NoQ – Real Time Queue Management Software

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Abstract—**This paper talks about a Hospital Queue Management Software that helps hospitals work better and faster. The main aim is to reduce the time patients have to wait and make their visit more comfortable. This software allows patients to book appointments, see their position in the queue, and get their ticket using a website or mobile app. It also helps hospital staff manage doctor schedules and gives emergency cases higher priority. Patients can register by themselves, and the system keeps updating the queue in real-time. The software also checks when the hospital is busiest and helps use staff and resources better. In the end, it helps avoid crowding, saves time, and improves hospital services for everyone.**

Index Terms—**Hospital Queue Management, Patient Flow, Healthcare Software, Real-Time Queue, Self-Registration, Online Ticketing, Less Waiting Time, Better Resource Use, Emergency Priority**

I. INTRODUCTION

In today's fast-moving healthcare world, smooth and efficient hospital operations are more important than ever. One of the biggest problems hospitals face is poorly managed patient queues. This often leads to long waiting times, frustrated patients, stressed-out staff, and overcrowded waiting areas. Traditional methods—like standing in long lines, writing appointments by hand, or using simple token systems—just don't work well anymore, especially in hospitals with a high number of patients and multiple departments.

To solve these problems, Hospital Queue Management Software has been developed. It's a smart and modern solution that digitizes and automates the entire queuing process. With this software, hospitals can manage patient flow in a more organized, real-time, and clear way. Right from the moment a patient enters the hospital, the system guides them step-by-step through registration, triage (if needed), appointment booking, and finally to the consultation, all through a centralized digital dashboard. The software uses intelligent algorithms to focus on saving time and improving the patient's overall experience.

Here are some of the main features of the system:
- Self-Registration via QR: Patients can easily register themselves by scanning a QR code using the app or website. This reduces pressure on the reception staff and also avoids mistakes in registration.
- Digital Ticketing and Live Queue Updates: Patients receive digital tokens and can see real-time updates of their queue status on display screens or through mobile alerts. This removes the usual stress and confusion of not knowing when it's your turn.
- Doctor Scheduling Integration: The system works with the hospital's appointment system to automatically check doctor availability and assign patients to the right doctor, making scheduling seamless.
- Priority-Based Queuing: Emergency or critical patients can be flagged and moved ahead in the queue using triage data or set rules, ensuring urgent cases get treated quickly.
- Analytics and Reporting: Hospital managers can access detailed reports and dashboards showing things like patient flow patterns, waiting times, peak hours, and staff performance. These insights help them plan better and solve any issues that may slow down hospital services.

By using this system, hospitals can significantly reduce patient waiting times, make better use of doctors and nurses, and create a more peaceful and organized environment for everyone. The software is also flexible, it can be customized for small clinics or

large multi-specialty hospitals, depending on their needs.

The move towards digital queue management is a key part of the larger digital transformation in healthcare. It not only improves patient experiences but also helps hospitals deliver better care and run more efficiently. This paper takes a closer look at how the software is designed, how it works, the challenges faced during its implementation, and the positive impact it can have on the way hospitals serve their patients.

II. OVERVIEW

The Real-Time Queue Management Software is an all-in-one digital system created to improve how patients move through a hospital and to make hospital operations more efficient. Instead of using old-fashioned systems like physical queues, handwritten lists, or basic token machines, this software brings in a smarter, automated way to handle everything—from patient registration to appointment booking and queue tracking.

Patients can register themselves using kiosks at the hospital or through a mobile app, get digital tokens, and easily track their position in the queue using display screens or notifications on their phone. The system is connected to the hospital's scheduling tools, so it automatically assigns patients to available doctors. It also uses rule-based triage logic to give priority to patients with urgent needs.

For hospital staff and administrators, the software offers useful data and detailed reports. This includes information on patient flow, wait times, and peak hours, which helps them make better decisions and improve day-to-day processes.

By cutting down wait times, reducing crowding in waiting areas, and improving coordination among hospital staff, the software makes the hospital experience much smoother for both patients and employees. It's flexible and can be adjusted to work in different healthcare settings—from small clinics to large hospitals, including emergency departments and outpatient units.

This kind of digital queue management system is an important step in upgrading healthcare services. It helps hospitals become more patient-friendly, efficient, and ready to handle the challenges of modern medical care.

III. METHODOLOGY

The development of the Real-Time Queue Management Software follows a user-focused and step-by-step approach to make sure it meets the real needs of hospitals and improves the patient experience. The process starts with a thorough requirement analysis, where feedback will be collected from all key people involved—doctors, nurses, admin staff, IT teams, and even patients. These conversations will help identify current issues in the system, like where delays happen and what problems staff and patients face on a daily basis.

After gathering this input, the next step is to carefully study the existing patient flow and figure out exactly where the bottlenecks are. Based on this, a clear list of system requirements—both functional (like features) and non-functional (like speed and security)—will be prepared. Then comes the design phase, where different use cases (like how a doctor or a patient uses the system) will be drawn out, and a simple, easy-to-use interface for the website will be created.

