Innovation in Brazilian and Spanish hospitals: the managers perception upon electronic patient record

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ABSTRACT

This research describes the adoption of Electronic Patient Record in Brazilian and Spanish hospitals, focusing on the role of such technology upon hospital management and on controversies linked to the process of building and introducing this tool. The theoretical background discusses innovation from a Schumpeterian perspective; services on a socio-technical approach, and the notion of Techno-Economic Network. The research was undertaken in two hospitals in Brazil and one in Spain. Twenty managers, being 15 in Brazil and five in Spain were interviewed on the period from April 2009 to March 2010, based on a structured interview schedule. Content inductive analysis with categorization a posteriori was the main technique of data analysis. The main results show this kind of Record as a multifaceted innovation that appears both on the macro-, meso- and micro- levels. The Record is, also, an innovation in service and management that re-signifies the product of hospital service, behaving as an actor-network that mediates management, under control mechanisms.

Keywords: Electronic patient record; innovation; hospital management; actor-network theory; techno-economic network.

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1. INTRODUCTION

Latin term *promptuarium* means "place to store or deposit the things we may need at any moment" (NOVAES, 2003, p. 43). This repository substantially contributes with the management of hospital and patient information, to support the process of health care; allowing the registration of medical actions; providing support to research; and promoting education and management services (MASSAD; MARIN, AZEVEDO NETO, 2003).

Since the end of the 19th century, clinical records of patients in hospitals undergo problems of integration and management of clinical information, making it essential to improve cost control and payment of hospital care. Added to that is the need to consider that patient care is a multidisciplinary service that is offered, i.e., many people are involved in the generation and use of information (MASSAD; MARIN; AZEVEDO NETO, 2003). One way of making this process more efficient would be the use of information technology, where the Electronic Patient Record (EPR) would be a possible solution for the problem. The use of this technology has been widespread in hospitals in different countries.

Thus, this study describes the adoption of the Electronic Patient Record (EPR) in hospitals in Brazil and Spain, focusing on the role of this technology in hospital management and discussion of controversies inherent to the development of the management process and implementation of this tool. The hospitals surveyed are in various stages of implementation of records, and the health systems of both surveyed countries have similarities. This justifies carrying out of such multi-case study.

Interest for the study of innovation in hospitals is justified by the fact that these are systems in which complex interactions occur between service providers, patients, managers and policy makers. Such interactions determine the time, direction and success of innovations in this area dealing this line, analyses that consider the set of multi-agent interactions are recommended - (WINDRUM; GARCÍA-GOÑI, 2008). Thus, we intend to contribute to broadening the discussion of innovation in hospital services, addressing the phenomenon of administrative innovation, which is still incipient as to what is known about the adoption of new "re-signifying" technologies" of hospital management. The administrative innovation phenomenon is still "poorly understood" (BIRKINSHAW; HAMEL; MOL, 2008, p.839).

2. THEORETICAL FRAMEWORK

Innovation plays a key role in socioeconomic and organizational development. And, for Dosi; Nelson; Winter (2000), that would be the only way for organizational survival. Schumpeter (1985, p.48) proposes five types of innovation: 1) introduction of new goods; 2) introduction of a new method; 3) creation of new markets; 4) achievement of a new supply source; and 5) new organization of the industry (e.g. : creation or fragmentation of a monopoly). This author had, above all, an evolutionary view of innovation, when he pointed out how poor the economic system of the "aid of experience" (p.13). He did not merely propose a "creative destruction" (SCHUMPETER, 1961). Malerba (2004), considering the accumulation of knowledge as a driver of innovation, identifies a shift of "creative destruction" to "creative accumulation".

For Tether (2003), "innovation is the successful exploration of ideas transformed into profitable products, processes, services or practices," an innovative organization is able to experience success with skills: strategic (e.g.: ability to quickly assimilate technology) and organizational (e.g.: trained human resources surrounding an idea) (p.3.10). The Organization for Economic Co-operation and Development (OECD) suggests levels of analysis for the phenomenon of innovation: 1) something new to the firm, but not for the market; 2) something new for the market in which the organization is located; and 3) innovation that promotes something new worldwide, generating international changes (OECD, 2005, p.58).

Innovation in organizations generally involves changes in organizational culture and behavior, leading to change. Weick and Quinn (1999) suggest two dimensions for the understanding of change: episodic and continuous. In episodic change, organizational intervention is formalized, with a global view of the process, clarity of goals and establishment of new standards of judgment of the desired transition. The continuous change has micro perspective, the cyclical nature of continuous learning and long periods of adaptation, which include improvisation, translation and learning.

