

Patient Flow Analysis in a Public Hospital: A Case of Outpatient Services at Remera Rukoma District Hospital

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ABSTRACT

INTRODUCTION: Wait times in outpatient services are a major challenge for hospitals. This study at Remera Rukoma District Hospital aimed to analyze patient flow and waiting times in the outpatient department to improve service quality and resource utilization.

METHODS: A cross-sectional study was conducted from November 2023 to January 2024, involving 300 patients. Data was collected by observing patient flow and recording time spent at each touchpoint, then analyzed using SPSS version 25.

RESULTS: The average age of participants was 36.23 years, with a majority being female (55%) and referred patients (82%). Most visits (72.7%) were first-time consultations. Average wait times ranged from 19 minutes at reception to 104 minutes at the pharmacy, with the longest waits observed at the pharmacy.

CONCLUSION: The study highlighted the need for interventions to reduce delays, particularly at the cashier and pharmacy. Recommendations include process improvement, staff training, and regular monitoring of patient flow data to enhance patient satisfaction and healthcare service quality.

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INTRODUCTION

Patient flow analysis (PFA), a simple quality improvement tool to identify patient flow patterns, can be used in resource-limited settings to inform service delivery improvements [1]. Inefficient patient flow affects the quality and timeliness of care and patient satisfaction [2]. The shortage of resources and staff in lower and middle-income countries (LMICs) emergency rooms makes the overcrowding problem even worse than in developed countries [1]. As a result, LMIC emergency rooms struggle with too many patients and limited resources, compounding the challenge of providing timely care [1].

PFA pinpoints inefficiencies in how patients move through facilities, leading to better care experiences and outcomes and it identifies opportunities to streamline healthcare delivery, enhancing efficiency and patient satisfaction [3-7]. It also reflects how quick and efficient hospitals are in providing healthcare services, shows possible bottlenecks, and is an evidence-based tool for managing patient flow [8]. The use of patient flow analysis and the creation of patient care teams proved useful in identifying areas for improvement, targeting, and measuring the effectiveness of interventions [5]. Previous research has demonstrated that measurement of patient flow in emergency department might

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be a valuable tool to analyse the influence of internal factors on overcrowding [7]. Time-flow studies can be useful instruments for academic ambulatory practices to identify and ameliorate practice inefficiencies without sacrificing quality of teaching or patient care [3].

Although PFA is regularly used in developed countries to help evaluate wait times and improve efficiency and patient care, it has been applied minimally in healthcare facilities of LMICs despite the opportunity for improving care systems in those environments [1]. PFA is an effective technique to identify inefficiencies in patient visits and efficiently collect patient flow data [4], and once inefficiencies are identified they can be improved through brief interventions [4]. The duration of patient waiting time and the amount of contact time with providers varies from one facility to another and depends on some of the following factors: quantity and quality of medical equipment, capacity of human resources, speed of registration process, the physical layout of facilities and policies regarding payment for services [9].

In Rwanda, the Ministry of Health has committed to providing universal access to health services and improving the quality of care [10]. An important factor that impacts quality and access to care is the amount of time patients wait to see providers at health facilities [10]. There is evidence of the application of PFA in healthcare facilities, using patient flow data for estimating wait time and visit time, identifying bottlenecks in service-providing processes, optimizing schedules, and planning for future reorganization and resource allocation [8]. Public hospitals in Rwanda, particularly district hospitals like Remera Rukoma, play a crucial role in providing accessible healthcare services to rural communities. However, these facilities often face challenges with managing patient flow effectively, leading to long waiting times, inefficient resource utilization, and compromised patient satisfaction. Patients often report that they avoid coming to the health centres due to long wait times even though such delays could have serious consequences for their health [9]. Optimizing patient flow becomes even more critical in resource-constrained settings like Remera Rukoma, where every minute and resource count.

