

The Effect of Outpatient Service Digitalization on Patient Waiting Time Among Patients with Diabetes Mellitus at Royal Prima General Hospital Medan

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Abstract. *The development of information technology in the healthcare sector has driven the digital transformation of hospital services, including outpatient care. Service digitalization such as online registration, electronic queue systems, and electronic medical records is expected to improve service flow efficiency and reduce patient waiting time. This study aims to empirically analyze the effect of outpatient service digitalization on the waiting time of Diabetes Mellitus patients at Royal Prima General Hospital Medan. This study used a quantitative design with a cross-sectional approach. The study population consisted of 2,940 outpatient Diabetes Mellitus patients, with a sample of 352 respondents determined using the Slovin formula and simple consecutive sampling technique. Data were collected through questionnaires to measure the level of service digitalization and observation of patient waiting time. Data analysis was conducted using univariate and bivariate methods with the Chi-Square test at a 95% confidence level. The results showed that most outpatient service digitalization was categorized as good, and most patient waiting times were within the standard of ≤ 60 minutes. Bivariate analysis indicated a significant effect between outpatient service digitalization and waiting time of Diabetes Mellitus patients (p -value < 0.05). Outpatient service digitalization at Royal Prima General Hospital Medan has been generally well implemented and significantly influences the waiting time of Diabetes Mellitus patients. The better the implementation of digitalization, the shorter the waiting time experienced by patients. It is recommended to enhance system integration, strengthen human resource capacity, and optimize the use of digital technology to further reduce waiting time and improve service quality.*

Keywords: *Digitalization Service , Waiting Time , Diabetes Mellitus , Outpatient, Service Quality*

Received: April 12, 2026

Received in Revised: June 19,
2026

Accepted: June 1, 2026

INTRODUCTION

A hospital is a healthcare service organization that provides comprehensive medical services to individuals, including outpatient care, inpatient care, and emergency services (Latuconsina et al., 2023; Baker et al., 1994; Pedroto et al., 2013; Hansagi et al., 2001). Among these services, outpatient units are among the most frequently utilized due to their high patient visit intensity. Most patients use outpatient services for consultations, chronic disease management, follow-up examinations, and therapy monitoring without requiring hospitalization (Khera et al., 2020; Fromer, 2011; Sharma et al., 2010; Wolff et al., 2019; Buja et al., 2020).

The high volume of visits increases the complexity of the service process, as it involves multiple stages, including registration, administrative verification, medical examination, additional diagnostic tests when necessary, and pharmaceutical services. Inefficient management of this service flow may lead to patient congestion at certain service points (Risma & Mardahlia, 2023; Al Owad et al., 2022; Rahiminia et al., 2023; Bhattacharjee & Ray, 2014).

One of the most common consequences of this condition is an increase in patient waiting time (Moscelli et al., 2016; Reichert & Jacobs, 2018; Lewis et al., 2018). Prolonged waiting times not only cause discomfort but may also influence patients' perceptions of the quality of care received. In the context of quality management, waiting time is an important indicator as it reflects the effectiveness of resource allocation, inter-unit coordination, and the efficiency of administrative systems. The shorter and more controlled the waiting time, the higher the perceived efficiency and quality of hospital services. Therefore, controlling waiting time is an essential component in efforts to improve the quality of outpatient services (Naiker et al., 2018; Almomani & AlSarheed, 2016; Sun et al., 2017; Johannessen & Alexandersen, 2018; Michael et al., 2013).

Patient waiting time in outpatient services in Indonesia is regulated by the Regulation of the Minister of Health of the Republic of Indonesia Number 30 of 2022 concerning National Indicators of Healthcare Service Quality. The regulation stipulates that the standard outpatient waiting time, defined as the time from patient registration to examination by a specialist, is ≤ 60 minutes. This provision also refers to the Minimum Service Standards (SPM) as a benchmark of service quality that healthcare facilities must comply with.

The issue of waiting time becomes more significant when associated with chronic disease patients, particularly those with Diabetes Mellitus. Diabetes Mellitus is a metabolic disease that requires long-term monitoring, continuous therapy management, and regular evaluation of blood glucose levels and potential complications (Nadhiya et al., 2024; Lotfy et al., 2017; Alope et al., 2022). Patients with this condition generally have regular follow-up schedules, often on a monthly basis or more frequently depending on their clinical condition. The high frequency of visits makes this group consistent and recurring users of outpatient services (Wang et al., 2020; Moe et al., 2016; Acosta & Lima, 2015; Brennan et al., 2014).