Innovation can also be interpreted as a process consisting of steps: 1) researching environments - external and internal - that identify potential innovations; 2) selecting variables that would bring innovation and compromising resources; 3) choosing the option of innovation, from the accumulated knowledge and knowledge coming from the external environment; 4) implementing innovation; and 5) reflecting about learning from previous experience and/or accumulated from them (TIDD; BESSANT; PAVITT, 1997). That is a

linear view of the innovation process, not necessarily present in all cases, since the dynamics of innovation can lead to superimposed steps and recursive movements.

Birkinshaw; Hamel; Mol (2008) indicate four phases of administrative innovation: 1) Motivation, in which demands and facilitating factors lead to the development of innovation; 2) Invention, in which research based on the problem and trial-and-error actions lead to searching for new practices; 3) Implementation, in which agents of change are engaged and the necessary adjustments are monitored; and 4) Theorizing and Labeling, as institutional mechanisms to legitimize the new practice - assigning a name to innovation, e.g.: Total Quality Management, Balanced ScoreCard (BSC).

These authors assume that the innovation process is not something "simple as a sequence of activities, but rather a complex, recursive process, which occurs in cycles of variation, selection and retention" (BIRKINSHAW; HAMEL; MOL, 2008, p.832.) This is consistent with the approach proposed by Latour when dealing with the concept of 'circulating reference' (LATOUR, 2001), appointed by Brown and Capdevila (1999) as "perpetual mobile", whose innovation phenomenon is a network of translations.

Innovation represents a dynamic and complex process, giving rise to controversy. The mechanism of legitimating of innovation contributes to the confrontation of conflicts or disputes (MCADAM, 2005), being dispute a type of controversy (LATOUR, 2000). After minimizing conflicts, innovation becomes part of the routine (VASCONCELOS, 2008), even because the innovations of today are tomorrow's routines (BROWN, 1993). However, when it comes to service innovation, it is important to understand some peculiarities, since in this case, the process is more open and fluid. This entails the discussion of innovation in services from the perspective of techno-economic networks, which propels the logic of services like socio-technical interactions involving heterogeneous actors.

A service is the solution for a problem (GRONROOS, 1993). For Gadrey (2000; 2001) the provision of service is an interaction that occurs in socio-technical interaction in which hybridity between the technical and social occurs. There are situations where human intervention is small and technology is greater, and others in which social interaction predominates, with little participation of technologies.

Gallouj (2002) discusses three approaches of service innovation by proposing an integrated focus of analysis: 1) technicist approach, in which the overestimation of the dimension of technological innovation occurs, with primacy of the Information and Communication Technologies (ICT); 2) service-based approach, in which innovation is poorly understood, because it should not be analyzed in the same way as the industry

innovation; there are three ways: a) *ad hoc* innovation - the solution of the problem counts on customer's experience; b) anticipatory innovation - customer needs are monitored and generate expertise; and c) formalization of an innovation arising from a new method that formalizes behavior and 3) integrative approach, which assumes the necessity as a function that can be satisfied in the consumption of goods and services and symmetrically considers technological and non-technological innovations (GALLOUJ, 1994; 2002; DJELLAL; GALLOUJ, 1998, 2002).

This proposal of Gallouj (2002) shows to be compatible with the approach of this study, employing the Actor-Network Theory (ANT), which proposes a symmetrical approach, describing the hybrid construction of science and technology, not privileging a fact in relation to another (LATOUR, 2000; 2005). If a service is the combination of technical, methodological and social devices, then the best arrangement for the study of innovation in services may be the relationship between humans and non-human artifacts, regarding the view of ANT on the socio-technical networks. A network is comprised of translations, which are displacements or relocations of interests and goals (LATOUR, 2000). The translations that move this circulating reference (LATOUR, 2001) are necessary for the settlement of controversies. Therefore, it is important to know the types and reasons why controversies arise.

According to Venturini (2010, p.3) "a controversy refers to every part of science and technology that is not yet stabilized or closed in a 'black box'." Callon (2006, p.146) states that controversy "highlights the game of oppositions and alliances pursued by actors to identify, contain and divert constraints weighed upon them." From this perspective, Guesser (2006) presents factors that promote controversies about the adoption of a free software: a) the pressure-presence of relevant social groups; b) the beliefs, values - moral elements; c) the notion of risk, creating mistrust and insecurity; d) political, environmental and economic disputes; e) the relationship between individual and social expectations and goals of technological applications.

The purpose of controversies, Venturini (2010, p.4-5) suggests that they: a) involve all types of actors and heterogeneous relations among these actors, making a hybrid forum, with conflicts and negotiations; b) present the social aspect dynamically; c) are reduction and resistance, unlike the concept of dispute; d) are discussed, since they emerge when there is room for things, ideas, questioning; and e) are conflicts, because, although they do not generate open war, they create a shared universe that causes shock of worlds.

