LIGHTS AND SHADOWS IN THE IMPLEMENTATION OF THE ELECTRONIC MEDICAL RECORD: A COMPARATIVE CASE STUDIES

Abstract

The purpose of our study was to classify the literature review about the Electronic Medical Record and to clarify the strengths and weaknesses of these systems better. We used a comparative case study between Verona University Hospital (Italy) and Skåne University Hospital (Sweden). We conducted 71 semi-structured interviews held with the hospital staff (physicians, nurses, clinical director, and member of the board) and designed to enable the respondents to answer freely, in their own words. In the literature, it is quite challenging to understand if the Electronic Medical Record is or is not a useful system in a hospital. Many variables influence the EMR performance/quality. However, from the analysis, it is possible to check that in these two hospitals there are more "shadows" than "lights."

Keywords: electronic medical records, comparative case studies, electronic medical records impact

1 Introduction

Over the past decade the use of information communication technology (ICT) has become a leading driver of managerial reform in the public sector, and within the healthcare system in particular (Shareef et al., 2011; Zakaria et al., 2010). Over the last five years, the Electronic Medical Record (EMR) has been of particular interest, and consequently, EMRs have become one of the most studied ICT systems in the healthcare management literature. However, in the literature, it is still a controversial topic because, as was well argued by Lau at al. (2012), almost 51.2% of the EMR projects had a positive impact on the organizations, while 30.2% did not affect. In another study by Sanders et al. (2014), it was argued that almost 29% of all EMR projects had a negative impact on workflow, clinical volume, and patient care. Hence, it would be interesting to understand why the EMR has a negative effect on the hospital.

Moreover, there is no single definition of EMR, since it is dependent on the healthcare system; the EMR setup is quite different from country to country. In particular, there are many researchers (e.g., Lau at al., 2012; Adler-Milstein et al., 2013; Moore et al., 2013; Hyman, 2014) that highlight the negative impact of the EMR in the American and Canadian healthcare systems. Sin-sky et al. [2014, pp. 728] emphasized these concerns when they wrote that: "after a decade of growth in the use of EHRs (Electric Health Record) that has been both promising and painful, we believe it is time to step back and develop principles for their design, implementation, and regulation that support higher value primary care". Unfortunately, the authors identified only general principles that we would argue are not so useful, one specific problem from a European perspective is that the US hospitals are competitors and they do not want to share patient information. Hence, in the USA/Canada, it is not easy to develop a shared EMR. In Europe, the situation is entirely different because there is a public healthcare system. More often than not the hospitals are public, and they are not in a traditional form of competition, that being said other issues are of importance. In particular, the overall technical situation, i.e. the healthcare systems as such, within the EU is not so clear and harmonious. In the UK for example, they decided to implement/use a single EMR (with 2.1 billion dollars expected to be spent on the technology by the end of 2015). In France, they have implemented the Dossier Medical Personnel (DMP) and the Dossier Pharmaceutic, accessible to patients through Web services and under the responsibility of the regional health agencies.

In Germany, EMR is still not used, while in Sweden and Italy there are different patient record systems but not a harmonized one.

Nowadays, every Italian and Swedish region adheres to the fact that they have to have EMR records and in Sweden many areas want the records to be accessible in the cloud. The reality is that both countries have several different EMR systems they work with. Despite similarities between these two countries, there are also differences, e.g. in Italy, only a few hospitals have implemented or are implementing the EMR, while in Sweden almost all of them have achieved it.

In order to understand what the main principles are in this paper, we used the Zaharia et al. (2010) model, re-elaborated by Buntin et al. (2011), and we identified and categorized the positive as well as negative impacts and the critical factors generated by the implementation of the Electronic Medical Record in two university hospitals, one in Italy and the other in Sweden, in order to compare the differences.

Hence, the paper aims to respond to the following research questions: What are the positive and negative effects of the EMR in these hospitals? What are the main differences between the EMR be-tween Verona University Hospital and Skåne University Hospital?

In the first part, we do a literature review, after which we illustrate the research methodology and approach. We then analyze the differences between the EMRs at use in the Verona university hospital and Skåne university hospital and evaluate the EMRs impact on the hospitals' organization. The paper closes with the authors' conclusions.

2 The theoretical background

Over the past few years, technology has been reshaping organizations by blending their Information Systems with rapidly advancing information and communication technology (Bekkers, 2003; Frenzel and Frenzel, 2004), and ICT it is becoming the catalytic factor for economic growth (Buntin et al., 2011; Pierce, 2013).