Wait times for outpatients and the time management remain major challenges to providing outpatient services, especially in overcrowded hospitals [8]. As part of Rwanda's "people-centered" approach

to services, the patient's experience of care is paramount to its success [9], and consequently, the Ministry of Health has prioritized the reduction of wait times in the national strategic plan [9] [11]. In this regard, this study assessed the PFA at the outpatient department of Remera Rukoma District Hospital to determine the average waiting times of patients at each of the treatment stations and identify areas for improvement in patient care delivery within the existing system.

METHODS

Study design and setting

A cross-sectional study employing a mixed approach method was conducted at Remera Rukoma Hospital. Remera Rukoma Hospital is a district hospital located in Kamonyi District, Southern Province, Rwanda. It is located 9km from the main road of Kigali-Muhanga, and provides a range of services including both inpatient and outpatient in all age groups.

Study participants

The participants from this study were the patients who consulted the outpatient department at Remera Rukoma Hospital during the period of data collection. The inclusion criteria comprised consent to participate in the study and receive outpatient services at the hospital clinics.

Sampling

The sample size was primarily determined using the Fisher formula

$$n = Z^2pq/d^2$$

Where Z is the standard normal deviation at a 95% confidence level equivalent to 1.96; p is the prevalence of the factor under study, which was 84% from a previous study; q is a complementary factor for $q = 1 - p$; d is the precision/tolerable margin of error equivalent to 0.05.

This calculation gave a sample size of 207 participants, which was later corrected for a finite population (less than 10,000) giving the minimum finite sample size of 122 participants.

Non-probability, proportionate quota sampling method was employed. This method was performed in different stations of the service delivery process. Samples were selected independently from different service stations (Table 1) on different

Table 1: *The sample of the participants followed in each service or department*

Services	A sample size of the following client in each service
Reception	122
Admission/triage	122
Consultation	122
Cashier	122
Laboratory	122
Radiology	122
Pharmacy	122
Dental	122
Ophthalmology	122
NCDs	122
Maternity	122

days of the week. Sampling was continued until the sample size was completed.

Data collection

A checklist made by the researchers, who considered the study aim and outpatient workflow at the setting, was used to record patient entrance and exit times at each station. Observation of patient flow through the outpatient department (OPD), recording time spent at each touchpoint from 15 November 2023 to 30th January 2024 by 2 trained quality improvement officers and one customer care officer. They were familiar with the hospital and its workflow.

Data analysis

Data was analyzed using statistical methods (SPSS version 25) to identify patterns in wait times and determine the impact of various factors on patient flow efficiency. Descriptive analysis was used to estimate central and dispersion indices. The results were reported in tables and graphs.

Ethical Consideration

Before data collection, the aim and process of the study were explained to the patients. Only those patients who agreed to participate and gave informed consent were included in the study. The study was approved by the Ethics committee of Remera Rukoma Hospital.

RESULTS

Socio-demographic data of the participants

This study evaluated 300 samples from the outpatient department, cash station, and follow-up appointments. The patient flow of outpatients (Figure 1) was analyzed and the primary reason for the visit was predominantly general OPD. The mean age of the participants was 36.23 years, and the majority (55%) were female. Most patients (82%) were referred, and the majority of participants (72.7%) were of first visit. Regarding occupation, unemployment was most common (69.3%). The most prevalent insurance type was CBHI (64%), followed by those uninsured (21.7%). Education status varied, with no formal education attended being the most frequent (39.7%). Most individuals (72%) were married, followed by those divorced (17.3%) (Table 2).

Average waiting time per service/department

An analysis of patient flow at Remera Rukoma Hospital revealed varying wait times across different departments (Figure 2). The average wait time ranged from 19 minutes at reception to 104 minutes at the pharmacy. The longest wait times were observed in the Pharmacy (104 minutes), Cashier (81 minutes), and Consultation (61 minutes). Relatively shorter wait times were in Laboratory (36 minutes), Radiology (33 minutes), Dental (23 minutes), Ophthalmology (26 minutes), NCDs (29 minutes), Maternity service points (31