The Actor-Network Theory presupposes the concept of socio-technical network, or techno-economic network (TEN), composed of "actants" and actors who behave as intermediaries, spokesmen and mediators. Actant is the generic name of any network component, meaning anything that acts in a plot (human or non-human), including figurative roles, such as: citizen, armament (PINHO, 2005). The roles in a socio-technical network are not often clearly defined. An actor can be an intermediary or mediating-actor, provider of transformations or even spokesman for other heterogeneous actors. Hence the use of the term "jumble" (LATOUR, 1994) to explain behaviors and roles performed in networks. An actor is, in itself, the representation of the entire network it translates.

From this perspective, innovation can be considered a TEN translated into four periods: 1) questioning, in which actors and the nature of problems are defined; 2) definition of devices of attraction, in which agreements are carried outreach actor integrates or refuses the idea; 3) involvement of actors, assigning roles to each one; and 4) mobilization of actors, ensuring they represent their roles correctly (CALLON, 1986, pp.8-12). The translation results in "progressive learning, interactions, negotiations and adjustments that build the socio-technical networks". (CALLON, 1999, p.43) Innovation can be understood as "the result of a collective process of translation" (MACHADO; TEIXEIRA, 2005, p.5).

3. METHOD

This research was undertaken in three university hospitals (HUs): the *Hospital de Clinicas de Porto Alegre (HCPA)*, in Brazil, and *Hospital Universitario de Fuenlabrada (HUF)*, in Spain, which achieved visibility as a benchmark of success in the adoption of Electronic Patient Record (EPR), and the *Hospital Univesitário de Brasília (HUB)*, which has been discussing the implementation of this technology since 2004, without, however, consolidating its implementation. The *HUF* hospital started implementing EPR in 2004, on the same year it went into operation, and continued improving its EPR until the year of survey (2010). In turn, HCPA, since the 1980s, develops efforts of automation processes, emphasizing the development, improvement and expansion of the functions of EPR from the mid-1990s on.

We used the techniques of document analysis and interviews. The document analysis was based on consultations to the web pages of the hospitals. With these queries it was possible to better understand the organizational structures of the hospitals and, when available, the architecture of information systems. We also consulted the Spanish and

Brazilian legislation (laws, organic laws, resolutions of the class representative councils, internal newsletters, among others.) about the handling of patient information with the use of electronic media and other discussions relevant to the topic.

We interviewed 20 professionals with management positions in these hospitals, seven of the *Hospital Univesitário de Brasília (HUB)*, five at the *Hospital Universitario de Fuenlabrada / Madrid (HUF)* and eight at the *Hospital de Clinicas de Porto Alegre (HCPA)*. The selection rules of the respondents were based on Bardin (1977): completeness, representativeness, homogeneity and relevance. At the *HUB*, five interviewees were doctors and two were technicians in the IT area of the hospital, who monitor the efforts of implementing the EPR since years 2004/2005. At the *HUF*, four interviewees were performing double duty, acting as doctors and managers, and one was a manager in the IT area. At the *HCPA*, six respondents were doctors and/or nurses accumulating managerial functions, and two others worked with the management of information technology, and with file and hospital information management.

The "snowball" procedure (HENRY, 1990, p.21) was adopted, so that each subject indicated who would be the next interviewee. We used a structured questionnaire containing 12 questions, some based on Guesser (2006).

The average duration of each interview was 1h20min, totaling 23 hours of interviews, conducted between April 2009 and March 2010. After transcription, reading and re-reading each interview, we went ahead to the inductive analysis of the content with categorization *a posteriori* (BARDIN, 1977). The extraction procedures of topics, keywords or core meaning of the interviewees' statements were based on traditional procedures, of underlined notes and/or markings with colored painting brushes highlighting excerpts from speeches that would be important as empirical evidence of the analysis. Thus, we put together the inventory of emerging categories and/or subcategories of reading and re-reading of some 200 pages of interview content. Each respondent received a code, from G1, ..., G 20, together with the symbol of the country name (ES-Spain; BR-Brazil). E.g.: G20-BR (Manager 20 - Brazil) or G8-ES (Manager 8 - Spain), preserving anonymity.

The following sections discuss the process of adoption of the Electronic Patient Record, its role in hospital management and controversies resulting from this process, as well as the conclusions of this article.

4. THE PROCESS OF ADOPTING THE ELECTRONIC PATIENT RECORD

In two of the hospitals surveyed (*HCPA* and *HUF*), the adoption of electronic medical records followed the main stages of the innovation process recommended by Tidd, Bessant and Pavitt (1997), or phases of administrative innovation appointed by Birkinshaw; Hamel; Mol (2008) for the "solution of a problem" (DOSI, 1988) and/or taking an opportunity. It was initially a formal process, with schemes and action for the implementation of innovation, although this formalization was not clearly disclosed in the organizational environment.