Hence, private-sector companies deploy ICT solutions to optimise organisational performance precisely because of its potential to reduce transaction and agency costs (principal–agent issues), but also to rationalise their business processes. The introduction of ICT to the public sector is expected to produce similar results (Bekkers, 2003). These are highlighted by Smith et al. (2013, pp. 491), who write that "the impact of Electronic Medical Records sophistication on financial performance indicate that EMR sophistication is associated with improved revenue cycle management, and increased 'Days Cash on Hand' (DCOH)". According to Walji et al (2014; p. 362) "Electronic health records (EHRs) are increasingly being adopted by healthcare providers, who are attracted by financial incentives and the promise of improved quality, efficiency and safety".

On the other hand, some academics e.g. Adler-Milstein et al. (2013) identified that for the majority of practices, the return on investment of the EMR was negative, particularly for smaller practices. Some authors focused their attention on reducing wasted time or a reduction of quality of patient care. In this way, Shachak and Reis (2009; p. 644) verified that EMR use typically had negative effect on "patient centeredness", because physicians spend less time talking with patients and more seeing the monitor. Poissant et al. (2005) pointed out that nurses are more likely than physicians to gain time efficiencies by using a computer system to document patient information, because nurses usually use standardized documents, systems and information.

Dey et al. (2013; pp. 90) reinforce these assumptions, saying that: "Simply incentivising health care service providers to move up the stages of EMR capability may not lead to the realization of the potential benefits of the higher stages of EMR capability". The practical implication of this finding is that health care service providers need to assess whether their choice of EMR capability is commensurate with their idiosyncratic technological, organizational, and environmental contexts characteristics before committing to a stage of EMR capability. Hyman (2014) emphasizes these concerns in a paper titled: "The Day the EHR Died".

Unlike the previous authors, Bardhan and Thouin (2013; pp. 442) argue that "spending on health IT does matter ... and it is important to measure quality outcomes at the process level, and not only at an aggregate institutional level". The authors conclude by saying that the adoption of EMRs within US hospitals generates benefits for both patients and clinics.

As underscored by Hannan (1996), the medical record should be the main 'repository' of the patient's medical information, as it not only supports clinical decisions, but it is also a useful tool for other healthcare-related services (administrative, insurance, quality, epidemiology and so forth). As a result of the close relationship between medical decisional processes, data accumulation, healthcare costs and the quality of the health service (Shaw, 2014), the quality of clinical treatment, the efficiency of the health service and the health of citizens call for a medical record that is an effective decisional-support tool (Hannan, 1996; Lakshminarayan, 2012). The EMR might be a better tool since it enables immediate access to encoded and standardised patient information and "more active decision support" (Berner et al, 2005; pp. 3) through the alerting, interpretation, assisting, critiquing, diagnosing and management functions.

All these benefits are summarized by Shaw (2014; p. 200) that re-elaborated the Schoen et al. (2009) model, and he defines the EMR core features as: "the electronic ordering of tests, electronic access to patients' test results, electronic prescribing of medication, electronic alerts for drug interaction, and the electronic entry of clinical notes. Beyond these core capabilities, physicians may extend features by performing searches on their patient population, creating templates to speed their entry of notes, set reminders for medical tests, and ensure that non-electronic data are scanned and linked electronically to the patient record".

Another important point is that in the literature, there is not a unique definition of Electronic Medical Records, but rather the definition depends on the national healthcare systems model. Hence, sometimes there is another issue because the EMR and the EHR are considered interchangeable terms (Ajami and Bagheri-Tadi, 2013) and comprise all of the previous conceptualizations (Häyrinen et al., 2008); in fact "other similar interpretations exist, albeit with a sometimes slightly restricted focus" (Boonstra and Broekhuis, 2010; p. 1). Otherwise in this paper, these terms are not interchanged, because the case studies are only focused on the EMR.

