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Analyzing the effectiveness of waiting times at the pharmacy of the King Hamad University Hospital

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ABSTRACT

This study investigates the efficiency of waiting times at the pharmacy of King Hamad University Hospital, with a primary focus on optimizing patient experiences. Efficient pharmacy services are vital for ensuring the timely provision of medications to patients. Prolonged waiting times not only affect patient satisfaction but may also have implications for overall healthcare outcomes. To assess the effectiveness of waiting times, we conducted comprehensive analysis, including data collection, surveys, and observations. Our findings reveal valuable insights into the current state of pharmacy operations and the patient experience. We explore factors contributing to waiting times, such as prescription processing, queue management, and staff allocation. Through this analysis, we aim to provide actionable recommendations to enhance pharmacy efficiency, reduce waiting times, and improve patient satisfaction. Our study underscores the importance of optimizing pharmacy operations to ensure that patients receive timely and high-quality healthcare services. By addressing these issues, King Hamad University Hospital can not only enhance the overall patient experience but also contribute to better healthcare outcomes and increased operational efficiency. This research serves as a valuable resource for healthcare administrators, policymakers, and practitioners seeking to improve pharmacy services and patient satisfaction in hospital settings.

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1. INTRODUCTION

The King Hamad University Hospital under study is located in Busaiteen, Kingdom of Bahrain. and serves patients from all over Kingdom of Bahrain since it is one of the advanced centers in the Middle East. The research focuses on outpatient department (OPD) Pharmacy, Inpatient Pharmacy, Oncology pharmacy and Private Pharmacy, which aims to improve the quality of services provided to patients and enhance their experience. The pharmacy serves all outpatient clinics and the average waiting time for the patients is between 23.83 to 13.6 minutes. The size and layout of the pharmacy does not contribute to the number of prescriptions being prepared and the number of patients. Our goal is to decrease the waiting time, decrease the number of unclaimed prescriptions, and categorize the patients as following: long prescriptions patients, short prescriptions patients, special needs and low immunity patients and refill patients. In short, the paper aims to have more accuracy in prescriptions and communications between doctors and pharmacists, which will improve efficiency. The following are the pharmacy's main issues: Without a doctor's prescription, the medication might not be offered at the drugstore. No distinction between patient kinds is made; all patients

receive care from the same window. Various patient types require different amounts of the pharmacist's time. Patients with unique needs and poor immunity, for instance, need additional time since the pharmacist must properly explain the prescription. On the other hand, the patient service for refills needs to be quick and independent. Finally, the pharmacy treats all outpatients from all clinics, resulting in lengthy patient waiting times.

2. LITERATURE REVIEW

The literature reviews in this study aim to establish and examine the issues at hand. In 2018, a collaborative research effort by the World Health Organization (WHO) and the World Bank identified substandard health services as a significant barrier to improving health outcomes across nations, regardless of their income levels. WHO has defined healthcare quality as the degree to which healthcare services enhance desired health outcomes for individuals and patient populations, which necessitates safety, effectiveness, timeliness, and efficiency in healthcare delivery [1].

The definition of healthcare quality provided by WHO also emphasizes the importance of timeliness, which refers to reducing any unnecessary delays in both delivering and receiving healthcare, as elaborated in the study. In an effort to create a comprehensive definition of quality that meets the expectations of all health stakeholders [2]–[5]. Mosadeghrad [6] conducted a study that explored the perspectives of clients, professionals, managers, policymakers, and payers on service quality [7], [8]. Identifying the various attributes of quality can enable all stakeholders to establish and maintain continuous quality improvement programs [9], [10].

After conducting a thorough literature review, multiple definitions of healthcare quality were discovered, each pertaining to the different stakeholders involved. The study indicates that most of these definitions can be categorized into two groups. The first group refers to healthcare services that adhere to predetermined specifications and standards. In this case, quality is defined as "conformance to specified requirements or standards." The second group pertains to healthcare services that meet the expectations and needs of the customers. In this context, quality is defined as "meeting or exceeding customers' expectations and needs."

The first group of definitions primarily considers the perspective of the healthcare provider and internal factors, such as accuracy, reliability, and efficacy, to define and enhance quality. On the other hand, the second group focuses on the perspective of the customers and external factors, such as effectiveness, empathy, safety, and affordability, which are all regarded as significant quality factors. The author of the study employs pluralistic evaluation methods to incorporate the views of all stakeholders. The research concludes that healthcare quality has distinct meanings for each stakeholder group. Therefore, to evaluate and improve the quality of healthcare services to meet the needs and expectations of all stakeholders, managers, practitioners, and policymakers should consider the quality dimensions of both groups.

