used to protect confidentiality) made the use of a new EMR system mandatory for all its 34 paramedics. The EMR system comprised innovative electronic charting; the organization and its paramedics had been using a paper charting system for over 20 years prior to the change.

The leadership at AMB introduced the new system with clear policies and procedures ~~expectations~~ about when, where, and how the system was to be used. The change encountered resistance from paramedics, who reported a range of problems including, but not limited to, difficulties with the software, hardware, and practical issues around timing of use. The company leadership was initially rigid in its expectation of how the system would be used, particularly in regard to the timing and hardware, or mode, of use. As the implementation period progressed, however, significant flexibility was added to the system allowing for different individual patterns of access and use to develop.

This study was designed to answer the research question: how does permitting flexibility with timing and mode of use impact acceptance of the adoption of an electronic medical record system by paramedics? It is a case study of one small organization, but with potential for learning for other paramedic services.

The study was carried out 20 months after the EMR system was first introduced. A mixed methods approach obtained both qualitative and quantitative data from the paramedics employed at the company ~~case organization,~~ using semi-structured interviews and an electronic survey.

Changing systems and processes

~~The activity of introducing change into the systems and processes of an organization is acknowledged to be at one and the same time fraught with difficulties and an essential part of the role of leaders. As Pfeffer and Sutton (2006, p. 161) say, the only thing more dangerous than doing organizational change is *never* doing organizational change.~~

Academic research and practitioner advice on how to bring about organizational change is extensive, and ranges from theories that put forward a series of stages that leaders of change should follow, through inspirational approaches (Kotter, 1996, 2012; Appelbaum *et al.,* 2012) or through project management phases (Hayes, 2014), to theories that regard the leadership of change as a matter too complex to be represented by linear stages, and which advocate individualized context-sensitive approaches (Balogun and Hope Hailey, 2008; Balogun and Johnson, 2005).

For Peer Review

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 Swailes, 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 (Coeira, 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.

For Peer Review

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.~~

For Peer Review

Management reaction to resistance is also likely to have an impact on the success of implementation. Lapointe and Rivard (2005) concluded ~~that in the initial stages of EMR implementation, resistance is mainly aimed at the system itself and specific features of it. Their data suggests~~ that if managers are quick to recognize ~~the~~ resistance and seek to find workable solutions, barriers to acceptance may be overcome. Conversely if managers themselves fail to respond quickly to resistance, obstructive behaviour can become deeply entrenched (Rivard and Lapointe, 2012). Hamid and Cline (2013) also found that clinician acceptance was directly related to ~~the degree of management support for issues such as engaging clinicians during all stages of the change process and~~ management resolving technical problems as promptly as possible. It is not only management~~the leader~~, however, who can put feedback to good use. The process of disseminating innovation in a nonlinear fashion by participant stakeholders at all levels may influence adoption. As various stakeholders individually and collectively assess new practices they also accelerate or impede diffusion of innovations (Denis *et al.,* 2002). Encouraging early adopters to experiment and try local adaptation of health care innovation can enhance dissemination and reduce resistance (Berwick, 2003).

Given the emphasis on user perception in the TAM, the UTAUT, and other research approaches, a sensemaking perspective may be a useful framework for ~~approach to~~ interpreting reactions to the introduction of technological change (Jensen and Aanestad, 2007). Sensemaking involves an on-going effort to interpret actions, events and disruptions into a contextualised order that ~~the individual or~~ organization members find comprehensible (Weick, 1995; Weick et al., 2005). Clinicians are not simply the 'passive receivers' of an EMR system. Through contextualization of use and communication with peers, the clinicians ~~are~~ themselves define ~~defining~~ what the system will be (Hennington *et al.,* 2009).

