IMPROVISATION IN TIGHTLY CONTROLLED WORK ENVIRONMENTS:

THE CASE OF MEDICAL PRACTICE[1]

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ABSTRACT

We present a qualitative analysis of organizational improvisation and provide a preliminary insight into the following question: how is improvisation present in tightly controlled work environments? We conducted *in situ* observations of, and interviews with, several emergency medical teams and complemented this information with statistical and media data. Using grounded theory, we developed four propositions that were arranged into a model that allowed the identification of two use levels of established routines: (1) the visible side that accommodates contextual requirements, and (2) the improvisational side that provides a response to activity characteristics. This dual process is related to the existence of pressures that operate at the institutional level with practical needs emerging from the operational domain. In contrast with most of the literature, this study reveals that the presence of a broad procedural organizational memory does not restrict improvisation but enables a bureaucratic system to produce flexible improvised performance.

Keywords: organizations; improvisation; routines; medical practice.

INTRODUCTION

Considering improvisation as the reuse of organizational members' knowledge and procedures to accommodate an adequate performance that complies with situational specifications, the medical-hospital scenario is used to test improvisation's triggering and application conditions in a tightly controlled work environment.

Improvisation's importance as a study subject is related to the fact that the literature recognizes its relevance in organizational contexts (e.g., Moorman and Miner 1998) and because there is still the opportunity to explore this subject, especially in how performative flexibility subsists in an environment with a high number of procedural controls.

We have chosen the medical practice scenario to conduct this empirical research after examining previous work that pointed out the activity characteristics that makes it an interesting set to study, observe and analyse improvisation.

Medicine implies an individualized practice because of the nature of each specific situation. Our informants considered it "an art and a science", that contains a high degree of variability demanding an adjustment of behaviors and performances. Adjustments are made to comply with the nature of illnesses, the multiple variables that influence the human body's response to treatments, the complex combination of diseases, the physicians' need to integrate different patterns of information to elaborate diagnosis and treatment algorithms, and the existence of emergency situations. All these factors have led us to define this activity as suitable for developing empirical work on improvisation.

This study provides an opportunity to extract contributions for theory and practice. Regarding organizational theory we point out: (a) the external environment's influence in the use of improvisation; (b) the relevance of improvisation for an effective performance in environments with strong procedural controls; and (c) the conceptualization of two usage levels of routines to encompass the influence of conflicting variables. Contributions to

organizational practice include the development of an external perspective to the medical context that allows no penalty for improvisational action.

RESEARCH SCENARIO

The decision to study improvisation in medical organizations resulted from an analysis of previous work on organizational improvisation, where these organizations are presented as a convenient set for investigation (Crossan and Sorrenti 1997; King and Ranft 2001; Weick 1998).

To reinforce the suitability of this choice, we sought to access the nature of medical practice. Medicine is a science involving individualized practice, whose answers are not definitive, with the expression "medicine is more of an art than a science" holding some substance. The nature of medical practice implies that although it is not casual, it involves a great deal of impromptu action in the realms of both diagnosis and treatment. Considering that diseases present themselves differently in individuals, one can not capture its variable and ephemeral nature in predetermined ways. The factors that contribute to this uniqueness are extremely diversified. Every human being is different, and variables such as age, gender, and habits, among many others, may influence the way each complex bodily system will react in the presence of pathologic agents. Other factors, including psychological ones, also have an influence on the variability of treatment options for various diseases.

The ambiguity and complexity of treatment options and the fact that side effects, including other pathologies, occur, requires doctors to adjust their knowledge to every clinical case and specific situation (Tucker and Edmondson 2003; Weick and Sutcliffe 2003).

In diagnoses, particularly, physicians must be able to apprehend the given information in order to identify adequate therapeutic treatment regarding the combination of pathologies considering the non-linear probabilities inherent in each one of them. As King and Ranft

(2001) have noted, every medical procedure aggregates high levels of ambiguity that forces knowledge structures to be flexible enough to respond to procedural complexity and allow adjustment between information received and an uncertain result.

As Edmondson, Bohmer and Pisano (2001) pointed out, medical practice is more likely to be a trial-and-error process or a real-facts "guess trial", rather than a science. Estimates show that only 15% of medical activities are based on fully known facts (Pfeffer and Sutton 2006a). As such, this activity is characterized by decision making in the absence of all the information related to the situation under analysis (King and Ranft 2001).

After selecting the hospital as the research setting, we needed to establish what area to study. For this purpose, we contacted a hospital board member to assess potential areas of investigation. Considering the clinical specialities and all the hospital services, we narrowed our research area down to emergency service and intensive medicine service (intensive care unit), since actions that are developed there can be described as non-routinized and characterized by their circumstantial nature.

The final selection fell on the emergency service. This decision was based on references to the service dynamics, characterized by turbulence, where the arrival of sick people is unpredictable and inconstant. In addition, the diverse illnesses and injuries that compel individuals to come to this unit differ on a daily basis, which means this unit's work is extremely diversified.

Medical teams in this hospital unit are also under greater variability and rotation (in number of elements, clinical specialties and experience), in contrast to the remaining teams of health professionals in the unit (nurses and assistants), who work exclusively in the emergency service. This unit also receives patients in emergency situations who have not been admitted to other hospital units and whose lives can be at risk. This can require a

reorganization of service dynamics, in a limited time frame, to incorporate and adapt to the new situation in the task allocation plan.

The emergency service also allows, because of medical situations and team members experience diversity, to observe, in a small time gap, the iterative process of diagnosis definition that is progressively adjusted to therapeutics results.