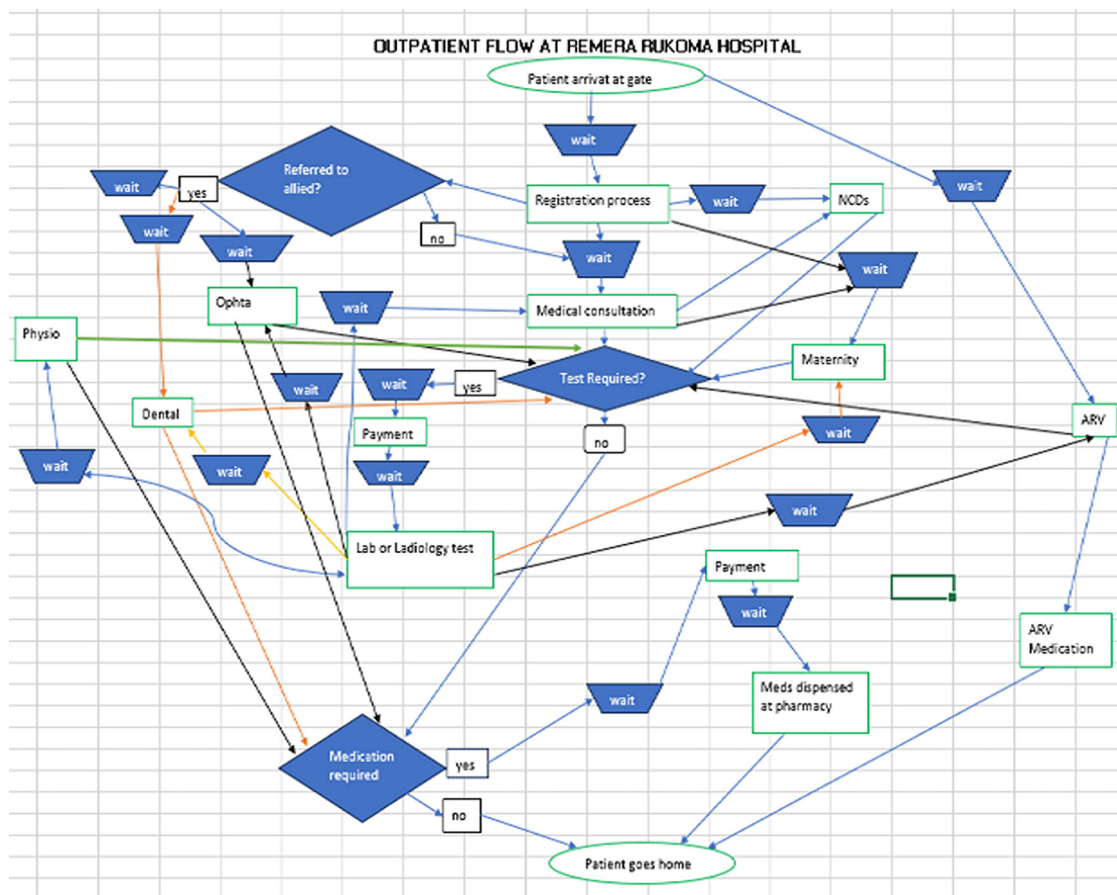


Figure 1: Patient flow chart at Remera Rukoma Hospital

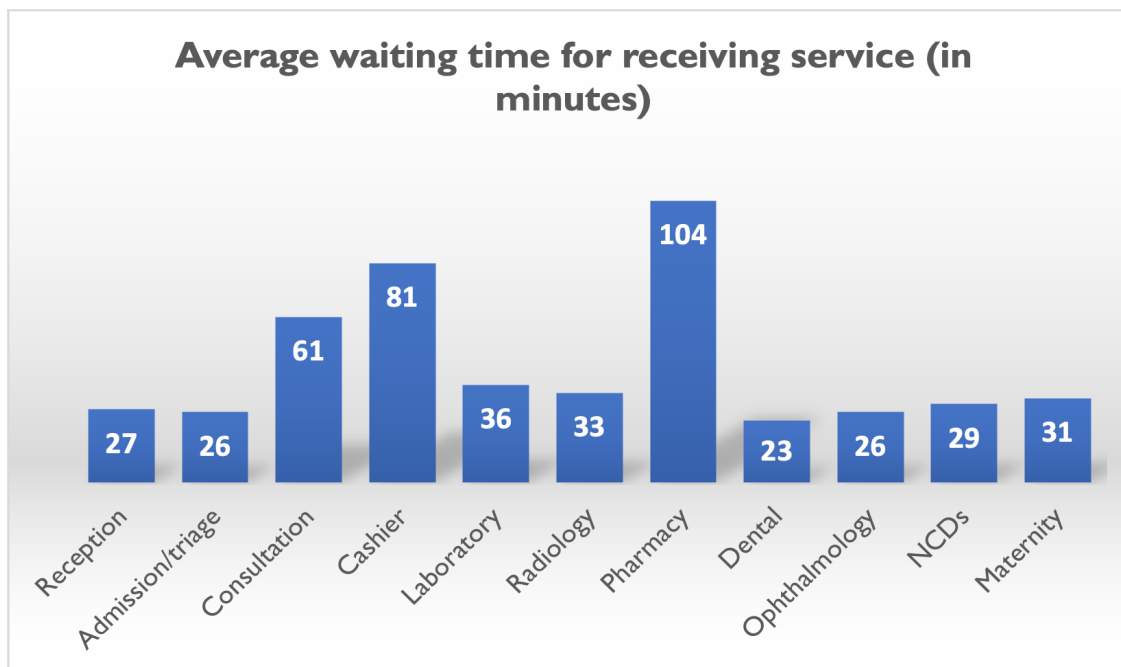


Figure 2: Outpatient waiting time at different services in Remera Rukoma Hospital

Table 2: Socio-demographic characteristics of the participants

Variables	Frequency (n)	Percent (%)	
Gender	male	55	45
	female	67	55
Referred	yes	22	18
	no	100	82
Visit type	First visit	89	72.7
	Follow-up visit	33	27.3
Occupation	student	9	6.7
	Full time	7	6
	Employed	22	18
Type of Insurance	Not Employed	84	69.3
	CBHI	78	64
	RAMA	14	11.7
	Others	4	2.7
Education status	Not insured	26	21.7
	Tertiary	34	28
	Secondary	20	16.3
Marital status	Primary	19	16
	No formal education	48	39.7
	Married	88	72
The primary reason for the visit	Single	13	10.7
	Divorced/separated	21	17.3
	OPD General	83	68.3
The primary reason for the visit	Obstetrics & Gynecology	18	14.3
	Surgery	8	6.7
	Others	13	10.7

CBHI: Community Based Health Insurance; RAMA: Rwanda Medical Insurance Scheme; OPD: Outpatient department

minutes). Reception wait time was 19 minutes.

DISCUSSION

Wait times for outpatients and the management thereof is a major challenge to providing outpatient services, especially in large centres and hospitals [8]. The provided data on average waiting times per service/department at Remera Rukoma Hospital reveals some interesting insights into patient flow efficiency. Overall, the average waiting times across most departments seem relatively long, exceeding 30 minutes in most cases. This consistent with the findings of a study which was conducted in the Kingdom of Saudi Arabia from Primary Health Centers, which founds that the

wait time to see the physician ranged between 21 and 30 minutes [12]. This could indicate potential bottlenecks or inefficiencies in service delivery, leading to patient dissatisfaction and impacting the overall healthcare experience [13].

The findings show that pharmacy with an average wait time of 104 minutes, the pharmacy stands out as a critical area needing urgent intervention. These findings are different to a study which was conducted in Medical City that is located in Riyadh, Saudi Arabia, waiting time to receive service at pharmacy was 120 minutes [14]. Such long wait times can be extremely frustrating for patients and negatively impact their perception of the hospital's efficiency. Moreover, it was found that the client spends 81 minutes at the cashiers

on average. This highlights that the cashier department requires significant improvement. Streamlining payment processes and potentially implementing alternative payment methods could significantly reduce wait times and improve patient convenience. Digitalization has been shown to enhance streamlined health processes, and integration of artificial intelligence (AI) can assist in claims processing, billing, and medical coding, further reducing the waiting time [15].

