

Towards optimizing outpatient waiting time through e-governance: Exploring digital registration barriers in first-level hospitals, Lusaka, Zambia

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<https://doi.org/10.51867/ajernet.6.4.73>

ABSTRACT

The issue of long queues in outpatient departments in urban hospitals is a topical challenge given the context of health facilities operating in the sphere of the state that brings the issue of patient dissatisfaction, frustration and loss of confidence in the healthcare delivery system. Such a long waiting time does not only cause inconvenience to the patients but also exposes the healthcare staff to excessive work, thus overworking the service-delivering systems. Waiting time is a major indicator of the health system performance; in the event whereby the waiting time is longer than the acceptable mark, it may contribute to the incidence of adverse health outcomes and reduce adherence to the treatment process by the patients and the overall quality of care. The latter phenomenon, in its turn, requires the consideration of reducing the patient experience and improving the health service delivery. Queuing theory guided this research. This study employed a qualitative design, the target population being those in charge of hospital managerial and operational decisions. This research involved the purposive sampling of 12 healthcare managers to give information on barriers associated with digital registration in first-level hospitals. The selected first-level hospitals were Chilenje and Kanyama First Level Hospitals, based in Lusaka, Zambia. Collection of data was done using in-depth interviews, and analysis was done using themes that were produced during the study. This study has revealed that digital systems are associated with barriers which ultimately impact patient waiting time. According to healthcare providers, the constant system malfunctioning was a major disruption of the registration process, forcing them to revert to the manual methods. In conclusion, this research recommends modernising infrastructure to maximise capacity, integrating registration with other departments to maximise patient flow, and ensuring reliable, well-maintained systems. The study further suggests a thorough focus on comprehensive staff training, supporting patient digital literacy, promoting staff adoption through change management, and increasing administrative response.

Keywords: Digitization, Health Systems Management, Hospital Efficiency, Lusaka, Patient Satisfaction, Waiting Time, Zambia

I. INTRODUCTION

The long waiting time in outpatients is a chronic issue in most of the public health institutions in the majority of the low and middle-income countries, including Zambia. Such a delay is detrimental to patient satisfaction, quality of care and causes further straining to the already overstretched health system resources (Hamoonga et al., 2024). Its infrastructure is inefficient because the number of patients is increasing, and the issues of staffing shortage in medical care institutions cannot be merely compared to the inefficiency of operations but also introduce an insurmountable difficulty to the process of providing healthcare in a just and timely manner. The effectiveness of the outpatient services is an essential sign of the receptiveness of the health system, and in its turn, the long waits ruin patient confidence and illusiveness of the shift to the universal health coverage (Alodan et al., 2020; Naiker, 2017).

In the case of Zambia, the first and the most common point of interactions between the society and the formal healthcare structure is outpatient departments (OPDs). However, the inflows of patients that are not manageable, lack of space to consult with, and lack of coordination of patient flow usually overwhelm these departments. (Bilandžić, 2022). Although it is not a secret that long waiting times are the order of the day, there is scanty data on Zambia regarding the factual nature of the delay experience, the perceptions of the delays by the patients and the overall impact of the factors on the delay systematically and demographically. As a fact, the waiting times depend on a vast number of factors predetermined and among the factors, there are: socio-demographic factors, arrival distributions, appointment scheduling habits, staffing rates and facility equipment. Nevertheless, these outcomes should be highly contextual and thus the need to have locally relevant research so that to arrive at the evidence that can be employed to formulate specific and sustainable interventions.

1.1 Statement of the Problem

Although the first-level hospitals in Lusaka District have introduced digital registration systems to provide improved efficiency and shorter waiting time by the patients, there are still many operational barriers that interfere with the efficiency of the system (Villegas et al., 2021). The common system crashes, insufficient training of staff, ineffective integration of the system, lack of digital literacy among the patients, and unreliable internet and power connectivity have all contributed to sabotaging the desired gains of digitalization (Alodan et al., 2020; Bolton Moore et al., 2022). Such issues do not only increase the wait of the patient, but also cause disruption in the workflow, frustrations by the staff and low satisfaction by the patients. It is important to understand the causes of these barriers through the lens of hospital managers to establish the specific intervention that may be used to streamline the process of digital registration and enhance the delivery of services in the context of a public health facility.