Thus, the emergency services unit was qualified as an adequate set in which to study improvisational behaviors. This complies with Crossan and Sorrenti's (1997) reference to the emergency unit as an improvisational scenario, and to Cunha and Cunha's (2001) indication of the occurrence of improvisation when an organization faces important, urgent, and difficult events. The existence of unexpected events is also present in this set where the existence of improvisation can be verified, because in these situations the existing forms of action included in organizational plans do not present the proper relevance or do not contemplate the situation (Moorman and Miner 1998). Thus, if emergency situations are enclosed in the "important, urgent and difficult events" category, meaning that they are not excluded from action plans, but that they are not standardized, the choice of the emergency service unit is confirmed as an convenient scenario to develop this study.

The exclusion of other medical units as possible research scenarios does not mean that improvisation does not take place there. The contacts established previously mentioned that those units, in general, are characterised by fewer unusual behavioral patterns. In this light, the emergency service unit was a potentially richer research set compared to other hospital services units. However, in every medical unit, the practical nature of medicine implies the permanent need to adapt knowledge to specific patient situations, which is not repeated in a systematic way. This supposedly implies the need for organizational improvisation.

METHOD

Research Design

Grounded theory was considered an adequate method to approach the research question. This method allows the development of a conceptual system using evidence from a complex context. It also enables to deepen the existing knowledge related to organizational improvisation and, simultaneously, keeps the research question within a broader scope to subsume the nature of situations that take place in the research scenario.

The possible use of different data sources, the analysis and the theoretical frame construction has to follow grounded theorizing guidelines. This allows more robust conclusions that are in line with the social and organizational reality and evidence about behavioral features that the participants consider of outmost importance for their activity.

From the application of grounded theory and the iterative process between data and theory, we obtained six categories that allowed the development of four propositions and were aggregated into a model of medical practice in the emergency service.

Data Collection

Data collection was performed in six different phases in a two and an half years period by the first author. Each preceding phase determined the following step of this process that was developed in an emergency service unit of a hospital in the European Union, which began its activity in October 1999, has 511 beds for in-patients, a staff of 219 doctors and 280 nurses, several clinics for outpatients and services in 25 medical specialties.

We started *in situ* observations (200 hours and 35 minutes) of several medical emergency teams working in different shifts. These teams, according to the day of the week and shift, do not have a standard composition. For example, night shifts have fewer physicians than day shifts. Normally, a day team would comprise ten experienced doctors and five or six interns; a night team would have two experienced doctors and two or three interns.

The observations enabled us to become acquainted with the work itself and with service procedures, as well as to collect facts related to the research goal. Twenty-six interviews were conducted to complement observations. The second phase was dedicated to gather supplement data (e.g., statistics and media information) and the third to additional observation hours (64 hours and 5 minutes) in order to establish if all the relevant facts were captured in the beginning of the process. The following phases were necessary to confirm that the categories and concepts emerging from grounded theory were a reflection of reality. This phase was used to test our interpretation with the health professionals. Figure 1 presents a brief description of the different types of collected data during the research process.

Data Analysis

The data collection and theory development process was based in an iterative analysis between data and the emergent theoretical structure as suggested by Strauss and Corbin (1998). This began by identifying concepts through "open" coding, that the participants related to their professional practice and with the relevance and restraints of medical performance. These codes allowed the construction of provisional categories, and data was reanalyzed to confirm the framework. If a category did not fit the data, it was revised or rejected. The remaining categories directed the subsequent stages of data collection determining what type of data was requested to continue the development of the study.

Literature on medical practice, improvisation and related constructs (e.g., defensive medicine; evidence-based medicine; routines; minimal structures; organizational memory; learning) provided the conceptual background to relate the existing incidents (e.g., performance references panels) to a broader category (e.g., standardization). The composition of tables and category summaries assisted the interpretation. Data source triangulation (e.g.,

observations; interviews; statistical data; press articles) helped overcome difficulties and improve and strengthen the emerging categories (Glaser and Strauss 1967).

Subsequent data analysis was performed, through comparison, to generate more general conceptual categories, and gradually depart from the informants' point of view to reach a higher level explanation (Locke 2001). After theoretical categories emerged, their properties and dimensions were checked to identify how they relate among themselves in a coherent way. At this point, notes taken at early stages were used to test for support of the relationships among concepts. New data and additional theory iterations allowed the identification of temporary theoretical frameworks. Afterwards, data was again re-examined to access its adjustment to the emerging theoretical framework (Glaser and Strauss 1967; Locke 2001). Feedback by most of the participants in the study reinforced the reliability of the construct and model that provides a plausible explanation of the phenomena under study.

IMPROVISATION IN MEDICAL PRACTICE

What emerged from data analysis was the existence of two apposite forces: one referring to the need of behavioral adaptability, due to the nature of this activity; and the second referring to the progressive standardization of behaviors as a consequence of the adoption of what is called "defensive medicine", which results from intense scrutiny from the media and institutional environment.

Our data suggests the existence of defensive behaviors especially when doctors are still in training, where several support structures exist that stimulate this behavior and its standardization (e.g., indications of therapeutic regimes, warnings and reminders concerning the accomplishment of certain performance parameters that are exhibited on the walls of observation offices', doctors' rooms, and nurses' rooms, through – see Appendix 1 and Appendix 2 for examples). Conversely, we can also verify the concern about the individuality

of each patient and the specifics of each situation, which gives rise to the adaptation of doctors' performances based on scientific indications or up-to-date parameters through complementary examinations of the patient's clinical situation.

Figure 2 presents a brief description of the categories that emerged from the analysis and some examples of the data that originated them. The names given to categories were the result of contextual suggestions and situations that supported their development (Strauss and Corbin 1998). It provides an insight on the collected data and its relevance to this study.

