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Development of an ICT-based framework towards sustainable optimal diabetes management in Nigerian health sector

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ABSTRACT

This study aims at assessing the importance of incorporating HIT tools into the Nigerian health sector, especially for diabetes management. Both quantitative and qualitative research methods were used in this study. Quantitative methods involve questionnaire administration, while qualitative methods comprise observation method and semi structured key informant interviews, used to complement the findings from the questionnaire data collection. AYDOT was developed to customize and adapt the international HIT standard, which can identify patients at risk and physicians could quickly attend to them in real-time through mobile text messages. The conditions used for 'At-risk' patients are if: the Blood pressure>140/80 mmHg, the sugar level before meal>7mm0/L; the Sugar level 2 h after meal>11.1mm0/L, the Body Mass Index BMI (W/H^2) >= 25 kg/m^2 and diabetes duration>10 yrs. The results from this study imply that for any diabetes management project to be successful, there is a need to move from paper-based to HIT-based system in the entire organization, as optimal management of diabetes relies on the availability and usability of Health Information Technology (HIT) applications.

1. Introduction

Chronic diseases such as heart disease, cancer, and diabetes are enlisting a growing burden and concern in global health sector, because of the alarming rate at which they are increasing. Africa experiences a serious and 'neglected epidemic' of chronic diseases like *diabetes mellitus* (simply called diabetes), stroke, hypertension and cancers, with the poor and rich; young and old; urban and rural dwellers being the affected populations [1–4]. These chronic diseases account for higher medical admissions in the hospital settings, even compared to some communicable diseases such as HIV/AIDS or tuberculosis [5]. In many countries, especially developing countries, the rate of complications and death rates of chronic diseases, especially diabetes, have increased rapidly over the last two decades, due to changing behavioural patterns, for example in diets and exercise [6–8]. A study by International Diabetes Federation [9] has shown that between eight and fourteen million deaths are recorded from diabetes yearly in developing countries, with Nigeria having the highest prevalence in sub-Saharan Africa. Studies have earlier noted that many Nigerians are estimated to have diabetes, and it will still account for more death if appropriate way of management is not urgently implemented [10–13].

Diabetes being a multi-faceted (multi-organ) disease, requires multi-disciplinary, multi-sectoral and multi-dimensional approach to be efficiently managed and controlled. Therefore, having an HIT in Nigerian health sector, to manage it cannot be overemphasized [14]. However, HIT adoption in the Nigerian health sector has been very slow and the health sector is using several other means to manage diabetes cases in the country. Thus, the quality of diabetes management in Nigeria is less than optimal. This poor quality of diabetes management is increasing the number of Nigerians travelling out of the country frequently seeking for optimal diabetes management. To know the number of patients that visited a particular diabetes clinic could take weeks, if not months, because multiple files have to be checked. Even the hospitals that are not research-based may not even have records to show [15–17]. Patient data and information reside in the medical record section of a particular hospital and thus, patient files have to be taken from one hospital to the other in case of referral or patient changing location. Sometimes, this results in some of the files getting missing, leading to inability to trace the medical history of the patient, and even loss of lives, if it is an emergent case. However, a general practitioner (GP) in other parts of the world use the electronic booking system to contact consultants, in case of referrals and to share the records of the patients which is not so in Nigeria because

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the whole health system is still paper-based. Thus making the physicians in the same hospital not to share patient records, nonetheless of physicians in different hospitals sharing records for there is no existence of electronic booking system. Therefore, there is a need for Nigeria to transform its health sector by benchmarking a successful country in the area of HIT, so necessitating this study. This study hence aims at assessing the importance of incorporating HIT tools into the Nigerian health sector, especially for diabetes management. For example, by giving patients appropriate diabetes education, thus a need for interactive and effective communication between the patient and the healthcare provider (through mobile technology); clinical decision support system (in terms of alerts and reminders for physicians) and electronic health records documentation and viewing (through electronic medical records system), and hence stop using any method that is not bringing optimal management of diabetes.

2. Materials and methods

This study was conducted in Southwestern Nigeria, which consists of six states: Lagos, Osun, Oyo, Ondo, Ogun and Ekiti States (Fig. 1). Six tertiary hospitals in these states were visited to have in-depth study and analysis, while the respondents were some healthcare stakeholders (Doctors, Nurses, Pharmacists, Laboratory scientists, Medical record officers, ICT unit professionals and Patients). Purposive sampling method was used so that both State and Federal tertiary hospitals would be included across the states, thus making a total of three Federal hospitals and three State hospitals. To avoid being bias in this study, one tertiary hospital was selected from each state, so that all the states would have equal representation in the study. The study population was adult type-2 diabetic out-patients attending the hospitals under study, their Doctors (both senior registrars and the consultants) and Nurses attending to them. The study used only out-patients because the majority of the diabetics' patients are not admitted in the hospitals. Also, the Pharmacists, Laboratory scientists (responsible for blood tests, x-ray, urine tests etc), Medical record officers and ICT unit professionals of the hospitals were included in the study.

In this study, both quantitative and qualitative research methods were used in this study. Quantitative methods involve questionnaire administration, while qualitative methods comprise observation method and semi structured key informant interviews, used to complement the findings from the questionnaire data collection. The purpose of the interviews was to explore their views, and also their efforts in implementing Health Information Technology for the Nigerian healthcare sector. In this study, all the ethics rules were followed, audio tapes were used to record all interviews and the information from the interview was transcribed verbatim using relevant themes. Data collection was enriched by secondary data collected from: Hospital Organization/Government reports on Health Information Technology; Nigerian Medical Association and National Health Record Association bulletins; and Patient Medical Record Files. A total of three hundred copies of questionnaire were distributed in the six hospitals. 50 questionnaire were distributed in each hospital, among 3 Doctors, 3 Nurses, 6 Pharmacists, 3 Medical Record Officers, 5 ICT Unit Professionals, 5 Laboratory Scientists and 25 Patients, making (50×6 hospitals) 300 respondents altogether. These sampling values were from all six hospitals used in this study. The response rate was one hundred percent (100%) because of the ethics clearance already obtained from each hospital. These ethical clearances were helpful in getting the 100% response rate because they were seen as important from the organizations to be allowed to carry out the research in the various departments.

Both descriptive and inferential data analyses were carried out to achieve the objectives of this study. The recorded interviews from the audiotapes were transcribed and the transcript was coded using qualitative research software (QSR Nvivo), which organized and summarized the data by concepts/themes. Keywords and themes from the interview discussions were provisionally classified into categories and coded to compare and contrast findings, categories and interpretations from all the research instruments used for this study. In order to ascertain data validity and reliability, the questionnaires were distributed during the time that the respondents were not too tired to go home and not too early in the morning when they were just resuming the day's work, so that the questionnaires would not be seen as a disturbance. Rather, the questionnaires were distributed in a 'neutral' time that the respondents were not too tired and not early in the morning. All these were taken into

Fig. 1. The Location of the Study Area in relation to Nigeria. The dots were the locations where data were collected (Source: Drawn using ArcView GIS Software).