Electronic Health Record System Contingency Plan Coordination: A Strategy for Continuity of Care Considering Users' Needs

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Abstract

Electronic Health Record system downtimes may have a great impact on patient care continuity. This paper describes the analysis and actions taken to redesign the Contingency Plan Procedure for the Electronic Health Record System of Hospital Italiano de Buenos Aires.

After conducting a thorough analysis of the data gathered at post-contingency meetings, weaknesses were identified in the procedure; thus, strategic actions were recommended to redesign the Contingency Plan to secure an effective communications channel, as well as a formal structure for functions that may support the decision-making process. The main actions were: 1) to incorporate the IT Contingencies Committee (Plan management); 2) to incorporate the Coordinator (general supervision of the procedure); and 3) to redefine the role of the Clinical Informatics Resident, who will be responsible for managing communication between the technical team and Electronic Health Record users. As users need the information for continuity of care, key users evaluated the impact of the new strategy with an adapted survey.

Keywords:

Downtime; IT Management; Survey; SWOT Analysis.

Introduction

Continuity of patient care as a health care process acquires great potential through information technology (IT). However, when applications or systems fail, the technologies become a dangerous vehicle for the perpetuation of erroneous information that may lead to mistakes in diagnosis and higher monetary costs [1]. The critical nature of hospital care impacts patient information management, therefore institutions are forced to plan and formalize courses of action to maintain their IT infrastructure at times of crisis[1].

During the review of the events experienced at Hospital Italiano de Buenos Aires (HIBA) and relevant literature [2,3], it has been noted that when all instances of "redundancy" and "control" designed to support and guarantee service continuity are exhausted, the institution's own alternative procedures are implemented in order to protect all crucial information. The impact of technology and informatization on hospitals' operating processes must be addressed as a complex process developed over time where an institution-wide transformation process is evident [3]. This process involves knowing and rating systems' "life cycles", as well as the importance of weighting the lessons learned from disasters and crises that

may jeopardize patients' data management. In order to offer continuity of patient care, technology is useful if the regulation, standardization, and protection of critical operating processes and relevant information are solved beforehand [4]. Therefore, it is essential to make periodic adjustments to the action plans designed by the institution for contingencies. The objectives of this study are to describe the redesign of the contingency plan of the Electronic Health Record (EHR), as well as to know the users' perceptions of it.

Materials and Methods

Background

The HIBA is a high complexity teaching hospital founded in 1853. It is member of a nonprofit health care network that runs a second hospital, 25 outpatient clinics, and 150 doctor's offices distributed throughout the city of Buenos Aires and the surrounding metropolitan area. This infrastructure also includes 750 hospital beds, 200 of which are prepared for intensive care, 1200 home care beds, and 41 operating rooms. The network is composed of 2800 physicians, 2800 health care agents, and 1900 management and administration staff.

A Health Information System has been gradually implemented since 1998, based on an in-house development process where medical and administrative information is managed from data gathering to data analysis. A modular, patient-centered, web-based EHR focused on problems, and known as ITALICA, has been implemented by the hospital. This EHR may be used to register outpatient care, hospitalization, emergencies and home care related data.

There is a formal procedure that defines the actions and forms of communication for maintenance of the processes while the EHR system recovers from a significant disruption.

This procedure was implemented in planned and unplanned downtimes. The procedure was tested during the following year, and after every downtime there were meetings with key users of the EHR system in order to learn of the impact to the workflow. Since the preliminary results showed inefficient communication, the procedure was redesigned.

The key users involved the most critical processes of the hospital, such as the Emergency Department, Laboratory, Nursing Department, Patient Admission area, Imaging Department; and specialized areas of the Health Informatics Department (HID) such as the Help Desk, Software Engineering, Clinical Informatics, and Policies & Procedures involved in the development process and operations for the activation and deactivation of the Plan. The IT Contingencies team is composed of key users of the EHR and members of the HID staff.

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[1] Crisis or disaster recovery, such as power failures, general hardware failures, logical or physical breaks in data connections, or downtimes planned for application updates.

Definitions

For the purpose of this research, the following definitions were used (see Figure 1):

- Patient Care Continuity [5]: Different aspects referred to the treatment to be applied to a specific health condition, from both chronological and geographical standpoints.
- IT Contingency Plan: A program detailing the methods and means necessary to control risk in information systems and to minimize negative consequences.

