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Implementation of an E-medical portal system for healthcare services in Calabar

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Abstract
This article is about the implementation of a web-based e-medical patient portal to facilitate the interaction between the hospital, the medical practitioners and the patients. The aim of this study is to develop a guideline that can be used to implement a web-based e-medical portal. An E-medical portal is an information system that provides to individuals the access to their personal health records and many other services related to healthcare. To achieve the aim, two questions were formulated: (1) what are the requirements for the implementation of interactive systems (portal) between the medical practitioners and patients? And (2) what are the factors that influences an interactive system (portal) that can be used by both medical practitioners and patients? The study was conducted using the qualitative method, with an inductive approach. The Data was collecting through Documentation using the desk research method as tool of collection. From the analysis, three important factors were find and discussed.

Keywords: Healthcare, Calabar, Patient Health Records (PHR), Patient-Portals

1. Introduction

Like other countries, in Calabar, there are private and public healthcare facilities. However, physical access to healthcare is still a challenge. The challenge with physical presence and long queues for consultation leads to delay, sometime deny patients access to healthcare services (Ijumba, Day & Ntuli, 2004) [23]. This challenge is mostly prevalence with the public health facilities. The long queue problem sometimes manifests into other challenges, such as corruption and huge surgical back-logs, which worsen the poor state of healthcare services (Moeti, 2017) [34].

Healthcare System is struggling to take care of every single person that request their services. That is due to the lack of medical practitioners/workers in the healthcare domain (Cullinan, 2016) [11]. There are limited health practitioners in the Calabar area. This lack of practitioners affects the efficiency of hospitals and many people are suffering from this situation. Hospitals are unable to recruit and retain skilled staff, and that is has negatively affected the ability of hospitals to provide quality healthcare (Sama Yende, 2017) [43]. Until now in Calabar, there is people that are struggling to see doctors or any medical practitioners. Some people are too weak to go to hospital, or live too far from hospitals to hope a real following service by doctors. Patients struggle to access care, so they often only get to us when they are very, very sick (Taylor, 2012) [49]. People are dying every day because of this problem and it is time to take measures and help those can't help themselves. My solution for this important problem is to implement an online web-based patient doctor portal system also called a Patient Health Record (PHR) that will be handle by a large database and that will request an internet connection. That Portal will help both patients and doctors and increase the efficiency of services provided by hospitals. In this research, the researcher will study the case, analyse the case and come up with a solution.

As in many parts of the world, the need for healthcare in Calabar continue to increase. This is in contrast to slow or not growing health facilities (hospitals and clinic) in the country. As a result of long queue, increasing needs, and the slow responses, it takes long for many individuals to get appointment with medical practitioners. It takes even longer and more problematic in the quest to consult with specialist doctors. This problem gets worse for those who have to travel long distances, as well as for the older (such as pensioners and or senior citizens) patients. Also, those who are critically ill or bodily weak suffers more in attempts to get care from health facilities. This problem makes the health conditions of many patients get worst, from which some have died as a result of the long wait for services. Over the years, this has contributed to mortality rate in Calabar. This problem can only get worse if solution, such as the one that will facilitate improved consultation between medical personnel and patients is not provided.

Thus, the questions the research seeks to answer are in two parts. First, what is required in order to implement a web-based E-medical portal that can be used to facilitate interaction between the health professionals and patients? The second part are: 1:

What are the requirements for the implementation of an interactive systems (portal) between the medical practitioners and patients? 2: What are the factors that influences an interactive system (portal) that can be used by both medical practitioners and patients?

2. Literature review

Implementing a patient-portal in hospitals or Healthcare request some knowledge about how works a portal and how it will work on hospitals and people. What is a patient-portal? Patient-portal, which is also known as Patient Health Records (PHR) is information systems that provides individuals with access to their Health records (Cimino, Patel & Kushniruk, 2002) [7]. If a user wants to be registered into a valid patient-portal system, he must get an internet connection, go to the website of the healthcare of his choice and fill a form for a proper registration. Once registered, he will get an e-mail with all the information, terms and conditions requested that the user should accept. The purpose of a patient-portal is to allowed patients and medical practitioners to work easily together.