Figure 2 about here

Professional Distinctiveness

Medical practice is characterized by the "trial-and-error" component of diagnosis that is accomplished by the elimination of possible hypotheses and by the need to adjust knowledge to the peculiarities of each specific situation (Tucker and Edmondson 2003; Weick and Sutcliffe 2003). This is complemented by the idea that diseases manifest differently among individuals, as well as the patient's clinical evolution (Katz-Navon et al. 2005; Ten Teije et al. 2006).

Medicine is characterized by forcing individualized practice because there are several variables that introduce ambiguity and complexity to its application (Adler et al. 2003; Reay and Hinings 2005). Diagnosis and subsequent treatment depend on the progressive elimination of hypotheses during clinical investigation of patients. Variability and suitableness are permanent factors in this practice that induce improvisation.

Considering this, we can advance the following proposition:

Proposition 1: The activity characteristics push medical practice towards improvisation.

Surrounding Sphere

We identified the environmental influence during the interviews and in press articles. It apprehends the fact that every clinical case or situation has some potential of media interest. As a physician told us "almost all news are about errors or negligence; it is difficult to find positive features [in medicine] in the media." Media's effect on performance is also related to the negative approach that is made in several reports/articles concerning such events as deaths, errors, the covering of faulty situations, lack of evidence and archiving legal processes. Media interference has already been mentioned in the literature that relates it to defensive practices (Elmore et al. 2005; Hiyama et al. 2006; Sharma et al. 2003).

We were also able to identify demanding behaviors towards emergency service staff, such as complaints, threats of media exposure, or lies to accelerate attending time (Charles et al. 1992). In the data-collection phases, it was possible to observe what users had learned about the sorting system to identify specific symptoms so priority could be given to more serious cases. In a medical setting, users cannot make an adequate assessment of the seriousness of their medical condition (Campbell 1999; Hunt et al. 1996). This is somewhat understandable since every human being feels his problem is unique and wants to solve it as soon as possible. There is total indifference towards others who are also using the emergency services and to the service dynamics and operation.

The environmental influence comprises ongoing changes in a society that shows a preference for legal defensible behaviors rather than more adequate organizational or interpersonal procedures (Pfeffer 1994), imposing negative conditioning on medical practice that can be transposed to the way physicians see their patients (as harmful to their careers). Although some interviewers consider this to be a daily concern, they try not to let it influence the patient-doctor relationship. To consider a patient as a potential threat can be harmful to the patient him/herself (Coates 2002; Manner 2007; Studdert et al. 2005; Summerton 1995). So,

the need, even if not conscious, to use pre-determined rules and procedures that allow for the protection of medical performance is imperative (Asher et al. 2007; Quinn 1998; Yokota et al. 2006; Zuckerman 1984).

The importance of knowing the attributes of the environment is related to the organization's need to establish a dynamic setting for its activities, either internally through its processes and organization, or externally through its activities in serving the needs of the population, which is impossible without knowing these characteristics. Legislation for the relevant sector often seeks to explain and incorporate these characteristics so organizations can adapt to their internal systems.

In this study, and regarding the influence of the external environment on the development of the medical practice, we point out the following factors: First, as referred to in interviews and complemented through observation and data obtained from the Doctors' Board, the Doctors' National Unit, and the media, one must consider the increasing numbers of people using the National Health Service to address claims of negligence or medical errors, which have resulted in loss of human life. We must also consider denunciations of the accuracy of certain facts and the results of lawsuits instigated against doctors.

Second, we acknowledge the existence of behaviors that aim to intimidate health professionals, which are manifested as physical threats, threats of lawsuits, threats of media exposure, etc. These were especially seen during the observation phases. As examples, we refer to the reaction of a relative who claimed an assistant doctor had not spent enough time examining his daughter and threatened to lay an administrative complaint against the doctor; a man in his forties who threatened to complain to the media because he thought the waiting time for analysis results was excessive; and a person who threatened to assault a medical assistant.

This kind of behavior can make a doctor apprehensive in his relationship with a patient, since any negligence or error on his/her part may have negative consequences on that doctor's career. In this context we may add the need to apply international protocols tested in wide samples for the purpose of protecting eventual justifications in the presence of processes which have been instigated.

Thus, we developed the following proposition:

Proposition 2: The environment pushes medical practice towards behavioral standardization.

Administrative Prescriptions

The quality accreditation process in progress demands that, for every service and hospital area, every member of staff must follow an established pre-set of rules (Cook et al. 1983; Smith and Mick 1985). These administrative changes are still in progress and some internal and external audits are still being made under the protocol established between the Health Quality Institute and the King's Fund Health Quality Service in 1999. This hospital is part of a third group of hospitals that have started paperwork for hospital quality accreditation by the National Program of Hospital Accreditation.

This program, which enhances the hospital's image and credibility, is financed by European Union communitarian funds. These funds are applied to finance such projects as human resources training and the provision of equipment and infrastructures to maintain improvements in structures and processes.

The implementation of the program in several functional and administrative areas of the hospital, leads to the establishment of a set of mandatory procedures to enhance the development of certain activities, whose fundamental purpose is to improve health care, and to improve the organization's performance, its management and innovation capacity.

At an operational level and for professionals who deal directly with patients it is verified that in view of the fact that the accredited organization assures the quality of its services rendered, patient risk transfers to the hospital, which implies protection of performance in the present context.

