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a Case Study on Electronic Health Records

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ABSTRACT

This chapter introduces a socio-technical organizational perspective on a EHR implementation in hospital setting through a qualitative a case study from one of the major hospital facilities in Portugal: the Hospital Doutor Fernando Fonseca in Amadora, Portugal. Through the account of eight key representatives pertaining to the main professional categories of the hospital, the researchers pinpointed the core organizational adjustments, strategic choices and relative challenges that anticipated, accompanied and followed the EHR implementation as perceived by key professionals, further capturing expectations concerning adjustments estimated but not yet realized. The study's main contributions are identified in deepening the link between qualitative organizational studies and EHRs, offering an empirical case study portraying a change management experience that could be replicated in similar framesets, and furnishing practical recommendations and insights on what adjustments are to be enacted, and which challenges to be expected, when implementing an EHR in hospital settings.

Keywords: Electronic Health Records; Qualitative Research; Case Study; Hospital Doutor Fernando Fonseca; EHR implementation; Healthcare Information Systems; Chief Medical Informatics Officer; Chief Informatics Officer

INTRODUCTION

Describe the general perspective of the chapter. End by specifically stating the objectives of the chapter.

Healthcare information systems (HISs) have been conceived as systems, replacing previously paper-based data, directed to facilitate the acquisition, utilization and sharing of information in healthcare settings. Electronic Health Records (EHRs) are healthcare information solutions that allow clinicians and staff of a given healthcare organization to access, gather, organize, store and share clinical information concerning a patient as well as permitting the prescription and scheduling of therapeutic acts. EHRs allow constituting structured clinical repositories accessible to a large amount of professionals without being close to the patient (Feufel et al., 2011) that can be used for quality and research purposes (Yamamoto and Khan, 2006). Moreover, they are means of practice standardization, building on streamlined models of data registration and communication intended to avoid error and foster quality and efficiency (Vishwanath et al.,2010). Finally, they are reliable tools for decision-making, as their system-aware nature, constructed around optimized workflows, is intended for action mapping (Likourezos et al., 2004). The comprehensive support that EHRs are apt to provide is particularly relevant in hospital settings where a wide number of professionals, pertaining to different practice categories and with diverse specializations, are obliged to develop interrelated clinical daily routines who are highly reliant on the possibility to easily access and transmit detailed and complete information, and endure necessary but repetitive tasks that are often exposed to errors, malpractice and inefficiencies. An EHR that is able to communicate with other existing administrative and technical systems allows, within a hospital, for a support of clinical practice transversal to the organization, striving for cohesion of the process of care delivery.

Notwithstanding the benefits that EHRs are believed to add to clinical practice, introducing an EHR within hospital settings is neither an easy nor a painless process to undergo. Hospitals are complex organizations characterized by non-linear workflows, bureaucratic processes, asymmetric hierarchies and inhomogeneous professionals categories (Bossen, 2007), where change constitutes a challenge of whose existence and dimensions involved parties may not be fully aware (Boonstra and Broekhuis, 2010). EHRs, on the other side, are vectors of organizational change not merely affecting single tasks and activities, but apt to give origin to transformative processes that may alter core organizational features, such as organization an distribution of processes, functions and roles, and organizations' overall culture, strategy and goals (Bossen, 2007; McCarthy and Eastman, 2010). The sociotechnical perspective, a consolidated approach to analyze the use of technological solutions in healthcare, explores how technical and socio-organizational features interact in the implementation of HISs (Berg, 1999; Ash et al., 2007;

Bossen, 2007; Ludwig and Doucette, 2009) concluding that an external agent of technological nature cannot be introduced without organizational adjustments. Further, according to the perspective, the implementation of the EHR agent entails, within an organization, the creation of ex-novo networks of persons, processes and technologies generated by new interaction patterns and consolidated by mutual adjustment (Bossen, 2007). This means that the change process is not a unidirectional one, but that HISs and organizations mold each other in the process of implementation (Berg, 2001), hence, any management strategy should be sufficiently supple as to introduce the change vector and let it develop without land marking its evolution too closely, since the potential of each HISs is only discovered during the implementation process, and guarantee that all involved parties are aware of the different social and operational processes that the organizational change process may generate (Berg 2001; Boonstra and Broekhuis, 2010). Change management literature (Campbell, 2008; McCarthy and Eastman, 2010), which covers technology adoption as one of its areas, frames, broadly, organizational adjustments engaged by the planning and implementing of EHRs, within the following processes and activities: leadership - recognition of the urgency to change, determination to act as to engage transformative processes, election of a guiding team; transition planning - definition of objectives, approaches and timeline for change implementation and stakeholder communication and engagement; and, finally, transition management - furnishing training and resources for change, verifying the compliance with deadlines, setting tools for crisis resolution and reporting of malpractice.

