

# Information Systems in Health Care Delivery Services: A Case Study of Selected Academic Medical Centres in Lagos State, Nigeria

Odunlade, Racheal Opeyemi & Ojo, Joshua Onaade  
Main Library, University of Lagos

---

## Abstract

*Information Systems play a major role in the overall healthcare management. It has much to offer in managing healthcare and improving the quality of care. However, Information Systems cannot be discussed outside the concept of information technology. This is because of the embedded role of information technology in clinical and diagnostics equipment through which Information Systems are uniquely positioned to capture, store, process and communicate timely information to decision makers for better coordination of healthcare at both the individual and corporate levels. This study examined the role played by Information Systems (IS) in healthcare delivery services in three academic medical centres in Lagos State, Nigeria. Descriptive survey design was used for the study. The total enumeration technique was adopted in administering questionnaire on resident doctors, nurses, laboratory technologists, pharmacists, and administrative staff. This technique was purposively adopted due to the fact that all the category of medical personnel selected as sample makes use of information systems in carrying out their duties. The study found that majority of respondents was aware of IS. Though, some of IS resources were available, computer and internet were the most used. Clinical services require the use of IS even though there were challenges such as lack of skills on how to use IS, lack of financial supports, inexperience on the part of IS suppliers by not being able to supply the required specifications, and use of faulty IS by medical personnel in the course of their duties. These had negatively affected their job productivity in the area of capturing, processing, and delivery of healthcare services. The study concluded that though IS have a major role to play in healthcare delivery especially where almost all aspects of healthcare services could be managed using technology, however, inadequate funding to procure modern equipment and lack of ICT skills on the part of medical professionals among other challenges can hinder effective capturing, processing and delivery of healthcare services.*

## Introduction

All over the world, there has been a strong agitation on the mode of healthcare delivery services and its direct implication on people living longer and enjoying sound health. This agitation which espouses the importance of healthcare to both individuals and governments and its growing costs to the economy have contributed to the emergence of healthcare as an important area of research for scholars (Informs, 2011). Healthcare does not only influence the quality of lives and how human beings function within the society, but can also affect our ability to carry out social and productive endeavours if mistakes are made.

To this extent, information systems (IS) have much to offer in managing healthcare costs and in improving the quality of care (Kolodner et al, 2008). However, the concept of information systems (IS) cannot be discussed outside information technology (IT). This is because of the embedded role of information technology in clinical and diagnostics equipment through which information systems are uniquely positioned to capture, store, process and communicate timely information to decision makers for better coordination of healthcare at both the individual and population levels (Informs, 2011). This, probably explains why Wilson describes information

systems as “a set of tools and procedures that a health programme uses to collect, process, transmit and use data for monitoring, evaluation and control in a health system” (Wilson et al, 2001 cited in Lungo, 2003).

Furthermore, Sapirie (2000 cited in Lungo, 2003) affirms that for effective management and development of health services, meaningful, reliable, accurate and timely information plays a major role. Therefore, health system managers need to ‘keep an eye’ on Information Systems and their performance.

Information has been identified as an essential commodity that affects all aspects of human endeavour either positively or negatively. It is an acceptable fact that no individual can perform beyond the measure of information at his/her disposal. Importantly, information has been described as a driver for change, resulting from and contributing to both globalisation and devolution (Nuffield Trust Series, 1999). If information has been so described as an indispensable commodity to human lives, then to conclude that information is central to healthcare delivery and essential for health care delivery processes will only be stating the obvious.

Specifically, Academic Medical Centers (AMC) as an arm of the nation’s health sector cannot shy away from using the various information systems in existence to manage health information. In fact, they are ideally positioned to implement meaningful health care reform because they have the requisite infrastructure, intellectual capital and networks to spearhead efforts to develop, pilot and disseminate new patient-focused measures and care models all of which is achievable through the use of health information systems (AHC health Reform Working Group, n.d). This study assessed the various hospital diagnostic equipment; used in capturing and processing information for managing healthcare delivery. To achieve this, three (3) academic medical centres in Lagos State were sampled for the study. The paper is divided into the following sub topics: statement of the problem, objectives of the study, review of relevant literature, methodology of the study, results, discussion of results, conclusion and recommendations.