Throughout the observation process it was also possible to verify that more experienced team members were available to cooperate and help other team members in their job performance. Those behaviors were explicitly visible among interns in more advanced stages of the learning process towards first-year interns; specialists and all other team members also demonstrated this behavior (Nelson 1991; Spitler 2005). There was also the generalized concern to teach undergraduate team members acceptable and adequate behaviors that enable them to perform as expected (Boudreau and Robey 2005; Pfeffer and Sutton 2006b).

This allows us to draw the following proposition:

Proposition 3: The existing administrative system pushes medical practice towards behavioral standardization.

Adjustable Structures

The information systems are built to provide information needed for the medical activity *per se*, and start off by gradually eliminating hypothetical diagnoses. These hypotheses are not static due to the variables that constitute them. The definition of diagnosis depends on the mental decision tree construction process. When a doctor starts excluding and limiting a range of possibilities, he or she needs to gradually add up information to reach an accurate diagnosis. A similar process is used in therapeutics, and it requires accessing the patient's medical evolutionary condition in order to proceed with a therapeutic regimen that will achieve a favorable outcome or eliminate the illness (King and Ranft 2001).

The same information retrieval mechanisms simultaneously allow the creation of some personal security towards the development of clinical cases. Thus, those systems restrict negative personal and institutional consequences related to medical performance arising from environmental changes. We are in the presence of a double use of the same mechanisms, the need for information for effective performance and, when necessary, to justify that the performance was accurate (Baicker and Chandra 2005; Quinn 1998; Summerton 1995).

Besides the observed behaviors throughout the field research, the interviews show the existence of this flexibility to accommodate the unique specificities of each clinical case. This was identified in the interviews and aims to comprise all the performance components of this activity that are used to minimize this reality of medical practice, and is specified through a wide set of procedures that are carried out throughout performance (Asher et al. 2007; Studdert et al. 2005).

The existing internal systems were developed to accommodate changes which result from the internal context. Those mechanisms allow addressing two different requirements: (1) effective performance and; (2) performance's need of protection.

The team that performs the emergency service is composed in such a way that it accommodates this double perspective. If the service in this area of the hospital is needed for the development of novices' skills so they can perform efficiently in future, the cooperation techniques developed amongst several members of the teams and the control exercised by the team leader and his peers, will ensure proper performance by all members, junior and senior. In the case of the less senior members of the teams, this control is manifested through successive questions made to the team leader and more senior colleagues.

The objects in the physical space of the emergency service that provide additional information also contribute to this double objective. If, on the one hand, they are supportive in rendering medical service as a "reminder" (e.g. communications with the Anti-Poison

National Centre) to meet a need, on the other hand through call registration (at the call centre) and through personal information registration, as well as information accessed in the patients' process, they ensure a better quality service as a protection device.

The antagonism need/protection is also broadened by the clinical registration of the patient and by the diagnostic complementary exams (e.g. x-rays, blood tests), which are added to the relevant clinical process that allows the same document (written or digitalized) to serve this double function.

This way, simultaneously, internal systems aim at minimizing negative consequences for the medical doctor and maximizing her performance. In fact, what happens is the diminishment of the perceived variability of the activity's performance, which continues to exist, but is covered by the procedures.

The purpose of these systems is to increase the success rate of rendered health care, which is a positive factor both for patients and doctors. Patients benefit from the existence of a superior number of means to minimize the risk of error. For doctors this serves to diminish the pressure on performance and increases the possibility of getting more information about the subject on which they are working (Pfeffer and Sutton 2006a). These changes are the result of contextual demands, but practically they may result in gains for both medical doctors and patients. As for the negative aspects, perhaps the most important is the excessive use of support equipment and the consequent costs and, that in the long term, given the changes of the internship system, there will be an eventual loss in the global clinical sense.

Considering what we have referred previously, the following propositions were developed:

Proposition 4a: The internal systems are designed to push medical practice towards behavioral standardization.

Proposition 4b: Internal systems allow the accommodation of medical practice variability and, thus, improvisation.

Standardization and Improvisation

We build the general data framework using relevant data (Figure 3). The theoretical categories allowed the drawing of two aggregated theoretical dimensions: standardization and improvisation. These dimensions stand out by the fact that two opposite forces coexist and share common elements. Each one has a different purpose in answering to the specificities of medical practice in the actual social context.

Figure 3 about here

The tendency to standardize behaviors is present both in the actions and speech of the study's participants, as well as in the existing performance-supporting structures. There is a wide range of pre-determined procedures physicians follow while developing medical practice. Those procedures are embedded in routines to prevent deviations in performance. There is a fixed component of performance, that derives from the rules imposed on the activity's practice and the existence of international performance protocols which must be present (Adler et al. 2003; Reay and Hinings 2005; Haidet 2007; Saunders 2000).

Standardization also recognizes the risk associated with this activity, since medical practice has a permanent relationship with the real or potential loss of human lives and physicians can be exposed to judicial risk as a consequence of situational performance (Elmore et al. 2005; Zuckerman 1984; Kessler and McClellan 1996).

Although standardization is easily acknowledged, there is a semi-variable component implicit in the medical doctor's performance. This component derives from the need for

preliminary information, obtained through performance routines, so that afterwards, a diagnostic hypothesis may be developed. The diagnostic hypothesis is later adjusted according to information obtained through complementary examinations and the way a specific patient reacts (Fridsma and Thomsen 1998; Haidet 2007; Pfeffer and Sutton 2006b; Saunders 2000).

Standardization and improvisation are developed in medical practice through the use of several routines. The existence of these routines copes with two distinct factors: (1) the need for standardization resulting from adjustment to the external context whose outcomes create high expectations among national health-care users; and from the minimization of the legal risk associated with the activity's performance, which results in the medical practice being labelled defensive, and (2) the assurance that the medical performance accords with recent scientific evidence.

