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The Significance of Electronic Health Records to Reduction of Patient Safety Events in Hospitals

 Akinade Frederick Akindele

Department of Information Systems Management, University of Roehampton, London, UK

ABSTRACT

Objectives: The alarming rate of occurrence of Patients Safety Events (PSEs) with all its ugly consequences is fast becoming a global emergency requiring well-coordinated and resolute intervention strategy to mitigate. PSEs are a daily occurrence in hospitals worldwide and it affects several of millions of patients yearly. This Research Project was aimed at examining and determining 'The Significance of Electronic Health Records to Reduction of Patients Safety Events in Hospitals'.

Methods: The relationship between Electronic Heath Records (EHR) and PSEs was determined through a positivist epistemology using the Survey methodology and quantitative method of research.

Results: The researcher hypothesis was confirmed with the majority 48.6% respondents agreeing and 41.8% strongly agreeing to assumption. The majority 52.4% respondents also strongly agree that the adoption of EHR in hospitals will guarantee an improved quality of care, improved population's health and improved efficiency of the health care system generally.

Conclusion: The study affirmed that adoption of EHR will significantly reduce PSEs in the hospital. This however can only be achieved with a 'good' EHR system and a stable power supply. A 'good' EHR system is that which contains all the EHR elements i.e. (Clinical Data Repository (CDR), Clinical Decision Support System (CDSS), Computerized Physician Order Entry (CPOE), and the Physician Documentation (PD). This is the sure pathway to the much-desired safety in our hospitals.

Keywords: Electronic health records, patient safety, safety

INTRODUCTION

Expectations from the Electronic Health Records (EHR) are high. This is because it is seen as the solution to the numerous challenges confronting the health system. According to Windle et al, the global pursuit of the improved medical care quality, improvement of the population's health as well as the promotion of the efficiency of the healthcare system depends on the EHR.[1] The occurrence of medical errors and high rate of Patient safety Events (PSEs) in any hospital is a pointer to a poor quality of care. Medical error is a global citizen; it is not restricted by geography. However, it is more worrisome in developing nations like Nigeria where visible attempts to curb the menace are rarely embarked upon.

Many health care managers have used EHR to bring about the much desired cost reduction. Hence, the eventual ability of EHR to reduce management's is no longer in contestable.[2,3] However, having prevailed in the debate on the priority between cost reduction and the improved care quality, health care managers' focus has been redirected to primarily pursue quality care.[1,4]

The debate has shed more light on the dangers of sacrificing quality care for cost reduction. In a view to right the wrongs of the past, many health care managers have started putting quality ahead of cost reduction targets.[1,4]

The world is making increased efforts to avoid medical errors because of the threat it poses to human continuous existence. The medical error has become the third biggest cause of death in the U.S claiming about 400.000 lives annually. According to the data released by the WHO's regional office of EU, medical errors contribute 8-12% cause of hospitalization.[5] Hospital-acquired infection affects 1 of every 20 hospital patients amounting to about 4.1 million patients. Twenty-three percent of EU citizens claimed to have been directly affected by the medical error. According to this report, if medical errors are put under control, harm-inflicting medical errors will reduce by 750.000 cases, there will be 260.000 fewer cases of permanent disabilities and 95.000 fewer deaths per year among EU citizens alone.

If the developed nations could have this kind of staggering and worrisome figures about the threats posed by medical errors, one could imagine what the case will look like in developing nations like Nigeria. More worrisome to this is the problem of paucity of data ravaging every sector in Nigeria including health. According to the Guardian newspaper of 8th April 2016, while reporting the rise of deaths by medical mistakes in Nigeria, the authors lamented that less than 5% of medical errors are ever reported in Nigeria.[6] Medical errors are encouraged in the Nigerian health sector by cultural notions, poverty, ignorance and the indifferent attitude of healthcare practitioners to the wellbeing of their patients.[7] Several studies have shown that leading causes of medical errors include misdiagnosis, poor communication, pharmacy errors and poor medical knowledge.

