Original Research Article

Provider satisfaction with the health information system based on the electronic health records in Burundi's hospitals

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ABSTRACT

Background: The computerization of the health record is one of the means to improve the performance of the information system within the hospital and therefore improve the continuity and quality of care and services offered to the population. The objective of this work was to determine the factors associated with the satisfaction of providers with the hospital information system based on the electronic health record.

Methods: This is a cross-sectional, descriptive and analytical study carried out in 11 hospitals in Burundi. A self-administered questionnaire was used to collect data from a sample of 155 providers. The data analysis was done with STATA 15.

Results: The majority were nurses (51%) followed by physicians (23%). Regarding satisfaction, 55.5% of the providers were satisfied with the new EHR-based system. Men were 2.21 times more satisfied with the use of the EHR than women (OR=2.21; CI95%: [1.09-4.46]). Providers who were trained by the project's computer scientists were 4.24 more satisfied than those who were trained by their colleagues (OR=4.24; CI95%: [1.47-12.23]) and 3.69 more satisfied than those who were trained by the hospital's computer scientists (OR = 3.69; CI95%: [1.25-10.89]). Similarly, the use of the software to generate reports and statistics was 2.27 times associated with provider satisfaction (OR=2.27; 95% CI: [1.14-4.49].

Conclusions: The sustainability and success of the patient record computerization project depends on taking into account the expectations of the providers during the implementation.

Keywords: Electronic health records, Hospitals, Providers, Satisfaction, Burundi

INTRODUCTION

In computer language, the health record represents all the features of the software that contain administrative and medical information (care, prescriptions, etc.) and all correspondence between health professionals. The electronic health record (EHR) ensures the traceability of all actions carried out by health professionals.[1,2] It is a tool for communication, coordination and information between providers on the one hand and between providers and patients on the other. It allows to follow up and understand the patient's hospital journey, it is a primary element of the care quality by allowing their continuity in the context of a multi-professional and multidisciplinary care.[3]

With the emergence of Information and Communication Technologies, African governments have adopted resource mobilization strategies to make the use of electronic health records effective in health facilities. Projects to implement and use the electronic health record

are thus newsworthy topics; however, their success depends on the adherence and acceptance of stakeholders at different levels of the health system in general by providers in particular.[4-5]

Although Information and Communication Technologies seem to be a vehicle for the coordination of health professionals, the optimization of health expenses through a good organization of care processes and close cooperation to allow better care of patients, projects for the computerization of health records have not always been successful.[5] According to some authors, the success of the electronic health records implementation project can be assessed on several axes, including the dimension of quality, utilization and user satisfaction. However, regardless of the results of the quality assessments of the EHR-based system, if users are not satisfied, they may not want to use it. Then the resistance of the users was suspected to be the main factor in the failure of the implementation of the EHR projects.[5]

In order to strengthen the Hospital Information System, the Ministry of Public Health and the Fight against AIDS in Burundi has started the project to computerize the medical record in hospitals. In 2015, computerization began with a pilot phase in 4 hospitals representative of the 3 levels (the district level, the regional level and the national level) of the health pyramid. For this purpose, one national hospital, one regional hospital and two district hospitals were selected to be part of the first pilot phase of computerization. In the logic of making a gradual extension of the computerization of hospitals in 2017, seven hospitals (tree national hospitals, one regional hospital and tree district hospitals) were equipped and started to use the computerized patient record software.[6-7]

The software that was chosen to computerize the patient record is Open Clinic GA. It is an open-source software and can be redistributed or modified, marketable versions are also available. The main modules of the Open Clinic GA software concern the patient's administrative record, the patient's financial record, the patient's medical record, health insurance, credit unions, pharmacy (including stock), laboratory, radiology, health statistics in the form of periodic reports, human resources, the clinical thesaurus with coding assistance validated for ICD-10, SNOMED and multimedia media (images, video, audio).[8]

The purpose of this research was to describe and analyze the factors associated with the satisfaction of providers with the use of the electronic patient record.