The concepts that emerged from data analysis and the propositions allowed the construction of a model for medical practice in the emergency service (Figure 4). Medical practice characteristics (Haidet 2007; Saunders 2000) positively influence improvisation since it requires a situational approach. Unlike the activity characteristics, the environmental influence persuades to behavior standardization, as the established administrative system (Miller and Bovbjerg 2002) does. The internal structure that results from this system combines the answer to two pressing needs: the flexibility required by clinical specifications (Fridsma and Thomsen 1998); and preventing medical practice risk and uncertainty by keeping this flexibility at a minimum level (Harrison and McDonald 2003). Although standardization stands out as a by-product of those internal systems there is a close liaison with improvisation. There are complementary phenomena.

Figure 4 about here

DISCUSSION

Medical practice, observed at a primary level, involves the use of a set of standard procedures that start with the registration process of the patient; then, by the way sorting is done, and ends with contact with the patient. When contact with the patient starts, the process usually follows certain patterns (e.g., questions about the symptoms, the medication being used, complementary diagnosis tests) that provide certain information that is later treated in a variable way to contemplate the activity's characteristics. The set of used routines also agglomerates the process of registering information in the patient's individual process and the contacts established with the team leader and duty specialists.

After moving ahead of the initial perception we can verify that certain routines are carried out to cover all the variables that exist in the health arena. When information has been gathered from the patient and/or relatives and the data given by complementary diagnostic examinations have been considered, certain rules are applied to accommodate the specifics of each situation.

The use of routines is performed in a rigid way (visible side) and, simultaneously, at a distinct level of performance, in a flexible way. Figure 5 shows the two sides of routines in medical practice that seek to accommodate both the activity characteristics and the administrative need to safeguard the physician's performance.

Figure 5 about here

Organizational Routines and Medical Practice

Medical practice is developed through the use of a set of routines that can be divided into two different types. On the one hand, there are administrative, fixed routines that are crucial to adequate performance; on the other hand, there's a wide range of practical routines that incorporate variability that is hidden by the administrative processes. In the initial stages of observation only the visible side of routines emerged. It was possible to predict ahead the procedures that were going to be used. Afterwards, it was possible to capture, both through the observations and interviews, the hidden side of routines that is related to improvisation.

The stability and recurrence of routines (Pentland 1992; Pentland and Reuter 1994) are observable in medical practice, since the activity is developed by following a standardized, frequently used set of behaviors. Time pressure, in some of the observed cases, implies the use of pre-determined routines that seem to be static but possess adaptability to the case at hand. This is in line with the existence of variability in routines (Feldman and Pentland 2003; Feldman and Rafaeli 2002) and the relation with organizational adaptation, innovation, flexibility, improvisation, and learning (Feldman 2003).

Procedures and written documents incorporate standard performances to accommodate contextual demands. Internal systems strive to unify behaviors that, because of their nature, are not totally standardized. The systems are also designed to establish a minimum standard of performance and limit perceived professional responsibility. In daily practice, these rules are the basis for performance and knowledge transfer, and are complemented by intuition and experience.

Routines are used as heuristics. Instead of always being used in the same way, they serve as a script that includes a high degree of variation (Suchman 1983). Medicine as an applied science needs these heuristics to guide physicians on their daily decisions. Saunders (2000) suggests that there is a need to recognize what is linear in abstractive terms when it is brought

to practice and fits into a grey area when the physicians try to encounter their patients' needs. It is the so-called "art" which constitutes a part of medicine as an applied science and relates it to improvisation.

For instance, when physicians are providing treatment (e.g., lumbar punctures, pleural punctures), although there are procedures explaining how these should be done, in practice there are always adaptations to incorporate patients' specific requirements. In general, they are executed in an established way; in practice, they are carried out with adjustments. Through practical experience each individual develops unique ways of procedure usage, which incorporates adaptability and variability in routine performance. After using a routine, individuals develop perceptions about what they can do and the consequences of their actions (Feldman 2000).

The use of routines, consequently, comprises the variable component of medical performance. To perform an activity effectively, it is fundamental that the entire work is developed from the process of gathering clinical information through flexible routines which aim to confirm and detail the elements that compose the information obtained and that are used in diagnoses and the definitions of treatment, which are permanently adjustable to new data and to the patients' reactions to treatment. Initially, the variability inherent in medical practice is not easy to detect due to the activity's complexity, but it is present in routines by the way they are applied by who uses them.

Interns use routines to minimize errors, since they have little clinical experience. The support given by more experienced colleagues introduces variability in their performance as they learn to deal with the adaptability that leads to good medical practice. Thus, routines adjust, incrementally, to experience as a response to the information return on results (Cohen et al. 1996; Levitt and March 1988). However, the standard set of routines enables actors to determine and choose a course of action in uncertain situations. This is particularly relevant in

internship due to the performers' inexperience, and can prevent the occurrence of serious mistakes (Dosi and Egidi 1991; Gersick and Hackman 1990; Munby et al. 2003; Scapens 1994).

The quality accreditation process encompasses the definition of clinical standards conceived to define the best way to act in a specific situation according to evidence-based medicine, separating medical practice for accumulated experience. When these standards are analyzed one can see a bundle of strict procedures that are considered flexible by those who use them, allowing both patient adaptability and adaptability of physician expertise. Thus, organization members activate specific performances from a restricted but potentially enlarged set of possibilities that allow action sequences and originate regular action patterns (Pentland and Reuter 1994).