Service digitalization includes the implementation of Hospital Management Information Systems (HMIS), online patient registration, electronic medical records, and technology-based queuing systems. The integration of these digital systems is designed to simplify administrative processes, accelerate access to patient data, and improve coordination among service units (Alshararl et al., 2025; Alshalawi et al., 2024; Chen et al., 2024; Gopal et al., 2019; Wang et al., 2021). With computerized and integrated systems, the potential for data duplication, administrative errors, and delays in information distribution can be minimized (Huabbangyang, et al., 2022).

Royal Prima General Hospital Medan, as one of the healthcare facilities in Medan City, has implemented digital systems in outpatient services as part of its strategy to improve service quality and efficiency. Based on historical data of Diabetes Mellitus patients at Royal Prima General Hospital Medan, there were 2,567 patients in 2022 and 2,637 patients in 2023. Compared to 2,453 patients in 2021, this shows a consistent increasing trend each year. The growth rate was 4.65% from 2021 to 2022 and 2.73% from 2022 to 2023, with an average annual growth of approximately 3.69%.

If this trend continues relatively steadily, the number of Diabetes Mellitus patients is projected to reach approximately 2,734 in 2024, increase to 2,835 in 2025, and reach around 2,940 in 2026. This increasing trend over the past five years indicates a growing burden of outpatient services for chronic disease cases, requiring a more efficient and well-organized service system, particularly in controlling patient waiting time as one of the key indicators of hospital service quality.

Based on a preliminary survey conducted among 10 Diabetes Mellitus patients in the outpatient unit, various perceptions regarding the implementation of service digitalization were obtained. Eight respondents (80%) stated that the online registration system facilitated access to outpatient services, while 2 respondents (20%) felt that the convenience was not yet fully optimal.

Regarding the electronic queuing system, 7 respondents (70%) reported that it helped speed up the service process at the polyclinic, while 3 respondents (30%) still experienced delays at certain stages. Six respondents (60%) stated that digitally available doctor schedules helped reduce waiting time, whereas 4 respondents (40%) felt the impact was not yet significant. In terms of medical examination, 7 respondents (70%) reported that electronic medical records accelerated the doctor's examination process. In addition, 8 respondents (80%) stated that digital notifications via SMS, WhatsApp, or applications helped them arrive on time, thereby reducing waiting time. For payment administration, 7 respondents (70%) reported that digital payment systems accelerated the service flow. Six respondents (60%) stated that since the implementation of digitalization, waiting times have become shorter than before.

From the human resource perspective, 8 respondents (80%) considered that hospital staff were able to operate the digital system effectively, resulting in more efficient services. Seven respondents (70%) also stated that the digital system was well integrated across service units. Overall, 8 respondents (80%) believed that outpatient service digitalization had a positive effect on reducing waiting time for Diabetes Mellitus patients. These preliminary findings indicate that although most patients perceive benefits from digitalization, variations in perceived effectiveness still exist across several service stages, highlighting the need for further research to objectively and quantitatively assess its impact.

Based on these considerations, this study is important to analyze the effect of outpatient service digitalization on the waiting time of Diabetes Mellitus patients at Royal Prima General Hospital Medan. The results are expected to provide empirical evidence as a basis for evaluating the existing system, as well as considerations for managerial decision-making to improve the efficiency and quality of hospital services in a sustainable manner.

METHODS

This study employed a quantitative analytic survey design with a cross sectional approach. This design was used to examine the relationship between outpatient service digitalization and the waiting time of Diabetes Mellitus patients at one point of data collection. The research was conducted at the Outpatient Installation of Royal Prima General Hospital Medan from February to June 2026.