1.2 Research Objective

To understand the challenges to successful digital registration and their impact on outpatient waiting time as experienced by first-level hospital managers in Lusaka, Zambia.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Queuing Theory

Queueing theory is a mathematical framework for analysing waiting lines and service systems, with emphasis on factors such as arrival rates, service rates, and the number of service channels (Biya et al. 2023). In the context of outpatient services, it clarifies how patient flow, staff availability, and service capacity interact to cause delays. Using queueing theory, healthcare management may forecast bottlenecks, optimise personnel, and minimise patient wait times. Outpatient waiting time studies have used this theory to model patient arrivals and service processes, demonstrating that inefficient resource allocation and uneven patient arrivals are major contributors to prolonged waiting, thus providing a basis for interventions to streamline service delivery.

2.2 Empirical Review

Waiting time is a period of time within which a patient has to wait in a healthcare facility before he or she is attended to in terms of seeking consultation or treatment (Hamoonga et al., 2024). Waiting time can be disaggregated into the phases of the following ones: registration, triage, consultation, laboratory, pharmacy, and discharge. Researchers distinguish between actual waiting time that can be objectively defined and perceived waiting time that may be considered subjective and experienced by the patients and has a strong impact on satisfaction. It is a fact that the perceived wait time can be more powerful to create satisfaction than experienced delays since the psychological aspects like uncertainty, anxiety, communication among others create dissatisfaction (Sialubanje et al., 2023).

The concept of patient satisfaction is multi-dimensional, as it assumes the accessibility, the timeliness, the contact with interpersonal relations and the perception of quality (Rapoport et al., 2023). The fact that there exists a negative correlation between long waiting time and satisfaction is high (Tanabe et al., 2023). Beck et al. (2021) report that more than 60 percent of patients in Ghana stated that they were not happy with wait time more than two hours. On the same note, other studies affirmed the same results claiming that the wait time was one of the strongest predictors of poor outpatient care ratings (Abeni et al., 2021).

The high-income setting is also not satisfactory (long waits) but the average wait is much less (15-45 minutes). In this respect, indicatively, defined the relationship between the smallest shifts in waiting times in the United States and the reduction in the rates of patient satisfaction. These results indicate that the waiting time has a universal effect on the quality perceptions in terms of healthcare but in the resources constrained environments, it has amplified effects.

The way in which people identify their health needs, evaluate the available options of care, and choose whether or where to obtain care is referred to as healthcare seeking behaviour (Biya et al., 2022). The Adams Behavioural Model holds that predisposing, enabling and need factors determines utilisation of health services. Waiting time is dependent as enabling factor in addition to being a system level determination that significantly impacts the patient decision to use or not use services.

Research carried out in sub-Saharan Africa suggests that excessive waiting time is a barrier to on-time access to care, and patients who undergo this treatment opt to find other ways. Moshabela et al. have found that there were long lines of waiting time in South African public facilities, which led to patients shunning out of the public facilities and instead turning to pharmacies and traditional healers. On the same note, Sialubanje et al. (2023) established that women in Zambia had to choose traditional birth attendants over the formal health providers due to the long waiting times. These findings prove that waiting times are not only a parameter which changes the level of satisfaction but a paradigm of healthcare consumption.

The systemic factors that contribute to long waiting time are shortage of staff, which is a widespread problem of low- and middle-income countries and also lack of adaptation to digital registration (Hall et al., 2022). The healthcare to population ratio in Zambia is significantly lower than the recommendations of WHO, and this aspect restricts clinicians in their ability to serve a large population (Schmidt et al., 2023). Others include poor planning of patient flow, digital faults, optimal triage, and a poor referral system (Musonda et al., 2021). Moreover, due to inadequate technology, the lack of the appointment booking system and electronic medical record, outpatient departments are overcrowded (Beck et al., 2021).