Two studies are particularly relevant in examining this. Wagner and Newall (2007) found that the use of off-the-shelf rather than custom software solutions provided a false promise of straightforward follow-the-recipe implementation. In reality the process involved an on-going cycle of configuration, customization, and implementation based on user input. This is congruent with Berwick's (2003) more general observation that innovations in healthcare are more often adapted than adopted.

Hennington *et al.* (2009) found the implementation and acceptance of mandatory EMR use by a group of hospital nurses led to a new multidimensional view of nurses' use of EMR technology. ~~Hennington and colleagues discovered that although the use of EMR was made mandatory by management, there was considerable variability in the mode of use, even within the same institution.~~ While the use of the system was mandatory, the study found that in practice the nurses engaged with the system in many individualized ways, in relation to timing and mode of use. Factors such as case load, work flow, and social influences of others impacted choice of mode of use.

For Peer Review

There is a paucity of research on EMR use in the emergency medical services and ambulance sector. Studies that have been undertaken focus on quantifiable specific effects ~~impacts~~ such as impact on the duration of ambulance calls (Kuisma *et al.,* 2009) and an increase in the total quantity of exam information documented (Katzer *et al.,* 2012). However, one small qualitative study of emergency medical service agency directors explored drivers and challenges of ~~found a common set of management concerns about the potential negative impacts on agencies and service delivery, yet concluded there is still a high degree of support for~~ EMR implementation in the sector (Landman *et al.,* 2012).

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

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

~~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).~~

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

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

For Peer Review

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.

For Peer Review

The interviews were audio recorded and professionally transcribed to aid in coding. Thematic analysis elicited patterns and major themes from the responses to the questions (Braun and Clarke, 2006). A manual approach was taken to coding, rather than using a software programme. With the small number of interviews, this was an appropriate method to keep close to the context and meaning of the information (Easterby-Smith *et al.,* 2012).

Key coded phrases were grouped into themes. Themes were then formatted in a side-by-side comparison table to evaluate the interviewee responses regarding conditions at the beginning of the change process as contrasted to conditions at the time of interview, 20 months after implementation.

The interview process provided deep insight into how the system was being used, and thus informed development of specific questions for the second phase of data collection, a structured survey of all 34 paramedics at AMB Company. Survey questions were primarily designed as closed response to allow for quantitative analysis of identified elements of system use. Two open-ended questions were included to provide those surveyed an opportunity to introduce new information and generate qualitative data that may support or refute findings of the semi-structured interviews.

The electronic survey was developed using QuickSurveys by Toluna Analytics, Inc. A pilot version of the survey was sent to two paramedics at firms other than AMB Company who had been through a similar transition to using EMR. The piloting ~~survey~~ identified several potential improvements, therefore ~~it~~ the survey was revised and sent out again. Following a second round of piloting the survey tool was finalised. The 17 questions in the survey focused on attitudes and preferences about using the hardware and software during both the initial transition and later following the introduction of multiple modalities of use.

A web link was emailed to the 34 paramedics employed at AMB Company in March 2014, along with a cover letter explaining the nature of the research, the topic, and a statement of confidentiality. The initial emailing resulted in 14 completed surveys returned within 10 days. A follow up email request was sent in April 2014 and the survey closed after 5 weeks. In total, 30 responses were received. One response was rejected as incomplete resulting in a total response of 29 or 85%.

Findings

The decision

The decision to adopt an EMR system was influenced by a desire to improve systems for billing for work carried out and to improved quality assurance (as found in Landman *et al.*, 2012). The particular EMR system was chosen as being compatible with the company's billing system. Close electronic integration with hospital

For Peer Review

systems was not possible, as Landman and colleagues also found, and the new EMR system transferred information to the hospitals by automated fax.

The implementation process

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

Initial training on the system was limited. Each paramedic was required to enter a series of mock patients into the system in order to gain basic familiarity. Once those were complete, the paramedics were required to use the EMR for all actual patient encounters. They did have access at all times for help from a group of peer volunteers who had undergone a day-long intensive training programme provided by the software vendor.