In this paper, we have analyzed the "high availability" and "IT Contingency Plan" concepts as two different yet supplementary notions. The "high availability" and "IT Contingency Plan" principles are IT management tools that represent the purpose of "continuity". The first concept refers to technology and information systems-based mechanisms, while the second one secures continuity based on alternative procedures that encompass all of the hospital's resources, including paper records of patients' medical evolution.
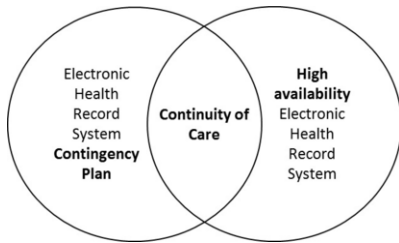

Figure 1 - Institutional Framework for Continuity Care

The redesign process is diagrammed in the following figure (see Figure 2). The first step was the SWOT analysis of the original procedure. A survey administered to key users was the next step. Finally, a new version of the survey was designed and validated by a committee of experts.
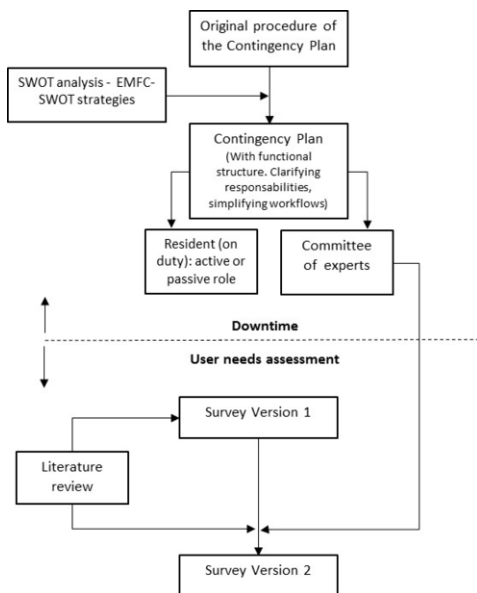

Figure 2 - Global Chart of the Redesign Process

Redesign

A SWOT analysis (see Table 1: strengths, weaknesses, opportunities and threats) was performed to redesign the procedure, and four possible implementation strategies were prepared[2]. Additionally, the work structure applied was based on rules and standards.

On the one hand, the NIST special publication 800-34 [6] and the guidelines for Contingency Plans preparation and drafting were considered to structure the Contingency Plan management and coordination; and on the other hand, the ISO 22301:2012 standard about "business continuity" management was considered to approach the "Plan-Do-Check-Act" [7] process applied to plans and procedures maintenance. Even though COBIT Management Guidelines [8] were considered, this paper is focused on users' needs.

Table 1 – SWOT Analysis of the Procedure of the Contingency Plan of EHR N°98/12 01 00

Strengths	Opportunities	Weaknesses	Threats
Technical capabilities of key areas of the HID	The Institution has specialized technicians and analysts to define processes and procedures	Lack of a clear position that handles the coordination and supervision to ensure the effective conduction of the proceedings	Facing crisis and contingencies, regarding critical services, is a process that relies on "key actors"
Includes a flow of communication for the activation and deactivation of the plan			
Use of software especially designed for contingencies	There is an institutional interest in reviewing plans based on the Policy "Continuity of Patient Care"	The procedure should clarify the active or passive mode of the workflow by the Resident on duty	The level of participation of critical sectors in post-contingency meetings does not meet the expectations
Clearly defined times of response			

EMFC-SWOT [9] Matrix results (Explore, Maintain, to Face, Correct) were obtained as a result of the SWOT analysis performed (see Table 2).

Impact assessment

With an adapted survey [10], key users assessed the impact of the new strategy. The redesigned procedure was evaluated after the unplanned downtime that took place on June 24, 2014.

With the findings of the first adapted survey and the literature review [11], a new version of the survey was designed. Once the preliminary list of questions was elaborated, the steps to follow were: (a) assessment by a committee of experts, (b) pretesting, (c) the validation itself, and (d) implementation. Pretesting was conducted with key users, who invited new users to participate in successive iterations.

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[2] The analysis universe was the EHR Contingency Plan Procedure N° 98/12 01 00. Strengths and weaknesses refer to the features of the procedure (internal environment), while opportunities and threats refer to the microenvironment context, in this case the HIBA.

The EHR system was affected by the unplanned downtime that took place on June 24, 2014. The post-contingency review was conducted on June 25 and July 17, 2014.

Results

Tests of the original procedure were conducted from December 2012 (formal publication) to June 2014. The post-contingency documentation and data analysis were conducted between April and June 2014.

As a major input, the SWOT analysis suggested a new allocation of responsibilities regarding procedural coordination and supervision. Strategies derived from the analysis were implemented and continue to be in place to-date (EHR Contingency Plan Procedure N° 98/12 01 01), taking into account the following strategic EMFC-SWOT Matrix that considers the four most relevant strategies to be followed:

Table 2 – EMFC-SWOT Matrix. Strategies to correct weaknesses detected in the procedure

Evaluation		Strategy		Action
weaknesses	Lack of definition in the coordination and monitoring of the process	correct	Develop a well-defined functions' framework	I
threats	Strong dependency on "key actors" on critical services	to face	Develop a procedure for activation and deactivation of the Plan, and update the instruction manuals in critical areas	I
strengths	Use of software especially designed for contingencies	maintain	Expand the use of contingency focused applications to all critical services	V
opportunities	There is a Policy for the Patient Care Continuity Plan	explore	Develop a Standard / Policy on the IT Contingency Plan	P

I: Immediate application; P: Programmed; V: Viability should be studied

New procedure

The following recommendations are made based on the findings of the procedure's post-contingency analysis:

- Incorporating two new players: the *IT Contingencies Committee*[3] (Plan management), and the Coordinator (general supervision of the procedure).
- Redefining the role of the *Clinical Informatics Resident,* who will be responsible for managing communication between the technical team and EHR users.

