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RESEARCH ARTICLE

E-Prescription in Nigeria: A Survey

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Abstract

Electronic prescribing or Electronic prescription (EP) is the computer-based electronic generation and transmission of a prescription. EP systems help to increase accuracy and safety of patient prescription and reduce costs through improved legibility and electronic delivery. The motivation for EP is greater safety of drug use and to counter the current unacceptable levels of adverse drug events. This study evaluated the feasibility of hospitals in Nigeria to adopt an EP system. A survey was conducted in four hospitals in Nigeria to determine the economic, technical and organisational feasibility of adopting e-prescribing. Respondents included 42 medical practitioners - doctors, pharmacists, pharmacy technicians and assistants - working at the hospitals at the time of the survey. Respondents felt that implementation of an EP system is economically feasible (p=0.031) and organisationally feasible (p=0.032) but were ambivalent as to whether it is technically feasible (p=0.446). However, inadequate funding by the government does not provide for the health sector to acquire the necessary resources and training skills.

Keywords: *E-Prescription; E Health; Survey; Nigeria.*

Introduction and Background

Electronic health services such as electronic health record, electronic referral, electronic prescription and picture archiving system are increasingly becoming popular among physicians in developing countries [1, 2, 3, 4, 5]. However, there are several challenges to its full adoptions; for example, an extensive review by Okoroafor et al [6]. Revealed that unavailability of digital tools, erratic power supply and poor communication networks are some of the Herculean challenges limiting the prospects of telemedical practices in Nigeria.

Not with standing, prescription of medications is amongst the most common forms of treatment in health care, but the process of managing written prescriptions and related telephone messages consumes substantial time for prescribers and their staff. Furthermore, these processes are prone to errors and miscommunication, which sometimes results in patient harm. In addition, it has been reported in several works that wrong prescription has led to severe adverse drug effects and even death of patients [7, 8, 9]. Electronic prescribing or e-prescribing (EP) has been proposed as an important approach to reducing medication errors, improving the quality of patient care, and creating healthcare savings [10]. Many barriers have hindered the adoption of e-prescribing systems (EPS), including the misalignment of financial incentives, the high cost of purchase, implementation and maintenance of systems, the immaturity of software products and vendors, the lack of integration between Electronic Health Record (EHR) systems, as well as physician resistance [11].

A survey conducted by the Massachusetts Medical Society in 2003 revealed a large gap between physicians' perceived value of EP and their intent to adopt this practice [11]. EPS's have the potential to greatly reduce adverse pharmaceutical effects caused by poor transcription, drug-drug interaction,

allergies, dosage errors, and process inefficiencies. Indeed, studies show significant improvements associated with EP implementation, including an 86% decrease in serious medication errors, and an increase in Medicare formulary adherence from 14% to 88% [12]. Despite this evidence, providers have been slow to adopt EP technology due mainly to cost and regulatory constraints in the health sector.

According to the U.S. Department of Health and Human Services, while most industries spent $8,000 per worker for Information and Communication Technologies (ICT) in the last decade, the healthcare industry invested only $1,000 per worker [13]. Since EP yields a variety of benefits to patients, physicians, and third parties, more investment is needed [14]. Factors affecting the slow adoption of EP in developed countries may differ from those in the developing world, suggesting a need for more contextual approaches. Several assistive health technologies have been proposed and implemented in recent years mostly in developed countries, the most common being the EHR system.

An EP system is an important component of a fully implemented EHR. But neither will, alone, achieve widespread adoption or success in developing countries unless the targeted users (physicians, other stakeholders, and government) are ready for the technology. Several varieties of EPS have been proposed including a secure intelligent EP, an electronic medication prescribing support system for diagnosing tropical diseases, and an EPS for paediatricians [15, 16, 17].

Evidence of improvement in physician workflow has been established by use of EP projects. For example, Tamblyn et al [18].Evaluated the acceptability and use of an integrated EP and drug management system called Medical Office of the XXIst Century (MOXXI) for primary care physicians. MOXXI was developed to enhance patient safety and process efficiency by integrating patient demographics, retrieve active drugs from pharmacy systems, generate an automated problem list, and ensure acceptability. Its impact was assessed using audit trails, questionnaires, standardised tasks, and information from comprehensive health insurance databases.