Using a patient-portal will help a patient with basic activities as recording symptoms and allergies, immunizations, schedule appointments, check benefits and coverage, send secure e-mail messages to medical practitioners, request medication refills, review labs and test results, make payments, update contact information contact and so on (Fraser & Blaya, 2010) [17]. Most of the time, patient-portals are focus on chronic diseases like asthma, Epilepsy, HIV, diabetes, chronic kidney disease, glaucoma, multiple sclerosis or Parkinson's disease, etc.… but can be a great help for others situations (Zhang *et al*., 2015) [57]. The medical records of the patient that is kept digitally, are often captured and managed in an Electronic Health Record (EHR) software application by the clinic or provider (Emont, 2011) [15]. EHR contains data collected from more than one practice (Garett & Seidman, 2011) [19]. It will help medical practitioners with the collection and recording of patient data, to be more electronic and paperless because collecting data on paper and then entered into the system by date entry manually is a handicap for the reliability of the data management of the Healthcare (Fraser & Blaya, 2010) [17].

The patient can upload information from their PHR to EHR and vice versa (Mostert-Phipps, 2012) [35]. After registration, all the patient's health information updates as a visit to the doctor, all kind of laboratory tests, and other medical procedures are sent from the EHR to the portal and their personal view of their health record is updated (Yau, Williams & Brown, 2011) [54]. Patient-portal are seen as a key route to engage patients in care (Adler-Milstein *et al*, 2014), and as a good way for patients to check up their health and condition by themselves (Kruse *et al*., 2015) [28]. That must be the reason why Patient-portals are welcomed in many healthcare and studies have shown that people are really satisfied with patient portals (Goldzweig *et al*., 2013) [21], and that is a sign of the good processes and outcomes of patient-portals in healthcare (Ammenwerth, Schnell-Inderst & Hoerbst, 2012) [2].

Despites the good results of PHR in some other countries, Nigeria didn't really adopt the concept (Mxoli & Mostert-Phipps, 2014) [36]. A survey conducted in the Calabar area in 2012 shows that 84% of participants were not aware of PHRs. Patient-portals can lead to some improvements in healthcare if it is better understood and if people are aware of it. The suitability of a personal tool like patient-portal extends beyond the functionality or ease of use and depends upon how it is presented to patients and guidance relevance in their day-to-day interactions with their providers (Emont, 2011) [15]. In the use of Coiera 'information value chain' (Coiera, 2015) [10] it is said that for a patient-portal to have impact, users have to first of all well interact with it, in order to receive the right information, which might influence their decisions making. If everything goes well, it could lead to improved care processes, and obviously better health outcomes (Coiera, 2015) [10].

When using Coiera 'information value chain' logic, the chain begins with the user interacting with the portal, that action can be interpreted as the usage and usability of the system; This step will show how come and how often the user logged in the system, what the user using the portal for and how long is he logged in. The next step of the chain is to know what kind of information the user will get with some interactions with the portal. That will depend on which functionalities the user will accessed on the system, for example the patient can request to view the results of a lab test or a prescription list or even the information of his profile, the amount and type of data are not the same as where the user request to record information, the quantity and accuracy of data registered into the system can be estimated (Coiera, 2015) [10].