In this way, starting from Wang et al. (2003) it is possible to define EMR as computerized medical information systems that collect, store, display and re-use patient information. They are a means to create legible and organized recordings and to access clinical information about individual patients (Häyrinen et al., 2008; pp. 129). They provide an effective, active decisional-support system, whether the decisions regard healthcare or management (Hannan, 1996; Berner et al., 2005). A hospital organisation can expect EMRs to generate key benefits, including enhanced quality of healthcare, reduction in clinical errors and gains in organisational efficiency, thanks to lower management costs. Hunt et al.'s (1998, p. 1339) review of the main studies on the information systems that support clinical decisions indicates that EMRs have increased the clinical performance of "drug dosing, preventive care, and other aspects of medical care". Further, in their study of the cost/benefits of EMR for primary healthcare providers, Wang et al. (2003; p. 397) note that EMR adoption has "a positive financial return on investment to the health care organization".

McDonald (1997) reports many cases in which the EMR has enabled healthcare organisations to reap significant rewards as a result of its positive impact on both physicians' behaviour, and he overall healthcare processes involving nurses and specialists. The two main effects of the EMR identified by the literature review carried out by Hayrinen et al. (2008) are: first, personal –that is – changes in clinical procedures and document management, improved decisional processes (although the timing remains the same) and the potential access for patients to their personal records. Second, organisational – that is – the effects of an IT system on the communication and cooperation of the various stakeholders, in particular, document accessibility and the possibility to re-examine clinical information. The enhanced quality of patient healthcare is further an important organisational effect.

According to Zakaria et al. (2010) and Beeuwkes Buntin et al. (2011) success or failure of the projects that introduce the EMR and decisional-support systems depends on many factors. These key factors can be divided into three categories: organizational challenge, human/people challenge, and technical/technological challenge. In the first category, the authors consider organizational costs associated with planning, specifying requirements, customizing and re-customizing systems, training providers, and reengineering the delivery of healthcare systems to accommodate hospitals. Moreover, they also define the concept of organizational culture, and resistance towards usage of ICT. In the second one, they insert the skills and expertise of the employee to use new technology, because organizations

that fail to manage their present staff stand little chance of obtaining and retaining outstanding individuals (Zakaria et al. 2010). In the last category, the ICT and in particular the EMR can enhance healthcare services electronically where barriers like time, distance and space no longer matters (Zakaria et al. 2010). Moreover, it helps the medical community to share patient information and supports them to make the right decision. Starting from Zakaria et al. (2010) model, in this article it was re-used, and it was enhanced by inserting both the positive and negative effects of EMR arising from the literature review analysis (table 1).

Challenge type	Positive effects	Negative effects
Organizational	Financial Performance (Smith et al., 2013)	ROI negative (Adler-Milstein et al., 2013)
	Improve Quality (Walji et al.; 2014)	Reduce work efficiency (Poissant et al., 2005)
	Improve efficiency (Walji et al.; 2014)	Not consider organizational, and environmental contexts characteristics (Dey et al., 2013)
	Measure quality outcomes at the process level (Bardhan and Thouin, 2013)	It is not easy to evaluate EMR impact on clinical outcomes (Holroyd-Leduc et al., 2011)
	Supports clinical decisions (Hannan, 1996)	Process issue (Holroyd-Leduc et al., 2011)
	Quality of the health service (Shaw, 2014)	Privacy concerns among patients or privacy violation (Menachemi and Collum, 2011)
	Electronic prescribing of medication (Schoen et al.; 2009)	Increasing costs in both the inpatient and outpatient settings (Menachemi and Collum, 2011)
	Recordings clinical information (Ajami et al. 2013)	Inadequate change management (Davidson and Chismar, 2007)
	Reduction in clinical errors (Berner et al., 2005)	Complexities in redesigning business processes (Abraham and Junglas, 2011)
	ROI positive (McDonald, 1997; Wang et al., 2003)	Lack of clinical leadership (Spetz et al. 2009)
	Reduced claims payments (Menachemi, 2006)	Poor integration of workflow (Bowens et al., 2010)
ical / Tecnological	Information sharing (Hannan, 1996)	Not indexed information (Schoen et al., 2009)
	Standardised patient information (Berner et al., 2005)	Implementation cost and maintenance cost (Menachemi and Collum, 2011)
	Electronic alerts for drug interaction (Schoen et al.; 2009)	Overdependence on technology (Campbell et al., 2006)
	Information re-use (Shaw, 2014)	It is difficult to define what is "common knowledge" (Pendergrass and Ranganathan, 2014)
lecn	Facilitate system integration (Hillestad et al., 2005)	EMR is not taylor-made (Pendergrass and Ranganathan, 2014)
F	Patient tracking (McGuire et al., 2012)	
People	Improve safety (Walji et al.; 2014)	negative effect on patient centeredness (Shachak and Reis; 2009)
	Patient time reduction	Spend less time talking with patients (Shachak and Reis; 2009)
	Improved self-care (Woods et al. 2013)	Increases the self-diagnosis (Woods et al. 2013)
	Increase the coordination (Lau et al., 2013)	Barriers to adoption of an EHR (Menachemi, 2006)
		Physician lose his or her autonomy in making patient decisions (blocks the ordering of certain tests or medications) (Campbell et al., 2006)
		Physician resistance (Lapointe and Rivard, 2005)
		More time-consuming to complete than paper record (Perry et al., 2015)