The need for improving management and assisting information was one of the motivating reasons for the implementation of EPR in the three studied hospitals (*HCPA*, *HUF* and *HUB*). One manager said: "The record was facing serious problems such as excessive volume; expanding archive area; unnecessary documents - it was hard to find information; and the IT did not contribute to generate information" (G13-BR).

Step 1 - motivation for the introduction of an administrative innovation - can embarrass the organization by responding to the "pre-conditions and facilitating factors" that are presented both as a "problem" and as an "opportunity". This motivation may also result from requirements derived from the macro-environment, when there is a need to meet legal or professional standards, which govern a particular branch or sector, which characterizes innovation as a change from being institutionalized from mechanisms of "coercive isomorphism" (DiMAGGIO, POWELL, 2005, p. 77). In both surveyed Brazilian hospitals, the EPR meant management and assisting problem solving through the development of routines (NELSON; WINTER, 1997). In Spain, *HUF* solved, with the EPR, problems like those that have been reported in Brazil, but, also, its adoption has meant taking opportunity and fulfillment of demands of political-governmental context.

Having clarity of the motivating factors of innovation, one can analyze the process steps necessary for its implementation. The first step relates to the research and verification of motivations for innovation, which seems to agree, although not wishing to establish this sequential logic, with the moment of questioning, as recommended by Callon (1986). Thus, discussions and actions for assessing needs that took place in the *HUF* and *HCPA* hospitals considered the regimentation and coordination of people, resources and organizational capabilities.

At the *HUB*, in Brasília, this process was not clear in the statements of the respondents, and we also observed the lack of documents relating to actions and decisions taken by the general hospital management, between the years 2004/2009, for assessing needs

for the implementation of EPR. Some meetings were held, according to respondents, in order to guide the user to properly handle the tool, but there were no efforts of socio-technical interaction between managers, technologists (system developers) and users.

In the *HCPA*, in Brazil and *HUF*, in Spain, the following actions were pointed out in the process of adoption of EPR: formation of committees and multidisciplinary working groups; involvement of experts in Information Technology (IT) managers and potential users of the EPR in assessing needs; establishment of criteria of project prioritization; appointment of leaders. The leader was not necessarily a boss, but someone capable of facilitating the interface between users and IT staff; granting of autonomy, which corresponds to political support and infrastructure - by the hospital management, drawing to itself responsibility for choices, granting authority and legitimacy to the actors involved. A Spanish manager noted: "If the strategic direction does not assume that the implementation of the IT project is strategic, nobody will be able to take it forward. Nobody!" (G12-ES)

The critical-relational perspective on innovation in services, discussed by Gadrey (2000), indicates the co - production between provider and user, and that was observed in the process of implementation of EPR in the *HUF* and *HCPA* hospitals, according to corroborating statements: "The very active participation of users [...] results in a system with the 'characteristics of the user'. So it has great adhesion "(G13-BR)," We, technicians, have the least to say, in the implementation of a system like this one! It needs to come from the health professionals!" (G12-ES)

The subsequent steps to motivation and research involve the selection of variables of innovation, and its development, implementation and institutionalization. The mechanisms, referred by Callon (1986) as of attraction, involvement and mobilization of actors were observed in a superimposed manner on each step, confirming the same pattern of management procedures adopted in both *HCPA*, and *HUF*. In the initial stage - research and motivation for innovation - a strong role played by the management was detected in the definition and legitimacy of leaderships, in addition to moral and political support, and also financial and infrastructure. Respondents said: "The IT in this hospital is the 'apple of the eye' of the management. Thus, we have a lot of support "(G14-BR).

We needed to see that the ability of the IT area to absorb it, to what extent was the hospital willing to invest financially and the problem of membership of the medical staff [...] The administration, since the 1980s, wanted to invest in IT. The will was growing - can we do this? Can the hospital afford it? [...] After the surveys being carried out, the hospital was ready. So it accepted and gave carte blanche (G15-BR).

Callon (1986) warns that the success of the translation of a techno-economic network - depends on actors being attracted, engaged, and mobilized. The degree of involvement of actors will provide treatment to the network multilateral negotiations, efforts and experiences (p.10). It is inferred that, at all stages of innovation, two hospitals (*HCPA* and *HUF*) resorted to similar mechanisms of questioning, attraction, involvement and mobilization of actors (CALLON, 1986). That may clarify the reason why, in 2010, these two organizations had consolidated processes of adoption of EPR. Table 1 shows the main management actions taken for the adoption of the Electronic Record in the surveyed hospitals.

