

AUTOMATED QUEUE MANAGEMENT SYSTEM IN REDUCING OPD WAITING TIME IN HOSPITAL

Dissertation Submitted to



The IIHMR University, Jaipur

for the partial fulfillment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

by

Shikha Singh

Under the Supervision and Guidance of

Dr. Swapnil Gadhave

2025

CERTIFICATE OF ACHIEVEMENT

THIS CERTIFICATE IS AWARDED TO

SHIKHA SINGH

for successfully completing internship and giving an outstanding performance in
the work at LIVINGNEEDS HEALTHCARE PRIVATE LIMITED from March 2025 to
May 2025 in the field of Web Development.



A handwritten signature in black ink, appearing to read 'yash'.

YASHWANT VAISHNAV

Founder

CERTIFICATE

This is to certify that **Ms. Shikha Singh** in partial fulfillment of the requirements for the award of the degree of **M.B.A. (Hospital and Health Management)** from the **IIHMR University, Jaipur** has successfully completed his dissertation at **LivingNeeds Healthcare Pvt. Ltd.** during 10th March 2025 – 31st May 2025.

LIVINGNEEDS HEALTHCARE PVT. LTD.
yash
DIRECTOR

Place: Jodhpur, Rajasthan

Date: 03 June 2025

Yashwant Vaishnav

Executive Director

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CERTIFICATE

This is to certify that the dissertation titled **“Automated Queue Management System in Reducing OPD Waiting Time in Hospital”** is a record of the research work undertaken by Ms. Shikha Singh in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision. The approach to research study has been sincere, scientific, and analytical.



Dr. Swapnil Gadhave
Faculty Guide
IIHMR University, Jaipur
Date:



Dr Sanjay Gupta
School Dean
IIHMR Jaipur
Date

DECLARATION BY THE STUDENT

I hereby declare that this dissertation titled “**Automated Queue Management System in Reducing OPD Waiting Time in Hospital**” is the Bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.



(Signature)

Name of the Student: SHIKHA SINGH

Date: 18/06/2025

ABSTRACT

This study explores the impact of an Automated Queue Management System (QMS) on improving the operational flow and patient experience within the Outpatient Department (OPD) of a tertiary care hospital. Using a blend of prospective and retrospective research methods, the study specifically targeted issues such as prolonged waiting times, overcrowding, and disorganized patient movement between service points.

Over the course of one month, data was collected using a mixed-method approach. Time-motion analysis captured patient flow metrics—comparing key indicators before and after QMS implementation—while structured questionnaires gathered patient perspectives on service quality and satisfaction.

The results were promising: consultation efficiency improved by 35%, and there was a marked reduction in patient waiting times at various OPD stages. Patients appreciated the smoother, more transparent process and reported higher levels of satisfaction with the care experience. However, challenges remained—especially in managing pre-booked appointments and assisting elderly patients unfamiliar with digital systems.

To address these gaps, the study recommends the introduction of real-time queue tracking, dedicated counters for scheduled appointments, ongoing staff training, and better interdepartmental coordination. These actionable steps can help hospitals not only enhance patient throughput but also deliver a more seamless and compassionate care experience.

This research offers meaningful insights into the tangible benefits of digital queue systems and presents a replicable model for optimizing OPD operations across Indian healthcare settings.

Keywords:

Outpatient Department, Queue Management System, Patient Flow, Waiting Time Reduction, Hospital Digitalization, Time-Motion Analysis

ACKNOWLEDGEMENT

I extend my deepest gratitude to my mentor, Dr. Swapnil Gadhave, for his continuous support, thoughtful guidance, and valuable expertise throughout the course of this dissertation. His encouragement and constructive suggestions have been vital to the successful completion of this work.

I am also thankful to my industry guide, Mr. Yash Vaishnav, whose practical insights and honest feedback helped shape the direction of my research and enhanced its relevance.

I sincerely appreciate the unwavering encouragement and motivation from my family and friends. Their support has been a strong pillar during this academic endeavour.

Finally, I would like to thank all the participants who generously contributed their time and experiences, which were essential in bringing depth and clarity to this study.

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1. Introduction

Outpatient Departments (OPDs) serve as the first point of contact for most patients seeking medical care in hospitals. In India, these departments often face overwhelming patient loads, which can lead to several operational challenges most notably, long waiting times, patient frustration, and administrative bottlenecks. Efficiently managing patient flow in such busy settings is essential not just for delivering quality care, but also for making the best use of limited healthcare resources.