Furthermore, while consultation wait times (61 minutes) are longer than ideal, they fall within a more manageable range compared to pharmacy and cashier. The Institute of Medicine (now National Academy of Medicine) recommends that patients should be able to schedule an appointment within 2 weeks of their request and wait no more than 30 minutes past their scheduled appointment time [16]. The waiting time is consistent with a study which was conducted in primary health care clinic, in Gombak District, Malaysia with waiting time of 60 minutes for being consulted by doctor [17]. In contrast, other studies from Australia have shown that the average consultation time in a primary care setting ranges between 10 to 15 minutes [16], [17], indicating that patients spend 4 times more time at Remera Rukoma Hospital. Laboratory and Radiology waiting times were 36 and 33 minutes, respectively, which are relatively good, suggesting efficient processes in these places. The 36-minute laboratory waiting time at this facility can be considered relatively good when compared to some benchmarks, but there's room for improvement. According to a study by Goswami et al., the median laboratory turnaround time (TAT) for outpatient settings was 57 minutes, with a range of 29-80 minutes [20]. In this context, 36 minutes falls within the better-performing range. A 28-minute wait time for admission/triage is acceptable but could be further optimized for smoother patient onboarding. The Emergency Nurses Association (ENA) recommends that the triage process should be completed within 10 minutes of a patient's arrival [21].

In the current study, the use of PFA provided a good picture of the whole system. The study highlighted the importance of tailored interventions within the outpatient department, potentially focusing on accountability by reducing delays, among the staff and investigating the factors associated with this delay, especially at cashier and pharmacy.

The extended wait times in the pharmacy and cashier departments at Remera Rukoma Hospital

require immediate attention to improve patient experience and satisfaction. To address this issue, several interventions should be established. These include investigating the root causes of delays, such as staffing limitations, operational inefficiencies, or high patient volume, which have been shown to influence the waiting time [22], [23]. Implementing interventions like process improvement, staff training, or alternative payment methods, including digital processes, could significantly reduce wait times [23]. Additionally, regularly monitoring and analyzing patient flow data will help identify and address emerging issues proactively [24]. Overall, optimizing patient flow across all departments, particularly those with longer wait times, is essential for enhancing patient satisfaction and the overall quality of healthcare delivery at the hospital.

The study provided valuable insights that can inform measures for improving clinic efficiency, reducing wait times, and enhancing resource utilization. This study can serve as a model for other public hospitals, contributing to broader healthcare system advancements to enhance better patient experience and system efficiency expected to have positive impacts on the local healthcare landscape.

While this study provides valuable insights into current waiting times and potential areas for improvement, it has several limitations. Primarily, we did not assess the impact of implementing the suggested interventions on system performance. This lack of post-intervention data prevents us from drawing direct conclusions about the effectiveness of our proposed changes in improving patient flow and service quality. Furthermore, our assumptions about the potential benefits of improving patient flow are based on related studies rather than direct evidence from our specific healthcare setting. While these studies provide valuable context, they may not fully account for the unique characteristics of our facility. Future studies should address these limitations by implementing a pre-post intervention design, allowing for direct measurement of the impact of patient flow improvements on waiting times and patient satisfaction in our specific context.

CONCLUSION

The study on patient flow analysis at Remera Rukoma Hospital reveals critical inefficiencies

in the outpatient department, particularly in the pharmacy and cashier departments, where extended wait times significantly impact patient satisfaction and the quality of care. These findings underscore the need for targeted interventions to streamline operations, such as optimizing staffing, enhancing process efficiency, and introducing alternative payment methods. Additionally, consistent monitoring of patient flow metrics will be crucial in sustaining improvements. To ensure the delivery of timely and quality care, it is recommended that the hospital management prioritize these interventions and adopt a patient-centered approach to service delivery.

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