TABLE 1: MANAGEMENT ACTIONS FOR THE DEVELOPMENT AND IMPLEMENTATION OF EPR OBSERVED IN THE STUDIED HOSPITALS

<i>Hospital de Clínicas de Porto Alegre (HCPA)</i>	<i>Hospital Universitário de Brasília (HUB)</i>
<i>Hospital Universitario de Fuenlabrada - Madrid (HUF)</i>	Unconsolidated Implementation of EPR
Consolidated implementation of EPR	
Definition and legitimacy of leadership, moral, political, financial and infrastructure support.	Insufficient legitimacy in definition of leadership of the process, in addition to little moral, political, financial and infrastructure support. -
Constitution of committees and multidisciplinary working groups.	Insufficient clarity and organization in the regimentation of actors to be involved in multidisciplinary working groups.
Involvement of experts in Information Technology (IT) managers and potential users of the EPR in needs assessment.	Little involvement of experts in Information Technology (IT), managers and potential users of the EPR in needs assessment.
Establishment of criteria for prioritizing projects.	Lack of clear criteria for prioritizing projects.
Appointment of leaders. The leader was not necessarily a boss, but someone capable of facilitating the interface between users and the IT staff.	Appointment of leadership without considering how critical the fact that this leader should be someone able to facilitate the interface between users.
Granting of autonomy, which corresponds to the political and infrastructure support of the administration, drawing to itself responsibility for choices, granting authority and legitimacy to the actors involved.	Granting of autonomy to the project leader, but with insufficient political support and infrastructure by the administration.

The senior management of organizations in general plays a crucial role in the processes of organizational change and innovation. The routinization of management and resources, and of organizational capabilities are factors that promote the competitive maintenance of an organization and, in moments of change, it is essential to resort to such mechanisms for achieving the goal.

In the case of the *HUB*, which had not implemented the electronic record by the year 2010, some of the difficulties faced by the hospital, according to interviewees' statements,

may explain the fact: "The big problem was: 'it is necessary to do the EPR. But, forget that you need manpower!'. I believe the board of the hospital is involved, but lacks qualified personnel" (G5-BR);

This wearing out [...] is not because of the tool itself. It's the way it came and was introduced [...]. That's why I say, with all the letters: it is lack of competence to implement it. This caused serious problems, that today we will have to recover somehow ... [...] In fact, the electronic record has never been permanently implemented. There has always been partial implementation ... (G2-BR).

The "technicist" view of innovation, criticized by Djellal and Gallouj (2007), fails to take into account that the hospital organization is a complex network with multi-agent interactions which must assess style of leadership, existing socio-technical interactions organizational culture change-oriented, and other mechanisms that show a recognition that innovation is a "multifaceted phenomenon" (VAN de VEN; ANGLE, 2000). Furthermore, if the organization does not have capabilities that are motivating the development of resources, only the intention would not be ingredient enough for the consolidation of a complex process as the adoption of innovations.

Rothwell (1994, p.11) cites organizational factors that contribute to the success of innovation: commitment of the administration; ostensible support for innovation; corporate strategy associated with a long-term technology strategy; long-term commitment to major projects; flexibility; acceptance of change; risk taking by management; sensitivity to innovation and reception of entrepreneurship. This was verified in the *HCPA* hospitals, in Porto Alegre, and *HUF*, in Madrid. Respondents from both hospitals mentioned that "the general management assumed this" fight "or" believed in this project" and then, things happened.

5. THE ELECTRONIC RECORD IN HOSPITAL MANAGEMENT

When asked for the reason of adopting the electronic medical records and what it added to the hospital management, the respondents cited advantages offered by the tool. While the gains were pointed out, four components of a category to classify the EPR emerged from the inductive content analysis: 1) control of time, expediting assistance; 2) control of work, changing work methods and behaviors, as well as providing monitoring of performance of people and industries; 3) cost control and 4) control of information, regarding safety, registration and storage, providing intelligent systems for decision support.

The statements described below show, respectively, control of the working process, control information and control of time: "The pharmacy avoided much prescription error,

because the 'doctor's confusing handwriting' is over" (G13-BR); "Everything in the literature said about record in paper and the advantages of EPR were apparent to us. Storage, security, preservation of confidentiality; quality of information; research, management, the legal aspect and indicators ..." (G13-BR)

EPR means I have control of everything! Everything! From my computer I can see agendas, new patients [...] If there is delay, I can time the delay. That is: absolute control of everything. And that's good ...(G8 - ES).

The Electronic Patient Record is perceived as a mediating actor-network of administrative and assisting management control. By observing the role played by the electronic patient records in the techno-economic networks in the surveyed hospitals, there is a category of analysis for the record as mediating actor that translates a series of interest, summing up in the actor-network itself, which forms and crystallizes the network into study, as is possible to identify in these statements: "You can link all sectors" (BR-G1), "The EPR coordinates pathologic analysis, x-rays, video, everything!" (G10-ES), "The tool is a great recognition of multi-professionalism in medical care" (G2-BR).