Abdelhadi and Shakoor [11] conducted a study in Abha City, located in southwest Saudi Arabia, to measure the service quality provided by public health hospitals, specifically in the inpatient and outpatient pharmacies of a large public regional hospital. To evaluate and enhance service quality and reduce waiting times in both pharmacies, the study implemented the Lean Manufacturing technique, which is also known as Toyota's Production System (TPS). This management philosophy, developed by Toyota Motors Corporation in Japan, emphasizes waste elimination, problem-solving, worker collaboration, and continuous process improvement. The TPS approach is commonly used in various industries, including healthcare, to enhance service quality and efficiency. The technique is based on principles that aim to identify non-value-added steps or waste in the system, eliminate them, and meet customers' needs to achieve perfection. The TPS methodology serves as an improvement tool that enhances the efficiency and quality of service by comparing the efficiency between the two pharmacies [12]–[18].

The researchers collected data by observing the workflow in the two pharmacies for a week. In their study, they utilized a metric tool in lean manufacturing called Takt time to measure the efficiency of both pharmacies. The results indicated that the inpatient pharmacy was more efficient than the outpatient pharmacy, as the time required to fill a prescription was close to the ideal situation. The study suggests that the adoption of lean manufacturing principles could serve as an effective efficiency measure for healthcare service quality by comparing the efficiency between two or more departments within the system. The paper's findings are particularly useful for pharmacy managers in identifying the causes of efficiency variations between departments and implementing corrective measures to address the problems [19], [20].

The literature reveals that various managerial tools and techniques have been used to improve healthcare services and address related problems. For example, one study implemented Six Sigma processes to reduce patients' waiting time in an outpatient pharmacy specialized in cancer treatment in Pakistan. Another study undertook a patient flow project to improve efficiency in pharmacy queues and provided a

framework to evaluate pharmacy performance. In a primary healthcare clinic, patient waiting time and doctor consultation time were studied, and strategies were formulated for improvement, such as increasing the number of staff at the registration counter, implementing staggered appointment systems, and improving the queuing system for walk-in patients [21]–[26].

3. METHODS

In this study, we will employ a mixed-method approach, combining quantitative data collection on waiting times, prescription processing, and queue lengths with qualitative data from patient surveys, staff interviews, and on-site observations to analyze and enhance the effectiveness of waiting times at the pharmacy of King Hamad University Hospital, culminating in the development and implementation of recommendations and an action plan to improve pharmacy efficiency while maintaining ethical standards as shown in Figure 1.