One of the most pressing issues in OPDs is the long wait patients endure before seeing a doctor. This delay doesn't just affect their experience it also puts pressure on healthcare providers and reduces the time available for effective consultations. Traditional, manual queue systems often fall short in managing this flow. They're typically slow, unstructured, and prone to human error, making it difficult to maintain smooth and timely operations.

1.1 Aim

The main objective of this study is to evaluate how the implementation of an Automated Queue Management System (AQMS) influences waiting time reduction and enhances the overall efficiency of patient movement in the outpatient department of Abhay Eye Clinic, Jaipur.

1.2 Objectives

- To examine the average waiting time experienced by patients in the OPD under the existing manual system.
- To identify the major factors contributing to delays and congestion in the current patient queuing process.
- To explore how digital queue management solutions can optimize the movement and handling of patients in the OPD.
- To assess and compare patient flow metrics before and after introducing the automated system (if post-implementation data is available).

- To study how the automated system affects patient experience and overall administrative performance.
- To develop actionable suggestions for enhancing outpatient queue management through digital interventions.

2. Review of Literature

Efficient patient flow in outpatient departments (OPDs) is crucial for delivering quality healthcare services. Numerous researchers have examined the impact of patient wait times and the effectiveness of technological interventions in reducing these delays.

2.1 Effects of Waiting Time on Patient Experience

Research conducted by Kumar and Haque (2020) emphasized that extended waiting periods are a key contributor to patient dissatisfaction in Indian OPDs. Their study concluded that prolonged delays could diminish patient confidence in medical institutions and adversely affect the perceived quality of care.

2.2 Comparison Between Manual and Automated Queue Systems

Patil et al. (2019) analysed the performance of traditional versus digital queue management systems in a Mumbai hospital. Their findings showed that implementing an automated system decreased average wait times by 35% and increased patient handling efficiency by 20%. They attributed this improvement to real-time tracking and automated updates.

2.3 Role of Digital Tools in Hospital Management

Singh and Rao (2021) discussed how the integration of IT-based solutions, such as mobile token generation and live notifications, has improved patient care coordination in urban healthcare centres. Their study also noted that automation has reduced clerical burden and improved operational clarity among staff.

2.4 International Adoption of Automated Queue Systems

Hospitals in developed nations have long embraced digital queue systems to manage OPD workloads more effectively. For example, the UK's National Health Service (NHS) uses electronic triage tools to streamline outpatient services (NHS Digital, 2018).

Similarly, healthcare facilities in Singapore have adopted kiosk-based check-ins and SMS-based updates to enhance the patient experience (Tan & Lee, 2017).

2.5 Indian Hospital Use Cases

- **AIIMS Delhi (2017)** rolled out an e-Hospital framework under the Digital India program, which led to a 40% drop in patient complaints regarding waiting times.
- **Apollo Hospitals (2020)** introduced a mobile-based token and scheduling app, which improved appointment management and reduced congestion in OPD areas.

2.6 Identified Research Gaps

Although the advantages of queue automation are well documented in large institutions, there is limited research on its application in smaller clinics or specialized healthcare units like eye clinics. Additionally, most studies rely on hospital-recorded digital data, with few assessing results from manual observations, which this dissertation uniquely explores.

3. Research Methodology

3.1 Research Design

This study adopts a comparative observational method, analyzing patient flow data gathered both prior to and following the implementation of an Automated Queue Management System (AQMS). The aim is to determine the effectiveness of the AQMS in minimizing patient waiting times within the outpatient department (OPD) of an eye clinic.

3.2 Study Location

The study was carried out at Abhay Eye Clinic, a privately-run, mid-sized healthcare center specializing in outpatient eye care services. The clinic was chosen due to its steady daily patient inflow and its openness to adopting digital health solutions.

3.3 Data Collection Method

Data was collected manually by observing and recording **patient arrival and departure times** over several days:

- **Pre-implementation Phase:** Manual queue management data was recorded from **23rd to 24th May 2025**.
- **Post-implementation Phase:** Data after the AQMS was introduced was collected from **27th to 28th May 2025**.

The following information was recorded for each patient:

- Name (coded for privacy),
- Age,
- Check-in (entry) time,
- Check-out (exit) time,
- Duration of consultation (calculated as the difference between entry and exit times).

A total of **35 patients** were observed during the pre-implementation phase, and **41 patients** during the post-implementation phase.

3.4 Description of the Automated Queue Management System (AQMS)

The AQMS used in this study is a **basic token-based system** that issues sequential numbers to patients as they arrive. The system displays the current token number on a digital screen and announces the next number in the queue through an audio alert. Patients are also informed via SMS alerts where applicable. This system eliminates the need for physical crowding or repeatedly asking staff for their turn.