Paramedic concerns about the difficulties of implementing EMR in this way were communicated to the company leadership a few weeks into the change process, and the system was redesigned. New hardware devices and points of access were added to the system enabling much greater flexibility in mode of access (see table 1) and the protocol was revised to allow for the time of use to be determined by the paramedic, at any time during their 24 hour shift. Subsequently, access from home or other remote locations was added to further enhance flexibility. Software configuration was also modified as the change progressed, in order to add flexibility of use. This is referred to as the 'adjusted design' in the text that follows.

INSERT TABLE 1 HERE

Reactions

Three of the four interviewees were experienced paramedics, with leadership roles in the company; the fourth had less than 5 years' experience. Of the 29 respondents to the survey, 13 had less than 5 years' experience, seven had 5-10 years', and nine had 11 years' experience or more.

The interviewees indicated that there were difficulties using the system at first. The process of actually using the tablet while on a call was problematic for some. Interviewee KC said: "I hated it." However, interviewee EW said: "I'm a Millennial. We live on computers. It's very easy for me to adopt this system."

All interviewees said that during initial implementation the process of documenting and completing a chart became much more complicated. Interviewee SF said: "I

For Peer Review

noticed that instead of doing patient care, I was too focused on trying to figure out what to put where in the computer." Some concerns that were raised were quite surprising. It was revealed that many paramedics became car sick while attempting to use the tablet computers, for example.

In the survey, 10 respondents said they found the adoption of EMR difficult or very difficult, while 11 said they found it easy or very easy. Of the 11 who found it to some extent easy, seven had less than 5 years' experience; only one respondent with less than 5 years' experience reported finding the change difficult or very difficult (see Figure 1). During the initial design phase ~~one~~ of EMR implementation, when only the tablet computer and stylus were available, 20 respondents (67%) found the system frustrating or very frustrating, and the same number reported that using the system as initially designed by management was difficult or very difficult. All of the paramedics with 11 years or more experience reported they had difficulty.

INSERT FIGURE 1 HERE

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

INSERT FIGURE 2 HERE

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

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

For Peer Review

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.

For Peer Review

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 Swailes, 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.

For Peer Review

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

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

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

The findings indicate individual paramedics engaged in a sensemaking process during the implementation phase (as in Jensen and Aanestad, 2007). In so doing they were able to comprehend and adapt to a disruptive change. This process was aided by the social influences of more adept paramedics helping their colleagues and by active learning between peers. The paramedics themselves strived to share and develop their learning, to overcome perceived barriers and build a successful system. It could have been aided further by more formal training at the outset.

~~The change strategy adopted by the leadership of the company could best be described as emergent (Hayes, 2014). Leadership allowed emergent, organic modification to the initial design, which made sense to users while still achieving the over-arching goal (Balogun and Johnson, 2008). Problems with the initial design were signalled by feedback, and the leadership responded by adjusting the design. The paramedics themselves strived to share and develop their learning, to overcome perceived barriers and build a successful system.~~

This study focused in particular on aspects of the ease of use of the new technology in a situation where implementation of an EMR system was mandated. It has not, therefore, uncovered the range of facilitators and challenges that have been discussed in other studies. The research did not, for example, explore paramedic perceptions of usefulness of the technology at the start of the implementation process, so it is not possible to say whether this factor was influential in this case. However, the paramedics interviewed 20 months after implementation ~~as part of this study~~ recognized the benefits the new EMR system~~, which~~ 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 Peer Review

~~for paramedics, ambulance services, and academia~~ (Katzer *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.

For Peer Review

References

Aitken, P. H. and Higgs, M. (2010), *Developing Change Leaders*, Butterworth-Heinemann, Oxford.

Appelbaum, S.H., Habashy, S., Malo, J-L. & Shafiq, H. (2012),"Back to the future: revisiting Kotter's 1996 change model", *Journal of Management Development,* Vol. 31 No. 8, pp. 764 – 782.

