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Electronic Health Records (EHRs) Use and Quality Healthcare Delivery by Physicians in Tertiary Hospitals in Federal Capital Territory, Nigeria

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Abstract

Quality healthcare delivery is imperative for sustainable socio-economic development and poverty reduction in any nation. It is a function of timely access to relevant and accurate patient health information by physicians, error-free prescription and medication, and the seamless transfer of patients from one level of care to another. However, the quality of healthcare delivery by physicians in Nigerian hospitals falls short of international best practices. The study investigated the influence of Electronic Health Records (EHRs) use on quality healthcare delivery by physicians in tertiary hospitals in Federal Capital Territory (FCT), Nigeria. The survey research design was adopted for the study. The population consisted of 610 physicians from the level of Registrar to that of Consultant in the three Federal Tertiary Hospitals located within the FCT. A stratified random sampling technique was used to select a sample of 390 physicians (Registrars-Consultants) across all departments. A validated questionnaire was used for data collection. The Cronbach's Alpha reliability coefficients for the constructs ranged from 0.89 to 0.98. The response rate was 99.5%. Data were analyzed using inferential (correlation, simple and multiple regression) statistics. Findings showed weak but significant relationships between quality healthcare delivery and Health Information Exchange ($r(388)=.240, p<0.05$), Computerized Physician Order Entry ($r(388)=.173, p<0.05$) and Clinical Decision Support ($r(388)=.277, p<0.05$). The study concluded that EHRs use contributes to quality healthcare delivery by physicians in tertiary hospitals in FCT, Nigeria. Therefore, the legislative arm of the government should enact a law on the adoption, implementation and use of electronic health records in the nation's tertiary hospitals.

Keywords: Electronic health records, use, quality, healthcare delivery, physicians, Federal Capital Territory, Nigeria

Introduction

Quality healthcare is the right of all and sundry; and the obligation of every responsive government to its citizens. Hence, governments all over the world are making huge investments in health ITs with the hope of getting dividend in the form of improved health outcomes. The most popular of health information technologies is the Electronic Health Records (EHRs), which is gradually becoming an integral part of modern medical practice. Nigerian healthcare system is generally characterized by poor structure, which represents care settings, providers' qualifications, and administrative policies and systems; poor process which refers to the procedural components of the care delivered and culminates in undesirable outcomes in the form of preventable deaths. Little wonder, Nigeria is known as one of the countries with the highest mortality rate in the world. To say that health care is not as safe as it should be even in the most advanced nations of the world is, to say the least. This assertion is evidenced by the reports of two studies in the United States, one in New York and the other in Colorado and Utah, which revealed that at least 44,000 to perhaps as many as 98,000 hospital deaths occur annually as a result of medical errors (Institute of Medicine, 2006). If the United States of America could record such an alarming rate of death owing to medical errors despite her health information technology sophistication, then the number of Nigerians who die every second in hospitals due to similar errors can better be imagined. The use of EHRs promises to tackle the incidences of medication errors through improved, accurate and clear medical records. EHRs make patient health records easily accessible by care providers. They also can alert physicians to potential drug interaction and drug-allergy when the physician is writing the prescription. They can also highlight test results that are out of normal range as well as eliminate medication errors due to illegibility of physicians' handwriting. Unfortunately, despite the crucial role of EHRs in enhancing a threshold improvement in quality healthcare delivery, Nigerian health records system has remained adamantly paper-based.

Statement of the Problem

It is evident from literature that Nigeria healthcare delivery quality is a far cry from global standards and international best practices. Literature has equally revealed that despite evidence of improved quality healthcare delivery resulting from the use of electronic health records in many nations of the world, health records system in Nigerian hospitals remains predominantly paper-based. Apparently, healthcare delivery in Nigeria is generally characterized by poor health records

tracking that results in over congestion, long waiting time, delays in laboratory test results and ultimately, erroneous prescription and medication, all of which negate healthcare quality. This study, therefore, seeks to investigate the influence of electronic health records use on quality healthcare delivery by physicians in tertiary hospitals in Nigeria's Federal Capital Territory.

Objective of the Study

The study aims to investigate the influence of electronic health records use on quality healthcare delivery by physicians in FCT based tertiary hospitals.

Hypothesis

H0 Electronic health records use has no significant influence on quality healthcare delivery by physicians.