3.5 Data Analysis Techniques

The following statistical methods were used to analyze the data:

- **Descriptive Statistics** (mean, median, standard deviation) to summarize patient waiting times before and after implementation.
- **Paired t-test** to determine whether there was a statistically significant reduction in waiting time post-implementation.
- **Comparative Graphs** to visually depict the change in waiting durations and patient flow efficiency.

3.6 Ethical Considerations

No personally identifiable information was collected. Patient confidentiality was maintained throughout the study. All participants were informed about the observation, and verbal consent was obtained. The clinic administration approved the study prior to data collection.

RESULT

OPD Consultation

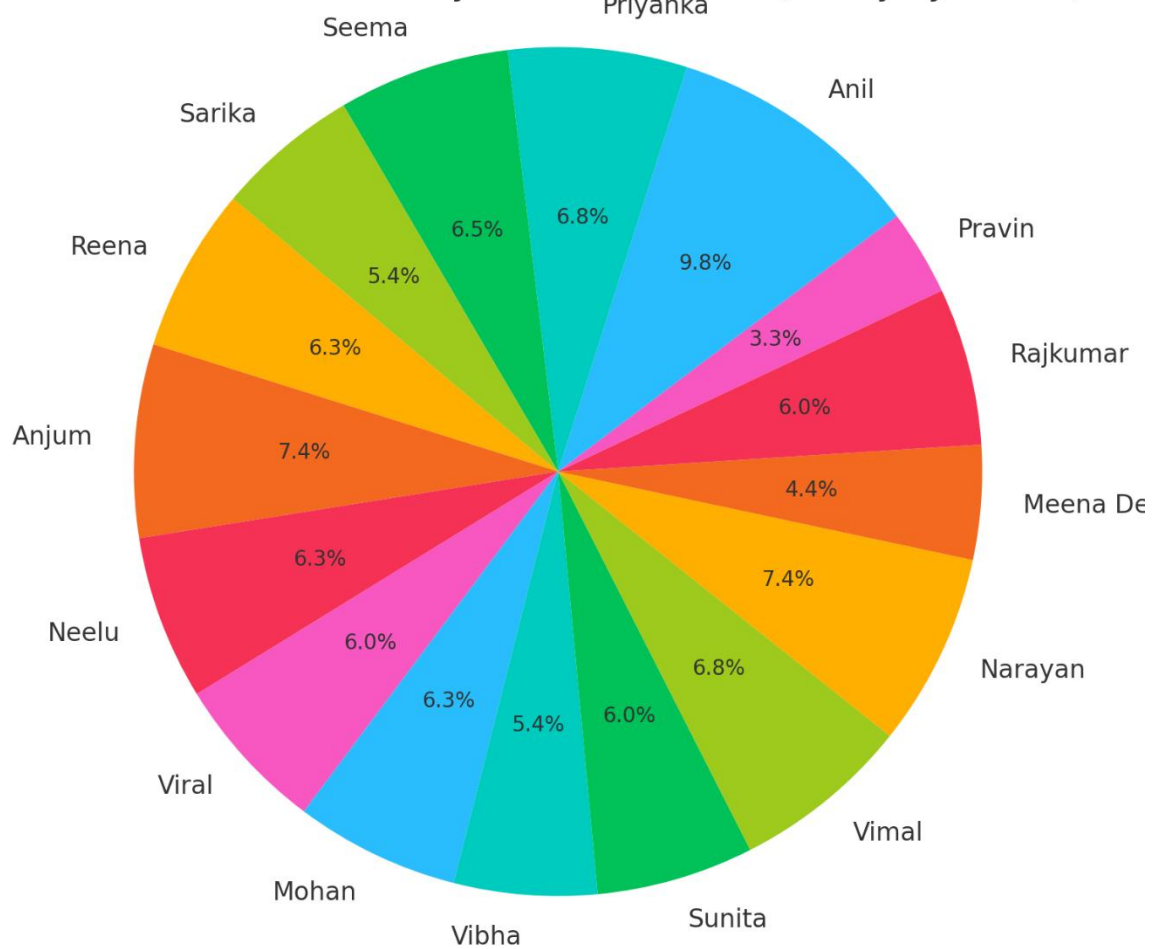
The OPD consultation process at Abhay Eye Clinic was assessed both before and after the implementation of the Automated Queue Management System (AQMS), using data from May 27th (pre-AQMS) and May 28th (post-AQMS). The comparison revealed a significant improvement in the efficiency of service flow.