Organizational culture and social systems motivate learning (Ruef et al. 1998). In a medical hospital the obligation to train and assist interns, and the need to build learning curves for new techniques and procedures still subsist. In this context, learning is a trial-and-error process, and this establishes the need for improvisational learning. According to Pfeffer and Sutton (2006b: 212), "no doctor can learn without years of experience – without learning by doing".

Learning develops through improvisation. This type of learning is different from formal learning since it is not organized, nor pre-defined by those in the organization who have the ability to do it. It is pushed by those who believe they still have something to learn about a new concept, technology or system. It does not follow a single plan but arises in daily situations, and depends on the needs of the organizational actors (Nelson 1991; Spitler 2005). Improvised learning is a process that integrates new technologies, concepts and systems, and becomes effective as social actors contribute toward improvisation (Boudreau and Robey 2005).

Considering changes in external context, internal context and internal systems to accommodate the variation in focus from experience-based medicine to evidence-based medicine, and the difference between codified and tacit knowledge (Edmondson et al. 2003), in medical practice improvisational learning is still used to transmit tacit knowledge (Nelson and Winter 1982). Although the systems in use try to standardize available and usable knowledge, in fact and in a continuous way, tacit knowledge is being transferred to new organizational members.

Evidence points to behavioral standardization and to behavior restraints in the established rules. However, improvisation is a reality. Improvisation is present in the effective development of medical practice through the use of intuition and accumulated experience, components of the individual capacity to improvise. Suitableness, which derives from the use of improvisation, is crucial so that the health care rendered is appropriate for the circumstances presented by patients.

The coexistence between standardization and improvisation allows surpassing the prudence inherent in medical normalization and the risk of eliminating intuition in medical practice. Sullivan (2000) considers that the essential skills for medicine cannot be treated as a commodity. Procedures must be used as heuristics that allow a better assessment of complicated cases (Davis 2007). Circumstances have to be a moderator in the liaison of the available evidence.

The use of routines derives from the need to establish a scientific basis and a "security net", but for the performance to be considered good these routines cannot be used without accommodating the diversity of patients' unique characteristics. The liaison between theoretical knowledge and experience which is passed on allows the development of clinical expertise that accelerates the speed of identifying a medical condition and ensuring that patients are treated in an individualized way (Mills and Spencer 2003). The conjugation

between the standardization of scientific knowledge and the improvisational skills of medical professionals is accomplished.

CONCLUSION

Routines have two distinct levels of application. They have a set of fixed elements aimed at assuring an acceptable level of medical care and preventing liabilities both for the organization and its members. Simultaneously, the practical application of a routine subset, related to diagnosis, therapeutics, and exams, possesses the flexibility required for effective performance. Thus, it allows improvisation to occur, but is conditioned by the growing need to legitimate medical practice and distance it from its "art" component (Haidet 2007; Saunders 2000).

External factors such as legal liability risks, quality processes, legislation, and pressure from professional associations and service users enhance the need for greater reliability in medical performance (Miller and Bovbjerg 2002). To address those influences, the organization implements politics and internal systems that increase security visibility and establish performance patterns and reports (Cook et al. 1983; Miller and Bovbjerg 2002; Smith and Mick 1985).

Internal procedures and protocols, combined with perceptions of medical risks, also initiate individual behavioral changes that result in the practice of defensive medicine (Asher et al. 2007). This is translated through actions such as instituting a higher number of additional exams and referring patients to other specialities (Bowman 1992; Manner 2007; Zuckerman 1984).

We support Harrison and McDonald's (2003) reference to the appearance of a new type of bureaucracy in the health system, a bureaucracy that restricts the "art" component of medicine

(Peterson 2005). This renewed bureaucracy is not accompanied by technical, political and behavioral skills that initiate better health services (Harrison and Smith 2003).

This research corroborates that improvisation faces several operational barriers, namely the quest to legitimate medical practice translated into a progressive routinization. The pressure to lessen medical practice variability is related to the actual environment request for the existence of a legal basis to support and justify medical decisions in a particular situation. The introduction of performance variability, intuition and experience are considered arbitrary elements with no legal justification (Harrison and McDonald 2003).

Institutional and administrative efforts to standardize medical practice and neutralize improvisation are not translated into reality in current medicine. Improvisation is the process that assures the individuality of medicine as an applied science (Shaughnessy et al. 1998).

Standardization and improvisation coexist by the double composition of routines. Although, traditionally, routines were considered to be stable (Nelson and Winter 1982), Pentland and Reuter (1994) mention that they have both stability and change characteristics and use the term "grammar" as an analogy that explains routine variation.

The dynamic component of routines is mentioned by Feldman (2000; 2003), who highlighted routines' endogenous capability for initiating organizational change according to how they are used. This is the result of previous interactions and the interpretation that users made of the routine. Thus, there is an incorporation of a flexible component into the stable constituent of routines, through the usage that is made of the routine itself.

However, in this research the use of routines does not influence their formal change. Routines are kept the same so that the activity is legitimated and a contextual stability is developed. At a usage level, and through concealing the flexibility routines have, the characteristics of medical practice are preserved.

Improvisation can occur in organizational environments with high procedural memories. This has already been considered by the concept of "grammars of action" (Pentland and Reuter 1994), which enables the use of an almost eliminated combination of routines. If we analyse the composition of routines we can establish an analogy between the demonstrative component and the visible side, which is standardization; and the performative component and the hidden side of routines, which is improvisation. The presence of these two opposing forces, environment and activity characteristics, consigns improvisation, that does not need to be something radical, to a backup place, although it is a process that makes adjustments to the demands of this activity. The purpose of this behavioral restraint is to ensure a standard performance pattern both by experts and novices.