### **Statement of the Problem**

Studies have established that health information systems evolved as a result of the new role assumed by changing demands to healthcare and healthcare information, which is supported by the possibility to apply new technological advances to healthcare organisations. However, it is not certain if this evolution has been embraced in this part of the world. Hence, this study assessed the rate of adoption of information systems in delivering healthcare services vis-a-vis the effect on national development.

### **Objectives of the Study**

The main objective of this study is to identify the role of information systems in health care delivery services and its effect on nation building. The specific objectives are to:

1. identify the level of awareness of information systems among health personnel in selected Academic Medical Centres in Lagos State,
2. establish the level of availability of information systems in the Medical Centres,
3. determine the various clinical services that require the use of information systems,
4. identify challenges facing health managers in their bid to use information systems in the selected Medical Centres, and
5. evaluate the influence of these challenges on medical personnel’s job productivity.

### **Review of Relevant Literature**

In considering the role of healthcare sector in assuring a nation’s health, the people as individuals and as a population must have the benefit of high quality healthcare services that are effectively coordinated within a strong public health system (The Future of Public’s Health in the 21<sup>st</sup> Century, 2003). The Institute of Medicine (IOM) (2001:6 cited in The Future of Public’s Health in the 21<sup>st</sup>

Century, 2003) in its report, summarises this by affirming that ‘All healthcare organisations, professional groups, and private and public purchasers should adopt the use of information systems as their explicit purpose to continually reduce the burden of illness, injury, and disability, and to improve the health functioning of the people’. These, supposedly are important in achieving national development in any nation.

In these days of information technology, adequate and proper management of healthcare is obtainable through the use of information systems. Research has established that information systems (IS) have great potential to reduce healthcare costs and improve outcomes (Informs, 2011). Also, mistakes in healthcare can have serious repercussions that can affect man’s ability to carry out social and productive endeavours and may even result in death. Medical errors which are a leading cause of adverse events and other ills are expensive, and they increase patient’s length of stay in the hospital, and may even cost human lives (Classmen et al 1997 In Fichman et al, 2011). Failure to manage infectious diseases can cause serious public health challenge which may have serious negative implication on nation building. Information systems can play vital roles in monitoring, controlling, and even sensing dangerous health challenges before outbreaks. Diseases such as high blood pressure, cancer, diabetes, coronary diseases, and even infectious ones like HIV/AIDS, sexually transmitted diseases, hepatitis, the current rampaging Ebola Virus Disease (EVD), and others to mention a few can be sensed, monitored and controlled through information systems.

It is, therefore, important that medical personnel embrace information technology and be versed in the usage especially those that are valuable for managing healthcare. Decision makers in Academic Medical Centres should, as a matter of priority, procure modern day facilities that have to do with healthcare management while medical personnel avail themselves of the use. These facilities include: computer system, internet connectivity, electronic gadgets devices (eg self-adhesive wireless electronic devices, Ipads, Iphones, Androids, Blackberry phones, etc), software, diagnostic devices (imaging diagnostic laboratory equipment, blood pressure monitor, etc), information database (e.g. Medline, Science Direct, etc ), This is because health information systems enable decision makers to “integrate data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services” (Lippeveld, Sauerborn, & Bodart, 2000). In conclusion, generation of data on hospital operations such as administrative records, service records, health and disease records are better managed using information systems (IS).

## Methodology

The descriptive survey design was used in this study with quantitative questionnaire to explore and analyse the role of Information Systems in health care delivery services. The study population consisted of three Academic Medical Centres in Lagos State, Nigeria. These are: University of Lagos medical centre, Yaba College of Technology medical centre and Federal College of Education (Technical) medical centre. These medical centres are attached to federal own higher institutions which cut across University, Polytechnic and College of Education. The total enumeration technique was adopted in drawing sample covering resident doctors, nurses, laboratory technologists, pharmacists and administrative officers in these medical centres. All category of health workers were used because the concept of IS involves more than just the computer and Internet. It is assumed that almost all aspect of healthcare delivery involves the use of one form of IS or the other. Hence, none of them was exempted since they are all professionals in their own right.