A control system is used to measure and motivate performance, both individual and organizational (MINTZBERG, 1998). It is proposed that a network is stable when its control system advises that the disputes were resolved by means of translations that occurred in the organizational process. Control was one of the words spoken by most respondents, involving the field of information for effective decision support and control of proceedings, as advantages offered by the EPR.

In addition, Spanish and Brazilian managers who were interviewed emphasized that the electronic medical record is an unfinished tool, constantly evolving, which authenticates the concept of perpetual mobile (BROWN; CAPDEVILA, 1999), or circulating reference (LATOUR, 2001). The EPR is perceived as an uninterrupted process of network of "translations" (LATOUR, 2000), with a non-static nature of formation and dissolution. Some respondents said: "It is never ready and never will be! [...] 'EPR is not a product. It is a process!'. We will never have a completed system." (G13-BR), "It is a process that is just not over [...] Well, let's go on." (G ES-9), "The EPR is a living thing; it is like a *tamagotchi*. It is always growing ..." (G18-BR)

The Electronic Patient Record portrays characteristics of administrative innovation that occurs incrementally. It is an innovation based on the introduction of a new method or process of providing service. Considering the taxonomy of Weick and Quinn (1999), it is possible to state that the introduction of EPR in *HCPA* hospitals in Porto Alegre and *HUF* in Madrid occurred as a continuous change, due to the cyclical nature, with periods of

adaptation, translation and continuous learning. However, at first, there were plans and schemes of action, typical of episodic change.

Innovation is so complex that it is advisable to establish levels of analysis for their classification. When the interviewed discoursed about the meaning of EPR for hospital management, it was evident that this record is perceived as a management innovation, being considered at **macro** level of analysis, an innovation in services, in the hospital industry. Statements of the respondents mentioned a concern: "It is not easy. If it were, the U.S., all hospitals would be computerized and would have a 'handful' with a complete EPR!" (G13-BR).

The quality of care is associated with the availability of patient information. It is no longer an innovation. That decision, hospitals should have made 10 years ago. We're late. It is not 'we, Brazil.' It is the world. I visited a month ago, a hospital in the U.S. which has a medical record system, if I can call it that, which is pure computerization of processes in "DOS"! A hospital having sophisticated equipment, which cost \$4 million dollars, of very little use. Why do they not have a better system? I don't know why ... (G20-BR).

Thus, it can be said that the EPR is an innovation for the service sector in general, when analyzing its support for the intelligent integration of information and decision support not only when introducing process automation.

At a **meso** level of analysis, it appears that the electronic records are an innovation in hospitals which are still in the initial process of adoption of this tool. However, in hospitals that already have it implemented and matured, this record cooperates with the routine of management and assisting support, i.e., it becomes an organizational capacity. That is reinforced by the following statement:

In a few hospitals you will find EPR in the format it should be! People try to 'computerize'. However ... EPR the way we know it is innovative when it has nature of integration, of generating information for decision making. (G19-BR).

The electronic medical record means, therefore, an innovation to the market. Thus, the EPR can be classified as a type 2 innovation, considering the classification of the OECD, by bringing "something new to the market" in which the organization is located (OECD, 2005, p.58).

At the **micro** level of analysis, the EPR is an administrative innovation (BIRKINSHAW; HAMEL; MOL, 2008), a fact reinforced by respondents: "The hospital processes are highly optimized with an appropriate information system. Knowledge regarding management improves ostensibly!" (G12-ES) In this line, this record serves as an actor-network facilitator, under the condition of a mechanism for management control. That

inference is reinforced by four categories related to control, which represent the electronic medical record: control of time, labor, cost and information.

As for the agility provided by the EPR to patient care, there are differences among respondents. Some say that although they have quality information and in greater volume, daily life with the EPR makes the work more thorough and in need of more information to be entered by the user. "We were afraid it would not be fast ... That it would make the job more complicated. And what we have seen is that the EPR does not make the work more agile [...]" (G8-ES)

The HCPA measured the time of entry, length of stay and when the patient leaves, after the implementation of EPR and concluded that there was no significant increase in service time. However, the hospital recognizes that the work of the user becomes more methodical, requiring greater attention in particular as regards the insertion of information into the system. Thus, it is clear that there is controversy. Some respondents said that the work is expedited with the use of electronic medical records, while other respondents believe that the work becomes slower, although more thorough, providing information with the highest level of quality. The statements below indicate that the EPR is a mediating actor assisting in the control and improvement of working methods:

In a normal appointment, the EPR slows the service ...A patient is seen more slowly. Even if you have information on the screen, you have to write ... The doctors write very badly on the machine ... [...] the organization of medical records was done by assistants. Now, the doctor has to do it! (G9-ES).

The staff sees in it a powerful tool of control. The personnel performing the tasks thinks, "I will be controlled" and the leader thinks "this will allow me to better observe the development of activities.(G 2-BR).