Comparative research brings out operational innovations. The use of appointment systems and the electronic queue management of waiting times in Tanzania and Uganda also reduced the waiting time (Parast et al., 2022). The described interventions demonstrate that even in the settings of limited resources, the operational performance can be improved with small systematic shifts.

III. METHODOLOGY

3.1 Study Design

The study was a qualitative descriptive design which aimed at investigating challenges health care providers face when using the digital system and how it affects outpatient waiting time.

3.2 Study Setting

The research was conducted in Kanyama First Level Hospital and Chilenje First Level Hospital in Lusaka, Zambia. Kanyama Hospital is in a low-income informal settlement where the population density is high, which is marked by large numbers of patients and limited resources. Chilenje Hospital has more socio-economically dispersed population, and it has the same problems. These institutions were selected as case study sites to represent the general systemic and functional constraints present in the Zambian tertiary facilities of the Zambian public healthcare.

3.3 Population and Sampling

The study focussed on healthcare providers and administrators, those in charge of day to day operation of the hospital and present at a time of study. The sample of the participants was selected as purposive and included those that were able to provide elaborative and informative descriptions of outpatient waiting times. The choice of the sample was determined through the accomplishment of data saturation.

3.4 Data Collection

Data was collected using in-depth interviews, consent was gotten to record participants during the discussion and field note were used too.

3.5 Information Processing and Processing.

It is essential to state that, the transcripts of the qualitative data were transcribed word-to-word and anonymised and placed in password-protected databases. Thematic analysis was applied as per the six steps laid out by Braun and Clarke and it was applied in the identification, coding, and categorization of patterns and common themes. The coding was repeated and cross validation was conducted between the members of the research team to enhance the reliability.

3.6 Ethical Considerations

Ethical approval was given by the University of Zambia Biomedical Research Ethics Committee (UNZABREC) and local authorities (Lusaka District and Provincial Health Offices and National Health Research Authority). There was an informed consent of the participants, and there was also guaranteed voluntary participation. All the details were kept secret by making sure that the use of study codes and any other audio recordings and transcripts were stored in a safe place.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Social Demographic Characteristics

This section describes the sociodemographic characteristics of the health care managers who took part in the study. Understanding these features helps to contextualise the data and comprehend differences in responses to outpatient waiting times and hospital management strategies. The data collected includes respondents' professional designations, which represent their roles, responsibilities, and possible impact on service delivery. Table 1 summarises the distribution of responders across various managerial roles in hospitals.

Table 1
Socio-Demographic Characteristics of Health Care Managers

Designation	Frequency	Percent
Head of Clinical Care	1	8.3
Principal Clinical Officer	2	16.7
Nursing Officer	2	16.7
OPD Nurse In-Charge	2	16.7
Hospital Administrator	2	16.7
Planner	2	16.7
Quality Assurance Officer	1	8.3
Total	12	100%

The study comprised 12 healthcare managers, whose socio-demographic characteristics are summarised in Table 1. The respondents held roles such as Principal Clinical Officer, Nursing Officer, OPD Nurse In-Charge, Hospital Administrator, and Planner, accounting for 16.7% of the sample. The Head of Clinical Care and the Quality Assurance Officer each represented 8.3% of the participants. This distribution shows a varied range of managerial jobs within healthcare institutions, including both clinical leadership and administrative control. The inclusion of these diverse positions gave a full view of operational issues, and solutions for outpatient treatment delivery and wait time management.

4.1.2 Thematic Analysis

Theme 1: System Crashes and Technical Faults. The study found that frequent system outages and technical issues had a major influence on the registration process, resulting in longer patient wait times. These technological disruptions frequently disturbed the normal flow of patient data submission and verification, resulting in congestion at registration locations. As a result, employees were frequently compelled to use manual techniques, which not only delayed the process but also produced inconsistencies and inaccuracies in patient data. This back-and-forth between technological and manual methods caused confusion among personnel and patients, worsening delays and decreasing overall service efficiency.