The organization and its members do not admit to a high degree of variability in medical care (Fridsma and Thomsen 1998). Although protocols and records annotations are similar, physicians do not limit their practice to established rules, and the accumulation of both practical and theoretical knowledge originates a better use of experience and intuition (Burke and Miller 1999) that enhances performance. However, these subtleties are not introduced on the record organization that is the basis of the legitimacy of the activity.

Research Limitations and Implications

A major limitation of this research is the use of a single scenario and a single activity for data collection, and caution should be exercised in generalizing the results (Eisenhardt and Graebner 2007).

This research allowed knowledge expansion concerning the coexistence of improvisation and behavioral standardization established by procedural memory. Although there is growing behavioral standardization, improvisation is still a part of medical practice (Haidet 2007).

Improvisation exists because it is the process that ensures individual human characteristics are not neglected, and it allows for the singularity of medicine as an applied science

(Shaughnessy et al. 1998). Improvisation is hidden by established routines, but these routines are what allow improvisation to emerge. This research also enabled to reinforce the relevance of improvisation in individual performance in a volatile and ambiguous environment.

For medical practice it was possible to clarify how this activity unfolds and expose the pressures it has to face (Miller and Bovbjerg 2002). We highlighted the contribution of improvisation for clinical decision making and its relevance in organizational practices (Shaughnessy et al. 1998).

Future Research

As a development of this research we can suggest a comparative study, with an appropriate structure and different scenarios (e.g., firefighting corporations; traffic control; police investigation units) to test these conclusions. This could be a way of adding depth to the standardization and improvisation topic and supply new research leads.

The use of a double routine provides an opportunity to establish what the consequences are for training and learning this phenomenon. Another suggestion is to assess the individual and organizational effects of the co-existence of these distinct organizational systems, procedural bureaucracy (Harrison and Smith 2003) and a minimal structure (Kamoche and Cunha 2001).

This paper confirms the environmental influence (Miller and Bovbjerg 2002) in the definition of the internal systems that characterize medicine and induce standardization. The existence of this normalization is understandable since it is a risky activity and errors are a threat to reliability (McDaniel Jr. et al. 2003; Montgomery 2003) and organizational efficiency (McLaughlin 1996). However, medical practice characteristics (Elstein 2001; Fridsma and Thomsen 1998) originate an unpredictable aggregation of art and science to respond to the surprise factor (McDaniel Jr. et al. 2003).

The coexistence of standardization and improvisation, through routines, conjugates formal knowledge and adjusts individual skills to established patterns (Haidet 2007). It also overcomes the limitations of evidence-based medicine, smoothing it out with clinical experience (Lau et al. 1999; Shaughnessy et al. 1998).

This approach sheds some light on the research question and determines new study subjects. It is necessary to keep on developing knowledge about improvisation and routines (Pentland and Feldman 2005), as well as the consequences of the simultaneous existence of procedural restraints and minimal structures for good medical practice. The increasing procedural bureaucracy also has to be considered with caution since the replacement of improvisational learning by clinical standards *per se* is not going to allow the development of all the skills needed to perform at the highest level. The tacit component of knowledge is present in the improvisational side of routines, and that, as mentioned by Pfeffer and Sutton (2006b), is an important aspect of knowledge transmission, learning and medical practice.

This paper, embracing the two dimensions of organizational routines and the proposed implications, contributes to future studies with a new perspective about the use of routines and with a reflection about the downside of limiting the improvisational and artistic component of medical practice since it is, as Haidet (2007) refers, a learning and skill-development process that helps enhance performance.

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FIGURE 1
Data Collection

Type of Data	Amount of Data	Collection Timing
Observation		
Observations in the Emergency Service in what regards the work developed by medical teams	200 hours and 35 minutes (66 pages)	From October 2004 to April 2005
	64 hours and 5 minutes (15 pages)	January and February 2006
	119 hours and 10 minutes (21 pages)	From July to September 2006
	93 hours and 5 minutes (17 pages)	From January to March 2007
Public Documents		
Public Documents (e. g., newspapers articles; statistical reports)	32 pages	From May to September 2005 From April to June 2006
Interviews		
Individual interviews with physicians (specialists, residents and interns)	26 interviews (210 pages)	March and April 2005
	12 interviews (72 pages)	From July to September 2006
Archives		
Internal and external documents (e. g., work schedules; number of patients; complaints presented to the Physicians Board; complaints presented to the Physicians Union)	55 pages	From May to September 2005 From April to June 2006
Internal and external documents (e. g., trauma and resuscitation manuals)	545 pages	
Presentations		
Presentations to physicians (specialists, residents and interns)	4 presentations (2 pages)	From January to March 2007
Total	**1.035 pages**	

FIGURE 2
Categories Description and Data Examples

Categories	Description	Data Examples
Professional Distinctiveness	It comprises the "trial-and-error" component of medicine and the idea that diseases and clinical evolution have different individual manifestations.	"…the truth is that we're not dealing with an inert organism… when something is inert we know the reaction to our action… but if an organism is not inert… the reaction is not always the same …" (MD32, September 7, 2006)
Surrounding Sphere	It apprehends the media interest in medical situations, especially cases with a negative outcome, and the growing need of rules and procedures that diminish the personal risk of physicians' performance.	"…journalists are very aggressive… they assume… that the physician or the hospital is guilty … mistakes are definitely the physician, administrative, or hospital fault … [the] media induce those behaviours…" (MD06, March 14, 2005)
Administrative Prescriptions	It aggregates the efforts that are being made for staff members to follow an established pre-set of rules, and the cooperative environment among team members, especially in teaching standard performance behaviours to undergraduate staff.	"…whenever possible you should use the same type of protocol…" (MD09, March 19, 2005) "…we need evidence [given by the procedures]… that everything we did was correct…" (MD27, August 21 2006)
Adjustable Structures	It conglobates the mechanisms that exist in emergency service that supply additional information indications and the double use that is given to the information systems allowing the retrieval and the confirmation of information.	"…we have to see the standards as something for the general patient… then… there are peculiarities of the patient that forces us to adjust…" (MD37, September 29 2006)