Table 1.Positive and negative effects of EMR

Following the previews schema (tab. 1), the article aims is to understand the main factors (positive and negative) associated with use of the EMR. This model and the cases are used, because as highlighted in the table 1, the situation in the literature review is nothing short of controversial and unclear.

For these reasons, we decided to analyse two case studies, an EMR in an Italian hospital, and another in a Swedish hospital. With the help of these two real cases, we try to test the main positive and negative effects of EMR on the organizations.

3 Case Study

In our study, we decided to analyse an Italian and a Swedish EMR, because the healthcare systems and the hospital dimension are quite similar, nonetheless the positive and negative effects of the Electronic Medical Record are pretty different. Moreover, in these countries, there are many EMRs but not a harmonized one, because every region has decided what they deem to be "basic information" that every one must share. Each organization (hospital, retirement home, clinic, etc.) can independently integrate this information with others. For this reason, it is quite difficult to compare different EMRs because the information is closely linked to the strategy, the organizational structure and the processes in the organization. However, these cases are interesting because it is possible to compare the strengths and weaknesses of these two EMR models. We also decided to analyse these

EMRs, because in the Italian hospital the EMR was developed internally (a legacy systems), while the implementation in the Swedish hospital was done by an external provider (Siemens, originally).

The Verona university hospital is one of the largest healthcare providers in Italy and is composed of two facilities. The two facilities combined treat an average of 60,000 inpatients per year, 10,000 of whom come from other Italian regions. Daily admittances total 1,300 for ordinary stays and approximately 400 for day hospitals. The goal is to automate and computerise the most important organisational processes, the number and complexity of which are far higher than most other healthcare providers. One of the main components of the Electronic Health Record (EHR) is the EMR, the repository for all the internal information generated by the hospital's individual organisational units. Thanks to Gekos system, hospital physicians are able to view a lot of data, such as: laboratory test values, RX picture, TAC picture, old documents, and other patients' data. Gekos is a legacy system used in the Verona hospitals to manage all patient information.

The SUS organization in Sweden is a combination of hospitals in the Malmö – Lund Region. The combined hospitals treat an average of 144 000 inpatients per year. On a typical day there are 357 visits to the A&E, 5318 primary care visits, 141 operations carried out, 1020 X-rays done and 1180 inpatients. The organization has been struggling with its IT installations for some time. The organization is working with many old legacy systems that are now semi-integrated through an umbrella portal (SIEview) in order for the users to be able to access data from different EMRs as well as different hospitals and systems. There are more than 20 subsystems that have to interact in todays environment, but the main system being used is Melior, which is from the early nineties.

4 Methodology and Method

The study uses a qualitative approach to respond to the research questions. In particular, the multiple case study analysis (Patton, 2002; Creswell, 2007; Eisenhardt and Graebner, 2007) enables the object of analysis to be investigated in its natural state by taking into account multiple dimensions that are difficult to analyse using a quantitative approach. As well highlighted by Eisenhardt and Graebner (2007; pp. 26) "cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs".

Using Patton's (2002) model, two main reasons led the authors to select Verona and Skåne (Lund, and Malmo) as their case studies. First, these hospital cases are particularly insightful for research into EMR adoption and use because they involve an e-government tool used by highly complex public healthcare providers (Eisenhardt and Graebner, 2007). Further, the hospitals have two different, highly structured organisational (university and healthcare) identities (spirits) that, while integrated, have specific, complex natures. Second, the authors were given direct access to the data.

The case studies were conducted according to the methods and instructions suggested by Yin (2009). This entailed gathering data through semi-structured interviews, direct observation and document research. The interviews and the internal documentation were used as the testing sources. Privileged access to the relevant information enabled the authors to collect data from several sources, increasing the quality of the information obtained.