Audet, A-M., Squires, D. and Doty, M.M. (2014), "Where are we on the diffusion curve? Trends and Drivers of Primary Care Physicians' Use of Health Information Technology", *Health Services Research* Vol 49 No. 1, pp. 392-404.

Bagozzi, R. P. (2007), "The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift", *Journal of the Association for Information Systems,* Vol. 8 Issue 4, pp. 244-254.

Balogun, J. and Hope Hailey, V. (2008), *Exploring Strategic Change,* Financial Times Prentice Hall, Harlow.

Balogun, J. and Johnson, G. (2005), "From Intended Strategies to Unintended Outcomes: The Impact of Change Recipient Sensemaking", *Organization Studies,* Vol. 26 No. 11, 1573-1601.

Berwick, D.M. (2003) "Disseminating innovations in health care", *JAMA* Vol. 289, No. 15, 1969-1974.

Björklund, E., Stenestrand, U., Lindbäck, J., Svensson, L., Wallentin, L. & Lindahl, B. (2006) "Pre-hospital thrombolysis delivered by paramedics is associated with reduced time delay and mortality in ambulance-transported real-life patients with ST-elevation myocardial infarction", European Heart Journal, Vol. 27 No. 10, pp. 1146-1152.

Black, A.D., Car, J., Pagliari, C., Anandan, C., Cresswell, K., Bokunet, T., McKinstry, B., Procter, R., Majeed, A. & Sheikh, A. (2011), "The Impact of eHealth on the Quality and Safety of Health Care: A Systematic Overview", *PLoS Med* Vol. 8 No. 1, e1000387.

For Peer Review

Bledsoe, B., Wasden, C. and Johnson, L. (2013), "Electronic Prehospital Records are Often Unavailable for Emergency Department Medical Decision Making", *Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health*, pp. 482-488.

Boddy, D., King, G., Clark, J.S., Heaney, D. and Mair, F. (2009), "The influence of context and process when implementing e-health", *BMC Medical Informatics and Decision Making,* Vol. 9 No.9.

Braun, V. and Clarke, V. (2006), "Using thematic analysis in psychology", *Qualitative Research in Psychology,* Vol. 3 No. 2, pp. 77-101.

Burchell, J. (2011), "Anticipating and Managing Resistance in Organizational Information Technology (IT) Change Initiatives", *International Journal of the Academic Business World,* Vol. 5, pp. 19-28.

Car, J., Black, A., Ananden, C., Cresswell, K., Pagliari, C., McKinstry, B., Procter, R., Majeed, A. & Sheik, A. (2008), *The Impact of eHealth on the Quality & Safety of Healthcare: A Systemic Overview & Synthesis of the Literature*. The University of Edinburgh & Imperial College London available online at: https://www1.imperial.ac.uk/resources/32956FFC-BD76-47B7-94D2-FFAC56979B74/ (accessed Sept 27, 2015).

Christensen, C.M., Marx, M. & Stevenson, H.H. (2006) "The Tools of Cooperation and Change", *Harvard Business Review,* October, pp. 73-80.

Coiera, E. (2009), "Building a National Health IT System from the Middle Out" *Journal of the American Medical Informatics Association*, Vol. 16 No. 3, pp. 217-273.

Davis, F.D. (1989) "Perceived usefulness, perceived ease of use, and use acceptance of information technology", *MIS Q,* Vol. 13, pp. 319-339.

Denis, J.-L., Yann. H., Langley, A., Lozeau, D. and Trottier, L.-H. (2002), "Explaining Diffusion Patterns for Complex Health Care Innovations", *Health Care Management Review,* Vol. 27, pp. 60-73.

Easterby-Smith, M., Thorpe, R. and Jackson, P. R. (2012). *Management Research*, Sage, Los Angeles.