An occasion where a patient's health is harmed or unreasonably predisposed to harm while receiving care in a health facility is called Patient Safety Event.[3] To err, they say, is human but it is a responsible act to identify wrongs and to make deliberate efforts at preventing future recurrence thereby minimizing the rate of PSEs. Unfortunately, many hospitals use the cover of the difficulty to differentiate between conventional risks from medical mismanagement risks to indulge in this ill and wriggle out of it unpunished. However, the tune of the music is changing with more awareness of rights by patients and the population. People are beginning to know that many ills they suffer are either direct or indirect consequence of clinical negligence or medical errors and they have started seeking redresses even in developing nations. This development demands improved responsibility and actions among health practitioners and managers.

Responsible players in the health world believe the solution to the occurrence of PSEs in hospitals lies in EHR. This is because of the belief that EHR enhances the quality of medical care and when the quality of care is improved through EHR [1], PSEs will naturally reduce drastically. However, this assumption is yet to be confirmed with an empirical research data, hence, this study.

In view of the general assumption that EHR has a relationship with improved quality of medical care and reduces PSE, there is the need to test this assumption with real data for the confirmation or rejection of the claim. In doing this, it is crucial to determine:

Research Question 1: Does the EHR actually relates to an improved quality of medical care and how?

Research Question 2: Moreover, does EHR actually reduce medical errors and patients safety events in Hospitals?

Research Question 3: How does EHR help in reducing PSEs? To what extent can EHR reduce PSEs?

Research Question 4: What is the scope of coverage of EHR implementation and investment that can bring about the desired result of a reduction in PSE?

Research Question 5: What barriers can militate against this goal, especially in developing countries like Nigeria and how can they be mitigated?

The main goal of this study is to help provide a clear roadmap, by clearing doubts, towards solving the problem of PSEs in our health institutions thereby making them safer for patients and clients. This study seeks to pursue the following objectives:

Establish a cause and effect relationship between EHR and PSEs in hospitals;

Should the above be true, to give logical explanation on how EHR reduces PSEs;

Determine the scope of EHR implementation and content that can affect PSEs;

Identify possible barriers to these; and

It is also aimed at furthering existing studies, especially that of Chukwuneke while contributing to the body of knowledge in health management especially in the area of reduction of PSEs in hospitals.[7]

The result of this study will contribute to the body of knowledge, and help mitigate the challenges of PSEs in hospitals as well as encourage and justify the adoption and implementation of EHR in hospitals.

METHOD

EHR has been acclaimed to provide a reduction in the cost of healthcare as well as improved quality of care in hospitals.[2,3] However, Lizawatti et al. has discovered that this claim will only be possible if the EHR is clinically oriented in design and there is a proper synchronization of all the sociotechnical elements of EHR.[1,4,8]

This study is based on a positivist epistemology adopting the survey methodology and quantitative method of research. Primary data source was surveyed with well-structured Likert scale questionnaires for data collection tool.

The research data for this study is obtained from surveyed medical practitioners in different hospitals (both private and public) across Nigeria. Their opinions about the research variables were obtained using structured questionnaires. This primary data targeted questionnaire was to allow a good level of control over the phrasing of questions with a view to addressing the research questions and objectives.[9]

Data captured the rate of occurrence of PSEs with and without EHR implementation in respondents' hospital, as well as their opinion on the relationship between EHR and PSEs. Also, suggested elements of EHR that may be connected to increased quality of medical care and reduced medical errors were advanced to elicit respondents' opinion. The aim of this was to elicit practitioners' opinion of core and optional elements of EHR in relation to reduced PSEs. Similarly, functional deliverables of EHR that may be connected with quality and PSEs were suggested to obtain respondents' feedback on the core and optional deliverables in relation to improved quality of care and reduced PSEs.

A total of 500 medical practitioners in hospitals where EHR is implemented and those where it is not were randomly sampled to enable a comparison of the rate of occurrence of PSEs in the different hospital category. This was done using the simple random sampling technique for equal opportunity of being selected for representation.[9]

The sample size of 500 respondents was determined using the formula provided by Charan et al for quantitative studies.[10] This is bearing in mind that there is no single perfect way for calculating the sample size of a survey research. The data was analyzed with SPSS software.

RESULTS

The personal data contains the entire 500 surveys validity intact because no records were missing sequel to the research approach adopted as discussed in above.