Regarding the perception of EPR as a mediating actor of cost control, this became evident due to the fact that its adoption is, according to most respondents, associated with money savings. Respondents cited cost control and saving money as advantages of the Electronic Record in hospital management: "There has been a significant economic investment for us to take the idea forward. Possibly, not much more than we would spend if we had a 'traditional file" (G9-ES);

Doctors ... requesting an exam today, did not even wait for the results and went ahead and requested the same exams again [...] so that generates cost, it is expensive. So we felt the need for EPR, because if the exam has been requested [...] it will not request again (G5-BR).

The size of the electronic medical record as a mediating actor, acting on information control, was the most explored by the interviewees. EPR improves the management, saving and organization of information: "What matters is: which information do we want to keep? [...] On paper, you place whatever you want, however, soon you will look for it ... On the

computer, perhaps one of the advantages is to structure all the information"(G9-ES), " The Federal Council of Medicine [...]just wants do know if the manager will follow whatever is in the rules about saving medical records. If someone asks for the record, is the data available? Does he have the right to? Who will be able to access it?" (G4-BR)

Other benefits of control information from the use of EPR were mentioned by respondents: the availability of information at any time and place where managers and health professionals need them, plus the improvement of research activities, inherent to hospitals. One respondent reflected: "We saw how the paper record is flawed when we collected data for research. I went to survey 1000 colonoscopies; I needed the age of patients, but 30% did not have an age..." (G4-BR).

Given the survey data, on the four dimensions of control that support environmental decision-making with information and assistance in hospitals, Figure 1 was organized in order to synthesize the meaning of the EPR.

FIGURE 1: THE ELECTRONIC PATIENT RECORD AS A MEDIATING NETWORK-ACTOR ON MANAGEMENT ON ADMINISTRATIVE AND ASSISTING CONTROL

Figure 1 shows the defining category of the Electronic Patient Record, as a network-actor that serves to mediate between government and other actors of hospital activity, also representing an important "actor" for the strategic focus of the administration - the patient. Brazilian and Spanish respondents emphasized that "the patient is now in the middle" of management and assisting concerns. This definitely moves the view, which was before administrative and organizational, and now, assistive.

6. CONTROVERSIES INHERENT TO THE ELECTRONIC MEDICAL RECORD

In order to learn about the controversies and solutions regarding the Electronic Patient Record, the concept of "translation as the displacement of interests and goals" is resumed (LATOURET, 2000, p. 187). Without controversy, the translation is not questioned and the network stabilizes.

Some manifestations of controversy were found in interviews conducted with respondents in Brazil and Spain: usability - system initially user-unfriendly - which led to a strike of a certain category of users in one of the hospitals surveyed; fear of unauthorized access to records; moderate interference of trade unions and union councils regarding confidentiality and security of patient information; questions about working conditions for users; certification of electronic documents - how to validate them. Moreover, inter-departmental disputes arose regarding the prioritization of demands; interface problems with applications; difficulties due to reduced IT staff; fear of system crashes that would prevent the continuation of care; necessity of customizing the design of EPR per medical specialty; and, finally, the need for better filters as to the best information available, reinforcing the need for customization, as reflected in this statement:

[The record] helps, but I miss a customized system [...] we have a system "for all". Why would I want to look at a gynecology record? I would dare to say: abolish it. I don't need that information. And I cannot ask for it ... (G10-ES).

Other symptoms of controversies were also mentioned: allegations of refractory users to new ICTs - where the computer would deteriorate the doctor-patient relationship, and complaints as to the requirement for a more methodical approach by the users. For example, what this statement says: "It seems that it takes up more time. I sit and write. But now, you have to do a lot of things on the computer that force you to be methodical ..." (G 8-ES)

The controversies enrolled are reproduced in the literature, which cites these symptoms in the process of introducing innovations (GUESSER, 2004; 2006; McADAM, 2005; Venturini, 2010). These manifestations of controversy presented by the interviewees can be grouped as: 1) controversies related to information security; 2) controversies regarding changes in the working process; 3) controversies arising from disputes between specialties / professions / departments.

We sought to understand how managers of surveyed hospitals solved this controversy. The solutions mentioned by respondents from *HCPA* and *HUF* were: continuous improvement of the system with the participation of professionals and users; contingency plans; eventual disclosures of standards; legitimacy of leadership; attitude of management,

assigning power to the committees of users and IT; meetings with groups and committees inter-organizational, as seen in statements: " We have three contingency plans [...] because each sector is different. We restrict access much, by zeal, so the 'thing does not get out of hand' after implemented" (G17-BR), " The controversies have nothing to do with the information systems and EPR. They are of organizational nature ...Leadership! Clear rules and procedures, delegation of authority and responsibility; focus on process management "(G12-ES).