Ford, J. D. and Ford, L. W. (2009), "Decoding Resistance to Change", *Harvard Business Review,* Vol, 87 April, pp. 99-103.

Gray, D.A. (2014), *Doing Research in the Real World,* Sage, London.

For Peer Review

Hamid, F. and Cline, T. W. (2013), "Providers' Acceptance Factors and their Perceived Barriers to Electronic Health Record (EHR) Adoption", *Online Journal of Nursing Informatics,* Vol. 17**,** pp. 1-11.

Hayes, J. (2014), *The Theory and Practice of Change Management*, Palgrave Macmillan, Basingstoke.

Hennington, A., Janz, B., Amis, J. and Nichols, E. (2009), "Information Systems and Healthcare XXXII: Understanding the Multidimensionality of Information Systems Use: A Study of Nurses' Use of a Mandated Electronic Medical Record System", *Communications of the Association for Information Systems,* Vol. 25**,** pp. 243-262.

Hsieh, P-J. (2015) "Physicians' acceptance of electronic medical records exchange: An extension of the decomposed TPB model with institutional trust and perceived risk" *International Journal of Medical Informatics,* Vol. 84, pp. 1–14.

IOM (2007), *Emergency Medical Services: At the Crossroads*, The National Academies Press, Washington, D.C.

Jensen, T. B. and Aanestad, M. (2007), "How Healthcare Professionals 'Make Sense' of an Electronic Patient Record Adoption", *Information Systems Management,* Vol. 24**,** pp. 29-42.

Joshi, K. (1991), "A Model of Users' Perspective on Change: The Case of Information Systems Technology Implementation", *MIS Quarterly,* Vol. 15**,** pp. 229-242.

Katzer, R., Barton, D. J., Adelman, S., Clark, S., Seaman, E. L. and Hudson, K. B. (2012), "Impact of implementing an EMR on physical exam documentation by ambulance personnel", *Applied Clinical Informatics,* Vol. 3**,** pp. 301-308.

Kotter, J. P. (1995), "Leading Change: Why Transformation Efforts Fail" *Harvard Business Review,* March-April pp. 59-67.

Kotter, J. P. (2012), "Accelerate!" *Harvard Business Review***,** November, pp. 45-58.

Kuisma, M., Väyrynen, T., Hiltunen, T., Porthan, K. and Aaltonen, J. (2009), "Effect of introduction of electronic patient reporting on the duration of ambulance calls", *American Journal of Emergency Medicine,* Vol. 27**,** pp. 948-955.

Landman, A. B., Lee, C. H., Sasson, C., Van Gelder, C. M. and Curry, L. A. (2012), "Prehospital Electronic Patient Care Report Systems: Early Experiences from Emergency Medical Services Agency Leaders", *PLOS ONE,* Vol. 7, Iss. 3, e32692.

Lapointe, L. and Rivard, S. (2005), "A Multilevel Model of Resistance to Information Technology Implementation", *MIS Quarterly,* Vol. 29**,** pp. 461-491.

For Peer Review

Maillet, E., Mathieu, L. and Sicotte, C. (2015), "Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT", *International Journal of Medical Informatics,* Vol. 84, pp. 36–47.

Martinez, R. 1996. *EMS Agenda for the Future,* National Highway Transportation Safety Agency, Washington D.C.

McGinn, C.A., Grenier, S., Duplantie, J., Shaw, N., Sicotte, C., Mathieu, L., Leduc, Y., Légaré, F. and Gagnon M-P. (2011), "Comparison of user groups' perspectives of barriers and facilitators to implementing electronic health records: a systematic review", *BMC Medicine* Vol. 9 No. 46.