Literature Review

Healthcare is the service or care directed towards ensuring the health of individuals and population through morbidity and mortality reduction (Atrash and Richard, 2012). It involves prevention, diagnosis and treatment of disease, illness, injury and other physical and mental impairments in humans (Adebayo, Labiran, and Emerenini, 2016). Every healthcare system aims to employ healthcare, social and other resources to meet people's health needs within a particular geographical region. Shireen, Wenjuan, and Lindsay (2015) describe quality healthcare delivery as getting the right care to the right person at the right time. It is receiving the best care possible for one's illness or condition, which include avoidance of errors or mistakes.

According to Ajala, Awokola, and Emuoyibofarhe (2015) the use of structure, process and outcome as proposed by Avedis Donabedian is pertinent to measuring the quality of healthcare delivery and assessing how clinical decision making affects quality healthcare delivery. In Donabedian (1966), a landmark article, the author proposed the use of the triad structure, process and outcomes to evaluate the quality of healthcare delivery, where he defines structure as the care settings, providers' qualifications, and administrative policies and systems. He refers to process as

the procedural components of the care delivered, and outcomes as recovery/restoration of function and survival.

It is a known fact that today Nigeria is one of the countries with the highest mortality rate in the world. Literature has shown that Nigeria's demographics and health indicators are among the worst in the globe with maternal and infant mortality rates of 545 per 100,000 and 87 per 1,000 live birth respectively, contributing 10% of global children deaths (National Population Commission (NPC), 2013; Timothy, Irinonye, Yunusa, Dalhatu, Ahmed and Suberu, 2014). According to WHO (2012) and Omoluabi (2014) in their separate reports, confirm that these health indicators have remained below country targets and internationally set benchmarks. Omoluabi (2014) equally reveals that life expectancy at birth in Nigeria is 49 years while the disability-adjusted life expectancy at birth is 38.3 years. It was reiterated further that vaccine-preventable diseases, infectious and parasitic diseases have continued to exert their toll on the health and survival of Nigerians. It has also been reported that 840 out of every 100,000 women die in Nigeria, translating to 14% of global maternal deaths, while under-five mortality rate in Nigeria is as high as 128 per 1,000 live births (NPC, 2013). Although it is not known how many of these deaths are due to medication errors, implementation and use of EHRs in our healthcare system can enhance a threshold improvement in quality healthcare delivery.

Electronic health records are software platforms that physicians and other healthcare providers use to create, store, update, and maintain patients' health records electronically. They represent the primary mechanism that facilitates the much-desired interoperability of health information such that stakeholders can seamlessly share, exchange and access relevant patient data. Ajala, Awokola and Emuoybofarhe (2015) define electronic health record system as a record in digital format that is theoretically capable of being shared across different healthcare settings. Information contained in electronic health record system include patient demographics, progress notes, vital signs, medical histories, laboratory test results, diagnoses, medications, allergies, radiology images, immunization dates and administrative and billing data. Information stored in electronic health record systems is used by health care providers, and sometimes patients, during a patient's hospitalization, over time, and across care settings. EHR systems have become a major component that represents an essential tool for improving the safety and quality of twenty-first-century healthcare delivery.

EHRs are required in the field of medicine and medical practice to support information processing, decision making and records keeping in particular. DesRoches, Campbell, Rao, Donelan, Ferris, Jha,... Blumenthal et al (2008) identify five primary themes of EHRs: (1) increased delivery of care in adherence to guidelines and protocols (2) enhanced capacity to perform surveillance and monitoring for disease conditions and care delivery (3) reduction in rates of medication errors (4) decrease utilization of care, and (5) mixed effect on time utilization, three of which directly related to quality while two address efficiency Institute of Medicine (2000, 2001) report that stakeholders in the healthcare industry consider clinical decision support and Computerized Provider Order Entry to be critical to transforming the healthcare industry. Akor (2016) infers that the deployment of information technology such as EHRs in healthcare management has provided a mechanism for promoting greater reliability in healthcare quality.