As argued by Bossen (2007), organizational aspects have not been studied as much as other determinants affecting EHRs implementation, a claim that is confirmed by Boonstra and Boekuis' (2010) systematic literature review on the barriers to EHRs acceptance, whose findings highlight that, among a universe of twenty-two reviewed studies, only two contemplated features of organizational nature, being the majority focused on factors of technical, economical or time-related nature. Such gaps in research clarified the need for a study pinpointing core organizational adjustments, strategic choices and relative challenges engaged by the implementation EHRs in hospital settings as perceived and experienced by key professionals. With this objective, and keeping in mind the specificity of each change management process, we considered relevant to present a qualitative case study, provided by the experience of implementation of a hospital-wide EHR solution (Siemens Clinicals, 2014) in one of the major hospital facilities in Portugal. Through the account of eight key representatives pertaining to the main professional categories of the hospital, the researchers reviewed the three phases of the EHR installation: a) the one preceding the implementation, capturing the managerial, technical and human resource requirements that prepared the introduction of the EHR, and the main challenges associated b) the first 6 months of implementation, clarifying which strategic decisions characterized the implementation process and the

main obstacles experience by professionals; and c) the final phase of the implementation (ongoing at the time of redaction) picturing the professionals' perspective concerning main organizational features affected by the implementation and disclosing expectations concerning adjustments yet to realize, uncovering the conditions that the professionals perceive as having insofar inhibited the exploitation of the EHR's full potential. The study's main contributions are identified in deepening the link between qualitative organizational studies and EHRs, offering an empirical case study portraying a change management experience that could be replicated in similar framesets, and furnishing practical recommendations and insights on what adjustments are to be enacted, and which challenges are to be expected, when implementing an EHR in hospital settings.

CONTEXT AND METHODOLOGY

EHRs in Portugal

According by a document redacted by the Portuguese Central Authority for Health Systems (ACSS, 2009), entity responsible for providing HISs within the Portuguese National Healthcare Service (NHS), the availability and utilization of HISs in Portugal is coherent with the European average, although being behind in terms of health data exchange between healthcare organizations due to a lack of appropriate infrastructures (ibid). A thematic group on EHRs within the Central Authority is currently mapping the state of the art of EHR implementation in Portugal as to highlight structural deficiencies and produce a series of evidence-based recommendations to be followed transversally in implementation projects within the NHS, guaranteeing an alignment of the national approach to European best-practices and recommendations (ACSS, 2009).

Hospital Setting

The Hospital Doutor Fernando Fonseca was identified as a relevant setting for the case study, as it one of the largest and busiest publicly-owned facilities of the country, serving a population of 6000 individuals within the metropolitan area of Lisbon through 772 beds and 2.300 employees, for a total of 284,872 outpatient and 35,032 impatient registered episodes in 2012 (HFF, 2012). The emergency department (ED) of the hospital is arguably the largest in Portugal attending 689 cases per day in two distinct but interrelated units (HFF, 2012). The population that the hospital serves is not merely numerous, being the district where it is situated the most densely populated of the Lisbon metropolitan area and growing, but also a socially vulnerable one, where the high urban concentration, ethnically diverse population and average low socioeconomic conditions vehicle a high concentration of social exclusion, violence and

addictive behaviors and of their related ill-health outcomes (Machado et al., 2007; Vasconcelos et al., 2011), as well as leading to delays in hospital discharge due to the difficulties in ensuring a return to a domicile (HFF, 2012).

Features of the EHR solution

The solution object of this case study was launched in 2001 by one of the worldwide leader companies in medical technology with the objectives of downsizing interfaces and obtaining high quality and patient centeredness in the process of care delivery. The solution connects medical modalities to information technology helping hospitals streamline and navigates the tasks and processes involved in caring for patients across the continuum of care (Siemens Clinicals, 2014). In Portugal its was first launched in in a private healthcare 2006. This case study depicts the solution's first implementation in a publicly owned hospital where it was introduced as to replace paper-based health records by covering the functionalities of electronic clinical repository, electronic prescription and clinical documentation, clinical summary and social worker registration. Additional functionalities of the EHR are the computerization of existing workflows and clinical pathways and the interoperability with existing HIS, such as laboratory tests consultation and imaging, among others, and integration with adjacent systems, from administrative management to supplementary diagnostic and therapeutic activities.