In addition to these solutions, respondents cited the stimulus to the suggestions and notifications coming from the user; concern for transparency in the development of EPR; disclosure of safety guarantees and security of patient data. "I think it's keeping the door open for people to suggest improvements and make criticism [...] the system is being much discussed" (G20-BR), "People join because they participate [...]You can't build anything alone, right?" (G15-BR)

The strategies used in dispute resolution characterize *HUF* and *HCPA* hospitals as "innovative organizations" (TETHER, 2003). Besides the efforts to make things happen, resources, people and capabilities towards the desired goal are made feasible. It is inferred that the administration has a crucial role in the adoption of EPR, and it would be important to deepen investigations on the existence of a relationship between the posture of the administration and the level of adhesion of those involved in the success of an innovation.

7. CONCLUSIONS

This study aimed to describe, in the view of managers, the process of introducing the Electronic Patient Record in hospitals in Brazil and Spain, the role of this technology in hospital management, as well as controversies and solutions inherent to the adoption of this technology. It is worth noting that Farias et al. (2011) studied the user perspective of EPR (doctors, nurses and other health professionals of higher education) in two hospital organizations which were also *locus* of this research. This study presents the perspective of the hospital manager, so both studies may provide an integrated view of the meaning and importance of the adoption of EPR in hospitals.

Based on empirical evidence and the support provided by the theory, we conclude that the EPR is an innovation when the three levels of analysis are considered: **macro-level**, it is an innovation in a branch of the service, which is the hospital, although we cannot state it is an innovation for the macro services sector, given it has turned into daily routine in hospitals that

already use it routinely. In the classification of innovation in services it is important to consider intra-sectorial differences.

At **meso** level of analysis, it represents innovation for the hospital market, considering the universe of hospitals around the world, however, to hospitals where its adoption is already matured such as the *Hospital de Clinicas de Porto Alegre (HCPA)* and the *Hospital Universitario de Fuenlabrada (HUF)* in Madrid, it becomes a tool inserted into the routine, despite having brought about substantial changes regarding service (GADREY, 2001).

At **micro** level of analysis, the EPR is an administrative innovation by "re- signifying" the decision-making process into something smarter, safer, more thorough, less costly, through mechanisms of control, driving the management of a significant amount of information. In addition to bringing new meaning to the product of service, the EPR allowed to re-think labor control, the performance of people, and also the re-design of processes and working methods, which classify the studied innovation as the "introduction of new methods" (SCHUMPETER, 1985, p.48).

It is admitted, finally, that the EPR is a network-actor whose primary role is to translate the techno-economic network represented, in the case of this research, by two hospitals studied (*HCPA* and *HUF*), working as a network-actor mediating strategic administration, which implementation process resulted in translations and controversies, reflecting the concept of perpetual *mobile*, associated with the evolutionary-incremental view of innovation.

Concerning the translations and disputes noted in the introduction of the EPR, it was found that Callon's (1986) steps of translating overlapping the management process of innovation introduction suggested by Tidd, Bessant and Pavitt (1997) and by Birkinshaw, Hamel, Mol (2008) support the perspective of episodic view discussed by Weick and Quinn (1999) in a first moment of definitions, schemes and plans of action. In the second stage, actions arise from improvements and increased innovation, making the situation change to a process of continuous change, in which knowledge and experience become part of the context, and again the translations and controversies redesign a new EPR. An electronic medical record constantly changing, which resignifies itself as a network-actor, as well as resignifying, as mediator, labor, management and hospital care process in an integrated manner.

This study contributed to knowledge in an area lacking studies in Brazil - adoption of information technologies and communication in the management of hospitals. Another empirical-theoretical contribution of this research refers to the study of technology adoption

in organizations using the perspective of the Network-Actor Theory and, specifically, the application of the concept of controversy. An empirical contribution of this study was the identification of items related to the reactions of managers about the EPR, which can enable the generation of a standardized instrument to identify barriers and facilitating factors for the implementation of this tool in hospitals. Furthermore, the research results provided input for the organizations studied and other similar organizations. Among these contributions, we mention the analysis of management actions recommended for the implementation of the Electronic Patient Record.

This research has limitations. In the case of a study supported by the perceptions of managers, it does not cover what other users think of the studied tool. The number of organizations involved also represents a limitation of the study. This means that the results cannot be generalized. Anyhow, the fact that the study was performed in hospitals located in two countries was a strategy to minimize these limitations. The study did not analyze, also, if possible cultural differences between the two groups of respondents - Brazilian and Spanish, might have something to do with the results. For that end, it would be necessary to include, in the data collection, items related to culture in their countries. It is important to remember, however, that the institutional structures of health systems in Brazil and Spain hold more similarities than differences, and the interviews showed that the perceptions of Brazilians and Spanish about the electronic medical records in hospitals, are similar.

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