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[3] This is a department Committee formalized by Policy N° 73/14 IT Contingency Plan. The IT Contingencies Committee is made up of the Head of HID, the Deputy Head of HID, the Head of Clinical Informatics, the Head of IT, and the Head of Software Engineering.

Findings of the first version of the survey

The redesigned process was subjected to evaluation through a survey conducted post-contingency of the unplanned downtime of June 24, 2014. The survey showed:

Table 3 – Survey Results. Unplanned downtime, included EHR: June 24, 2014. Post-Contingency survey: June 25 & July 17, 2014

Questions	A	B	C	D	E
1. How downtime affected the workflow?	Great Impact	Moderate	No impact	No impact	No impact
2. Were there problems to communicate with HID?	YES	NO	NO	NO	NO
3. How long did you wait to launch the Contingency Plan?	10'	Up to 5'	Up to 5'	1 hour	1 hour

A: Imaging services Department; B: Laboratory; C: Emergency Department; D: Nursing Area; E: Admissions

Validation of the second version of the survey

The operationalization of variables and the questionnaire design were validated by the IT Contingencies Committee for the purpose of measuring users' opinion on the redesigned procedure and how it affected their workflow from downtime to uptime.

The new survey variables are: knowledge of the procedure; Plan implementation; user's response capacity; accessibility during downtime; post-contingency data restoration; communication (between the HID and the areas); workflow impact; registration possibilities; and the time needed to activate the Plan.

The pre-testing, started on January 19, 2015, assessed the post-contingency of the downtime planned for January 7, 2015. This assessment was conducted by 12 representatives of the hospital's critical areas or services. The pretesting resulted in the reorganization of questions and the modification of some words for a better understanding.

The most important pretesting findings were related to communication, an alternative work plan, and training. Users perceived that communication with the HID has improved. As for planned downtime, they have recognized to have an alternative work plan when downtime occurs. As for unplanned downtime, they stated that training is necessary.

Discussion

This paper describes the analysis and actions taken to redesign the HIBA's EHR Contingency Plan. It also provides answers to questions regarding the importance of regularly reviewing plans, as well as of formally describing a functions structure.

The procedure's redesign was changed while structuring functions, and it triggered the creation of an IT Contingencies Committee that comes into play in case of contingencies so as to facilitate the Plan's management coordination, supervision, and communication. The original procedure showed the flow of activities were conducted so that the HID may activate and

deactivate the Plan, but it did not clearly describe the decision making process. Restructuring functions and responsibilities while redesigning the Plan turned out to be essential to providing the team with adequate leadership, and to make decisions despite the uncertainties proper of any contingency.

According to the findings of the first version of the survey that was performed after the unplanned contingency, the workflow of the imaging services department was the most affected, as, unlike all other services, communications with the HID reported to be delayed. During the downtime period, most services used paper-based forms while only two services used the software and hardware specially designed to face the contingency.

Although it may be assumed that recommendations made regarding the IT Contingencies Committee, the procedure's supervision, and the coordination role to improve communication with all other sectors, will positively affect the Plan's execution, these results may not be generalized, as the survey was only conducted on key users. In addition, the survey (see Table 3) was translated from English to Spanish and it did not take into account cultural differences, nor was it validated. The second version of the survey, although already validated by the Committee, is still being tested. The main findings of this study are from first survey and the pretesting step of the second survey. The final version is expected to be conducted on general users by June 2015, after correction and validation.

As for the implications of the results, the need to regularly review procedures that are part of contingency plans becomes apparent in the systems' "lifecycles". These are not static procedures; they keep pace with the dynamics of IT systems that may change either gradually or abruptly as cutting edge technology moves forward. Therefore, the maintenance stage is an important part of the EHR Contingency Plan.

An important aspect of this paper is how users' needs have been approached. Despite the fact that authors do not pay much attention to this [12,13], it is important to consider users because they are in contact with the information system and are responsible for recording the patient's clinical evolution.

Based on our findings, we suggest three future lines of work:

1. Performing a new IT risk analysis to supplement the Standard on IT Contingency Plan and the institutional Standard/Policy on Continuity Plan;
2. Conducting the EHR downtime survey validated by the IT Contingencies Committee;
3. Developing contingency applications for internal support purposes (redundancy of elements).

Because of the importance of EHR systems for hospitals [14], regularly reviewing the Contingency Plan designed for such system is paramount to achieve care continuity [15]. This review must include an efficient communication channel as well as a formal function structure that may support the decision making process.

Conclusion

First, it is important to recognize the dynamic aspect of organizations, which involves regularly reviewing their contingency plans; second, in order to make efficient decisions in a contingency scenario, it is important to have a structure in place that may guarantee the Plan's direction and supervision. As for the approach, taking into account users is key to any Contingency Plan; as in any ideal situation, it is they who should guarantee that all the information needed to achieve care continuity will be recorded.

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