The cases were analysed using the results of 71 semi-structured interviews (each of approximately 40 minutes duration) held with the hospital staff and designed to enable the respondents to answer freely, in their own words. Each interview was attended by two researchers, using the protocol presented by Arksey and Knight (1999, pp. 74–75) and was recorded. The respondents consisted of physicians, nurses, head nurses, general directors, radiographers, in different hospital departments like: general surgery, internal medicine, radiology, cardiology, ER, etc.

The data and results obtained were presented to the main organisational actors (usually clinical director) and the board of directors of the hospitals through the interview transcriptions and the interim results of the data-collection phase. The authors used Atlas.ti Computer Assisted Qualitative Data Analysis Software (CAQDAS) to analyse the data because it enables organisation and summarisation by concept (for example, improved collaboration, system adequacy and error reduction). Data collection commenced in November 2013 and continued for approximately one year. The analysis and integration of the existing data began in December 2014.

5 Data analysis and discussion

Starting from the model presented in the table 1, in this article it was re-used, and it was enhanced by inserting both the positive and negative effects of EMR arising from the two case studies (Verona university hospital, and Skåne University Hospital).

Thanks to these two cases and 71 semi-structured interviews, it was possible to know that in these specific contexts, the implementation of the Electronic Medical Record has led to more disadvantages that advantages.

According to Lau at al. (2012), but also Moore et al. (2013), and Hyman (2014), it was possible to note that the EMR project in these cases had few positive effects (seven codes), and a lot of negative impacts (twenty codes) on workflow, clinical volume and patient care.

In particular, for the Skåne University Hospital the situation is quite negative, where it was not possible to find a lot of positive effects. All this is highlighted by the interviewed persons. First a physician – orthopaedic (#2), "we invested a lot of money in the EMR implementation but I do not see benefits". Second, a paediatric anaesthesiologist,(#3) highlighted this situation when she said "We do not work so much with Melior (EMR) in the intensive care department. This means that it is even harder for us to find information in the system. It is worthless". In table 2, we show the main codes identified during the phase of coding and memoing.

Challenge type	Positive effects	Negative effects
Organizational	Electronic prescribing of medication (Lund)	Inadequate change management (Lund, and Verona)
	Supports clinical decisions (Verona)	Reduce work efficiency (Lund, and Verona)
	Recordings clinical information (Verona)	Not consider organizational, and environmental contexts characteristics (Lund)
		Lack of clinical leadership (Verona)
		It is not easy to evaluate EMR impact on clinical outcomes (Lund)
		EMR could increase bureaucracy (Verona)
Tecnical / Tecnological	Patient tracking (Verona)	Not indexed information (Lund)
	Check info everywhere (Lund, and Verona)	EMR is a legacy systems> systems are not interfaced (Lund)
	Standardised patient information (Verona)	Redundancy> the information is saved in different databases and duplicate the diagnosis for the same patient (Lund)
		EMR does not encourage information exchange (Lund)
		No real-time patients' data (Lund)
		EMR is not stable> often EMR crash (Lund)
		Overdependence on technology (Verona)
		EMR is not taylor-made (Verona)
		Do not exist electronic alerts for drug interaction (Verona)
People	Increase the coordination (Verona)	Barriers to adoption of an EHR (Lund)
		EMR could be dangerous to patients' health (Lund)
		negative effect on patient centerednes (Lund, and Verona)
		More time-consuming to complete than paper record (Lund, and Verona)
		Spend less time talking with patients (Lund, and Verona)

Table 2.Positive and negative effects of EMR in the hospital of Skåne and Verona

As has been shown in the previews table (table 2), in the first category, called "organizational", through the coding analysis, the authors identified three positive effects, two in the hospital of Verona, and one in the hospital of Skåne. According to Schoen et al. (2009), in the hospital of Skåne, the EMR has allowed to eliminate the medical prescriptions, thereby reducing the cost for the hospital and in general, also for the regional healthcare system. The interviewed (#4) (Nurse Emergency Room) said, "In the ER, we use an useful system for prescription medicine, it is user-friendly and efficient. Thanks to this system, we can save a lot of time and money". On the other hand, in the hospital of Verona the EMR helps physicians, and nurses to record and store clinical information. As has been described by Ajami et al. (2013), this code is useful in order to re-use all information about a patient. In this way, it is possible to store a lot of information forever, and at the same time reducing: physical space, cost, and time. All data is recorded and stored, so patient's path can be monitored, from acceptance to discharge. This can also be used in order to develope the compliance system. In fact, as highlighted by the interviewed #7, and #10 (orthopedic, and internal medicine specialist) "The EMR is not perfect, but it is pretty good because I can easily find the patient history. Hence, I can personalize the cure depending on his/her overall situation. In the past, the patient should give us the medical reports, but often he/she forgot these documents at home (or he/she lost some of them). In this situation, it was not easy to make an accurate diagnosis. Recording the process and data, now is also easier to defend themselves in court". This is linked to the next code titled "support clinical decisions" (Hamman, 1996). A