In all, 75 copies of the questionnaire were distributed. 55 were filled and returned, representing 73.3% response rate. Data was analysed using descriptive statistics such as frequencies, percentages, and standard deviation.

### Data analyses and discussion of results

Descriptive data revealed that 41.8% of the 55 respondents were from the University of Lagos Medical Centre, 32.7% from Federal College of Education (Technical) Medical Centre while the rest 25.5% were from the Yaba College of Technology Medical Centre. In addition, the gender distribution of the respondents revealed that 60% were female while 40% were male. The age distribution showed that many of the respondents (38.2%) were between the age of 35years and 44years, 27.3% were between 25 years and 34 years, 25.5% were between 45years and 54year while the remaining 9.1% were between 55 years and 64years old. The employment status shows that most of the respondents - 30.9% were administrative officers, 23.6% were medical doctors, 12.7% were laboratory technologists, 25.4% were nurses, while 7.2% were Pharmacists. Demographic data further revealed that 34.5% of the respondents had between 1 and 5 years work experience, 30.9% had between 16 years and 20 years, 18.2% had between 11years and 15 years, 12.7% between 21 years and 25 years while the remaining 3.6% had 31years and above work experience.

**Table 1:** awareness of Information Systems Used in Managing Health Care in Hospital

Awareness	Frequency	Percentage
Yes	41	74.5%
No	14	25.5%

**Sources:** Field study 2014.

Table 1 indicated that 74.5% of the respondents were aware of the information system used in managing health care in hospitals.

**Table 2:** Availability of Information Systems in Academic Medical Centres

Information system	Not Available	Available	Mean	Std.dev
Computer systems	6 (10.9%)	49 (89.1%)	1.89	0.315
Internet	6 (10.9%)	49 (89.1%)	1.89	0.315
Electronic gadgets devices	27(49.1%)	28(50.9%)	1.51	0.51
Software	12(21.00%)	43(78.2%)	1.78	0.42
Diagnostics devices	10(18.2%)	45(81.8%)	1.82	0.38
Information databases	37(67.3%)	18(32.7%)	1.33	0.77

**Sources:** Field study 2014.

Table 2 showed that many of the respondents (89.1%) agreed that computer system and internet were available for use in their organisation, so also electronic gadget devices such as Ipad, Iphone etc. (50.9%). In the same sequence, medical software (78.2%) and diagnostic

devices (81.8%) were also available as indicated by respondents. However, most of the respondents (67.3%) indicated non availability of information database (e.g Medline) in their medical centre.

**Table 3:** Use of Information Systems in Academic Medical Centres

	Not use	Use	Mean	Std. dev
Computer systems	4(7.3%)	51(92.7%)	1.93	0.26
Internet	2(3.6%)	53(96.4)	1.96	0.29
Electronic gadgets devices	44(80%)	11(20%)	1.20	0.40
Software	49(89.1%)	6(10.9%)	1.11	0.31
Diagnostics devices	45 (81.8%)	10(18.2%)	1.82	0.38
Information databases	49(89.1%)	6(18.2%)	1.82	0.38

**Sources:** Field study 2014.

A cursory look at table 3 revealed that most of the respondents (92.7%) agreed that computer system is being used in their organisation. Similarly, 96.4% indicated that they make use of internet services in the course of their jobs. On the other hand, 80% agreed that electronic gadget devices were not in use in their medical centre, so also medical software as indicated by 89.1%. Diagnostic devices (81.8%) and information databases e.g. Medline (89.1%).