Most of the respondents are male constituting 59.0% of the total survey. Most of the respondents with 25.8% are Health Information Officers followed by Medical Doctors with 19.0% of the whole. Result from survey on the contribution of EHR to improved quality of medical care shows that Most 52.4% of respondents strongly agree that adopting EHR in hospitals will guarantee improved quality of medical care, improved population's health and improved efficiency of the health care system. Also on the respondents' opinions on whether EHR help reduce medical errors and PSEs in the hospital or not, while 41.8% strongly agreed, the majority 48.6% simply agreed that EHR help reduce medical errors and PSEs in the hospital. Most 43.8% respondents strongly agree that HER, through E-prescription, can promote medication safety by eliminating ambiguity and poor penmanship common to paper prescriptions thereby reducing medical errors and PSEs. Another 46.6% and 42.8% respondents agreeing and strongly agreeing respectively that EHR help eradicate medical errors emanating from paper-based medical records (Table 1).

Most respondents with 59.0% also strongly agreed that timely and simultaneous access to comprehensive medical records of patients through EHR promotes high quality medical care. Meanwhile on the strength of online access to hospital information, most 44.6% respondents strongly agree that patients' online access to hospital and information improves provider-patient communication and quality of care through better adherence to drug and therapy instructions. Most 48.6% of respondents also agree that EHR help reduce hospital work complexity and bridge knowledge gaps thereby improving the quality of medical care and reducing instances of medical errors and PSEs.

In another survey, most 64.6% respondents strongly agree that EHR scheduling system help reduce patients' waiting time and thereby improve hospital efficiency. Also, while a significant 12.4% respondents were not sure, most 42.8% agree that EHR clinical alert and warning system helps providers to make accurate clinical judgment and decisions on patients thereby improving the quality of medical care and reducing instances of medical errors and PSEs.

Furthermore while checking the challenges to EHR's benefits, most respondents with 71.8% strongly agreed that poor power supply is a threat to reducing PSEs through EHR. And on the other challenges, most 58.0% respondents strongly agree that poor knowledge of ICT is a threat to reducing PSEs through EHR. Furthermore, on the inadequate deployment and use of EHR in the hospitals the highest 19.3% respondents sees erratic power supply as the main challenge to the adoption and implementation of EHR in Nigeria hospitals. In addition to the other suggested challenges, respondents submitted that malware attacks, hasty and non-systematic transition to EHR, as well as inadequate

Table 1. Participants opinions on the HER

	Strongly disagree n (%)	Disagree n (%)	Not sure n (%)	Agree n (%)	Strongly agree n (%)
Opinions on Do you agree that EHR help eradicate medical errors emanating from paper-based medical records?	5 (1.0)	29 (5.8)	19 (3.8)	233 (46.6)	214 (42.8)
Opinions on do you agree that EHR help reduce medical errors and PSEs in the hospital?	0 (0.0)	24 (4.8)	24 (4.8)	243 (48.6)	209 (41.8)
Opinion on do you agree that timely and simultaneous access to comprehensive medical records of patients through EHR promotes high quality medical care?	0 (0.0)	10 (2.0)	24 (4.8)	171 (34.2)	295 (59.0)
Opinion on do you agree that patients' online access to hospital and information improves provider-patient communication and quality of care through better adherence to drug and therapy instructions?	0 (0.0)	48 (9.6)	48 (9.6)	181 (36.2)	223 (44.6)
Opinions on do you agree that poor power supply is a threat to reducing PSEs through EHR?	8 (1.6)	12 (2.4)	14 (2.8)	107 (21.4)	359 (71.8)
Opinion on do you agree that poor knowledge of ICT is a threat to reducing PSEs through EHR?	4 (0.8)	6 (1.2)	14 (2.8)	186 (37.2)	290 (58.0)
Opinions on do you agree that EHR through E-prescription can promote medication safety by eliminating ambiguity and poor penmanship common to paper prescriptions thereby reducing medical errors and PSEs?	0 (0.0)	29 (5.8)	71 (14.2)	181 (36.2)	219 (43.8)
Opinions on do you agree that adopting EHR in hospitals will guarantee improved quality of medical care, improved population's health and improved efficiency of the health care system?	0 (0.0)	0 (0.0)	33 (6.6)	205 (41.0)	262 (52.4)
Opinions on do you agree that EHR help reduce hospital work complexity and bridge knowledge gaps thereby improving the quality of medical care and reducing instances of medical errors and PSEs?	0 (0.0)	5 (1.0)	14 (2.8)	243 (48.6)	238 (47.6)
Opinions on do you agree that EHR scheduling system help reduce patients' waiting time and improve hospital efficiency?	0 (0.0)	3 (0.6)	7 (1.4)	167 (33.4)	323 (64.6)
Opinions on do you agree that EHR clinical alert and warning system helps providers to make accurate clinical judgment and decisions on patients thereby improving the quality of medical care and reducing instances of medical errors and PSEs?	0 (0.0)	19 (3.8)	62 (12.4)	214 (42.8)	205 (41.0)
Opinions on do you agree that EHR help reduce work burdens that predispose physicians to errors?	0 (0.0)	24 (4.8)	38 (7.6)	214 (42.8)	224 (44.8)