“The system is usually down in the morning and we are forced to register patients manually. This clearly slow down all these things.” (P02)

“Sometimes the digital system malfunctions and we will lose patient information hence patients will have to wait as we edit the records.” (P09)

“We struggle to fully transition from paper-based to SmartCare electronic records due to lack of computers, unreliable power supply, inconsistent internet, and insufficient funds for maintaining hardware and software. These issues often cause system breakdowns and force staff to revert to manual processes” (P04)

Theme 2: Lack of Adequate Staff Training. Healthcare Managers claimed that inadequate training on the digital registration system hampered its efficient usage. Many employees battled with system navigation, frequently unclear of how to access various modules or execute common duties quickly. Furthermore, numerous data input mistakes occurred as a result of unfamiliarity with the system's interface, necessitating more time for repairs and verification. Small technological difficulties, such as system freezes or error warnings, exacerbated the situation since staff lacked the confidence or abilities to fix them independently. Collectively, these difficulties slowed patient processing, increased wait times, and occasionally prompted staff to resort to manual procedures, undercutting the digital system's expected productivity improvements. Ratio systems can perform properly and help to optimise patient flow.

“There is very little training that we were offered hence many of us do not feel comfortable with the system. This impacts on the speed of patient registration.” (P07)

“New employees are prone to mistakes in the system, which are time-consuming to resolve, contributing to the waiting of patients.” (P11)

Theme 3: Low System Capacity to large volumes of patients. According to participants, the computerised registration system frequently failed to effectively manage the large volume of patient registrations during peak hours. The system would slow down or stop responding when several patients tried to register at once during busy times, causing bottlenecks at the registration locations. Overall waiting times increased as a result of the visible lines that formed for both staff members trying to process the inputs and patients waiting. In addition to frustrating patients, the system's incapacity to grow with patient demand put extra strain on medical staff, who had to deal with both the system's technological constraints and the expanding lines.

“On hectic mornings, the system becomes slow and patients have to be patient enough to wait as they await to be attended to.” (P12)

"Sometimes the system is unable to accommodate large numbers at a time so we have to make up lists manually to keep pace with this and this nullifies the point." (P01)

Theme 4: Lack of Integration with other Hospital Systems. The participants indicated that the registration system was not completely connected with other departments in the hospital and this has caused repetitions of data entry and slowing of patient traffic. This disconnectivity had the effect of adding to the total outpatient waiting time. Respondents noted that the registration system was not completely connected with other departments within the hospital, resulting in considerable bottlenecks in patient processing. Because the system could not interact with the laboratory, pharmacy, billing, and clinical records departments, employees were sometimes needed to enter the same patient information numerous times across various units. This repetition not only raised the likelihood of data inconsistencies and mistakes, but it also hindered patient movement through the hospital because each department had to process information individually rather than relying on a centralised system. The lack of communication between departments exacerbated patient delays, resulting in greater total outpatient wait times.

"Regarding the registration system, I was told that it does not send any information to the pharmacy and lab systems, which means that patient information must be entered into the pharmacy and lab systems manually." (P01)

"Poor integration is seen to make patients wait longer to have the test results or medications even after the patients are registered digitally." (P08)

Theme 5: Issues of Power and Connections. Participants reported that any disruption of digital registration due to intermittent power failures and unreliable internet connections resulted in a shift to paper-based systems, which further increased wait times. Providers stated that occasional power outages and inconsistent internet connections disrupted the digital registration system, affecting patient flow significantly. During such outages, employees were compelled to temporarily forsake the computerised system and return to paper-based registration procedures, which are intrinsically slower and more prone to mistakes. This abrupt change not only hindered the registration process, but also caused confusion among staff and patients, since manual records had to be reconciled with digital data once the system was restored. Waiting times were extended further due to the additional processes necessary to preserve continuity and accuracy in patient information, especially during busy hours.

