Lack of Training for a Downtime Procedure: End User's Perceptions of an Electronic Health Record Contingency Plan

Rodrigo Cano, Brenda Bejarano, Mercedes Vidal, Daniel Luna, Sonia Benítez

Department of Health Informatics, Hospital Italiano de Buenos Aires, Argentina

Abstract

The implementation of an Electronic Health Record has many benefits; but when it is not available, it can impact patient continuity of care. If there is no support, or a failure to guarantee the continuity of services, contingency plans have to be implemented to overcome the information disruption. End users are in direct contact with the information system, and are responsible for documenting patient clinical information. Focusing on them, we propose the design, development, and validation of a survey to evaluate the beliefs, knowledge, and perceptions of end users, about the Electronic Health Record contingency plan. Preliminary results showed that even when there were less downtime periods, end users perceived that they did not have adequate training or information about how to go through the downtime event.

Keywords:

Electronic Health Records; Perceptions; Health Care Surveys

Introduction

Following the impulse given by different Electronic Health Records (EHR) Incentive Programs, the adoption of a Health Information System by organizations has increased [1]. Many benefits are attributable to EHR adoption [2,3], but when it is not available, it can impact health services costs and the patient continuity of care [4]. If problems related to standardization and protection of critical operative processes and relevant information are not solved, it is not possible to maintain the continuity of care [5]. The nature of hospital procedures has an impact over the patient's information management. If there is no support, or a failure to guarantee the continuity of services, different procedures should be initiated to protect important information [6,7]. Institutions must implement contingency plans for the maintenance of their systems during critical moments, and to overcome the information disruption. There are guides, such as SAFER, that assesses socio-technical aspects of contingency plans and identifies safety practices associated with EHR unavailability [8].

In that context an important point is the way that end users are engaged. In general, contingency plans tend to prioritize technical aspects [9,10] and responsiveness of it [11]. The importance of taking into account end users is because they are in direct contact with the information system, and are responsible of documenting the patient clinical information. Focusing on end users, we proposed the design, development and validation of a survey to evaluate the beliefs, knowledge, and perceptions from end users, about the EHR contingency plan.

Methods

Setting

Hospital Italiano de Buenos Aires (HIBA) is a non-profit health care academic center, with over 2,800 physicians, 2,800 other health team members (including 1,200 nurses) and 1,900 administrative and support employees. HIBA has a network of two hospitals with 750 beds (200 for intensive care), 41 operating rooms, 1,000 home care beds, 25 outpatient clinics, and 250 associated private practices located in Buenos Aires city and its suburban area. It has a Health Maintenance Organization that covers more than 150,000 people and also provides health services to other people who are covered by affiliated insurers. In addition, HIBA is a teaching hospital, with over 30 medical residency-training programs and 34 fellowship programs [12].

Survey

This is a mixed method study that included a survey design and validation. We designed the survey in 4 phases:

- Phase 1: Literature review and qualitative research
- Phase 2: Panel Expert Review
- Phase 3: Qualitative pretest
- Phase 4: Survey Validation

Phases 1, 2 and 3 are described in [13]. We continued analyzing phase 3 in this paper, recruiting new participants. In preliminary phases, the survey was paper based, in successive iterations we used Google® Forms, and finally we implemented the survey using REDcap® platform. We recruited participants through snowball sampling and key users representatives. The validation phase was carried out on active personnel of HIBA in 2015. They performed the following tasks using the EHR:

- Data visualization
- Image and lab results visualization
- Clinical notes
- Vital signs
- Request of laboratory orders
- Drugs prescriptions
- Referral Request
- Drug administration documentation

Exclusion criteria were:

- Refusal to participate in the study
- Workers with less than 6 months in the institution
- EHR super-users

● Personnel that have not used the EHR in the last 12 months

We used Stata® 13 and Microsoft Excel® for the quantitative and descriptive analysis. For validation and to evaluate the internal consistency for complete sections of the survey, we used Cronbach's alpha. In addition, we included semi-structured interviews to respondents, looking for agreements, disagreements, and new domains.

This research did not imply any additional risks for participants, and was executed in accordance with national and international norms. All data of the study was treated with maximum confidentiality and in anonymous way.