FIGURE 3
General Data Framework

Initial Coding	Theoretical Categories	Aggregated Theoretical Dimensions

- Statements referring to the activity's results exposition to the press and to the perceptioned changes in the patients' behaviour (e.g., magazines and newspapers news[ia]; demand and scandal[o])

"…there is some sensationalism in the media… the news around the world… people go to the internet… and believe to know everything and that are right bout it…" (MD11, 24 March 2005)

- Statements referring to changes in the social conjuncture that originate litigations[o, ia]

"… lawsuits are increasing… and the media have some influence on it… on the other hand people do have more knowledge and demand more…" (MD11, 24 March 2005)

Surrounding Sphere

- Statements referring to behaviours concerning knowledge transmission, how emergency teams work and the availability in supporting novice's performance[o]

"…all colleagues are able to teach… because you do not have practice and receive input from all colleagues…" (MD03, 09 March 2005)

- Statements referring the use of protocols and practices internationally tested, as well as the ongoing quality accreditation process[o,ia]

"…everything has to be standardized… it's the only way you feel comfortable in justifying your practice…" (MD28, August 24 2006)

Administrative Prescriptions

Standardization

- Statements referring to the need of using mechanisms that allow complementing the available information for rendering health care and their use (complementary) in protection the physician's performance[o, ia]

"…Sometimes we do this procedure because we need the information… other times… just for the record …" (MD11, March 24 2005)

Adjustable Structures

- Statements referring the need of diminishing risk and uncertatinty of medical practice through the use of protocols and procedures that don't expose flexibility[o,ia]

"…in practice… the use of the existing protocols is a dynamic exercise…" (MD02, 07 March 2005)

Adjustable Structures

- Statements referring to suitableness and variability of clinical situations (e.g., patients' clinical condition time evolution[o]; suiting performance to the specific case[o])

"…this is not an exact science… there are variations in a patients clinic… we have to play with variability…" (MD37, 29 September 2006)

Professional Distinctiveness

Improvisation

All data were gathered from interviews, semi-structured; the "o" shows "complemented with observation"; "ia" shows "complemented with additional written information".

FIGURE 4
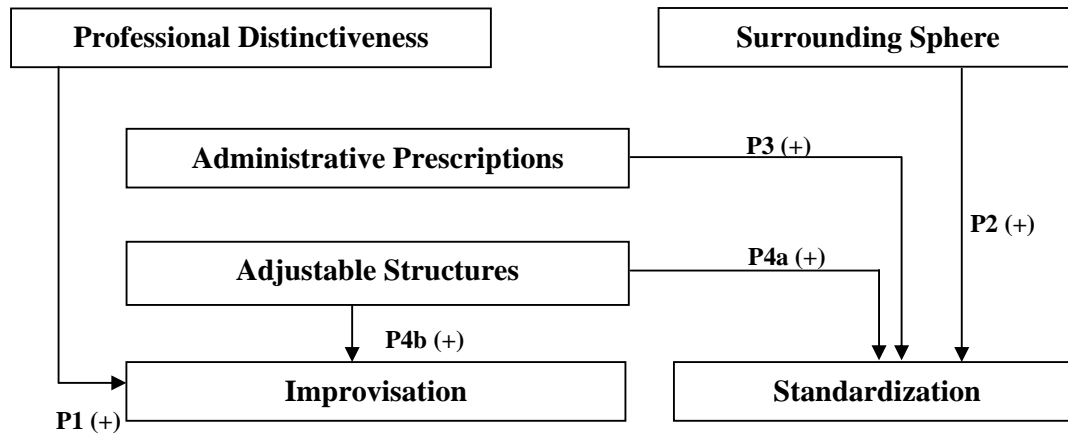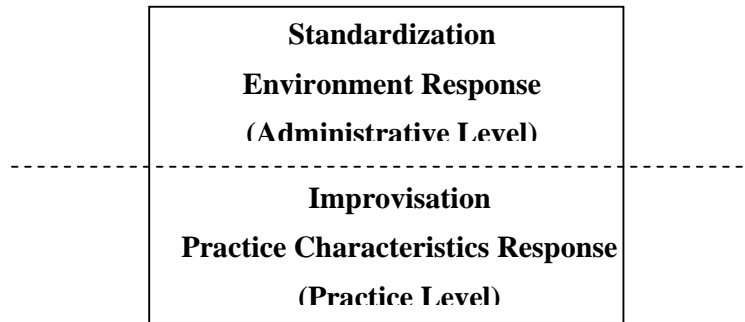**Proposed Model for Medical Practice in the Emergency Service**

FIGURE 5
The Two Sides of Routines in Medical Practice

Standardization

Environment Response

(Administrative Level)

- -

Improvisation

Practice Characteristics Response

(Practice Level)

APPENDIX 1
Example of Information Available in Medical Offices

Please do not forget to **REGISTER** IN THE
ADMISSIONS BULLETIN:
- Time of the 1st Clinical observation
- Time of the other observations hours
- Time of discharge or transfer from the ER
- Signature and mechanographic number

APPENDIX 2
Example of Information Available in the Emergency Room