Physician usage of MOXXI was good in the first three months; however, physicians wrote EP in 37% of visits and reviewed the patient's drug profile in just 13% of visits. Physicians rated printed prescriptions, the current drug list, and the re-prescribing function as the most beneficial aspects of the system. They concluded that the primary care physicians believed an integrated EP and drug management system would improve continuity of care, and they were more likely to use the system for patients with more complex, fragmented care.

In 2008 Went investigated if an EP would lead to fewer errors in prescribing medicines in a secondary care setting [19]. An EPS was compared with paper prescription charts of 16 patients in intensive care to assess any change in the number of prescribing errors.

The overall level of compliance with nationally accepted standards was significantly higher with the EPS (92%) than with the paper system (47%). Fewer deviations from accepted standards were found in electronically generated prescriptions (28 of 329 prescriptions; 8.5%) compared to written prescriptions (208 of 408 prescriptions; 51%).

They concluded that the reduction in prescribing errors with the EPS was significant, and that involving clinicians in the design and development of an EPS raised acceptance and adoption. Woan et al. surveyed nine national healthcare groups in Singapore to investigate satisfaction with EPS implemented in that country [10]. Their study showed high levels of satisfaction with electronic prescribing; doctors and pharmacists agreed that EP reduced prescribing errors and interventions, and they did not want to go back to the paper-based system.

Only 60% of pharmacy respondents expressed satisfaction with the review function of the EP, and only 52% and 60% were satisfied when processing prescriptions that included items to be purchased from an external pharmacy or prescriptions with amendments, respectively. The results also revealed that satisfaction with the system was associated more with user perceptions about the EPS's impact on productivity than quality of care.

Shams also showed that overall satisfaction which integrated e-prescription was high [20].

Physicians, pharmacy staff and nurses surveyed, 'highly agreed' that their EPS reduced prescribing errors, and they did not want to go back to the paper-based prescription system [14, 21]. Pharmacy staff and nurses viewed the EPS more positively and were more satisfied with it than were physicians. Seventy-four percent (74%) of patients who responded to the survey were either satisfied or very satisfied with the EPS and preferred it to paper-based prescriptions.

Shams concluded that although the majority of stakeholders were generally satisfied with the current status of the EPS, they also perceived a few key weaknesses. A total of 12 recommendations were offered to improve EP in clinical settings in the Sultanate of Oman. Similarly, Perdikouri and Katharaki provided a review of factors to consider when implementing and evaluating an EPS using Greece as case study [22]. They also compared these finding to the current situation in Greece, identifying key factors that would determine acceptance and success of EP.

These were: standards, appropriate coding and interoperability (to assure long-term viability of an EPS), and participation of all stakeholders (clinicians, patients, healthcare providers and healthcare organizations) to ensure successful implementation and functioning of these systems. However, in any given setting, these general principles should be modified in order to fit the special socioeconomic needs that e-prescribing is expected to fulfil. Dolezel [23] performed a qualitative research focusing on the attitudes of Czech physicians to the adoption of EP in their country.

Their analysis covered the dominant medical discourse in some months of 2017 and the criticisms of physicians were analysed. Results indicated that state despotism, high cost of adoption and overpricing are some of the possible factors in the adoption of e-health practices. Also, Hassain et al. [24] gathered information from 95 randomly selected rural patients through a field survey in order to examine the factors affecting compliance with EP issued by a human assisted healthcare system called a portable health clinic (PHC).

In their results, it was found that of the 74.7% compliant patients, gender, education, distance to health care facilities and frequency to care provider are some factors associated with the patient's compliance. The reviewed literature confirms the importance of EP but many of them failed to note some of the challenges faced before adoption, and the impact government can have on EPS adoption. EP remains at an immature stage in developing countries like Nigeria, and will stay so until the level of readiness and preparedness of users is understood.