**Table 4:** Adequacy of Information System

Information Systems	Rate of Adequacy					Means	Std.dev
	5	4	3	2	1		
Computer systems	16(29.1%)	18(32.7%)	9(16.4%)	8(14.5%)	4(7.3%)	3.62	1.25
Internet	12(21.8%)	21(38.2%)	17(30.9%)	2(3.6%)	3(5.5%)	3.67	1.03
Electronic gadgets devices (Ipad, Ip hones, android, BB, Self-adhesive wireless electronic devices)	3(5.5%)	30(54.5%)	8(14.5%)	2(3.6%)	12(21.8%)	3.18	1.29
Software	2(3.6%)	27(49.1%)	8(14.5%)	4(7.3%)	14(25.5%)	2.98	1.33
Diagnostics devices e.g. (Imaging diagnostic laboratory equipment)	9(16.4)	19(34.5%)	10(18.2%)	9(16.4%)	8(14.5%)	3.22	1.32
Information databases e.g. Medline	3(5.5%)	23(41.8%)	11(20%)	6(10.9%)	12(21.8%)	2.98	1.28

**Sources:** Field study 2014.

Table 4 indicated that many of the respondents, with a mean score of 3.62, considered computer system as adequate in their organisation. Similarly, most of the respondents with a mean score of 3.67 also agreed that an internet facility is adequate for use in their organisation. However, most of the respondents considered electronic gadget devices (mean = 3.18) as fairly adequate in their organisation. In the same vein, software with a mean score of 2.98 was also considered fairly adequate in their organisation. Diagnostic device (Mean= 1.32) and Information database (Mean=1.28) were rated not adequate by most of the respondents.

**Table 5:** Clinical Services that Require the Use of Information Systems

	Not Required	Required	Mean	Std.dev
Patient care information	5(9.1%)	50(90.9%)	1.91	0.29
Pharmacological (drug) information	10(18.2%)	45(81.8%)	1.82	0.38

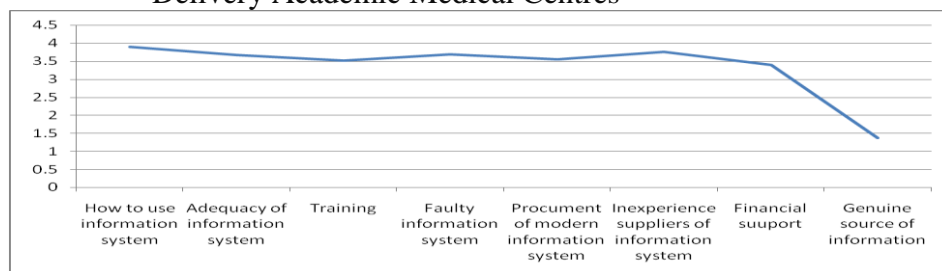
Medical-Legal Information	20(36.4%)	35(63.6%)	1.64	0.49
Recent advances in medicine	10(18.2%)	45(81.8%)	1.82	0.38
Clinical trials and case reports	25(45.5%)	30(54.5%)	1.55	0.50
E-medicine alerts and updates	10(18.2%)	45(81.8%)	1.82	0.39
Modern approach to treatment modalities	10(18.2%)	45(81.8%)	1.82	0.39
Latest information on current practices in medicine	5(9.1%)	50(90.9%)	1.91	0.29
E-journal alert service	10(18.2%)	45(81.8%)	1.82	0.39

**Average mean** = 1.79

**Sources:** Field study 2014.

Statistics shown in table 5 revealed an average mean of 1.79. However, the most required clinical service that make use of Information Systems is patient care information (Mean = 1.91) and latest information on current practice in medicine (Mean= 1.91) than any other type of information. Next to these are information on Pharmacological drugs (Mean = 1.82), Information on recent advances in medicine (Mean= 1.82), E-medicine alerts and updates (Mean = 1.82), modern approach to treatment modalities (Mean= 1.82), and E-journals alert service information (Mean = 1.82). The least required information are Medical-legal information (Mean = 1.64) and Clinical trials and case reports (1.55).