Results

During the **pre-testing phase** we evaluated and assessed the post-contingency of a planned downtime. Seventeen participants that completed the survey were interviewed with a semi-structured questionnaire, and they commented aspects related to wording and semantics. The identified domains with previous phases were:

● "If there is a downtime of the system or it is unavailable"
● "About the communication of the downtime"
● "During the downtime or unavailability"
● "When the system is available again"
● "Considering the downtimes of the EHR over time"

The most important findings were related to "communication", "an alternative work plan", and "training". This resulted in the creation of new variables, which were: knowledge of the procedure, plan implementation, end user's response capacity, accessibility during downtime, post-contingency data restoration, communication between the health informatics department and other areas, workflow impact, registration possibilities and time needed to activate the plan. The result was the *pre-tested qualitative survey*. For this phase, participants' characteristics can be seen in Table 1.

Table 1 – Pre-test phase participants' characteristics

Characteristics	Participants n=17
Female (%)	41
Age Range(years)	21-51
Occupation	
Physicians (%)	71
Nurses (%)	24
Administrative personnel (%)	6

The number of resident physicians and attending physicians were balanced. 35% of physicians have an internal medicine certification, 12% were endocrinologists, 6 % pulmonologists, 6 % pediatricians, and 6 % were orthopedists, among others. About the working place, 59% in inpatient care, 35% worked in ambulatory care, and 6% in emergency care. The length of service was between 1 to 5 years for 35%, 6 to 15 years for 24%, and more than 16 years for 35% of the participants.

The **validation phase** started in the second semester of 2015, and it is planned to finish in the first semester of 2017. We sent a new version of the survey, and invited the participants to a semi-structured interview when the survey was completed. Characteristics are shown in Table 2. The result of this process was a *validated survey*. About the completeness of the survey, thirty seven (72%) did fully completed it and thirty three (64%) of the participants did not perform

supervision or coordination tasks. Twenty two (43%) participants had an alternative plan for downtimes and thirteen mentioned that it was not documented. Thirty (58%) participants denoted not haven received training about the actions that have to be performed during a downtime, and twenty four (80%) answered that they would like to receive appropriate training. About the need to communicate with the Health Informatics Department, thirty three (64%) said that it was not necessary to establish communication, and seventeen stated that they needed to communicate with another area of the hospital. Twelve participants talked about not knowing where to obtain information about contingency plans or downtime actions to carry on, but 83% of them indicated that it would be useful. Only two of the participants who knew the contingency plan, answered that the web page with information about contingency was useful.

Table 2 – Validation phase participants' characteristics

Characteristics	Participants (n = 51)
Female (%)	63
Interviewed; n (%)	27(53)
Occupation	
Physicians (%)	28
Nurses (%)	21
Other (%)	10
Health technician (%)	6
Administrative personnel (%)	35

About the working place, 56% worked in ambulatory care, 39% in inpatient care, and 5% in emergency care. The length of service was between 1 to 5 years for 35%, 6 to 15 years for 22% participants, and more than 16 years for 27% of the participants. Related to the time needed in working hours to communicate a downtime, 43% of them mentioned "less than 1 hour", 14% more than 1 hour, and 43% did not know and could not estimate the time.

In relation to the access of information needed to work from the EHR, 85% stated that they could not access needed information. 80% mentioned that during downtimes they could not record clinical or other information required, in the patient EHR. 59% considered the information documentation in the EHR was affected by downtimes.

About perceptions of the frequency of downtimes along time, four (10%) participants considered that there are more downtimes than before, twenty five (64%) that there are less downtimes, six (15%) referred that there are the same events than before, and four (10%) did not give an answer.

The estimated time to complete the survey was around 5 minutes, and the estimated time to complete the interview was 15 minutes. The calculated Cronbach's alpha for structured and completed items from the domains identified was 0.76.

In addition we compared results to assess agreement between the presented answers in the interview compared to the survey answers. The qualitative analysis of the interviews is still in progress, up to now we did not find any major discrepancies with the results of the survey.