There is a need to identify and provide solutions for the major challenges to wider deployment of e-Health systems in developing countries which some suggest may be due to the lack of hard evidence of benefits.[12] This paper evaluates the feasibility of hospitals in Nigeria to adopt an EPS to enhance patient drug adherence and improve healthcare service delivery.

Methods

A questionnaire was developed after reviewing the literature. Questions addressed demographic information, experience in healthcare, and experience using an EPS. The questionnaire consisted of three sections and twenty questions. The sections addressed economic feasibility, technical feasibility, and organization feasibility.

The economic feasibility section contained seven questions to determine the economic benefits to the hospitals of the proposed EPS. The questionnaire was structured to elicit user satisfaction with a variety of EP functions based on the list of tasks in the workflow carried out by the doctors, pharmacists and nurses, and was also structured to draw out user satisfaction with the ease of working 'paperless'.

The technical feasibility section contained seven questions, intended to provide an understanding of the present technical resources of hospitals and their applicability to the expected needs of the EPS system.

The organisational feasibility section contained six questions to determine whether the current system will fit into the organisation and meet the new system goals and objectives, whether the new system would have enough support from users to be successfully adopted, and whether users could operate the system.

Using a Likert scale, respondents were asked to check which of 5 responses (i.e., Strongly Disagree, Disagree, Not Sure, Agree, and Strongly Agree) best matched their belief. The questionnaire also contained questions asking respondents to indicate their agreement or disagreement with statements regarding the adequacy of training and ongoing support, as well as their perception regarding the impact of the use of EPS on prescription errors and interventions.

The survey was conducted in a purposive sample of four Nigerian hospitals: Lagos State University Teaching Hospital (LASUTH), University of Lagos Teaching Hospital (LUTH), The Neuropsychiatric Hospital, Aro, Abeokuta, and the Federal Medical Centre Abeokuta. These hospitals were selected to ensure inclusion of Federal and State standard hospitals in South-Western Nigeria. Printed questionnaires were given out to doctors, pharmacists, pharmacy technicians, and assistants (present at the time of survey administration), for anonymous self-administration. For each aspect assessed (economic, technical, and organisational feasibility), a one-sample Chi square test was performed. Correlation between factors was analysed using Pearson's correlation. Alpha was set at 5%.

Results

Forty-two respondents completed the questionnaire (29 males; 69%). Years of practice of respondents varied from zero to five years (n=16; 38%); ten to fifteen years (n=18; 43%), and fifteen to twenty years (n=6; 14%). Also (n=2; 5%) was incompletely filled. The profession distributions consist of 21 doctors, 12 pharmacists, 5 nurses and four assistants. 43% of the respondents have over 10 years of practice experience. The detail of the questions presented under the three different categories appears in Table 1, Table 2 and Table 3.

Table 1: Economic feasibility

Economic feasibility	
1.	Do you think the hospital firm can afford to improve the internet network?
2.	Do you think paper prescriptions are prone to errors?
3.	Do you think the hospital firm can afford to get all physicians computer?
4.	Do you think you waste much calling card and time calling the pharmacy for corrections?
5.	Do you think paper prescription is effective in your job?
6.	Do you think using e-prescription system will improve the quality of health service?
7.	Do you think e-prescription system will save your time and reduce error?

Table 2: Technical feasibility

Technical feasibility
Do you think using computer for electronic prescription would make your work more effective and accurate?
Do you think the internet network in the hospital is good?
Do you think you are good at operating computer system?
Do you think you are fast in responding to training on new device?
Do you think the e-prescription system would be easy to use?
Do you think you are really motivated to pick up the new electronic prescription system?
Do you think you have ability to use the electronic prescription system?

Table 3: Organizational feasibility

Organizational feasibility	
1.	Does the government respond well to the need of the hospital?
2.	Would learning to operate the computer be easy for you?
3.	Do you think it will be easy to adapt to the new workflow?
4.	Can the hospital firm manage and be consistent the system over a long time?
5.	Do you think your hospital firm would be ready to adopt the new system based on the infrastructural facilities?
6.	Do you think the patient will be ready to adopt the new system?