"Once the power goes off the system will not work anymore, and patients are obliged to wait until we will find other methods to get them registered." (P04)

"The slow internet connection frequently results in the delays in records of patients saved, which slows the whole outpatient procedure." (P11)

Theme 6: Digital Registration-related Problems with patients. According to healthcare managers several patients encountered difficulties with registering online for National Health Insurance Scheme with the National Health Insurance Management Authority (NHIMA), this is to insufficient digital literacy, which delays the procedure and resulting in large lines especially for people accessing NHIMA services for the first time. Many patients were unfamiliar with fundamental digital self-services such as using the National Health Insurance Management Authority (NHIMA) web site and appropriately inputting personal information. This lack of knowledge resulted in several mistakes that required rectification or further help from personnel, significantly delaying the registration process. As a result of these digital registration issues, waiting times increase intensely, particularly during peak hours. Providers emphasised that personnel have to redirect their focus away from other vital jobs to help patients who are having trouble with self-service online registration, which increased their workload and stress levels.

"The reason is that some patients do not know how to use the NHIMA registration portal, and we end up wasting more time attending to the patient, which influences the overall waiting time." (P07) "

"Older patients usually require the help of other people, and the staff is not enough, which makes everyone wait." (P06)

Theme 7: Poor system maintenance and updates. The study found that the digital registration system was inadequately maintained, owing mostly to the usage of old software that was not consistently upgraded and old gadgets. The system had a poor processing speed, making it difficult for personnel to register patients effectively, especially during peak hours. Furthermore, the system faced regular outages and technical issues, which disrupted the registration process and required staff to halt or utilise manual techniques. These disruptions not only extended patient wait times, but also increased staff workload and added to confusion when maintaining patient information. The absence of periodic maintenance, software upgrades, and technical support exacerbated these challenges, emphasising the vital need for modernised, well-supported digital infrastructure to enable dependable, efficient, and uninterrupted service delivery in outpatient departments.

"I personally think the system is not well maintained even the gadgets we use are not modern gadgets hence limited with functions, even when we request to purchase laptops, we are told the grant received is not sufficient." (P05)

“Unless it gets regularly maintained, it will accumulate minor problems that will generate large delays in the registration.” (P10)

Theme 8: Workflow Interruptions and Employee resistance. According to the participants, staffs had a noticeably unfavourable attitude towards utilising the digital registration system. Some workers were reluctant to embrace the technology, either because they were used to manual processes or because they thought the system was too complicated and challenging to use. The system was used inconsistently as a result of this opposition, with some employees avoiding specific features or disregarding established protocols. Because certain procedures were delayed or repeated needlessly, these utilisation disparities interfered with workflow and patient flow. Further undercutting the productivity improvements that the digital system was supposed to offer were mistakes in data input, improper handling of patient information, and longer wait times due to a lack of excitement for utilising it.

“Not all the colleagues register patients digitally hence the inconsistency, which leads to delays, in most cases new staff members find it difficult to adapt to digital system.” (P05)

“Workflow is interrupted, this is because when one half of the staff goes on the digital system, the other half adheres to the manual system, this disrupts the workflow.” (P08)

Theme 9: Insufficient Administrative Support and Feedback. Participants stated, that top administration from different levels in the health system was insufficiently helpful and receptive to the issues connected with the digital registration system as much of the efforts is directed towards other pressing issues. Staff claimed that when issues raised, ranging from system malfunctions to workflow bottlenecks, there was little managerial involvement to address or fix them in a timely way as management claim the issue is above them. Furthermore, the lack of formal feedback channels meant that staff had no systematic way to report problems, make changes, or seek advice on best practices. This lack of communication and reactivity limited the system's continual improvement, diminishing its efficacy at expediting patient registration and restricting its ability to reduce outpatient wait times.