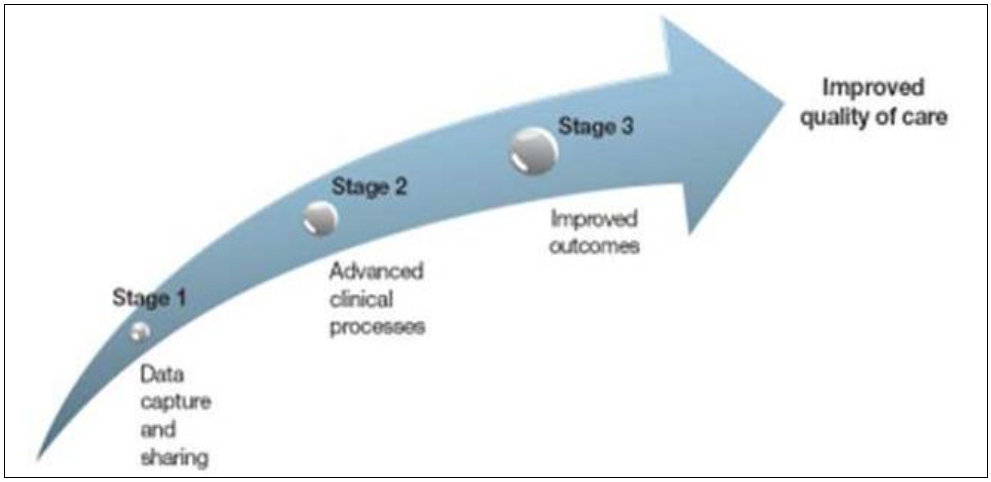

Fig 1: Corea's conceptual approach to a meaningful use

The next step of the chain is to evaluate how the 2 first steps will lead to the patient and medical practitioner TAKING or CHANGING a decision (Coiera, 2015) [10]. It means that for example a patient could decide to contact his doctor for a test lab result that he does not understand or a mistake in the prescription/medication list, and the doctor wants to change it or need to do an extra lab test, that is kind of decisions it can lead to. Directly or indirectly those decisions can affect the process of care which is the next step of the chain, affect the process of care in a positive way in such that the patient will more and more use the healthcare resources, to access patient activation and medication prescriptions. If it is well managed, such changes could lead to better health outcomes, the last step of the chain. PHR has the potential to improve the current state of health for developing countries through better decision-making, diagnosis and treatment, which will lead to a better health outcome (Mxoli & Mostert-Phipps, 2014) [36]. A better process of care means a better health outcome because more the patient uses the portal, more he will be satisfied, and more he is satisfied more he will continue to use it and that is a good big change for his quality of life (Tavory & Timmermans, 2014).

My study will focus on the improvement of care processes by the implementation of a Patient-portal that will lead to a good health outcome for many African countries healthcare. There is a great number of reviews on that two points (Kruse, Bolton & Freriks, 2015) [29] as, de Lusignan *et al*. (BMJ Open, 2014) considered 143 studies in their systematic review to investigate the effect of patient-portals on provision, quality and safety of healthcare, at the same time also evaluating the quality of these studies. Giardina *et al*. (Davis Giardina, Menon, Parrish *et al*., 2014) [12] included 20 randomized controlled trials and 7 observational studies to investigate on the impact of patient-portals on efficiency, effectiveness, timeliness, patient-centeredness, and equity. There is another review focused on the effect on chronic conditions outcomes and identified 27 studies (Kruse *et al*, 2015) [28]. All these studies shows that there is a gap for the three first steps of the impact of patient-portals, in context of patient-portals with only one review (Irizarry *et al*., 2015) [24] focusing on identifying factors related to patient's engagement with the system that includes usability and usage. However, there is no PHR system developed for many Africa countries (Mxoli & Mostert-Phipps, 2014) [36].

Difficulties in E-health implementation do not only affect Calabar, similar cases has been reported around the world. However, there is some paper, stories, reports and case studies from which we can anecdotally draw lessons about measurement and the impact of the patient-portal in terms of quality and efficiency (Emont, 2011) [15].

3. Research methodology

The research methodology will show which method the researcher will adopt to reach the aim and objectives and answer all the research questions. For this study, the qualitative method has been used. According to Khotari (2004) [27], Qualitative approach to research is concerned with subjective assessment of attitudes, opinions and behaviour. Qualitative researcher is interested in understanding how peoples interprets their experiences, how they construct their world, and what meaning they attributes to their experiences (Merriam, 2009). As argued by Butina, Campbell and Miller (2015:186), "the primary characteristics of qualitative research include: the focus on understanding peoples' experience with intent to convey experiences into meaning, the researcher is the key instrument for Data collection and analysis, the research process is inductive and not deductive, and the product of qualitative research is richly descriptive". Why using qualitative method in this study? Qualitative is suitable for this project because according to the research questions, the researcher is in quest of data that are not numerical, data that will be analyse and understand to answer the research questions. A work that is assess to determine the nature of an intervention and its implementation might call for a qualitative method (Shavelson & Towne, 2002) [45]. Qualitative method is oriented or headed for analysing existing cases in their temporal and local particularity and starting from people's expressions and activities in their local context (Flick, 2014) [18].

Research strategy

As Research Strategy, the case study will be used in this study. Case study been used in many studies such as community studies, education, public health and business (Yin, 2012) [56]. Case study research is a study of a case within a real-life contemporary context or setting (Yin, 2009) [55]. Conducting case study research is the appropriate method to investigate phenomen through the use of "when", "How and why" questions. In the use the case study, the researcher has the control over the behaviour of events and the study is a contemporary phenomenon (Yin, 2014). The case study should be employed at the exploratory stages, and will leads into unconformable conclusions (Yin, 2014). Qualitative case study research seeks to describe that unit in depth and detail, hostically and in context (Patton, 2002) [41].

Research approach

The research approach of the study is inductive, following the research method which is Qualitative. The use of inductive approach is here to create clear links between the assessment or research objectives and the findings of the data analysis (Thomas, 2006) [51]. After the analysis of data collected, the researcher using the inductive approach should have an open mind to the answers he will find, which will help him to know what is relevant in the data he did collect (Clough & Nutbrown, 2012) [8]. The inductive approach is used in this study because the researcher wants to build a theory out of the data I will collect and apply it to my research questions.