stakeholders' involvement, ignorance and poor political will are other vital obstacles to the adoption and implementation of EHR in Nigeria hospitals. Most 19.7% respondents submitted that quackery and other medical malpractices as well as corruption and unethical behaviors are the other factors contributing mostly to medical errors and PSEs.

On the ideal content of EHR that will be effective in reducing PSEs, Most 44.1% respondents think all suggested EHR components (PD, CPOE, CDSS and CDR) must be contained in the EHR deliverables if reduced medical errors and PSEs is to be guaranteed.

Examining how EHR brings about PSEs, most 32.3% respondents thinks EHR promote better quality of care and reduce medical errors and PSEs majorly through the provision of timely and accurate information to support treatment decisions. In addition to other significant roles of EHR towards reduction of PSEs respondents also think it boosts physicians' confidence and improve communication.

And while checking the extent to which EHR can affect PSEs, a very significant 97% of respondents agree that EHR promotes quality of care and reduce PSEs to a great and very great extent. This shows that almost all healthcare pro-

fessionals believe that EHR enhances the quality of medical care and reduces PSEs in hospitals.

DISCUSSION

This study is aimed helping provide a clear roadmap, by clearing doubts, towards solving the problem of PSEs in our health institutions thereby making them safer for patients and clients. Although the researcher hypothesized that EHR implementation reduces PSEs in hospitals because of his personal opinion formed from experience and literature, the study sought to unravel the following puzzles of interest with facts: "Does the EHR actually relates to an improved quality of medical care and how?". Moreover, "Does EHR actually reduce medical errors and patients safety events in Hospitals?", "How does EHR help in reducing PSEs?", "To what extent can EHR reduce PSEs?", "What is the scope of coverage of EHR implementation and investment that can bring about the desired result of a reduction in PSE?" and, "What barriers can militate against this goal, especially in developing countries like Nigeria and how can they be mitigated?".

The objectives of this include to: Establish a cause and effect relationship between EHR and PSEs in hospitals; should this be true, to give logical explanation on how EHR reduces PSEs; determine the scope of EHR implementation and content that can affect PSEs; and Identify possible barriers to these. This was done through the positivist epistemology using the Survey methodology and quantitative method of research to explore, prosecute and execute the research questions.

It is worthy to emphasize that medical error and PSEs are serious threats to human continued existence.[11] Several millions of people around the world have died, incapacitated, or adversely affected directly or indirectly by medical errors and PSEs in the hospitals. This necessitated the concerted global efforts to put it under control. As part of the global efforts to curb the menace of medical errors and PSEs in the hospitals, EHR has been suggested to be a potent tool in mitigating this challenge.