~~McLeod Jr, A. J., Clark, J. G., Warren, J. and Dietrich, G. B. (2008), "The Impact of Information Systems on End User Performance: Examining the Effects of Cognitive Style Using Learning Curves in an Electronic Medical Record Implementation", *Communications of the Association for Information Systems,* Vol. 22, pp. 165-184.~~

Money, A.G., Atwal, A., Young, K.L., Day, Y., Wilson, L. and Money, K.G. (2015), "Using the Technology Acceptance Model to explore community dwelling older adults' perceptions of a 3D interior design application to facilitate pre-discharge home adaptations", *BMC Medical Informatics and Decision Making*, Vol. 15, No. 73.

Newgard, C. D., Zive, D., Jui, J., Weathers, C. and Daya, M. (2012), "Electronic Versus Manual Data Processing: Evaluating the Use of Electronic Health Records in Out-of-hospital Clinical Research", *Academic Emergency Medicine,* Vol. 19**,** p. 217.

Paton, R. A. and McCalman, J. (2007), *Change Management: a guide to effective implementation*, Sage, London.

~~Pfeffer, J. and Sutton, R.I. (2006), *Hard Facts, Dangerous Half-Truths and Total Nonsense,* Harvard Business School Press, Boston, MA.~~

Rivard, S. and Lapointe, L. (2012), "Information Technology Implementers' Responses to User Resistance: Nature and Effects", *MIS Quarterly,* Vol. 36**,** pp. 897-920.

Robson, C. (2011), *Real world research: a resource for users of social research methods in applied settings*, Wiley, Chichester, West Sussex.

Rogers, E.M. (1995) *Diffusion of Innovations,* Free Press, New York.

Senior, B. and Swailes, S. (2010), *Organizational Change,* Pearson Education, Harlow, Essex, England.

For Peer Review

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003) "User acceptance of information technology: towards a unified view", *MIS Q,* Vol. 27, pp. 425-478.

Wagner, E. L. and Newell, S. (2007), "Exploring the Importance of Participation in the Post-Implementation Period of an ES Project: A Neglected Area", *Journal of the Association for Information Systems,* Vol. 8**,** pp. 508-524.

Weick, K. E. (1995), *Sensemaking in organizations,* Sage, Thousand Oaks, Cal.

Weick, K. E., Sutcliffe, K. M. and Obstfeld, D. (2005), "Organizing and the Process of Sensemaking", *Organization Science,* Vol. 16**,** pp. 409-421.

For Peer Review

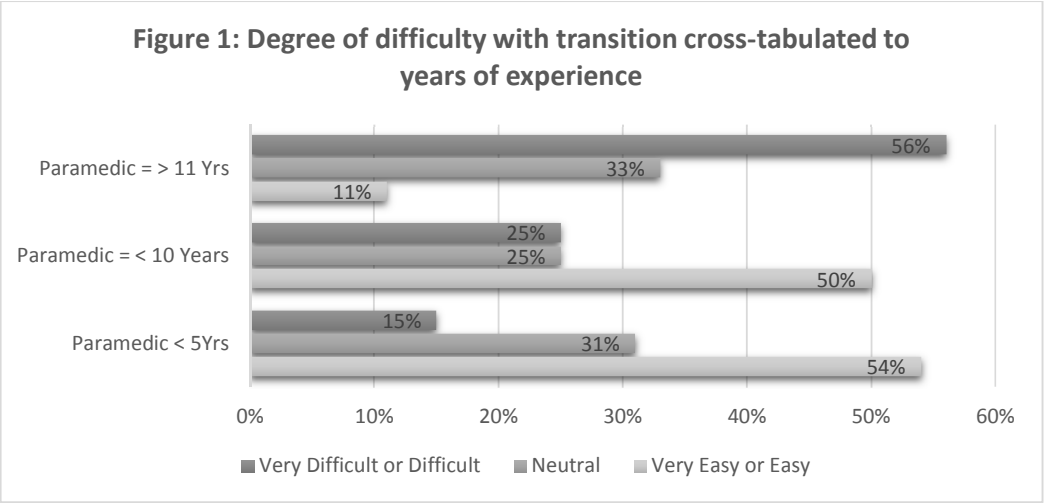
Modes of Access	Initial Design	Added Later	Removed later
Tablet	x		
Touch Screen	x		
Stylus	x		
Bluetooth Keyboard		x	x
USB Keyboard		x	
Desktop in Station		x	
Mouse		x	
Private Laptop		x	
Remote Web Access		x	