Research design

The research design that will be used in this study is the Desk research method which requires the use of secondary sources to collect Data. Green & Thorogood (2018) [20] said: "Secondary sources are Data sets that already exist prior to a research project, and which were not created especially for that project". In some project as this project, the research questions can be answered only by using existing resources, rather than producing new resources (Green & Thorogood, 2018) [20].

Data collection

In this study, the data will be collected through Documentation. As argued by Bowen (2009) [5], document analysis is a systematic procedure for reviewing or evaluating documents, both printed and electronic (computer-based and Internet-transmitted) material. Corbin

& Strauss (2008) said like other analytical methods in qualitative research, document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge. The Document that will be analysed contains resources like images or words that have been collected without the researcher's intervention (Bowen, 2009) [5].

Data analysis

Based on the research questions, the data will be collected and analysed. Data that will be collected by using the desk research method and using Documentation technique to collect the data. The data will be analysed by following the research questions and answer it to produce findings that will lead to the achieving of the aim of the study.

4. Data analysis and findings

4.1 Introduction

The aim of this study was to develop guideline which can be used to implement a Web based E-medical portal to facilitate the interaction between the hospital, the medical practitioners and the patients. In achieving the aim, two main questions were formulated: (1) what are the requirements for the implementation of interactive systems (portal) between the medical practitioners and patients? And (2) what are the factors that influences an interactive system (portal) that can be used by both medical practitioners and patients?

4.2 Data collection process

Based on the aim of the study which was to develop guideline that can be used to implement a Web based E-medical portal, to facilitate the interaction between the hospital, the medical practitioners and the patients, data was collected. Peer-reviewed articles were used a data in the study. The methodology that was followed in the collection of the data is detailed in the previous submission. The process that was followed is presented in this section:

There were three phases in the process of collecting data for this study. The phases are:

Phase One: Based on the aim of the study, criteria were formulated: (1) extraction of keywords from the aim of the study. This includes e-health; e-portal, implementation of e-portal; and challenges of implementation; (2) years of publication. The range of years within which the articles were published was set to, between 2002 and 2018.

Phase Two: Search was conducted. Google scholar was used in the search for peer-reviewed articles were collected, based on the aim of the study, and the criteria as stated above.

Phase Three: The data was documented. The data was put in perspective, in accordance to the scope as shown in Appendix A "Data Collection".

4.3 Data analysis

The analysis of the data was conducted by following the research questions. The analysis is presented in this section as follows:

Question 1: What are the requirements for the implementation of interactive systems (portal) between the medical practitioners and patients?

More facilities in healthcare

Studies have shown that healthcare, especially in rural areas are in lack of resources or facilities. The lack of facilities is a problem to consider as the missing facilities are the tools in need to help Healthcare to face some challenges and deliver good outcomes to the patients. As stated by Ouma & Herselman (2008) [40]: "The major barriers that the participants pointed out include lack of computer equipment, lack of computer skills, cost of computer equipment and internet connection".

More care workers especially in rural areas

In terms of good outcomes or good health system performance, there is many barriers that constrains it, and the lack of care workers is one of the most important challenges that encounter good health system performance. Kahn, Young & Kahn (2010) [26] stated: "There are not enough healthcare workers (shortages are estimated at 800,000 for Africa), and such workers are difficult to recruit and retain, especially in rural areas". More care workers will significantly and definitely mean the good performance and efficiency of Healthcare.

Train these care workers to understand and use the new system

The implementation of an e-portal will obviously lead to changes in the Healthcare running system or more specifically to the adoption of a whole new system, and that implies that the medical staff needs to learn how to use the new system. Sheikh *et al* (2011) [46] stated that it requires time to build, configure, customize the system and it also requires time to give the needed training and support of end-users (clinical and non-clinical staff). Fraser & Blaya (2010) [17] said: "Local staff in developing countries usually have limited exposure to IT systems and data management, making effective training especially important".

Strong communications between medical practitioners and IT software developers

One of the requirements for a good implementation of an e-portal is a strong communication between medical practitioners and IT software developers. There is always a need for a good relationship between users and developers, as the user can report back to the needed features or adjustments to get the perfect software in terms of usability and outcomes. Local clinical staff needs to be involved from the initial planning to the full operation. Fraser & Blaya (2010) [17] said: "A local champion who can be taught in more depth on the system and can liaise between clinical staff and developers is a key success factor, this person can communicate issues and areas for improvement to the developers".