lot of respondents, 36 physicians and nurses out of 71 confirmed this benefit. Hence, for example the interviewees #14, and #21 (nurse, and surgeon) declared that "*EMR is really useful for our job. Thanks to this systems it is possible to better define the patient's situation, thereby reducing potential errors*", and more "*I use this system everyday in order to schedule all the surgeries that I have to do daily. It is very valuable, because I can find a lot of information about patients, but at the same time, I can consider only the info that I need during the surgery process*".

On the other hand, in the same category "Organizational", there are six negative effects. The main issues that the authors identified are: inadequate change management (Skåne, and Verona), reduce work efficiency (Skåne, and Verona), not considering organizational and environmental contexts characteristics (Skåne), and it is not easy to evaluate EMR impact on clinical outcomes (Skåne).

According to Davidson and Chismar (2007), all respondents (71 out of 71) underlined that the change management was inefficient, because the vertical communication between the top management and the head of departments was completely absent. The respondent # 42 (head of the department of internal medicine), for example explained that "*No one ever asked us what could be the information to be included in the EMR. This is the main problem that we had and also we have now… the communication system has had large gaps*". This issue is also strongly linked with the work efficiency. Both in Verona and Skåne, the introduction of the EMR in these hospitals has reduced the work efficiency. A lot of respondents (36 out of 71) expounded this concept, in particular interviewee #37 (Cardiologist) said "*The new system is slower and it is easy to miss important information… We have to read – always – similar information. Sometimes the same info is duplicated more than 100 times*".

Moreover, in the hospital of Skåne there are other two important issues. According to almost all respondents (20 out of 32), as previously highlighted by Dey et al. (2013), the EMR does not consider organizational, and environmental contexts characteristics. This concept is well expounded on by the respondents # 57 (Medical ER) and # 61 (nurse ER) when they answered that "Sometimes I think that the paper based system was better than an electronic one... the context where we work was not considered because these systems are completely useless". In addition, the majority of respondents highlighted the impossibility to evaluate EMR impact on clinical outcomes. Similarly to the results founded by Holroyd-Leduc et al. (2011), also the interviewed # 69 (orthopaedic) expounded that "we invested a lot of money in the EMR implementation but I do not see benefits… no one measures service quality, outcomes, and safety of the systems (20 different software)".

From the second category (Technical/Technological), the situation is even more problematic. In fact, as shown in the table 2, it was possible to observe three positive effects (3 Verona, and 1 Skåne) and nine negative effects (3 Verona, and 6 Skåne). All these issues are direct consequences of the organizational design failure, which are strongly connected with the issues showed in the previous category (Organizational challenge type). In the Skåne hospital it was only possible to find one positive effect, where 80% of the interviewees answered that the EMR is helpful, because they can check patient information everywhere, and when they need. In this way the respondent 16 (Orthopaedic) said "*The EMR is really helpful, because I am a physician and also a professor, so when I travel to conferences, etc., I can evaluate and verify the situation of my patients. Hence, in some cases, I give advice to practitioner in order to better plan the surgery*". In the hospital of Verona there are two other benefits that are linked with this code. Thanks to EMR is possible to track the patient's path in the hospital, but also to evaluate the evolution of her/his situation. Moreover, The systems require users to enter information, thereby it is possible not only to assess the situation of each patient, but also compare patients with similar diseases.