The population of this study consisted of all Diabetes Mellitus patients who received outpatient services at Royal Prima General Hospital Medan during the study period, totaling 2,940 patients. The sample size was determined using the Slovin formula with a tolerable margin of error, resulting in 352 respondents. Respondents were selected using consecutive sampling, in which all patients who met the inclusion criteria were invited to participate until the required sample size was fulfilled. The inclusion criteria were patients diagnosed with Diabetes Mellitus, receiving outpatient care at Royal Prima General Hospital Medan, aged 18 years or older, able to read and write, and willing to participate by signing informed consent. Patients who were unable to complete the questionnaire or whose waiting time could not be fully observed were excluded from the study.

The independent variable in this study was outpatient service digitalization, while the dependent variable was patient waiting time. Outpatient service digitalization was measured using a structured questionnaire developed based on key components of digital outpatient services, including online registration, electronic queue systems, access to doctor schedules, electronic medical records, digital notification systems, digital payment administration, staff ability to operate the system, and integration of digital services across units. The responses were

scored and then categorized into good and poor digitalization based on the total score obtained by each respondent.

Patient waiting time was measured through direct observation of the outpatient service process. Waiting time was defined as the duration from patient registration until the patient was examined by a specialist. The observed waiting time was then categorized based on the national outpatient service quality standard, namely meeting the standard when the waiting time was ≤ 60 minutes and not meeting the standard when the waiting time was > 60 minutes.

Data collection was carried out using two techniques. First, questionnaires were distributed to respondents to obtain data on their perceptions of outpatient service digitalization and demographic characteristics, including age, gender, and education level. Second, observation sheets were used to record patient waiting time during the outpatient service process. Before data collection, respondents were informed about the purpose of the study, their voluntary participation, and the confidentiality of their responses.

The collected data were analyzed using SPSS software. Univariate analysis was conducted to describe respondent characteristics, the level of outpatient service digitalization, and patient waiting time. Bivariate analysis was conducted using the Chi Square test to determine the relationship between outpatient service digitalization and waiting time among Diabetes Mellitus patients. The level of statistical significance was set at 95 percent confidence level, with a p value of less than 0.05 considered statistically significant.

RESULT AND DISCUSSION

Table 1. Frequency Distribution of Respondent Characteristics at Royal Prima General Hospital Medan

Characteristics	Number (n)	Percentage (%)
Age		
< 36 years	23	6.5
36-45 years	149	14.9
> 45 years	180	51.2
Gender		
Male	169	40.0
Female	183	60.0
Education		
Junior High School	9	2.6
Senior High School	140	39.8
University	203	57.6
Total	352	100

Based on Table 1, the majority of respondents were aged > 45 years, totaling 180 respondents (51.2%). Most respondents were female, totaling 183 respondents (60.0%), and the majority had a university-level education, totaling 203 respondents (57.6%).

Table 2. Distribution of Outpatient Digitalization and Patient Waiting Time at Royal Prima General Hospital Medan

Variables	n	%
Outpatient Digitalization		
Poor	109	31.0
Good	243	69.0
Diabetes Mellitus Patient Waiting Time		
Not meeting standard (> 60 minutes)	125	35.5
Meeting standard (≤ 60 minutes)	227	64.5
Total	352	100

Based on Table 2, most respondents perceived outpatient service digitalization as good (69.0%), while 31.0% rated it as poor. Regarding patient waiting time, most respondents (64.5%) experienced waiting times that met the standard (≤ 60 minutes), while 35.5% experienced waiting times exceeding the standard (> 60 minutes).

Table 3. Cross-Tabulation of the Effect of Outpatient Digitalization on Waiting Time of Diabetes Mellitus Patients at Royal Prima General Hospital Medan

Waiting Time for Diabetes Mellitus Patients							
Outpatient digitalization	Waiting Time Not Meeting Standard		Waiting Time Meeting Standard		Total		p -value
	n	%	n	%	n	%	
Poor	101	28.7	8	2.3	109	31.0	0,000
Good	24	6.8	219	62.2	243	69.0	
Total	125	35.5	227	64.5	352	100	

Based on Table 3, among respondents who perceived outpatient digitalization as poor, most experienced waiting times that did not meet the standard (> 60 minutes), totaling 101 respondents (28.7%), while only 8 respondents (2.3%) experienced waiting times within the standard. Conversely, among respondents who perceived digitalization as good, most experienced waiting times that met the standard (≤ 60 minutes), totaling 219 respondents (62.2%), while 24 respondents (6.8%) experienced longer waiting times. This indicates a clear difference between the level of outpatient digitalization and patient waiting time. The statistical test results showed a p-value of 0.000 (< 0.05), indicating a statistically significant relationship between outpatient digitalization and waiting time among Diabetes Mellitus patients at Royal Prima General Hospital Medan.