Ensure reliable and strong communication between health centres, laboratories, clinics and district medicals offices to deliver a good outcome

Studies has shown that the use of ICT for health purposes or commonly called e-health symbolises the key tools for healthcare delivery and public health. The use of e-health also implies a good relation between all the institutions that are involved in the care of a patient. That good, strong and reliable communication between health centres, laboratories,

clinics and district medicals will ensure the effectiveness of the implemented system (Drury, 2005) [14].

Question 2: What are the factors that influences an interactive system (portal) that can be used by both medical practitioners and patients?

Provide healthcare services

Providing Healthcare services is one of the main factors that influence an interactive system as it is created to improve the quality of delivery outcomes of healthcare. The improvement of the system will improve the efficiency of the services. For example, it will improve the data management as Data was collected on papers, then entered into an information system by date entry either locally or remotely but now the Data will be collected electronically (Fraser & Blaya, 2010) [17].

Improve the Quality of outcomes/services of the Healthcare

Improve Quality of outcomes/services of the Healthcare is the main factor that influence an interactive system. The improvement of the quality of outcomes/services of the healthcare will increase the efficiency of the services and mean the decrease of death rate in hospitals. Because as Schnipper *et al* (2008) [44] said: "By empowering patients to become active participants in their own care, an interactive patient portal linked to an EHR has the potential to help address many medications safety and quality issues".

Increase/Improve the communication between medical practitioners and patients

The improvement of the communication between medical practitioners and patients is an important factor because the sharing of informations between the medical practitioners, and the patients and the back-up that the patient will provide helps the medical practitioners to improve the quality of services efficiently in terms of results and time (Schnipper *et al*, 2008) [44].

4.4 Findings and discussion

From the analysis, three factors were found to be crucial to the implementation of e-health interactive system. This means the factors can be used to guide the implementation of e-portal for healthcare services.

4.4.1 Criticality of interactive systems (e-portal) requirements

The success of the implementation of e-health interactive system lays on the application of the requested requirements. The formulated requirements are made to face the potential challenges that the system can encounter. If the requirements are not applied when implementing the system, it can lead to a failure of the system improving the healthcare delivery. As argued by Blaya & Fraser (2010) [4]: "Computerized physician order entry systems have been shown to reduce medical errors, but they can also increase error rates if not well designed and implemented". That means if the interactive system is not well implemented, the outputs of the system can be severely compromised in terms of high quality and timely data (Fraser & Blaya, 2010) [17].

4.4.2 Technology infrastructures flexibility – this is to enable and support compatibility

When implementing an interactive system, there is always a question about compatibility in multiple levels. In most cases, the compatibility challenge can be encounter at the level of implementing in the system, contents that reflect the local languages and culture (Drury, 2005) [14]. But most importantly, one of the challenges about compatibility is the fact that there is a possibility of the in-place ICT infrastructure to be inadequate for the implementation of the interactive system as a result to various challenges that can be encounter (Ouma & Herselman, 2008) [40].

4.4.3 Alignment between process and the final product

During the process of implementation, there are many levels to consider in terms of alignment. The process requires times to work on each level and align it with the requirements that will provide the expected result. Fraser & Blaya (2010) [17] said: "The challenge is having the flexibility to adapt and extend the system. Open MRS was created with these concerns in mind, allowing adaption at multiple levels from form creation, though addition of software modules, to modification of the core code".

5. Recommendations

From the analysis, some requirements were find. According to the findings my recommendations for the success of the implementation of a web-based e-medical patient portal are:

1. Install more facilities in healthcare
2. Hire more workers especially in rural areas
3. Train the care workers to understand and use the new system
4. Care workers shall have strong communications with IT developers
5. Ensure reliable and strong communications between health centers, laboratories, clinics and district medical offices to deliver a good outcome.

If all the recommendations are followed, it will lead to the successful implementation of the web-based E-medical patient portal.

6. Conclusion

The aim of this study was to develop guideline which can be used to implement a Web based E-medical portal to facilitate the interaction between the hospital, the medical practitioners and the patients. The two formulated questions: (1) what are the requirements for the implementation of interactive systems (portal) between the medical practitioners and patients? And (2) what are the factors that influences an interactive system (portal) that can be used by both medical practitioners and patients? was answered during the analysis of the data. The Data was collected by using the documentation technique, and following a process of 3 phases which are: formulated criteria, search for peer-reviewed articles based on the formulated criteria and documented the data. The data analysis was conducted by following the research questions which got answered and led to the findings. From the analysis, three factors were found to be crucial to the implementation of e-health interactive system, which are Criticality of interactive systems (e-portal) requirements, Technology infrastructures flexibility and Alignment between process and the final product. The three factors can be used to guide the implementation of e-portal for healthcare services.

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