“We report the problems, but nothing is implemented to rectify the problems hence the system is not efficient enough and the waiting period will always be long.” (P03)

“When the system fails, there is no actual administration assistance, and we only manage to get through with it thus impacting patient flow.” (P10)

4.2 Discussion

This study has revealed that digital systems are associated with barriers which ultimately impact on patient waiting time. According to healthcare providers, the constant system malfunctioning was a major disruption of the registration process forcing them to revert to the manual methods. It is in line with the international literature that depicts that technical unreliability in electronic health systems may significantly increase patient waiting time, decrease staff productivity, and distrust in digital interventions (Zhang et al., 2023). Data loss on failures of the system also contributes to delays, which shows how vulnerable the existing electronic structures are.

Inadequate Staff Training was found to be one of the biggest limitations. Lack of training meant that staff could not easily navigate the system or solve a problem and this resulted in problem with data entry and increased time of registration. This is consistent with other studies which indicated that, insufficient training can cause low competence of users and unwillingness to use digital health technologies (Malécot et al., 2022). This challenge is particularly experienced by new employees, which means that they should be inducted in a structured manner, and their professional development should be continued.

The study further indicates that, poor System Capacity at Periods of Peak led to long waiting periods. The failure of the system to manage large numbers of patients caused the personnel to go back to manual lists, which meant that the advantages of the digital registration system were nullified. This observation is similar to the literature on resource-constrained environments where system performance at times of high demand frequently defines the efficiency of the entire patient flow (Sialubanje et al., 2023).

The absence of Integration of registration points with other Hospital Systems led to duplication of data input, inefficiency and slowness in patient throughput. Digital registration differed in that it was not connected with pharmacy or laboratory systems, and patient data were required to be inputted into the system several times. It is also well-known that poor system interoperability is a condition that hinders health system efficiency and is one of the factors that contribute to long waiting times (Musonda et al., 2021). Operation was also hampered by the problems of Power and Connectivity. Regular power outages and unstable internet connectivity compelled employees to quit all digital solutions and start using manual operations. Similar context research has already shown that the infrastructural instability is an important factor influencing the sustainability of digital health intervention (Oeser & Romano, 2021).

The low-digital literacy patients especially the elderly found it difficult to use the self-service registration, thus asking the staff to assist them further, which led to delays among other patients. This highlights the role of the patient-centered design and education in deploying digital health solutions. Furthermore, according to the study, the old software had minor errors that had been accumulated over the years hence causing significant disruptions. It is important to

maintain the systems with regular maintenance and software updates to ensure maintenance and reliability (Girmenia et al., 2020).

Lastly, Proper Administrative Support and Feedback was found to be a major obstacle. Inadequate feedback mechanisms and responsiveness of the management prevented the timely process of solving technical and operational issues, which reduced the motivation of the staff and the efficiency of patient flow. Digital adoption is needed to be supported by an organization that guarantees the seamless functioning (Bontia, Md & Babsa-ay, Md, 2024).

On the whole, these findings indicate that the issues of digital registration systems are complex and refer to technical, human, and organizational levels. The combination of the system malfunctions, under-training, infrastructural constraints, and change resistance is a cumulative delay, which can have a substantial impact on outpatient waiting.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The research shows that digital registration at public health facilities has a number of digital registration barriers which are interrelated to increase outpatient waiting time. The most common challenges are frequent system failures, staff incompetency attributed to lack of sufficient training, inadequate capacity of the system at times of peak period, lack of integration among other platform in the hospital, infrastructural problems (power and internet), patient related digital literacy challenges, obsolete software, staff opposition, and weak administration. These issues are to be overcome in order to have efficient registration of patients, less waiting time, and better patient satisfaction.

5.2 Recommendations

In order to improve outpatient digital registration, the study suggests updating infrastructure for maximum capacity, integrating registration with other departments to optimise patient flow, and guaranteeing dependable, well-maintained systems. It places a strong emphasis on providing thorough staff training, assisting with patient digital literacy, encouraging staff adoption through change management, and improving administrative responsiveness. To maintain efficiency and shorten outpatient wait times, it is also recommended that staff productivity, patient happiness, and system performance be regularly monitored and evaluated.

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