**Figure 1:** Challenges faced in the course of using Information Systems to manage HealthCare Delivery Academic Medical Centres



**Sources:** Field study 2014.

Evidence from figure 1 revealed that many of the respondents do not know how to use any of the information systems (Mean= 3.89) and this has affected them greatly. In addition, most of the respondents indicated inadequacy of information systems (Mean= 3.67) as the challenge facing them. Lack of training on how to use information systems (Mean = 3.51) faulty information system (Mean= 3.69) and non-procurement of modern information systems (Mean = 3.55) has fairly affected their use of information systems. Most respondents considered lack of experience on the part of information systems supplier (Mean = 3.75), lack of financial support for information systems (Mean= 3.40) and ingenuity of sources of information systems (Mean =3.42) as major challenges which has affected them in the use of information system in their routine work.

**Table 6:** How Challenges of Information Systems Affect Productivity in AMC's

	Challenges	SA	A	NA	U	Mean	Std.dev
1	Access to patient medical records during consultation	26(47.3%)	14(25.5%)	13(23.6%)	2(3.6%)	3.16	0.92
2	Management of patients medical records	22(40%)	19(34.5%)	12(21.8%)	2(3.6%)	3.11	0.87
3	Faulty diagnosis as a result of lack of functional information systems	22(40%)	11(20%)	17(30.9%)	5(9.1%)	2.91	1.04
4	Wasting of patients time in case of emergency	20(36.4%)	13(23.6%)	17(30.9%)	5(9.1%)	2.87	1.01
5	Misleading/ inappropriate handling of information systems	19(34.5%)	19(34.5%)	13(23.6%)	4(7.3%)	2.96	0.94
6	Lack of experience on the part of the hospital personnel	25(45.5%)	11(20%)	18(32.7%)	1(1.8%)	3.09	0.93

7	Lack of modern information systems equipment	27(49.1%)	15(27.3%)	8(14.5%)	5(9.1%)	3.16	0.99
8	Lack of funds to procure information systems	30(54.5%)	14(25.5%)	7(12.7%)	4(7.3%)	3.27	0.96
9	Sustainability of information systems	22(40.0%)	17(30.9%)	9(16.4%)	7(12.7%)	2.98	1.05
10	Lack of cooperation on the part of the patient	21(38.2%)	9(16.4%)	18(32.7%)	7(12.7%)	2.80	1.09
11	High cost of some information systems technologies	27(49.1%)	17(30.9%)	7(12.7%)	4(7.3%)	3.22	0.94

**Sources:** Field study 2014.

A look at table 6 showed that all the variables measured under how the challenges in Figure 2 affected respondents' job productivity in table 5 indicated that on the average; more than 50% respondents agreed that their job productivity is affected by all the challenges.

### **Discussion of Results**

The initial part of the questionnaire consisted of demographic information such as specialties, age, gender, and years of service in the Academic Medical Centres.

Observation from the result of the study showed that medical personnel were aware of the various information systems used in managing healthcare delivery. Also, the study found that all the variables of Information Systems under study were available except Information databases. However, their rate of use differed. The study found that four out of six variables were merely used as against just two which are computer system and internet that enjoyed high level usage. On adequacy of Information systems, the study found that computer system and internet were the most adequate in terms of usage. This is not surprising since the two were the mostly used. Next to these are diagnostic devices and electronic gadgets devices.

A significant finding of the study showed that all the variables under clinical services actually require the use of Information systems which implies that (IS) has a great potential in harnessing and managing health information for service delivery. However, figure 2 showed that there were challenges that could hinder the effective use of Information systems in managing healthcare. The major challenge was how to use IS by health personnel. Majority of the respondents lacked the necessary skills in using IS and this had affected their job performance. This finding is in agreement with Gatero (2010) who affirmed that there were inadequate ICT skills among the medical professionals. Also, lack of financial support and inadequacy of information systems were found to be part of the challenges of using IS in Academic Medical Centres. Table 4 of this study further revealed that diagnostic devices were not adequate for use in these medical centres while, table 6 and figure 1 revealed that there was lack of modern information systems in these hospitals. This discovery has further buttressed the affirmation made recently at a workshop by Professor Akin Oshibogun, the Chief Medical Director of the Lagos Teaching Hospital, Idi Araba that the use of obsolete and poor medical diagnostic tools has further compounded the problem of misdiagnosis in hospitals in Nigeria (Newswatch: September, 2014)

These challenges have significantly affected the productivity of health workers under study in the area of access to and management of patients' medical records, accurate diagnosis, timely treatment of patients, and so on.