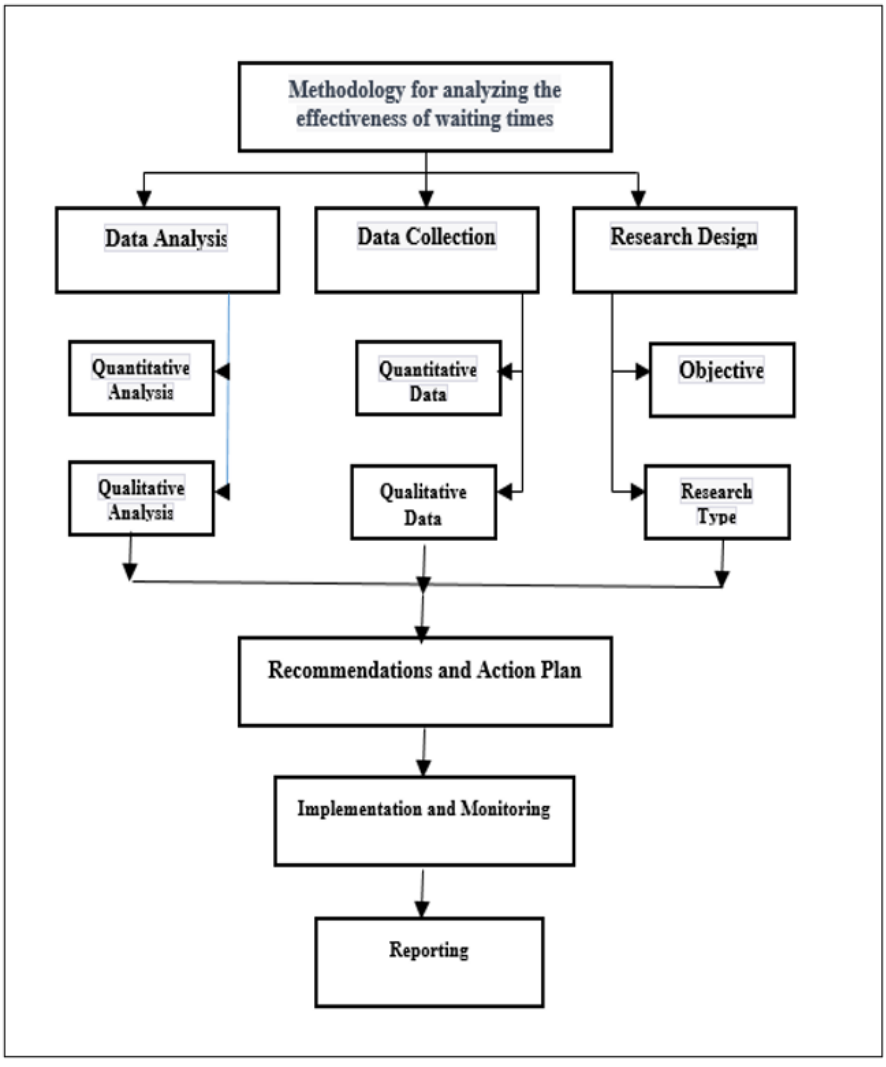

Figure 1. Methodology for analyzing pharmacy waiting times

4. DATA COLLECTION AND ANALYSIS

Tables 1 to 4 provide data on the number of patients who received medication from the OPD Pharmacy, Inpatient Pharmacy, Oncology pharmacy and Private Pharmacy from 2019 to 2022. These tables can be used to see how the number of patients served by the pharmacy has changed over time, and to identify any trends or patterns in the data, the number of patients served increases during certain months of the year, or that the number of patients served has increased over the three-year period. This information can be useful

for the hospital and pharmacy to understand the demand for their services, and to make decisions about staffing, inventory, and other operational factors. Additionally, by tracking the number of patients served overtime, the hospital and pharmacy can monitor their performance and assess the effectiveness of any changes they have made to improve the efficiency of the pharmacy.

Table 1. Number of patients served OPD pharmacy

Months	2019	2020	2021	2022
January	20,007	14,807	16,405	17,629
February	18,968	13,610	14,822	16,962
March	21,157	14,784	18,706	20,793
April	20,960	14,470	15,844	16,895
May	18,954	10,729	15,132	18,200
June	17,143	13,891	16,552	19,980
July	16,939	14,206	15,262	16,304
August	13,183	12,029	17,224	18,918
September	13,612	15,102	18,640	19,707
October	16,048	15,123	17,653	20,144
November	13,547	16,735	19,323	20,022
December	14,687	16,857	18,558	18,020
	205,205	172,343	204,121	223,574

Table 2. Number of patients served inpatient pharmacy

Months	2019	2020	2021	2022
January	8,367	8,596	8,326	8,338
February	7,425	9,000	7,882	7,832
March	8,149	9,335	8,570	8,950
April	8,225	8,041	8,398	8,146
May	7,934	6,788	8,690	9,086
June	7,587	7,431	9,032	8,894
July	8,195	8,649	8,416	8,613
August	7,782	7,864	8,700	8,496
September	8,277	8,619	9,014	8,591
October	9,407	8,406	9,016	9,187
November	8,943	8,456	9,474	9,817
December	9,146	8,085	8,759	9,982
	99,437	99,270	104,277	105,932

Table 3. Number of patients served oncology pharmacy

Months	2019	2020	2021	2022
January	394	816	2,112	2,843
February	372	919	2,202	3,047
March	443	992	2,624	3,693
April	490	1,011	2,381	3,492
May	486	830	2,346	3,648
June	460	1,216	2,468	3,907
July	632	1,213	2,366	3,449
August	547	1,115	2,532	3,765
September	549	1,748	2,886	3,561
October	685	1,697	2,709	4,087
November	628	1,893	2,965	4,562
December	854	1,878	2,864	4,951
	6,540	15,328	30,455	45,005

Table 4. Number of patients served private pharmacy

Months	2019	2020	2021	2022
January	336	314	810	1,616
February	296	288	691	1,548
March	332	267	1,025	1,977
April	326	205	752	1,286
May	253	140	766	1,589
June	219	201	1,134	1,812
July	291	240	1,017	1,352
August	194	129	1,140	1,534
September	245	8	1,280	1,615
October	350	504	1,234	1,930
November	216	825	1,734	2,000
December	219	831	1,585	1,660
	3,277	3,952	13,168	19,919