A qualitative approach to EHR implementation

According to Bossen (2007), qualitative studies are relevant to investigate the patterns of interaction of technological, social and organizational features that the introduction of HISs arise, as they focus on social actors and try to contextualize their choices. Furthermore, qualitative studies are purposeful for studies of healthcare settings as they allow gaining a profound understanding of complex phenomena, which respects the real world context whilst being rich in human experience and insight (Vaismoradi et al., 2013). The case study model was considered suitable for the intended study, as it is apt to describe with accuracy a given phenomenon within a defined context using a limited number of examples (Stake, 1995), being particularly indicated for areas in which information is partial or lacking (Punch, 2005).

Primary data for the study was collected through semi-directive interviews administered face-to-face with eight key professionals covering different organizational areas, where for key professionals it is intended professionals that were personally involved in the definition and enactment of the EHR implementation process, or service directors whose departments are affected by the implementation. Key professionals were the following: Medical Information Officier (CMIO), Chief Information Officer (CIO), Information technology (IT) Manager, Clinical Adjoint Director, Emergency Department Director, Nurse member of

the Clinical Informatization Committee, Production Manager and Quality Manager. Semi-directive interviews were considered a relevant instrument to broadly analyze perceptions, understandings and expectations related to the implementation process within three themes, a) organizational culture and pre-implementation adjustments; b) implementation phase, strategies and challenges; and c) perceived impacts in daily working practices overall organizational structure. The study as well as the semi-structured interview protocol were submitted and accepted by the hospital's Ethics Committee as well as the Clinical Investigation Commission prior to the study being conducted. Interviews, conducted in Portuguese, registered and then transcribed verbatim were carried out in the period November 2013 – February 2014. Complementary data was furnished by the Hospital's financial report (HFF, 2012) and by internal assessment study of the EHR executive team.

The perceptions of the interviewees were examined through content analysis. Content analysis is a research methodology that allows evaluating qualitative information, and has been widely used to detect patterns and build categories within narration (Garvin, 2008). Within the study, it has been used to detect, through the coding of interview's transcriptions, patterns of understandings, dispositions and expectations of the different stakeholders related to the themes explicitly addressed by the semi-directive interviews. Additionally, for what concerns the implementation phase, a critical success factors (CSFs) analysis was conducted on the strategic choices individuated through content analysis, so as to ascertain which factors and contingencies were deemed fundamental in the hospital's experience. Acknowledging Berg's (2001) critique of the multi-dimensional, relativistic and changing nature of the definition of success, this methodology chooses to adopt CSFs analysis as a tool to better elucidate factors that allowed and facilitated the realization of the solution's implementation for this particular case, accepting that the unpredictability and context- specificity intrinsic to the nature of EHR make so that such CSFs may not be as critical in other situations. Finally, for the post-implementation phase a value creation analysis model was used as to: identify dimensions affected by the change vector assessing the perception of change by interviewees. CSFs and value-change analysis methods were engaged following the tool section of the Organizational Effectiveness Initiative (Washington University, 2013). Data was organized and reported according to Polkinghorne' Chronological analysis of narratives (Polkinghorne, 1995), where data is presented as a narration, capturing recurrent themes within different accounts, by pinpointing relevant information and discarding irrelevant content. The main limitations of the study are the ones intrinsic to qualitative analysis in what the interpretative role of the researcher in first extracting relevant parts of data and then analyzing it, leads to difficulties in guaranteeing the arbitrariness of interpretation and the incontrovertibility of the results (Ricolfi, 1997). Further limitations are specific to case study analysis which, with its specificity in terms of context and timeframe, creates issues of "generability"

(Stake, 2005). On these grounds this research finds its contingent limitations in the subjective basis of perceptions, and in the limited selection of professionals: it is not possible to affirm that the perceptions concerning the implementation process, although pertaining to key professionals, are representative of a majoritarian perspective, nor to make distinctions based on professional categories. Such limitations may be overcome by the carrying out of further more comprehensive studies of both qualitative and quantitative nature.

RESULTS

a) Organizational context and pre-implementation requirements

The journey of the solution's implementation started in 2009, soon after the hospital had undergone an important transition in its management model and jurisdictional nature. After being a public hospital with a private management contract for more than a decade (a unique formula in the Portuguese national health system guaranteeing high organizational autonomy to the institution since 1994), the hospital was reconverted as an entirely public hospital in 2009 under the jurisdiction statute of EPE (Entrepreneurial Public Entity), it is to say, a social public institution whose nature is guided by principles of efficiency and merit, contemplating features of competitiveness as well as collaboration with other institutions pertaining to the national health system (Ramos, 2005).