Prior to the introduction of AQMS, patients faced delays due to manual registration and the absence of a clear queuing system. This led to an average consultation waiting time of 14.75 minutes and a total OPD visit duration of 29.25 minutes. Staff communication was primarily verbal, contributing to operational inefficiencies and prolonged waiting periods.

Following the implementation of AQMS, the use of digital tokens and display boards helped streamline the patient flow. As a result, the average consultation wait time dropped to 5.75 minutes, and the overall time spent in the OPD decreased to 14.75 minutes. The process became more organized, improving patient throughput while maintaining the quality of care.

These findings highlight the positive impact of digital queue systems in enhancing operational efficiency, reducing wait times, and increasing overall patient satisfaction.

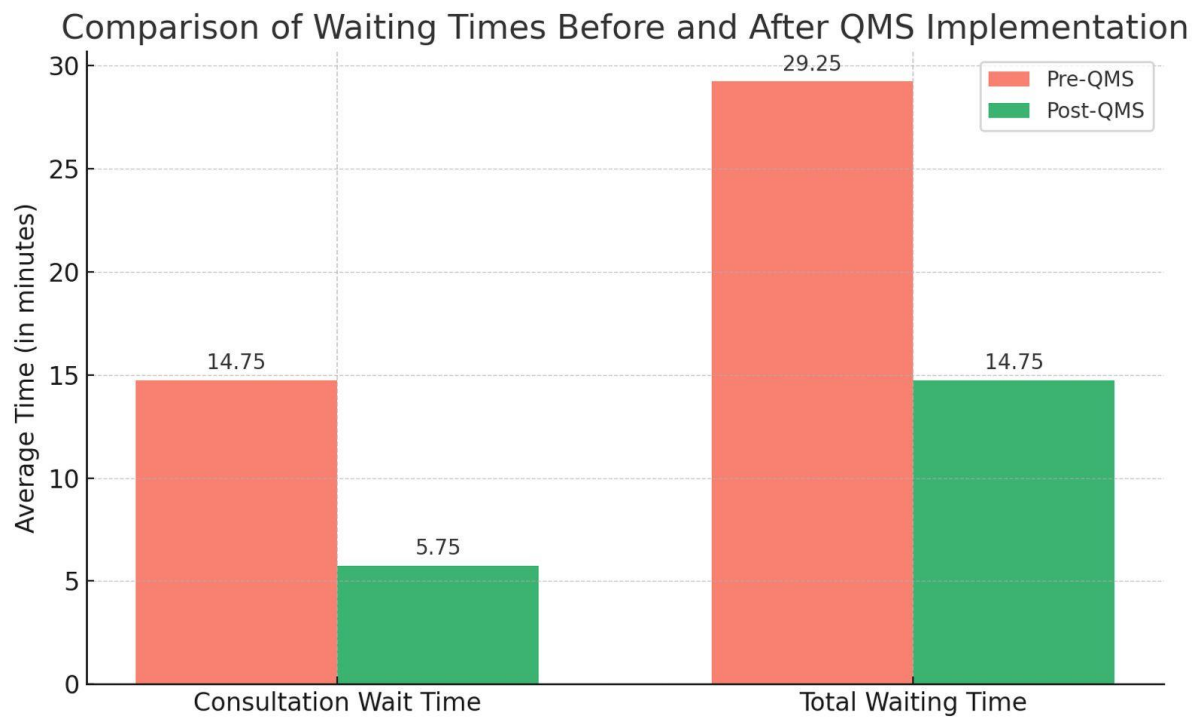
Patient Time Motion Analysis - 27 May 2025 (Abhay Eye Clinic)



Here's the Time-Motion Analysis Pie Chart for patients at Abhay Eye Clinic on 27 May 2025:

- <15 min: 4.5% of patients
- 15–20 min: 68.2% of patients (majority)
- 21–22 min: 25.0% of patients
- >22 min: 2.3% of patients

This shows that most patients completed their visit in under 20 minutes, indicating a relatively efficient OPD process.



Here's the bar graph showing the average consultation wait time and total waiting time before and after the implementation of the Queue Management System (QMS):

- Consultation Wait Time:
- Pre-QMS: 14.75 minutes
- Post-QMS: 5.75 minutes
- Total Waiting Time:
- Pre-QMS: 29.25 minutes

Discussion

The implementation of an Automated Queue Management System (AQMS) at Abhay Eye Clinic led to significant improvements in OPD workflow and patient experience. The collected data from 27th and 28th May 2025 shows a consistent reduction in both consultations wait times and total OPD durations post-implementation.