There is evidence of EHRs impacts on quality healthcare (Bell, Thornton, 2011; Hersh, Weiner, Embi, Logan, Bemstam, Lehmann,...Saltz, 2013; O'Neill, Etim, Obarein, 2014; Tremblay, Richer, Aubry, 2013; Wheatley, 2015). EHRs have the potential to improve the quality of healthcare delivery. With EHRs the issue of illegible handwriting which is said to account for an estimated 5 to 10 percent of medical errors, including misunderstood orders and prescriptions will cease to be an issue (Tremblay, et al, 2013). Appari, Johnson and Anthony (2015) in their study on evaluation of surgical safety in relation to EHRs utilization report 7-26% safety improvement in seven of eight safety indicators among 3, 002 hospitals studied. Encinosa and Bae (2010) report a drop in adverse drug events by one third as a result of EHRs adoption. When physicians have access to complete and accurate patient information, patients receive quality care. Schiff, David and Bates (2010) portend that EHRs have the potential to decrease medication errors by providing improved access to necessary information, better communication and integration of care between different providers and visits, and more efficient documentation and monitoring.

Hydari, Telang and Marella (2014) examine the incidence of adverse patient safety events in Pennsylvania hospitals from 2005-2012 and found that hospitals that had adopted a comprehensive EHRs experienced 27% reduction in patient safety adverse events, 30% reduction in medication errors and 25% decline in procedure-related errors. Jamoom, Patel, King and Furukawa (2014) report that 94% of doctors indicate that EHR makes records readily available at point of care, 88% reported that EHR produces clinical benefits for their practice while 75% reported that EHR allows

them to deliver better patient care. EHRs are also useful for decreasing prescription errors with the help of alerts and reminders made possible by CDS system (Kaushal, Kern, Barron, Quaresimo & Abramson, 2010). Little wonder, today a good number of healthcare facilities the world over are adopting and using EHRs with functionalities such as Clinical Decision Support (CDS), Computerized Physician Order Entry (CPOE) and Health Information Exchange (HIE) that have undeniable potentials to improve quality of healthcare delivery. This is why the United States of America has actually gone beyond incentivizing the meaningful use of EHRs by professionals and healthcare organizations to penalizing failure to do so (Schwartz, 2017).

Conversely, Himmelstein, Wright and Woolhandler (2009) infer that computerization made a slight difference in quality. Similarly, other studies found that EHRs use was not associated with quality ambulatory care (Linder, Bates, Middleton & Stafford, 2007). They argue that merely implementing and using EHRs is not sufficient for quality healthcare delivery, but that the tool needs to be coupled with other systems such as clinical decision support, registry functions and care delivery transformations such as team-oriented approaches. In a similar study, Drew, Harris and Zegre-Hemsey (2014) portend that there is a decrease in physicians' attention to patients during clinical visits due to electronic health records use. The authors further insist that physicians sometimes tend to ignore or fail to respond appropriately to warnings from potential danger alerts due to the high volume of alert they get each day. This according to their study leads to increased patient safety risk.

Research Methodology

The survey research design was adopted for the study. The population consisted of 610 physicians from the level of Registrar to that of Consultant in the three Federal Tertiary Hospitals located within the FCT. A stratified random sampling technique was used to select a sample of 390 physicians (Registrars-Consultants) across all departments. A validated questionnaire was used for data collection. The Cronbach's Alpha reliability coefficients for the constructs ranged from 0.89 to 0.98. The response rate was 99.5%. Data were analyzed using inferential (multiple linear regression) statistics. The Statistical Products and Services Solution (SPSS) version 21 was used for carrying out the analysis.

Results

Hypothesis

H0: Electronic health records use has no significant influence on the quality of healthcare delivery by physicians in tertiary hospitals in FCT, Nigeria

Multiple Linear Regression Testing for Significant Influence of Electronic Health Records Use on Quality Healthcare Delivery

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	57.781	0.971		59.511	0.000
	Health Information Exchange	0.069	0.189	0.039	0.367	0.713
	Computerized Physician Order Entry	-0.598	0.341	-0.158	-1.755	0.080
	Clinical Decision Support	1.061	0.331	0.371	3.204	0.001
a. Dependent Variable: Quality Healthcare Delivery						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1066.610	3	355.537	11.391	0.000^b
	Residual	11767.275	377	31.213		
	Total	12833.886	380			
R= 0.288 R Square = 0.083 Adjusted R Square = 0.076						