As clarified by the CIO the transition from a hybrid to an entirely public management model directly relates to the solution's introduction. In fact, although the switch was carried out, as the Production Director points out, with an attention to preserve "everything as it already was" it is in this phase that some managerial re-organizations that proved fundamental for the choice to implement an EHR were made. According to the CIO, the fact that board management mandates went from an extent of one to three years as to conform to the public contracting regulation, furnished an incentive at a top-management level to implement and supervise projects requiring more than a year timeframe. He further clarifies that, although top management positions were maintained, the intermediate CIO manager's position was discontinued, and the professional figure of the CMIO was created. The CMIO advocated the need of implementing a transversal EHR solution able to grant access to clinical information to all staff independently from their work position whilst ensuring data streamlining and safety, as, he reports, in 2009 the hospital was "clearly behind average in information technologies", and the board management accepted. The new CIO was identified within the figure of a computer scientist, who, in a hospital more

than 200km away, had managed to build, with few resources and a small but motivated team, a whole healthcare informatics system from scratch. On his side, the computer scientist reports that the hospital management lured him until he finally accepted to become the Chief Information Officer. Such proactive search for a CIO is, in the CMIO's view, a testimony to the determination that the board had to proceed with the project of an EHR implementation.

The CIO and the CMIO pinpointed as most urgent barriers to implementation the existence of more than one rudimentary EHR, a strategic void concerning HISs and a lack of technical and human resources. The CIO manager clarified that different EHRs, which had been slowly evolving since the 1990s, were operating in different clinical areas, but presented numerous shortcomings: data was not structured, coverage touched only five to ten per cent of clinical areas, and access was destined merely to medical doctors who used it discretionarily. Such shortcomings caused, for instance, the impossibility of ambulatory staff to obtain information from the emergency department and vice versa and permanently excluded nurses, creating what CMIO described as "segregated islands of digital information", which gave origin to separation among categories of professionals and created lack of solidarity among different teams. In the CMIO's words the different rudimentary EHRs were "exterminated", as medical staff was convinced it was for the best. The strategic void was answered by the creation of an Executive EHR team composed by the CIO the CMIO and a board member whose first duty was identified in the optimization of structural, technical and human resources through investments directed to renovate spaces, implement network coverage, create a data center, hire a team of newly graduated informatics, and proceed with communication and training activities destined to all professionals. The EHR executive's team second assignment was the redaction of an assessment study specifying the criteria for the choice of the EHR solution and the partnership with the IT provider. The assessment phase lasted throughout 2009, and consisted of three essential moments captured by the CIO's as: 1) a meeting of the EHR executive team with potential providers so as to capture the degree of maturity, expansiveness and flexibility of the offered solution and negotiate the intended model for partnering with the hospital; 2) a showcase and sampling of the potential solutions to a test group of professionals constituted by the representatives of each department; and 3) the selection of the EHR solution, taken by an enlarged commission of stakeholders constituted by board members and managers from clinical and non-clinical departments. According to the CIO the meticulous clarification of the requirements that the prospective EHR would have to bear was a critical aspect, whose overcoming was only possible, the CIO pointed out, if both the informatics leadership and board management had the know-how and vision to identify what they want and need. The detailed specification of requirements was intended to avoid the risk of the provider taking a lead over critical decisions, and the hospital's staff not being satisfied with it. The choice of the provider

was deemed equally crucial in terms of the willingness to adopt the partnering model intended by the EHR team.

The CIO remembers 2009 as a very stressful time when roughly fifty projects relevant to the informatics department were running in parallel to the preparation for an EHR. Additional pressure was imposed by the Portuguese Health Ministry who, considering the newly acquired public status of the hospital, was claiming for the hospital's system to connect to the national health system's network, as well as feedback constantly on its activity. Retrospectively, the CIO remarked that a best-case scenario would have been one where resources were optimized prior and not simultaneously to the decision to implement an EHR, as the juggling of many needs constituted a threat to the success of the project. On the other side, he acknowledged that real-life situations are hardly linear; in this case, having a board management willing to proceed with an EHR implementation was deemed as a favorable and potentially transitory conjuncture that had to be taken advantage of notwithstanding contextual boundaries. Luckily, as agreed by the CIO and the Clinical director the hospital culture was one acquainted with change, experienced by the transition from and to public management, enriched by a private management inclination to absorb change and seek for innovative pathways within care delivery and linked to the young age and competence of professionals. Such clarification of the organizational culture as incline to change wasn't backed by the IT manager in whose perspective roles and tasks had been crystalized for too long, leading to a situation in which people were confortable in their routines and were not inclined to put in cause sub-optimal workflows and practices.