### **Conclusion and Recommendations**

Information has been identified as a critical tool in providing healthcare, and Information Systems have a major role to play in achieving this (capture, store, process and communicate timely information) especially in these days of information technologies where almost all aspects of healthcare services can be managed using technology. However, inadequate funding to procure modern equipment and lack of ICT skills on the part of medical professionals can

hinder effective capturing, processing and delivery of healthcare services. In view of this, the study recommends that:

- there should be national policy framework that will encourage and promote the provision and use of information systems as tools for healthcare delivery;
- development of ICT skills and training for medical professionals should be seen as vital tools for service delivery and improving the quality of healthcare. Hospital managements should organize in house training on ICT for health personnel from time to time in order to enhance their capacity building;
- adequate budgetary allocation should be provided for the procurement of appropriate IT hardware, software and other accessories, cost of installation and maintenance by respective institution management;
- hospital managements budget should make provision for e-resources (databases like Medline) in a way that will allow for accessibility of e-journals to medical personnel;
- respective institutions should put in place technological infrastructure through which the use of information systems could thrive. This will enhance research and free flow of research output for decision making vis-a-vis national development.

## References

- Agarwal, R.G., Guodong, G., Desroches, C., Jha, A.K. (2010). The digital transformation of healthcare: Current Status and the Road ahead. *Information System Research*, 21 (4) pp.796-809.
- AHC Health Reform Working Group (n.d). *Academic\_Health\_Centers\_Position\_Paper\_pdf*.
- Fichman, R. G; Kohli, R. and Krishnan, R. (2011). *Information Systems Research*, 22 (5), pp.419-428 Retrieved from <http://dx.do:ord/1.1287/isve.1110.0382>
- Gatero, G.M (2011). Utilisation of ICTs for accessing health information by medical professionals in Kenya: A case study of Kenyatta National Hospital. *Journal of Health Informatics in Developing Countries*. 1(5). Retrieved from <http://www.jhidc.org/index.php/jhidc/article/view/55>.pp.60-88.
- Health Systems Assessment Approach (2012). A how-to manual. Retrieved from [www.healthsystems2020.org/content/resource/detail/528](http://www.healthsystems2020.org/content/resource/detail/528)
- Inform (2011). The role of information systems in healthcare. current research and future trends. *Information Systems Research*, 22 (3), pp. 419-428. Retrieved from <http://dx.do:ord/1.1287/isve.1110.0382>



- Kolodner, R, M., Cohn, S.P., Friedman, C.P. (2008). Health information technology: strategic initiatives, real progress. *Health Affairs* 27, w391-w395. Retrieved from [pacis2014.org/data/PACIS.../pdf/pacis2014\\_submission\\_207.pdf](http://pacis2014.org/data/PACIS.../pdf/pacis2014_submission_207.pdf).
- Lippeveld, S. and Bodart (2000). Health systems assessment approach: a how-to manual. Retrieved from [library.health.go.ug/download/file/fid/776](http://library.health.go.ug/download/file/fid/776).
- Lungo, J.H. (2003). Data flows in health information systems: a thesis submitted to the department of informatics, University of Oslo, Norway. Retrieved from [www.ub.uib.no/elpub/Norad/2003/uio/thesis01.pdf](http://www.ub.uib.no/elpub/Norad/2003/uio/thesis01.pdf)
- Nuffield T. (1999). Reducing the zone of confusion. *Nuffield Trust Series No.9*. Available at [Trust\\_Series\\_9\\_Realising\\_the\\_Fundamental\\_pdf](#)
- Oshibogun, A. (September, 2014). Licensed to Kill: How Doctors send Nigerians to Untimely Death. *Newswatch International*. 2 (9) p.16 -17
- The Future of the Public's Health in the 21<sup>st</sup> Century (2003). Washington, DC: The National Academies Press. Retrieved from [www.nap.edu/catalog.php?record\\_id=10548](http://www.nap.edu/catalog.php?record_id=10548)