Implementation Level of Outpatient Service Digitalization at Royal Prima General Hospital Medan

Based on Table 2 regarding the distribution of outpatient service digitalization at Royal Prima General Hospital Medan, most respondents rated the implementation as good (69.0%). Meanwhile, 31.0% of respondents considered it to be poor. These findings indicate that, in general, the implementation of outpatient service digitalization at Royal Prima General Hospital Medan has been running relatively well. Most patients reported benefits such as improved convenience in registration, easier access to information, and enhanced service efficiency (Bowden & Coiera, 2017; De et al., 2014; Abernethy et al., 2008; Miller et al., 2016; Berry et al., 2003). However, a proportion of respondents still perceived that the digitalization system has not been fully optimal, indicating that implementation has not been evenly distributed or that several operational constraints still exist, both from system and user perspectives.

This condition suggests that digital transformation at Royal Prima General Hospital Medan is still in a transition phase from conventional systems toward a more structured and integrated information-based service system. In this phase, digitalization success is not only determined by technology availability, but also by system integration, interoperability, consistency of use among healthcare workers, and human resource readiness. In outpatient services, digitalization particularly online registration and electronic queuing systems has positively improved patient flow. Patients no longer need to register manually before arriving at the hospital, which reduces congestion at registration counters and distributes patient arrivals more evenly throughout service hours. This contributes to a reduction in waiting time at the initial stage of service.

These findings are consistent with Pujiatmika et al., (2025), who reported that online registration improves outpatient service efficiency and reduces waiting time, thereby increasing patient satisfaction. Mustari (2026) also stated that integration of digital systems such as Mobile

JKN improves service efficiency by reducing reliance on manual administrative processes, which are often a major cause of delays. In terms of Electronic Medical Records (EMR), their implementation has significantly contributed to improving clinical service efficiency. Healthcare professionals can access patient medical histories more quickly, accurately, and systematically without needing to retrieve physical files. This accelerates clinical processes such as anamnesis, diagnostic examination, and therapeutic decision-making.

This is in line with Nashrulloh & Anggraini (2024), who found that EMR implementation improves service efficiency by enabling faster and more accessible patient data retrieval. Pratama (2026) also emphasized that cloud-based EMR systems enhance efficiency through real-time data access and inter-unit integration. However, the findings also show that digitalization at Royal Prima General Hospital Medan has not yet been fully optimized. Several barriers remain, particularly in inter-unit system integration, where some processes still require manual data entry. In addition, human resource readiness and varying levels of digital literacy among staff remain significant challenges.

This indicates that digital transformation requires not only technological infrastructure but also organizational and cultural change within healthcare institutions. Similar findings were reported by Fitriyah et al. (2022), who highlighted that the implementation of digital health systems still faces technical, regulatory, and competency-related barriers. Damayanti & Widiyoko (2024) further emphasized that organizational readiness and staff training are critical determinants of successful EMR implementation. From a broader perspective, outpatient service digitalization has improved not only efficiency but also service quality. More structured systems enhance transparency, accountability, and monitoring, which in turn increase patient trust and satisfaction. This is consistent with Findayani who reported that digital transformation improves service responsiveness, accuracy, and patient satisfaction.

Sikki et al. (2026) also noted that digitalization through e-business approaches strengthens healthcare service management by improving data handling, accelerating decision-making, and enhancing inter-unit coordination. Thus, digitalization should be understood not merely as an administrative tool, but as an integral part of modern healthcare system transformation. Overall, outpatient digitalization at Royal Prima General Hospital Medan is considered to be in a good stage of implementation, particularly in online registration, electronic queuing, and EMR systems. However, further improvement is still required to achieve full system integration. Strengthening information system infrastructure, improving human resource capacity, and enhancing digital readiness are key factors to optimize its impact on reducing patient waiting time and improving service quality sustainably.