Figure 1 TO BE INSERTED

b) Implementation: strategic choices and challenges

The EHR solution was launched for utilization on tablet and personal digital assistant (PDA) with a departmental approach, starting, in December 2010 with the Emergency department (ED). The hospital's ED was composed, at the time of launch, by two units four kilometers apart, a central medical-surgical section and a dislocated basic section, hosting, overall, an average 689 patients per day (HFF, 2012). Considering the volume of admissions, and given that December is a hectic time of the year, the CMIO admitted that a great risk was taken by starting in the ED. On the other side, the risk was a calculated one, once taken into consideration that it was a strategic choice for more than one reason. As the ED director detailed, the solution's introduction coincided with the end of construction work in the ED, setting the basis for a fresh start; moreover it was taken into account that more than 80% of the hospital's clinicians

work in the ED rotationally, allowing a great number of professionals to approach the EHR gradually, without being obliged to immediately work with it all the time. Finally, according to the ED Director, starting from the hospital's most burdened area of care delivery was also intended to symbolize the need for a common solidarity effort towards the ED, which, in the CMIO's perspective was one of the staff's major struggles, as the IT manager adds the culture was one of "my department" and division. According to both EHR would foster cohesion through allowing both nurses and doctors the possibility of accessing diagnostic and therapeutic information even after the end of the shift. On a strictly practical level, starting with the ED, which has an ambulatory section similar to other hospital units whilst suffering the additional stress of an emergency ward, meant, according to the CIO, that the implementation in any other service would have been both replicable, being applicable to departments, such as intensive care, where information was to be updated every ten, fifteen minutes, and comparatively easier. The ED director explained how a critical point was the choice of champions within the ED, effectively identifying professionals motivated by the implementation process and apt to foster a right balance of peer influence and optimism towards the gains that the EHR was expected to add. Choosing champions is a matter of being receptive, the CIO complemented, and it should be taken into consideration that often interns are better suited to lead change than senior managers. The ED Director further added that it was precisely the motivation of various managers and professionals from different clinical and administrative areas that raised a general understanding that there would have hardly been any going back once the process of implementation had started.

The interviewed nurse reports that the solution's implementation in the ED, maybe because of its pilot nature, received an unequalled attention in the overall implementation process, with the software development team - which was composed by six informatics, half from the provider company and half belonging to the hospital's IT staff - working on site both configuring the EHR in detail and supporting users around the clock, Monday - to – Sunday, for the first 6 weeks. After all, the CMIO affirms, the EHR executive team had deliberately chose a baseline solution that, whilst supporting all the essential functionalities sufficient to answer the necessities of the hospital organization as a whole, was intended to be configured internally by the mixed software development team in collaboration with clinical professionals as to make so that processes and workflows were constructed directly by clinical staff with the support of informatics as, the CMIO pictured it, "a metal which is being modeled, strong enough to resist shocks but sufficiently flexible as to be shaped by them". The potential for the EHR to be adapted and personalized was such an added value, the CIO enhanced, that even the most skeptical staff were fascinated by the opportunities intrinsic in molding the EHR as to build tools in need. The joint hospital-provider implementation effort, as the CIO points out, was only possible due to the solution's flexible

nature and because the provider's posture was one oriented towards partnership and mutual learning, allowing for the hospital's informatics and clinical staff to be actively engaged during the implementation process and personalize the EHR solution. Clarifies the CMIO that Participative configuration was ensured operationally by the constitution of an interdisciplinary users' team, constituted by one representative of each organizational area: a doctor, a nurse, a pharmacist, a manager and administrative, which reunited once a week with the informatics implementation team, negotiating priority information to be added to the EHR. Clinical interviewees highlighted diverse perspectives upon the collaborative configuration model chosen for the EHR: whilst the Clinical Director stressed that the possibility of informatics implementing processes and workflows according to the clinical staff's request hinders a major value and a great potential for the hospital's care delivery process, the interviewed Nurse shared her doubts concerning whether the workload of time and resources supported by the hospital during the implementation process could have been of use for other purposes, and whether the effort should have been one supported in a major proportion by the provider than the hospital.