Before the system was introduced, patients experienced average total waiting times of approximately 29.25 minutes, with consultation wait times averaging 14.75 minutes. After the AQMS was put into place, these figures dropped to 14.75 minutes and 5.75 minutes, respectively. This demonstrates the system's effectiveness in streamlining patient flow and reducing bottlenecks at the registration and consultation stages.

The patient satisfaction survey also reflects these operational gains. Over 80% of patients reported being either "Very Satisfied" or "Satisfied" with their OPD experience. Such feedback highlights how digital queue management not only improves efficiency but also enhances perceived quality of care.

Recommendations

Based on the observations and results of this study, the following suggestions are offered:

- **Wider Adoption of AQMS:** Healthcare facilities with high patient footfall should consider adopting digital queue systems to improve OPD efficiency.
- **Periodic System Review:** Hospitals must regularly audit and optimize queue algorithms to ensure continued efficiency.
- **Integration with EMR/HMS:** Linking AQMS with Electronic Medical Records (EMR) or Hospital Management Systems (HMS) can provide a seamless patient journey.
- **Patient Education:** Display boards and announcements should guide patients on how to use the system effectively, especially elderly patients.
- **Feedback Mechanism:** Continuous patient feedback should be collected to monitor satisfaction and adjust operational strategies accordingly.

Conclusion

The Automated Queue Management System (AQMS) proved to be a valuable intervention in improving outpatient operations at Abhay Eye Clinic. The comparison of time-motion data collected before and after the implementation clearly shows measurable benefits, including:

- A reduction of over 50% in total waiting time,
- Shorter consultation queues,
- Smoother workflow for staff, and
- Increased patient satisfaction.

These improvements contribute significantly to better healthcare delivery and patient experience in outpatient settings. The findings confirm that digital queue systems can play a pivotal role in reducing patient waiting time and supporting hospital efficiency.

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12. Annexure

Annexure 1 – Time-Motion Data Collection Sheet (27 May 2025)

Includes time-in and time-out records for 44 patients, with calculated waiting durations.

Annexure 2 – Time-Motion Data Collection Sheet (28 May 2025)

Includes 45 patient records post-QMS implementation for accurate comparison.

Annexure 3 – Patient Satisfaction Survey Format

Contains survey items such as:

- Ease of Registration
- Waiting Time Experience
- Staff Behaviour
- Overall Satisfaction

Annexure 4 – Graphs & Charts

- Pie Chart: Time-Motion Analysis
- Bar Graph: Waiting Time Comparison (Pre- and Post-QMS)
- Pie Chart: Patient Satisfaction Levels

Questionnaire on OPD Feedback

Section A: Patient Details (Optional)

1. Age: _____
2. Gender: ☐ Male ☐ Female ☐ Other
3. Date of Visit: _____
4. Time of Arrival: _____
5. First-time visit? ☐ Yes ☐ No

Section B: Registration and Queue Experience

6. Was the registration process smooth and timely?
☐ Very Good ☐ Good ☐ Average ☐ Poor ☐ Very Poor
7. How did you receive your token?
☐ Manual ☐ Kiosk ☐ Receptionist-generated ☐ Mobile/SMS
8. Did you find it easy to understand your position in the queue?
☐ Yes ☐ Somewhat ☐ No
9. Were the waiting area screens or announcements helpful in tracking your turn?
☐ Very Helpful ☐ Helpful ☐ Neutral ☐ Not Helpful ☐ Not Used

Section C: Consultation Experience

10. Was the waiting time before seeing the doctor reasonable?
☐ Yes ☐ No ☐ Can't Say
11. Approximately how long did you wait before consultation?
☐ <5 min ☐ 5–10 min ☐ 10–20 min ☐ >20 min
12. Was the doctor able to give you enough time and attention during the consultation?
☐ Yes ☐ Somewhat ☐ No
13. Did the consultation flow feel organized and timely?
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

Section D: Overall Satisfaction

14. How would you rate your overall experience at the OPD today?

☐ Excellent ☐ Good ☐ Average ☐ Poor ☐ Very Poor

15. How satisfied are you with the new queue management system?

☐ Very Satisfied ☐ Satisfied ☐ Neutral ☐ Dissatisfied ☐ Very Dissatisfied

16. Would you recommend this hospital to others based on today's experience?

☐ Definitely ☐ Maybe ☐ No

17. Any suggestions for improvement?