Figure 2 illustrates the number of patients served at the outpatient department (OPD) pharmacy, inpatient pharmacy, oncology pharmacy and private pharmacy from 2019 to 2022. over a specified period, providing a visual representation of the pharmacy's workload and patient flow dynamics. These figures are crucial for monitoring and managing pharmacy operations, as they help healthcare administrators and staff:

a. Workload assessment: By examining the trends in patient visits over time, healthcare providers can assess the pharmacy's workload. Peaks in the graph may indicate high-demand periods, allowing the hospital to allocate resources and staff efficiently to minimize waiting times during these periods.
b. Resource allocation: It aids in resource allocation decisions, such as staffing levels and inventory management. When there is a significant increase in the number of patients served, the hospital can adjust staffing schedules and medication supply to meet the increased demand effectively.
c. Performance evaluation: Over time, Figure 2 can be used to evaluate the pharmacy's performance in terms of patient throughput. Improvements or declines in the number of patients served can indicate changes in pharmacy efficiency and effectiveness.
d. Optimization: The data can be used to identify potential bottlenecks or inefficiencies in the pharmacy workflow. If the number of patients served remains consistently high, it may prompt the hospital to explore process improvements or additional resources to reduce waiting times.
e. Planning for the future: By analyzing long-term trends, healthcare administrators can make informed decisions about future pharmacy expansion or renovation projects to accommodate the growing patient population.

In summary, Figure 2, depicting the number of patients served at the OPD Pharmacy, serves as a valuable tool for healthcare management, enabling them to assess, plan, and optimize pharmacy operations to provide efficient and timely services to patients.