In the ED, the shift from paper to electronic health records was completed in six months' time; there were non-negotiable deadlines, the IT manager clarified, but, in his perspective, the process was on general grounds collaborative rather than authoritative. Using the same time phasing and the same collaborative software configuration approach, the EHR was then gradually introduced and adapted to the remaining hospital inpatient and outpatient services. The IT manager reported that there was no fixed implementation roadmap enlisting the order in which the solution was intended to be implemented in each department, but rather, that the process followed somewhat of a spontaneous itinerary, taking advantage of the availability of local managers. Once the implementation in a department had begun, though, time-phasing was very strict; the CMIO explained that, after a preliminary acquaintance phase granted to all, there was no compromising on deadlines. This made so that the project advanced forward and that deadlines were respected "with a great focus on the project, and without getting distracted by external conditions". As of today, 90% of hospital beds have been informatized, exception made for the units of pathological anatomy, oncology, cardiology, intensive care and day care units and partial infectiology, whose specific needs made implementation more time-consuming but which are, at the time of redaction, on the roadmap for forthcoming informatization (HFF, 2012), as, even though the CIO clarifies that "there is no such thing as paperless hospitals", the hospital is continuing its effort towards a complete EHR adoption.

Although timely the implementation wasn't effortless, the ED director reports; the resolution of the executive EHR team to proceed rapidly with a strict time phasing and scarce attention to complications

did represent a factor of friction among the EHR executive team and clinical staff causing animosity and a few resignations connected to the stress of struggling to interact with an afresh solution whilst being confronted with emergency near-death scenarios, where every second lost could be potentially fatal, reports the Clinical Director. Aversion took various forms, from the creation of small category-based lobbies, to the abandonment of the EHR and the retour to paper-based practices at each system failure or crash, to the more simple refute to use the EHR until the moment it was made compulsory. The former ED director clarified how, although hardware and software failures did occur occasionally, technical impediments were irrelevant when compared to the people-based obstacles encountered throughout the implementation process, as, ultimately, it was on the staff's adhesion to the project that the whole implementation relied. According to the same, reluctance to change had various roots: individual's natural aversion to change, time and place induced pressure, and aversion to the redefinition of working processes the technological solution was expected to provoke. The last of these dimensions was defined by the ED director as the most pernicious one as the EHR set the basis for a transformative process were doctors and nurses' had their "clinical rationality", it is to say the mental frames and processes that had until that moment led the way they acted upon, and though about, their clinical practice put in question. Starting from the moment the EHR was adopted clinical professionals were deprived of the physical support the paper EHR furnished as well as the additional information it allowed, such as recognizing the authorship starting from the calligraphy. In this case aversion took the two forms of indolence, which the Nurse described as "if I am confortable with what I am doing why do I have to submit myself to something new which is toilsome, time – consuming and not intuitive?", and fear of mistakes due to the lack of mastership over the solution, which due to the accessible nature of the EHR, also meant being exposed. Such fear was particularly pertinent for the nurse category, as they hadn't used an EHR ever before, the CMIO clarified.

Whilst inner-based and time and place induced aversion, would not have been avoidable due to their intrinsic on one side and strategic nature, practice-based aversion could have been prevented, at least in some measure, the IT manager and Clinical Director clarify. The principal deficiency was identified in the communication between the management-informatics level and the clinical counterpart; the IT manager reports communication could have been better planned, as in his perception, configuration took charge over communication. Main failures were identified in making training and communication initiatives being sufficiently creative and attractive, leading to scarce participation. In the ED department, the nurse adds, there had been a great accent on communication, which increased participation and reduced user's aversion; yet, the Nurse believes such effort was diluted in successive departmental implementations. Secondly, and more importantly communication failed, since its very beginning, in managing to fully

inform professionals of the dimensions and objectives of the change process would entail, creating a situation were clinical professionals were "aware that change was going to happen, but not fully acknowledging the dimensions and impact such change would have on their daily practice" the IT manager clarifies; for example, they weren't aware of the degree of detail they would be required to complete their data registration, or of the fact they had to adapt their vocabulary to international standards. It was acknowledged by both the ED Director and the IT Manager that preparing staff to expected outcomes that the EHR was going to produce was a complex exercise once the EHR solution was being constructed day by day, and being the experience a pioneer one in Portugal, there was no similar experience to learn from or compare to. Also, the CMIO reports, sharing expectations can also represent a risk factor, as delays in meeting deadlines and perceiving gains can create mistrust and disappointment among users.

In 2012 an additional body, the Clinical Informatics Committee (CIC) was established with the objective of centrally evaluating the requests, originating from the different clinical services, to add information or make alterations to the EHR configuration the IT manager reports. The ED director specified that requests were so frequent, and so numerous, that their punctual resolution almost jeopardized the implementation process as a whole. The Clinical Director, also committee member, explained that although the solution can be molded locally as to adapt to every department, it has a common core of basic information concerning the patient that can be shaped at a central level. According to the physician, a small team operating at a central level with coordination and a clear methodology was able categorize requests and capture the best ideas, avoiding work redundancy whilst ensuring control and coordination.