Waiting Time of Diabetes Mellitus Patients at Outpatient Services

Based on Table 2, most respondents (64.5%) experienced waiting times within the standard limit of ≤ 60 minutes, while 35.5% experienced waiting times exceeding the standard. Overall, outpatient waiting time for Diabetes Mellitus patients at Royal Prima General Hospital Medan is considered relatively good and generally meets the established standard. However, a proportion of patients still experience longer waiting times, indicating that service delays or patient congestion still occur at certain service stages. In general, some service stages have met the standard, while others still experience delays, leading to inconsistency in waiting time performance across service points. This indicates that outpatient service flow has not yet been fully synchronized. Some units experience patient accumulation, while others operate more efficiently. This reflects uneven workload distribution and suboptimal patient flow management.

Waiting time is a direct reflection of hospital operational efficiency. Inefficient service flow results in patient accumulation at specific points, which ultimately increases total waiting time. Conversely, well-organized systems with clear task distribution and integrated information systems can distribute service time more evenly across all stages. At the registration stage, waiting time is influenced by patient volume, arrival patterns, and system efficiency. Although online registration is available, some patients still register directly on-site, particularly those less

familiar with digital systems, leading to congestion during peak hours. At the pharmacy stage, waiting time is also a critical component of total outpatient service time. The process from prescription reception to verification, compounding, and drug dispensing is highly vulnerable to delays, especially during peak prescription loads or limited pharmacy staffing. Overall, the study shows that Diabetes Mellitus patients' waiting time at Royal Prima General Hospital Medan still varies across service stages and has not consistently met the ≤ 60 minutes standard. This reflects the need for further optimization in service flow integration, human resource management, and health information system utilization.

Effect of Digitalization Level on Waiting Time of Diabetes Mellitus Patients

Based on Table 3, patients who perceived outpatient digitalization as poor mostly experienced waiting times exceeding the standard (> 60 minutes), while those who perceived it as good mostly experienced waiting times within the standard (≤ 60 minutes). The statistical test showed a p-value of 0.000 (< 0.05), indicating a significant relationship between outpatient service digitalization and patient waiting time. In general, higher levels of digitalization are associated with shorter waiting times across service stages, from registration to pharmacy services. Conversely, partially manual systems tend to result in patient accumulation and longer waiting times.

For Diabetes Mellitus patients, digitalization is particularly beneficial because they require routine follow-up visits. With an integrated system, they do not need to wait excessively during each visit. However, waiting time is also influenced by other factors such as patient volume, healthcare workforce availability, and service flow organization. Despite the presence of digital systems, challenges remain, including incomplete system integration, limited user adaptation, and varying levels of digital literacy among staff and patients. Therefore, digital transformation is still in a developing stage and has not yet reached full optimization. Outpatient digitalization includes SIMRS, online registration, EMR integration, electronic queuing systems, and pharmacy information systems. At Royal Prima General Hospital Medan, these systems have been partially implemented but are not yet fully integrated across all units.

In theoretical terms, digitalization improves service efficiency and reduces administrative barriers. It enhances structured workflows, minimizes data duplication, and accelerates information verification. This is consistent with Alfiannor et al. (2024), who found that digitalization significantly affects patient satisfaction through faster service delivery. Overall, the study found a negative relationship between digitalization level and waiting time, meaning that improved digitalization leads to reduced waiting time and better service efficiency. The researcher concludes that full integration of digital systems across all service units, combined with improved human resource readiness and training, is essential to optimize waiting time reduction and improve outpatient service quality.

CONCLUSION

The majority of respondents in this study were aged over 45 years, female, and had a university-level education. The level of outpatient service digitalization at Royal Prima General Hospital Medan was mostly in the good category, although some aspects were still not optimal. The waiting time for Diabetes Mellitus patients in outpatient services was mostly within the standard of ≤ 60 minutes; however, some patients still experienced waiting times exceeding the standard. There was a significant effect between outpatient service digitalization and the waiting time of Diabetes Mellitus patients (p-value = 0.000 < 0.05), indicating that the better the level of digitalization, the shorter the patient waiting time. Hospital management is expected to use these findings as a basis for evaluating and strengthening digital service policies. Efforts that can be made include improving the integration of digital systems across all service units, optimizing the use of electronic medical records, and strengthening online registration and queuing systems. With a more integrated system, it is expected that service efficiency will increase and patient waiting times can be significantly reduced.

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