Testing the veracity of this claim, this research's facts have clearly shown that this claim is correct. As demonstrated in the research, it is clear that EHR does not only cause an improved quality of medical care, it also reduces the rate of medical errors and PSEs in hospitals to a very great extent. This is also in confirmation of the work of McCullough, et al, Hydari et al, and Furukawa et al. among others.[3,12,13] Overwhelming number of medical practitioners confirmed that EHR promotes quality of medical care as well as reduces the rate of medical errors and PSEs in the hospital.[4,12,13] This is in concord with Hydari et al study with the result of a 27% overall decline in PSEs in hospitals that adopted and implemented EHR.[3]

This feat was achieved by EHR through improved communication, better labeling, clear writing, bridging of knowledge gaps, and timely provision of patients' medical records as well as improved physician's confidence. This finding confirms the work of quality HER.[3,13,14]

However, for this to work, the EHR system must be robust in scope and contain the PD, CPOE, CDSS and CDR components. Although the work of Hydari et al, mentioned these components, it did not spell out the content that must be present in an ideal EHR system to guarantee reduced medical error and PSEs.[3] Moreover, the major barrier of erratic power supply and other challenges to the successful adoption and implementation of the EHR system must be adequately addressed for the system to deliver the expected reduction in medical errors and PSEs optimally.

The major limitation of this type of study as earlier identified is the fear of employers' victimization exercised by employee medical practitioners which restrains them from giving honest opinion about medical errors and PSEs in their hospitals. This was properly mitigated by providing sufficient explanation on source protection and the study motive. Also, as part of the effort to mitigate bias from the survey, several hospitals in different geographical locations within Nigeria were surveyed to ensure that individual hospital's administrative peculiarities do not interfere in the judgment and opinion of respondents.

The implications of these findings include more demands for EHR in hospitals by all stakeholders–patients, medical service providers, hospital management, and government. This may burden the hospitals in view of the huge financial implication of acquiring, installing, and maintaining the EHR systems in the face of the current dwindling resources. Moreover, this calls for acquisition of new skills (Computer appreciation skills) by medical practitioners.

Having confirmed that EHR reduces the rate of medical errors and PSEs in the hospitals, all stakeholders–patients, medical care providers, hospital administrators, and government would begin to demand for its universal adoption and implementation to curb the menace of medical errors and PSEs. This means that medical care practitioners need to live above board by arming themselves with the required knowledge of EHR in order to use it effectively. This means personal and deliberate development of required skills in this new calling by employees who are wise and want to remain relevant.

Hospital administrators also, may be required to redirect their budgets in order to address this new line of action. All the funds hitherto budgeted for paper forms and files, storage cabinets, and building of file libraries may need to

be redirected into acquiring ICT/EHR infrastructure for their hospitals. Government at different levels may also need to formulate policies on the safe use of EHRs as well as encouraging its adoption and use in hospitals. In view of the importance of these findings to humanity, it has become crucial to make the following recommendations:

a. Hospital managements should create a SMART plan to adopt and implement EHR and eradicate paper-based records. This can be gradually and systematically implemented to avoid being discouraged by the initial hiccups characteristic of similar changes in every organization;

b. ICT training should be included into the training curricular of health professionals to help overcome knowledge gaps in ICT by health professionals. This will promote embracing EHR in hospitals as well as minimize ICT training needs, with its attendant costs, in the hospitals;

c. Alternative power sources should be provided in hospitals to mitigate the threat to the adoption and implementation of EHR;

d. Government should as matter of policy make it mandatory for hospitals to adopt and implement EHR by making it a part of the hospitals accreditation criteria; and

e. Government should also encourage the adoption of this technology by providing incentives to obedient hospitals similar to the U.S. Strategy on the adoption of EHR in the U.S. (3).

Although, the adoption of EHR requires a lot of resources, the budgeting and implementation can be done in installments. If this is done, the menace of medical errors and PSEs will be significantly mitigated and our hospitals will be safer for all.

In view of the fact that other factors other than information management factor contribute to medical errors and PSEs in the hospital, there is need for a further study on all the factors responsible for medical errors and PSEs with a view to addressing all holistically. Also, studies into ICT Hardware with long-lasting inbuilt batteries that can endure over 24 hours of power outage may be necessary to assist countries with electric power challenges like Nigeria. Moreover, studies into how to make all emerging EHR solutions interoperable in line with established standard need to be done to prevent loss of vital data sequel to software upgrades which is inevitable where E-solutions are adopted.

This study is limited by resources such money and time to reach more number of respondents for a broader survey opinions especially in other African countries. The study is also restricted to the interrelationships that exist between the adoption of EHR technology in hospitals and the occurrence of PSEs. This will require the analysis of EHR, medical care quality, medical errors and PSEs as well as the factors that may pose challenges to EHR in hospitals.

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