Discussion

The unavailability of the EHR during downtimes could result in important patient safety concerns in institutions that are not prepared to confront the contingency [8], for this reason we designed a survey to evaluate beliefs, knowledge, and perceptions that end users have, in relation to the contingency

plan of the EHR. We identified formerly ignored domains, and even with partial results of the preceding survey versions, this reassures the need of taking into account end users to design contingency plans.

In this phase the participants were from non-critical areas, with proper experience in the hospital (more than 1 year of length of work in their areas), but just half of them knew the exact procedures to apply contingency protocols, with previously described consecutive problems related to loss of information and patients' care [14]. Likewise, we found that the majority of participants referred that they wanted to establish a work plan, either protocolized, or created according to prior experiences of their areas. In addition, most participants reported not haven received training on the contingency work plan during downtimes. Although there is a work plan created in case of downtimes, the personnel find their own contingency mechanisms, which responded to the needs created among working areas, which according to participants, have been effective and sustainable over time. It is also worth mentioning the great acceptability that they have to receive training in the area of contingency.

Another interesting point is related to the communication needs between areas during a downtime, since there is evidence that communicating planned downtime in advance will minimize frustration and confusion about why the system is unavailable [15], we found that a minority had the need to communicate with the Health Informatics Department. We consider that this is due to existence of mechanisms already created in the different areas, where they can overcome the eventuality without requiring external advice. It is interesting to mention that most respondents described needing a relatively short time for downtime warnings. This may be a reflection of how organized they are with their own contingency mechanisms, to perform actions such as patient support, medical appointment assignments, and general consultations. However, in critical areas, we noted that they prefer being notified earlier in order to coordinate complex activities to preserve a good performance of their activities. As it is usual to expect during downtimes, most respondents informed not being able to access clinical records and information that they required. This could also mean a loss of data that would be impossible to recover later, with possible adverse consequences in the patient's future care. Despite this, most of the respondents mentioned that there are fewer downtimes events in relation to former years, and thus greater stability and confidence in the system and this is concordant with preceding findings that shows the expression of the stability that end users tend to demonstrate in association to periodical revision of contingency plans [16].

As a limitation of the work we find that there is certain resistance to answering the survey, apparently not because of the particular topic of the survey, but to find time during work hours to answer the questionnaire. We did not consider that there is selection bias, having recruited representative samples of different working areas of the hospital. The potential information bias that could be found in surveys was improved during each phase creation and process, with the design and identification of different domains [17]. As strengths of the survey we found that it was possible to design it to be completed in an average of five minutes. Because this is a cross sectional single-center study we cannot generalize our findings to be valid to assess similar dimensions in end users of others health centers. Future multi-centered studies are needed to assess the generalizability of our results.

The internal consistency was acceptable, but only reliability does not imply validity. The validation is a process that started in the first publication that we made before [13]: the first step was to establish face validity, and then the content validity with the Panel Expert Review; the next step was pre-testing the survey on a subset of our intended population, and finally was important to check the internal consistency of questions. We presented in this paper the pre-test and the evaluation of internal consistency. We are not using any score; therefore we did not perform any test–retest reliability. There were no possibility to evaluate convergent or discriminant validity or criterion validity because there is no gold or reference standard to compare. Iterative work is needed to develop future implementation for different institution's structures.

The partial qualitative analysis of interviews did not show any major discrepancies at the moment. Once we finish the qualitative analysis and the survey is implemented, it could be used to assess different contingency plans in any institution that uses an EHR, as the identified domains are common in health environments related to patient care. The assessment of the different domains and subsequent knowledge could lead to new interventions that could provide adequate training to face planned or unplanned downtime events. Related to this we are planning to do simulations for training and evaluation of knowledge of contingency procedures by the second semester of 2017.

Conclusion

This paper showed the continuation of our study about perceptions, beliefs, and knowledge of end users related to the contingency plan of EHR. This is an important topic to explore, that could lead to potential actions to improve mechanisms related to proper design and execution of future contingency plans. In our case, end users perceived that they did not have adequate training or information about how to go through the downtime event. Even with less downtime periods, the end users perceived the need of training and communication.

Acknowledgements

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Address for correspondence

Sonia Benítez

sonia.benitez@hospitalitaliano.org.ar