Table 1: Modes of access

For Peer Review

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

Figures



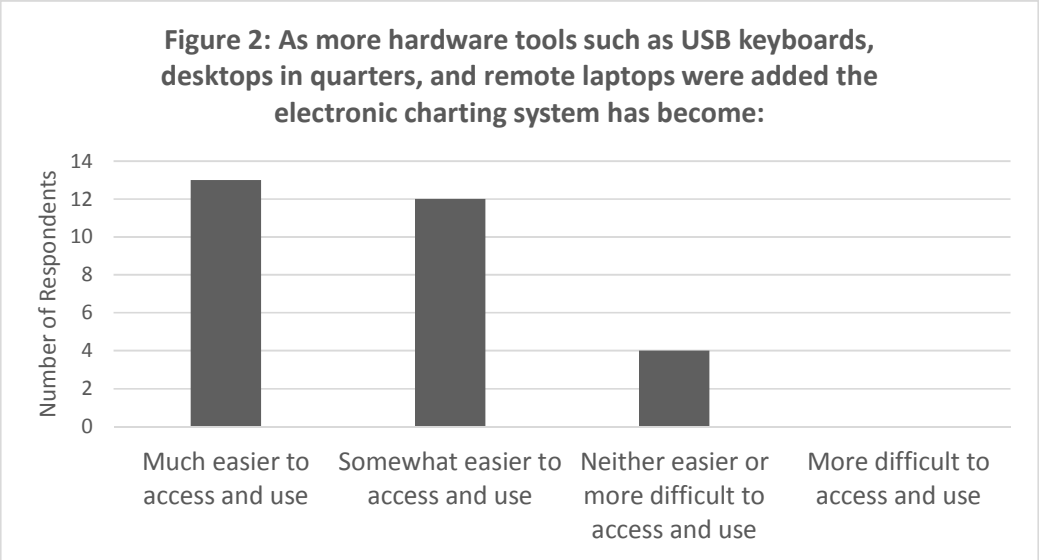
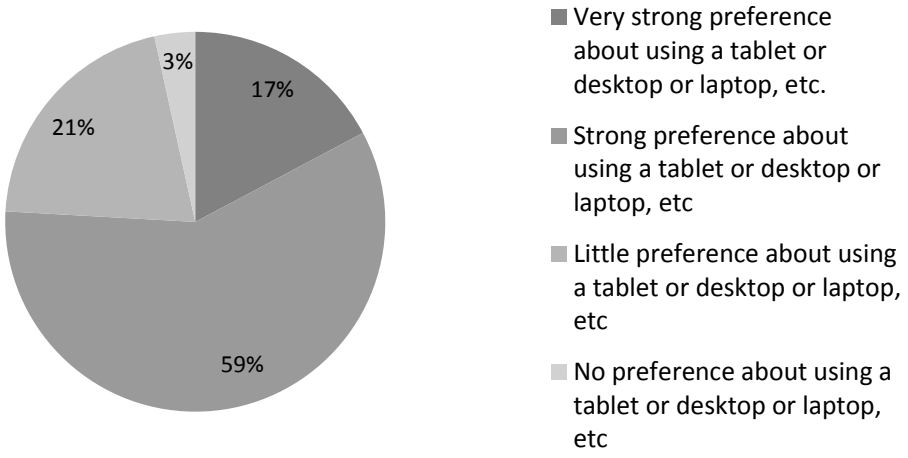


Figure 3: I have personal preferences about when and where I log on and use the hardware tools available for electronic charting. For example I have:



For Peer Review