Figure 2 TO BE INSERTED

c) Perceived adjustments in core organizational features

As argued by the CMIO, the objective of the EHR implementation was the conversion of clinical data collection processes from paper to informatics-based. Such conversion was expected to guarantee, on a procedural level, access to data to all professional categories independently from their professional or geographical position, redefine workflows towards best-practice and minimize error whilst facilitating its detection. Further, on an organizational, cultural and strategic level it was estimated to redefine the approach towards care, the relationships among professionals and the way the organization would be able to learn about itself through the analysis of collected data; all dimensions expected to positively impact current and prospective health gains of hospital patients.

In regard to data access the Clinical Director highlights its perception of increased support in decision-making through the possibility to consult data timely and without being close to the patient, yet the Nurse stresses the perception that some boundaries to access still exist, caused, in utilization, by the lack of intuitiveness of the solution's configuration, or, for instance, by the fact that the EHR doesn't alert in case of modification. Further, the Clinical Director points out that the usage of the EHR has effectively obliged professionals to align to international best practices by imposing the recording of allergies for all patients, the utilization of the Surgical Safety Checklist and nurses' adoption of the Standardized Nursing Language. As reported by the ED Director clinical records have become clear, homogeneous, visible and transparent, allowing the quality department to automatize auditing and error detection. The implementation has given origin to task shifting, adds the CMIO, with medical doctors executing activities of previous competence of nurses, such as compiling the discharge and transfer summaries, and vice versa. At the time of redaction the EHR potential to allow the construction of personalized workflows, a point used by the EHR executive team as a motivator during implementation, has not been fully explored, confirm both Clinical Director and Nurse, adding, that it a very toilsome, time-consuming and at times arid task, whose completion nevertheless, adds the Clinical Director, is expected to add great value to clinical practice. Concerning the potential of increased data access and quality, and workflow redefinition to readily engage health gains, different professionals present different degrees of optimism: whilst the IT manager and Clinical Director respectively affirm that the standardization of data registration allows "ensuring the avoidance of a group or risks in a very high percentage" and "creating a support to decision-making which is almost translational", conditions which "clearly are apt to engage clinical, economic and public health gains", the Nurse stands in the position that increased gains for the patient can not be guaranteed, in the absence of the study of accident and mortality indicators, which have had not been carried out at the time of redaction.

In a broader organizational perspective, the approach towards care is believed to have been modified, according to the CMIO, towards an increased attention and rigor, concerning international best practices, and overall, the IT Manager adds, as to refocus care towards the patient, as formerly information was focused on the ambulatory production line whilst currently it is patient-centered. The Clinical Director exemplifies this point as the possibility of the doctor to access necessary demographic and clinical information to understand the patient's history, being updated on complementary diagnosis, avoiding, for example, incompatible outpatient episodes to be scheduled on the same day, verifying whether the patient is attending the treatment, and schedule follow-up acts. According to the same, these possibilities set the basis for an improvement of the doctor-patient relationship that overcomes, in the long run, the

difficulties created in interaction by the presence of a technological device. The "democratization" of practice caused by transversal data access and the expected increased cohesion within different professional categories provoked by interdisciplinary reunions and teams, was not explicitly mentioned by interviewees as being impacted by the implementation. The author, on the contrary, supports the view that separation among professionals persists once the IT Manager refers to the connectedness of medical and nursing activities in a mere technological perspective, clarifying that interactions perceived as forced were expected to become spontaneous in the future. The potential for the hospital to become a "Learning Organization", which is, in the IT manager's words, an organization that learns about itself and its patients through evidence-based research, has not yet been explored as clarified the ED Director; "to date, the hospital still knows little or nothing about its processes following the solution's introduction (…) not because the EHR solution does not allow it, but because the users are not sensitized on how to extract data from the system and the opportunities such activity may imply". This situation, according to the Clinical Director, is due to the fact that the implementation process has to become instituzionalized and embedded in practice, adding that such opportunity is expected be put to use in the future. Less optimistically the CMIO points out that professionals had not managed to attribute sufficient value to the potential of the EHR due to the transition management's lack of investment in human skills; in this perspective a higher level of user training, not one focused on technological literacy and interacting with the EHR, but rather one based on business intelligence and clinical governance has been a crucial lacking feature, as, for a "learning" mentality to be shared among professionals the transition management approach should have been one oriented towards empowering people before investing in technology. Finally, according to the CIO, since the informatization as reached 90%, the reduction of the ecological footprint derived from diminishment in paper utilization, together with the low consumption of newly installed working stations replacing PCs, allowed for an estimation, whose criteria and methods were not divulgated, of paper consumption reduction equivalent to the saving 85 trees in 2013.