METHODS

Type and framework of study

This was a descriptive and analytical cross-sectional study. Eleven hospitals whose health records were computerized with Open Clinic GA software were included in the study. Five of them belonged to the third reference level (district), two to the second reference level (region) and four to the first reference level (national). Four hospitals were computerized in 2015 and seven computerized in 2017. They were all beneficiaries of a computerization project funded by an international organization with bilateral cooperation.

Study population and organization of data collection

To fully explore provider satisfaction, a questionnaire was developed and self-administered to caregivers and administrative staff. The sample size was calculated from 155 providers with the Raosoft software, a proportion allocation was made to determine the number of subjects to be investigated in each hospital. Simple random selection was used to identify providers to be included in the study at two per service. The data were collected in February 2020.

Data capture, processing and analysis

The collected data was entered with the EPI INFO software, the analysis was done with STATA 15. To investigate the factors that explain the satisfaction of providers with the new system based on the use of the electronic health record, the bivariate analysis was done using the Pearson Chi-2 statistical test. Associations between the dependent variable and the independent variables were measured by Odds Ratio (OR) and their confidence interval at 95%. A multi-varied analysis according to the logistic regression model was made to identify the independent variables associated with the satisfaction of the providers. All independent variables whose significance was less than or equal to 25% in the bivariate analysis were included in the initial model. Step-by-step top-down modeling was performed to determine statistically significant variables and at the end, a final model was selected. The significance threshold was 5%. The Hosmer-Lemeshow test was used to determine the suitability of the final model.

RESULTS

Description of the characteristics of the providers

Of the 155 recipients included in the study, the majority were 52.9% male. The median age was 36 years with the minimum age of 24 and the maximum age of 74. The majority of providers were nurses (51.0%) followed by physicians (22.5%) (Table 1).

Satisfaction of service providers

Of the 155 providers, 86 (55.5%) were satisfied with the new EHR-based system. Of the 86 providers satisfied with the new EHR-based system, the perceived benefits of computerizing medical records are good management of health records and information (25.6%); continuity and quality of care (22.1%); good management of resources

(12.8%), reduced service time (9.3%) and easy exchange of information between providers (7.0%); 4.7% of providers also referred to the ease of the software in producing reports and statistics.

The problems expressed by those who were not satisfied are (i) the software malfunction (lack of some diagnostics, updating of information on the EHR, interoperability and report generation problems in some services) expressed by 28.6% of providers; the need for training (16.3%), the insecurity of computers and tablets (15.3%), network problems (14.3%); the low capacity of providers to use the tool computer (10.2%), electrical power outages (7.1%). Difficulties in completing the EHR on time in emergency departments were expressed by 4.1% of providers.

Providers' knowledge and practices in using the software

The majority of study participants reported having the ability to easily use the authorizing officer (92.9%) and the software (87.7%). The majority of providers were trained by project computer scientists and those from the Ministry of Public Health and AIDS Control (45.2%), but a significant proportion had unmet training needs (85.8%) (Table 2).

Factors associated with provider satisfaction with the EHR-based hospital information system

In this study, variables such as gender, the profile of the person who trained providers on the software at the beginning of implementation, and the use of the software to produce reports and statistics were positively associated with providers ' satisfaction with the EHR-based hospital information system. Men were 2.21 percent more satisfied with the use of EHR than women (OR=2.21; 95% CI: [1.09-4.46]). Providers trained by project's hospital computer were 4.24 more satisfied than those trained by their colleges (OR=4.24; 95% CI: [1.47-12.23]) and 3.69 more satisfied than those trained by project computer scientists (OR=3.69; 95% CI: [1.25-10.89]). Similarly, the use of software to output reports and statistics was 2.27 times associated with provider satisfaction (OR=2.27; 95% CI: [1.14-4.49].

Table 1: Distribution of providers by characteristics, Burundi 2020 (n=155).