The mean scores for the five-point Likert item based economic factors, organizational factors and technical factors were shown in Table 4. The scale mean response of the respondents (2.46) reveals the certainty that government do not respond well to hospital needs. One-sample chi squared test also showed that: the economic (p= 0.031) and organizational feasibility (p = 0.032) of EPS usage are significant while the technical feasibility (p= 0.446) of EPS usage is insignificant. Correlation was noted between responses to economic feasibility and organisational feasibility (p = 0.047) and technical feasibility and organisational feasibility (p = 0.013) but not between economic and technical feasibility (p = 0.311).

Based on the feasibility analysis, results show that the higher group of respondents (85.71%) belonged to the younger age population of within the age of 40 as shown in Table 5. In return, they have scored high in computer literacy (52.38%), which implies computer exposure prior to their medical practice. As suggested by [23], "this could be reflective of the age of the majority of the respondents. It is likely that younger respondents obtained formal computer training prior to attending medical school, such as in an undergraduate program or in elementary or high school". All of the respondents use the computer regularly with 53.66% having been exposed to a healthcare system through past usage, training, and demo. This is satisfying since the majority is aware of the system's existence.

The scale mean for Internet network in hospital is 3.41 portraying a level of neutrality and a slight level of satisfaction. Regardless of the stakeholder readiness; in order to reach technical readiness, Nigerian government must be ready to support the implementation of the system. Attention has to be given to the identified issues before EPS can be deployed successfully in Nigeria. Currently, Nigerian lacks a centralized database in which patients' medical records could be retained for easier diagnosis and treatment.

The availability of such infrastructure would help doctors and pharmacists to be on the similar network, communicate through a single database, monitor patient's medical records, share medical feedbacks and hence improved prescription system.

Table 4: Mean score table

Factors	Overall Mean	0-30 Mean	30 - 40 Mean	40 - 60 Mean
Economic_ internet affordability	4.39	1.57	2.20	0.63
Economic_ paper error	4.12	1.47	2.06	0.59
Economic_ hospital affordability computer for physician	3.76	1.34	1.88	0.54
Economic_ calling time	3.48	1.24	1.74	0.50
Economic_ EP improve service quality	4.56	1.63	2.28	0.65
Economic_ save time	4.32	1.54	2.16	0.62
Economic_ EP effectiveness	3.58	1.28	1.79	0.51
Technical_ work accuracy	4.39	1.57	2.20	0.63
Technical_ internet network availability	3.41	1.22	1.71	0.49
Technical_ operating computer	4.25	1.52	2.13	0.61
Technical_ response to training	4.44	1.59	2.22	0.63
Technical_ ease of use	3.8	1.36	1.90	0.54
Technical_ motivation towards EP	4.15	1.48	2.08	0.59
Technical _ ability to use the EP	4.32	1.54	2.16	0.62
Organizational_ government response	2.46	0.88	1.23	0.35
Organizational_ Learning of computer	4.34	1.55	2.17	0.62
Organizational_ adaptation of EP	3.95	1.41	1.98	0.56
Organizational_ management of new system	3.41	1.22	1.71	0.49
Organizational_ infrastructural facilities	3.66	1.31	1.83	0.52
Organizational_ patient adaptation	3.43	1.22	1.72	0.49
Valid N	42			

Table 5: Frequency distribution table of age

Age	Frequency	Percentage of age
0-30	15	35.71
30-40	21	50
40-60	6	14.29

Conclusion

Through this study a questionnaire and process were developed that if applied more broadly could reveal other factors that influence whether or not Nigeria, and similar developing countries, are suitably positioned for the adoption of an EPS. This preliminary study of four hospitals in Nigeria has shown that respondents feel that EPS implementation is economically and organisationally feasible though, the government does not respond well to hospital needs. Similarly, EPS implementation is modestly technically feasible from an individual perspective, but not from the government perspective which must implement a centralised EHR to demonstrate commitment, and to facilitate EPS implementation and use.

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