CONCLUSIONS AND FUTURE RESEARCH

This chapter aimed to portray a change management experience and the core organizational adjustments, strategic choices and relative challenges that anticipated, accompanied and followed the EHR implementation in the hospital Hospital Doutor Fernando Fonseca in Amadora, Portugal.

The authors believe that the first contribution of the study is to highlight the link of EHRs with aspects of organizational nature and their relevance as vectors of a change management process: the case study

implementation was regarded, at an executive level, as a change management project directed not merely at operational improvement through the raising of quality and efficiency standards, but as an overall reformulation of the hospital's identity and objectives as an organization. The second contribution is identified in the provision of practical know-how to other hospital services planning to implement EHRs, by clarifying the relevance of managerial, structural and leadership requirements in the preparation for implementation, by offering strategic choices - their justifications, opportunities and challenges - as guidelines for replication, and by furnishing insider's considerations on the major achievements and failures of the implementation process. Being the study one of perceptions, carried out on a limited amount of professionals, it is not possible to affirm that such perceptions, although pertaining to key professionals, are representative of a majoritarian perspective, or to make distinctions based on professional categories. Through the analysis of reports authors were led to suppose that the Nurse's approach was critical towards some of the implementation's strategic choices, namely, the choice of a baseline solution and the partnership configuration mode, whereas clinical directors and informatics were concerned with leadership issues and the way pre-implementation requirements had been planned, raising doubts concerning the lack of sufficient investments in communication and training of human skills. Nevertheless, the only way to confirm such assumptions would be to carry out further qualitative and quantitative research to verify the differences between the various professional categories. On a general basis, the results of this case study prove coherent with findings from existing literature on EHR implementation, confirming that the introduction of EHRs in hospital settings is a risky and uncertain process requiring an important leap of faith of all involved parties without intrinsic guarantee of success, and that the effort is virtually an everlasting one, given that the fulfillment of each implementation goal sets the basis for further refinements or new perspectives of exploitation of the clinical informatics solution (Berg, 1999; Ash et al., 2007). On a context-specific basis the implementation experience highlights the importance to take into consideration the human dimensions of the EHR implementation process. On a first instance for what concerns the need for collaboration patterns to be reorganized (notwithstanding preexisting internal divisions) as to gain at least partial consensus for the implementation to be put forward. In this sense, the case study proves a testimony to the fact that strong decisional, inter-professional bodies have to be instituted to redeem situations in which such negotiation isn't successful or sufficient as to avoid the implementation project reaching a definitive stop. The participative dimension of the change management process was taken into consideration in the implementation strategy where, in order to pursue the negotiation of needs and responsibilities, users were involved systematically since the very start of the implementation process, starting with the assessment phase, continuing with the constitution of the interdisciplinary team in the ED department, later replicated in the following units, until the constitution of the CIC. And, yet, the thorough involvement of users did

not eradicate the development of people-based obstacles and resistance towards the EHR. Under this point of view, the case study elucidates how, although some level of reluctance is inner-based and unavoidable, there is share of resistance that results from sub-optimal instruction strategies. Given that users were systematically involved in the process of implementation, a further consideration has been put forward: users engagement may not be sufficient condition to create a strong motivation concerning the desire for EHRs, given that users have to be empowered to master the EHR and forecast gains that go beyond the simple access, gathering and sharing of data, in order to be able to fully value the HIS. The experience in analysis leads the authors to make the recommendation, to entities planning to undergo the same process, to equally valorize and optimize technical and human requirements without prioritizing configuration over training and communication, and vice versa. Finally, it is recommendable for the management strategy to be adjustable enough to allow strategies to accommodate as the potentialities and weaknesses of the solution unfold, highlighting new needs and priorities, as, Berg (2001) points out, EHR implementation is essentially an iterative process, calling for a cyclical redesigning and reformulating of objectives which accompanies the evolution of a clinical solution as to make sure it is always the best fit for its host organization.

This study on which this chapter has been based represents a pioneer example within the Portuguese hospital context and it is highly recommended that further studies may be carried on the same subject, in hospital settings with different management models (public institutions, public limited companies, or public-private partnerships) or along different levels of the care process (primary or tertiary healthcare) in order to gather evidence on parallelisms on issues and solutions and collect a greater body of evidence on the subject. Additional research is also suggested to compare previous and new indicators, as to corroborate the appropriateness of the statements pertaining to the section of perceived outcomes, such as the increased quality and safety of health records, and their utilization as means for decisional supports.

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