Provider characteristics		Number (n)	Percentage (%)
Sex	Male	82	52.9
	Female	73	47.1
Age (years)	24-30	29	18.7
	31-40	88	56.8
	41-50	27	17.4
	>50	11	7.1
Level of study	A3/A2	88	56.8
	Senior technician	32	20.6
	Doctorate in medicine/specialization	35	22.6
Qualification	Medical practitioners and specialists	35	22.5
	Nurse	79	51.0
	Other	41	26.5
Hospital services	Outpatient consultation	12	7.7
	Pediatrics	17	10.9
	Internal medicine	14	9.0
	Gyneco-obstetric	12	7.7
	Medical imaging	8	5.1
	Operational area	14	9.0
	Laboratory	12	7.7
	Pharmacy	13	8.4
	Emergency	17	10.9
	Administration and finance	18	11.6
	Other services	18	11.6
Number of years in hospital	≤2 years	47	30.3
	Between 2 years and 6 years	51	32.9
	>6 years	57	36.8
Year of start of EMR use	2015	47	30.3
	2017	108	70.7
Hospital reference level	District	57	36.8
	Regional	25	16.1
	National	73	47.1

Table 2: Distribution of providers according to their knowledge and practices in using the software, Burundi 2020 (n=155).

Knowledge and practices in using the software		Number (n)	Percentage (%)
Easy use of a computer	Yes	144	92.9
	No	11	7.1
Expressed ease of use of the software	Yes	139	87.7
	No	19	12.3
Satisfaction with time to complete the electronic patient record	Short	101	65.2
	Medium	15	9.6
	Long	39	25.2
Use of reference systems (ICD10, SNOMED)	Yes	78	50.3
	No	77	49.7
Production of statistics and reports from the software	Yes	79	50.9
	No	76	49.1
Profile of the person who gave the training on the software at the beginning of the computerization project	Colleague	24	15.5
	Hospital informatics officer	61	39.3
	Computer scientist from the ministry of health or technical and financial partners	70	45.2
Unmet software training needs	Yes	133	85.8
	No	22	14.2

Table 3: Identification of factors associated with provider satisfaction with the use of the EHR, Burundi 2020 (n=155).

Provider characteristics		%	Initial model		Final model	
			Adjusted OR IC$_{95\%}$	p value	Adjusted OR IC$_{95\%}$	p value
Sex	Female	49.3	1		1	
	Male	60.9	1.89 [0.89 - 3.90]	0.096	2.21 [1.09 - 4.46]	0.027
Expressed ease of use of the software	No	18.2	1			
	Yes	58.3	5.06 [0.94 - 27.25]	0.059		
Expressed ease of use of the software	Expressed ease of use of the software	29.2	1		1	
	Expressed ease of use of the software	57.4	3.10 [1.04 - 9.26]	0.043	4.24 [1.47 - 12.23]	0.008
	Expressed ease of use of the software	62.9	3.71 [1.19 - 11.51]	0.024	3.69 [1.25 - 10.89]	0.018
Satisfaction with time to complete the electronic patient record	Short	46.2	1			
	Medium	46.7	0.93 [0.24 - 3.52]	0.921		
	Long	60.4	1.39 [0.61 - 3.17]	0.429		
Production of statistics and reports from the software	No	44.7	1		1	
	Yes	65.8	2.38 [1.15 - 4.89]	0.019	2.27 [1.14 - 4.49]	0.019
Year of start of EMR use	2015	46.8	1			
	2017	59.3	1.92 [0.81 - 4.48]	0.133		
Constant			0.024		0.171	
Chi² of the model			25.73		18.23	
Significance of the model			0.001		0.011	
% Correct prediction			12.1%		8.5%	

Table 4: Distribution of providers satisfied by the use of EHR, Burundi 2020 (n=155).