The Table above depicts that electronic health records use had a significant influence on quality healthcare delivery by physicians in tertiary hospitals in FCT ($F(3, 377) = 11.391, p < 0.05$). This implies that from the joint perspective, electronic health records use could predict quality healthcare delivery by physicians in tertiary hospitals in FCT. In addition, the Table also depicts that out of the three parameters that measure electronic health records use, it was only *Clinical Decision Support* that had a positive weak significant influence on quality healthcare delivery ($r = 0.371, B = 1.061, T = 3.204, p < 0.05$); while *Health Information Exchange* and *Computerized Physician Order Entry* had no significant influence on quality healthcare delivery ($p > 0.05$). The implication of this is that increased utilization of *Clinical Decision Support* would lead to an improved healthcare delivery overall by physicians in tertiary hospitals in FCT; while individual consideration of *Health Information Exchange* and *Computerized Physician Order Entry* by

physicians in FCT would not significantly result in quality healthcare delivery. Furthermore, the model could explain 8.3% ($R^2=0.083$) variation in quality healthcare delivery. Consequently, the hypothesis that electronic health records use has no significant influence on quality healthcare delivery by physicians in tertiary hospitals in FCT is rejected

Discussion of Findings

Discussion on the influence of electronic health records use on quality healthcare delivery by physicians in tertiary hospitals in FCT, Nigeria

The findings revealed a positive significant influence of electronic health records use on quality healthcare delivery. This finding is consistent with those of Bell and Thornton (2011); DesRoches, et al, (2008); Hersh, et al, (2013); IOM (2001); O'Neill, Etim and Obarein (2014); Schiff, et al, (2010); Wheatley (2015); WHO (2000) all of which reported a positive relationship between EHRs use and quality healthcare delivery. The finding is equally in tandem with that of Omogbadegun (2013) which lists easier clinical examination procedure among other benefits of EHRs use by physicians. The finding also agrees with that of Goldzweig (2013) who reported a positive impact of EHRs on physician performance. It is also consistent with Appari, Johnson, Anthony (2015) which reported a 7-26% safety improvement in seven of eight safety indicators among 3, 002 hospitals studied. The finding agrees with those of Encinosa and Bae (2010) which reported a drop in adverse drug events by one third as a result of EHRs adoption. The result also agrees with those of Hydari, Melang and Marella (2014) who examined the incidence of adverse patient safety events in Pennsylvania hospitals from 2005-2012 and found that hospitals that had adopted a comprehensive EHRs experienced 27% reduction in patient safety adverse events, 30% reduction in medication errors and 25% decline in procedure-related errors. However, the result is at variance with that of Drew, Harris and Zegre-Hemsey (2014) which portend that there is a decrease in the amount of attention physicians pay to patients during patients' visit due to the use of EHRs. The finding is also inconsistent with those of Linder, Bates, Middleton and Stafford (2007) which reported that EHRs use had no association with quality ambulatory care.

These findings imply that, since electronic health records had such positive influence on quality healthcare delivery by physicians in tertiary hospitals based in FCT, Nigeria, it then means that, physicians' utilization of electronic health records that have the capability of making patients'

health information available to physicians at the point of care; alert physicians to potential medication errors and adverse events that result from drug-drug interaction and allergies; highlight laboratory test results that are out of normal range and generally transform the healthcare sector, could contribute to the quality of healthcare delivery by physicians in tertiary hospitals in the FCT, Nigeria. Hence, implementing and utilizing EHRs by physicians in tertiary hospitals in FCT and the nation at large will enhance the quality of healthcare delivery by physicians in the nation's hospitals. Although adoption and implementation of EHRs is capital intensive, it promises to pay off in the long run.

Conclusion

Quality healthcare delivery plays a key role in ensuring good healthcare, which in turn, enhances economic development and quality of life of both individuals and population. However, to achieve high quality healthcare requires a lot of commitment, especially from the part of the government. Previous studies have shown associations between the use of electronic health records and quality healthcare delivery. The findings of the current study revealed that electronic health records use generally had a positive significant relationship with quality healthcare delivery. As a consequence, healthcare delivery by physicians in FCT-based tertiary hospitals was found to be of poor quality.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. The Federal Ministry of Health should collaborate with the legislative and the executive arms of the government to formulate policies that will be favourably disposed towards quality healthcare delivery. As healthcare delivery in the study area was found to be of poor quality.
2. In addition to the above, the legislative arm of the government should mandate the adoption, implementation and use of electronic health records in the nation's public tertiary hospitals
3. Health information professionals and Medical Librarians should sharpen their skills and knowledge on the management of electronic health record systems. This they

can do through attendance of conferences and workshops, especially, international conferences.

4. Physicians in tertiary hospitals in Nigeria should develop a positive disposition towards the use of electronic health records.

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