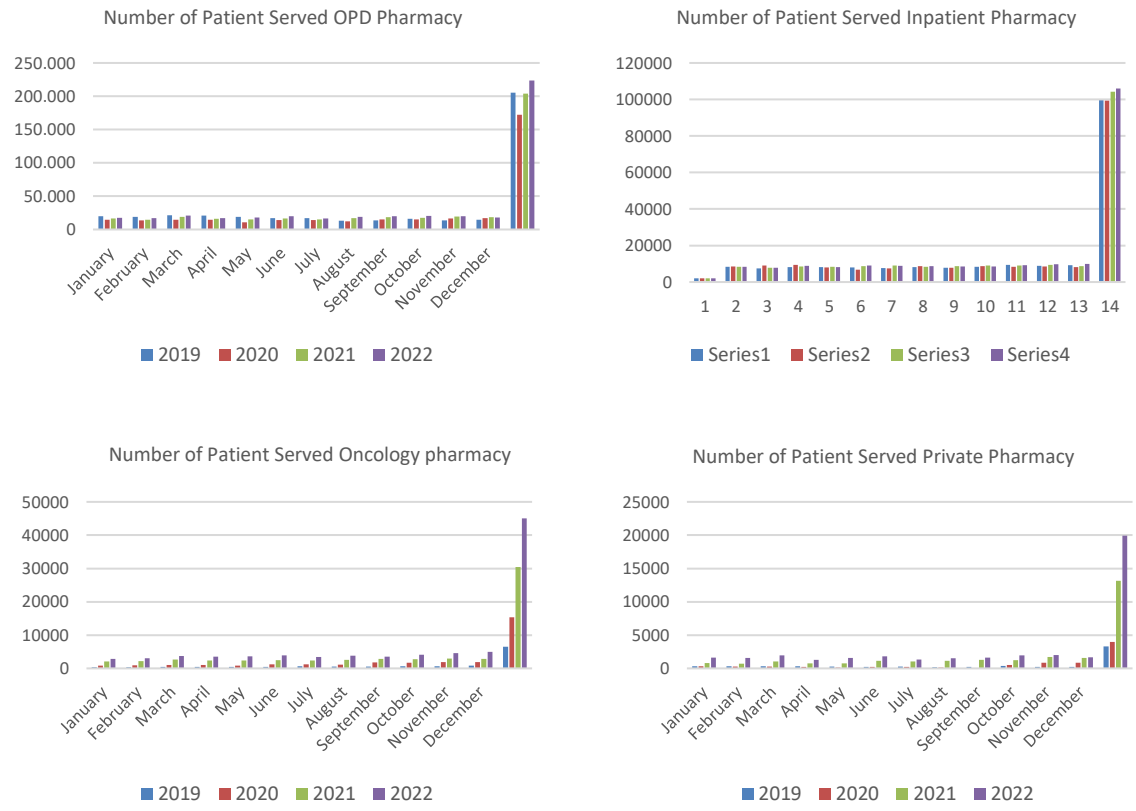

Figure 2. The number of patients served

Table 5 shows the average waiting time in King Hamad University Hospital, the average waiting time i.e. the turnaround time has slightly dropped from 23.83 min to 13.60 min as shown in figure 1. This information can be used to understand how long patients are waiting to receive their medication from the pharmacy, and to identify any trends or patterns in the waiting time data. For example, you may see that the average waiting time is higher during certain months of the year, or that the average waiting time has decreased over the four-year period. This information can be used by the hospital and pharmacy to identify areas for improvement in the efficiency of the pharmacy. For example, if the average waiting time is consistently high during certain months of the year, the hospital and pharmacy may need to consider ways to increase staffing levels or improve processes to reduce waiting times. By tracking the average waiting time over time, the hospital and pharmacy can monitor their performance and assess the effectiveness of any changes they have made to improve the efficiency of the pharmacy. This information can also be used to track patient satisfaction and ensure that patients are receiving the care they need in a timely manner.

Table 5. Average waiting time in minutes

Average waiting time before being called to the outpatient pharmacy dispensing counter (min)	2019	2020	2021	2022
January	38.14	8.07	2.12	1.19
February	23.41	3.17	.16	.35
March	25.04	3.03	.54	2.59
April	31.14	5.02	.17	.19
May	56.19	6.30	1.24	1.42
June	31.01	5.42	2.11	6.13
July	7.32	4.51	0.36	6.24
August	5.31	3.50	.17	0.07
September	9.34	4.03	0.32	6.23
October	3.89	4.04	3.55	
November	4.56	5.50	2.51	
December	7.23	7.58	3.42	

5. RESULTS AND DISCUSSION

The findings of this study highlight the potential advantages of integrating an automated waiting system and prescription management in the pharmacy at King Hamad University Hospital. The ability for doctors to send prescriptions electronically improves communication between healthcare providers and pharmacists, ultimately saving time and effort while enhancing service efficiency. This demonstrates how technological advancements can play a crucial role in optimizing patient care by streamlining processes within hospital settings.

A key benefit of this system is the reduction in waiting times, which allows patients to receive their medications more quickly and with greater accuracy. Improved coordination between doctors and pharmacists not only enhances workflow but also minimizes the risk of prescription errors, ensuring a safer and more reliable medication distribution process. By leveraging automation, hospitals can create a more effective and patient-centered pharmacy experience.

Additionally, categorizing patients based on their specific needs can further enhance efficiency. For instance, patients requiring extra time for detailed medication explanations, such as those with special needs or compromised immune systems , should have access to a private consultation window. Meanwhile, routine prescription refills, which require less time, should be processed separately and made available through phone or online requests. This structured approach helps address one of the main causes of unclaimed prescriptions (long wait times) by making the process quicker and more convenient for patients.

6. CONCLUSION

In conclusion, the study on the efficiency of waiting time in King Hamad University Hospital Pharmacy highlights the importance of effective communication and streamlined processes in providing efficient and effective patient care. The study's findings indicate that the implementation of an automated waiting system with automated prescriptions has the potential to enhance communication between doctors and pharmacists, save time and effort, and increase the overall efficiency of the service.

The results of the study provide valuable insights for healthcare providers and policymakers, highlighting the potential benefits of technology in improving the patient experience and providing more efficient care in hospital settings. The study's recommendations for the implementation of an automated waiting system with automated prescriptions also offer a practical and effective solution for reducing waiting times and minimizing the risk of medication errors.

Furthermore, this study underscores the importance of ongoing research and evaluation of hospital and pharmacy efficiency in order to continually improve patient care and outcomes. By building on the findings of this study, future research can help to identify further opportunities for improving efficiency and enhancing the patient experience in hospital and pharmacy settings.

In summary, the study's findings and recommendations have significant implications for the practice of healthcare in King Hamad University Hospital Pharmacy and provide a strong case for the implementation of an automated waiting system with automated prescriptions. The study also highlights the broader importance of improving communication and streamlining processes to enhance the efficiency and quality of care provided to patients.

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