Explanatory factors		Provider satisfaction n (%)		Gross OR [IC 95%}	p value
		Yes (n=86)	No (n=69)		
Sex	Male	50 (60.9)	32 (39.0)	1.61 [0.85 - 3.04]	0,145*
	Female	36 (49.3)	37 (50.7)	1	
Age (years)	24-30	17 (58.6)	12 (41.4)	1.77 [0.61 - 5.11]	0,418
	31-40	49 (55.7)	39 (44.3)	1.57 [0.66 - 3.74]	
	41-50	12 (44.4)	15 (55.6)	1	
	>50	8 (72.7)	3 (27.3)	3.33 [0.72 - 15.37]	
Level of study	A3/A2	47 (53.4)	41 (46.6)	1	0,823
	Senior technician	19 (59.4)	13 (40.6)	1.27 [0.56 - 2.89]	
	Doctorate in medicine /specialization	20 (57.1)	15 (42.9)	1.16 [0.52 - 2.56]	
Qualification	Administration	7 (50.0)	7 (50.0)	1	0,675
	Nurses	41 (51.9)	38 (48.1)	1.07 [0.35 - 3.36]	
	Physicians	20 (57.1)	15 (42.9)	2.67 [0.49 - 14.46]	
	Laboratory technicians	8 (72.7)	3 (27.3)	1.33 [0.38 - 4.62]	
	Others	10 (62.5)	6 (37.5)	1.67 [0.39 - 7.15]	
Unmet software training needs	Yes	13 (59.1)	9 (40.9)	1.19 [0.48 - 2.97]	0,713
	No	73 (54.9)	60 (45.1)	1	
Hospital services	Administration and finance	8 (44.4)	10 (55.6)	1	0,827
	Outpatient consultation	7 (58.3)	5 (41.7)	1.75 [0.39 - 7.66]	
	Paediatrics	8 (47.1)	9 (52.9)	1.11 [0.29 - 4.21]	
	Internal medicine	7 (50.0)	7 (50.0)	1.25 [0.31 - 5.07]	
	Gyneco-obstetric	7 (58.3)	5 (41.7)	1.75 [0.39 - 7.66]	
	Medical imaging	4 (50.0)	4 (50.0)	1.25 [0.24 - 6.63]	
	Operational area	10 (71.4)	4 (28.6)	3.13 [0.71 - 13.81]	
	Laboratory	9 (75.0)	3 (25.0)	3.75 [0.75 - 18.64]	
	Pharmacy	8 (61.5)	5 (38.5)	2.00 [0.46 - 8.56]	
	Emergency	8 (47.1)	9 (52.9)	1.11 [0.29 - 4.21]	
	Other services	10 (55.6)	8 (44.4)	1.56 [0.42 - 5.81]	
Profile of the person who gave the training on the software at the beginning of the computerization project	Colleague	7 (29.2)	17 (70.8)	1	0,015*
	Computer scientist	35 (57.4)	26 (42.6)	4.11 [1.50 - 11.22]	
	Computer scientist from the Ministry of Health or technical and financial partners	44 (62.9)	26 (37.1)	3.27 [1.18 - 9.03]	
Expressed ease of use of the software	Yes	84 (58.3)	60 (41.7)	6.30 [1.31 - 30.21]	0,008*
	No	2 (18.2)	9 (81.8)	1	
Satisfaction with time to complete the electronic patient record	Short	61 (60.4)	40 (39.6)	1.78 [0.84 - 3.75]	0,243*
	Medium	7 (46.7)	8 (53.3)	1.02 [0.31 - 3.37]	
	Long	18 (46.2)	21 (53.8)	1	
Use of reference systems (ICD10, SNOMED)	Yes	44 (56.4)	34 (43.6)	1.07 [0.57 - 2.03]	0,815
	No	42 (54.6)	35 (45.5)	1	
Production of statistics and reports from the software	Yes	52 (65.8)	27 (34.2)	2.38 [1.24 - 4.55]	0,008*
	No	34 (44.7)	42 (55.3)	1	
Year of start of EMR use	2015	22 (46.8)	25 (53.2)	1	0,152*
	2017	64 (59.3)	44 (40.7)	1.65 [0.83 - 3.29]	
Hospital reference level	District	29 (50.9)	28 (49.1)	1.12 [0.44 - 2.87]	0,335
	Regional	12 (48.0)	13 (52.0)	1	
	National	45 (61.6)	28 (38.4)	1.74 [0.42 - 2.02]	