On the other hand, the negative effects should be considered individually for the hospital of Verona and the hospital of Skåne. The EMR in the hospital of Verona is a mix of twelve different systems. All these systems are developed in-house, so in general these soft-wares are interfaced. The internal softwares' development are both an advantage and a disadvantage, because systems update are performed rarely and in many departments computers, network and equipment are obsolete. Moreover, the EMR is not "self" tailor-made, but the users have to send a ticket to the IT department in order to modify and/or personalize part of these systems. All these things are highlighted by respondents 2 (ward nurse) and 3 (internist) when they said that "*it is not user-friendly and it is not possible to create a personal desktop info*" or "*I would like to be able to have many different patient aspects open at the same time no just one system at a time*". According to Campbell et al (2007), in the hospital of Verona it was possible to note that the overdependence on technology should be an issue, because of the increased potential for human errors. In particular "*when clinicians begin to trust these systems without question, and when healthcare workers have no exposure or training in non-automated clinical environments*" (pp 97).

Otherwise, in the hospital of Skåne, the EMR (called Melior) was bought from a vendor (Siemens). Nowadays, this system is dated and it should be updated or replaced. In this case the main problem is not the hardware obsolescence, but the software obsolescence. In particular, the users (nurses, physicians, etc.) fill out hard paper that then should be scanned in order to save all the information in Melior. All these files are images (pdf or jpg), so it is quite impossible to find them because they are not indexed. Moreover the hospital of Skåne must pay 50-euro cents for each scanned page.

For all these reasons, all interviewees pointed out that the EMR is obsolete, useless, expensive, and not userfriendly. The interviewed 71 (nurse intensive care) underlined these concepts when she said, "the documents (hard paper) are simply converted into 'digital'. It is not possible to find and reuse the information". It is not a drilldown and roll-down system. The system is used only for saving info".

In the last category called "People", the authors found 1 positive effect (Verona), and 5 negative effects (3 Verona, and 5 Skåne).

Thanks to the EMR, in the hospital of Verona, it was possible to increase the coordination effects among departments and employee (nurse, physicians, laboratory technician, surgeon, etc.). During an interviewed a nurse (31) emphasized this, when she said "The EMR is not perfect, but it is pretty good, because now it is simple to integrate our journal (nurse journal) with the medical journal. In this way, we can share important patient info. In the past we wrote all these patient info in a hard book (nurse journal) or in a lot of post-it. Sometimes we lost these post-it or we did not understand the handwriting, so we lost a lot of info. In the past it was difficult to exchange info between physicians and nurses but also among nurses with different shifts".

The main issues analysed in the two cases are: EMR is more time consuming than paper record, physicians spend less time talking with patient, and EMR has a negative effect on patient centeredness. These codes emerged from almost all interviews (67 out of 71) carried out both at the hospital of Verona and the hospital of Skåne.

6 Conclusions

In the literature is quite difficult to understand if the Electronic Medical Record is or is not a useful system in a hospital. There are many variables that influence the EMR performance/quality.

In this paper, the authors tried to collect all these concepts from the literature in order to better clarify the strengths and weaknesses of these systems. For these reasons, starting from the Zakaria et al. (2010) model, in this article it was re-used, and it was enhanced by inserting both the positive and negative effects of EMR arising from the literature review analysis. This model was tested in two different hospitals: Verona University Hospital (Italy), and Skåne University Hospital (Sweden).

According to Adler-Milstein et al. (2011), the impact of the EMR in these two hospital is not so positive, but there are some differences between hospitals. The EMR in Verona University Hospital is quite useful, and all in all, it was developed internally (from the IT department), it did not cost so much in the implementation and maintenance. The main problem encountered during the implementation phase was the lack of coordination by the top management. Nowadays, the main issue is the hardware obsolescence that somewhat reduces the quality and performance of the system.

On the other hand, in the Skåne University Hospital the situation is more complex. The respondents were not at all satisfied with the system. Analysing the interviews, it is possible to read "we invested a lot of money in the EMR implementation but I do not see benefits", or "In the ER department Melior is expensive, more than 3 million euro per year. Melior is outdated and expensive to maintain, we should decide to start over, but it is not easy to find a new EMR", or "Sometimes I think that the paper based system was better than an electronic one". Similarly to Verona, also in Skåne, the main problem during the EMR implementation was the lack of coordination by the top management. Otherwise, the main issue now is the software obsolescence, because the EMR is outdated and pretty useless. As well shown in the figure 2, similarly to USA and Canada Lau at al., 2012; Adler-Milstein et al., 2013; Moore et al., 2013; Hyman, 2014), also in these two cases there are more "shadows" than "lights". In the future research, it should be interesting to test this model using a quantitative methodology.

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