DISCUSSION

The assessment of the level of provider's satisfaction was made through the self-administered questionnaire. The frequency of providers who are satisfied and the factors underlying their satisfaction were determined. The multivariate logistic regression analysis identified the factors associated with provider satisfaction in the 11 study hospitals. Of the 15 explanatory variables, six had significance below 25% in the bi-variable analysis were introduced into the initial model (table 4). Step-by-step top-down modeling was performed to determine statistically significant explanatory variables and at the end, a final model was selected. The Hosmer-Lemshow test concluded that the final model was satisfactory because the resulting p-value was 0.7699.

Of the 155 providers surveyed, the majority of providers were nurses (51.0%) followed by physicians (22.5%). Other providers included laboratory technicians, computer scientists, administrative and other support staff. In most provider studies on the implementation of the electronic health record, nurses are the majority. A study conducted in a hospital in Ethiopia on evaluating the implementation of the electronic health record, the majority of participants were nurses (64%) followed by doctors (27%).[9] Another study on the preparation of health professionals to implement electronic health records system in three hospitals in Ethiopia showed that nurses were numerous in a proportion of 52.6%.[10] This could be explained by the fact that in Africa, the availability of health personnel is estimated at 32 nurses per 10,000 inhabitants which is higher than the density of doctors per inhabitant (2 per 10,000 inhabitants).[11] Regarding satisfaction, the results of this study showed that 55.5% of providers were satisfied with the new EHR-based system, men were more satisfied than women (60.9% versus 49.3%). This proportion is lower than that found in a Ethiopia's study where 65.6% were satisfied with the overall context of the EHR-based system.[9]

A study conducted in Saudi Arabia indicated that EHR user satisfaction was 40%.[12] The proportion of providers satisfied by the use of EHR differs from study to study. The totally different contexts of implementation of projects in terms of the state of the infrastructures and the characteristics of the providers could explain this difference.[13-14] The multivariate analysis by logistic regression showed that the gender, the exploitation of reports and statistics released in the software and the person who gave the training at the beginning of the computerization project were the three factors associated with the satisfaction of the providers in the 11 study hospitals. Compared to the person who gave the training, those who were trained by computer scientists specialists from the Ministry of Health and project level (62.9%) were more satisfied than those who were trained by computer scientists from the hospital (57.4%) and by colleagues (29.2%); the difference was statistically significant. This difference can be explained by the fact that the computer scientists `from the project had a higher skill gradient than other staff (colleagues or computer scientists from the hospital). The proportion of providers who used the software to produce reports or statistics was higher than those who said they had never released reports or statistics; 65.8% versus 44.7%. The management of reports or statistics in the paper-based system is more difficult and tedious, so it is understandable that providers who from time-to-time needed reports or statistics are more satisfied than those who claimed to have never released reports or statistics, it should also be noted that the computerization of the health record makes it possible to automate the production of reports and statistics.[2,3] Satisfaction with the EHR-based system was not associated with the demographic characteristics of participants, including age, qualification, or seniority in the hospital, which is consistent with several other studies.[12,15-17] This consistent finding between the studies reaffirms the importance of the performance (ease of use, interoperability etc.) of the software used to computerize the health record and the aspects related to the project implementation process regardless of the characteristics of the providers.

In this study the main limitation to be highlighted concerns the fact that it was carried out in public hospitals with the EHR system developed with the Open Clinic GA software, and the results may not be generalizable to other types of hospitals in particular those of private status or to hospitals with a different EHR system.

CONCLUSION

This study showed that 44.5% of providers were dissatisfied with the hospital information system based on EHR. Some of the reasons for the lack of satisfaction were, among others, the lack of updating of information on the EHR, problems of interoperability and generation of reports in some services, the need for training, insufficient computers, problems with networks; the low capacity of providers in the use of the computer tool and power cuts. The continuous evaluation of the computerization process and the observations given by users should guide stakeholders to undertake corrective actions to improve the adherence and satisfaction of providers to the hospital information system based on the EHR.

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