The system will be built with a modular structure. This means it will have different components—like a main queue engine, a user-friendly front-end interface, and strong connections to existing Hospital Management Systems (HMS) and Electronic Medical Records (EMR). Everything will be designed to work together smoothly.

The software will be developed using agile methodology, which means it will be built in small parts with regular testing and feedback from stakeholders after each part is completed. Technologies like React.js and Flutter will be used for building the user interface, while the backend will be developed using Node.js or Django. Databases like PostgreSQL or MySQL will handle all the data. Different parts of the system will talk to each other using RESTful APIs, making it scalable and easy to manage.

Once the software is ready, it will go through several stages of testing—including unit testing (to test small parts), integration testing (to check how parts work together), performance testing (to see how it works under pressure), and finally user acceptance testing (where actual hospital staff and patients try it out).

If everything works well, a trial run will be done in one department of the hospital. Staff will be trained on how to use the system properly. If the results are good, the

system will be rolled out in the entire hospital. After launch, the system will be constantly monitored, and updates will be made as needed. A special dashboard will help hospital administrators track key stats like queue lengths, wait times, and number of patients, helping them make better decisions.

In the future, features like AI-based queue predictions and smarter triage systems could be added to make the system even more intelligent and efficient. The goal is continuous improvement and innovation in how hospitals manage patient flow.

IV. RESEARCH WORK

The Real-Time Queue Management Software was built on the foundation of strong and detailed research, carried out to understand and solve the real problems hospitals face with traditional queuing systems. The research was divided into three main parts: a literature review, field visits, and data analysis. Each part gave important insights that helped shape how the software was designed and built.

To begin with, the **literature review** involved studying how queue management works in hospitals and other service-based industries. Research papers, case studies from hospitals that already use digital queue systems, and healthcare IT reports were reviewed. Topics like queue theory, patient satisfaction, triage systems, and real-time data sharing were explored. This helped the team understand what works well, what doesn't, and why a more flexible and digital approach is needed for hospitals of all types and sizes.

Next, the team conducted **field research** to get hands-on knowledge from real hospital settings. Visits were made to different types of healthcare facilities—both government and private—to observe how patients moved through different stages, like registration, waiting, and consultation. Interviews were done with doctors, nurses, receptionists, and patients to understand their day-to-day problems. This research showed key issues like uneven patient loads for doctors, long wait times especially for elderly and emergency patients, and confusion caused by lack of clear queue updates. The situation was worse in busy departments like OPDs and emergency rooms, where manual systems couldn't handle the rush.

At the same time, **data analysis** was done using hospital records and manual logs. Important numbers like how many patients came each hour, how long consultations took, how many people didn't show up, and total daily footfall were collected. These statistics were analyzed to help build algorithms that could predict busy hours, manage staff better, and prioritize patients based on need. Simulation models were also created to test different queuing systems and see how automation could improve things.

Combining these real-world experiences with data and theory helped the team set clear and practical goals for the software. For example, feedback from patients and staff made it clear that real-time updates and clear wait time estimates were essential—so features like mobile notifications and queue display screens were added. The need to treat urgent cases faster led to flexible queue settings with emergency flags and triage rules.

The research also helped define success indicators for the software, such as reduced waiting times, higher patient satisfaction, smoother queue movement, and better staff workload balance. These KPIs (Key Performance Indicators) will be used to evaluate how well the system works after it's fully installed.

To sum up, the research phase was extremely important in building a software solution that is practical, user-friendly, and technically strong. By combining book knowledge, on-ground experience, and real data, the development team was able to create a system that truly meets the changing and challenging needs of hospital environments.

V. WORKING

The Hospital Queue Management Software works through a simple step-by-step process that makes it easy for both patients and hospital staff to manage appointments and reduce waiting time. Here's how the system functions in a real-world hospital setting.

Step 1: QR Code Distribution at the Entry Gate
As soon as patients arrive at the hospital, the staff or security guards at the main gate hand out a small QR code sticker to each person waiting in line.

- For smartphone users:
Patients can scan this QR code using the QMS (Queue Management System) app on their phones. This automatically registers them in the system.

- For elderly patients or those without smartphones:

There's a helpful "Register for Others" option in the app. In such cases, a hospital guard, a staff member, or even a fellow patient can scan the QR on their behalf, fill in their full name, and submit the details. This ensures everyone—regardless of tech comfort—is able to join the queue smoothly.

Step 2: Department & Room Allotment
Once registered, an IHMS (Integrated Hospital Management System) operator assigns each patient a department, floor, and room number based on their needs. The patient is then asked to stick the small barcode label on their prescription slip for easy tracking.

Step 3: Scanning at the Doctor's Desk
When it's time for consultation, the patient scans the barcode on their prescription slip using a barcode reader available at the doctor's room.

- Confirmation: A beep sound confirms that the patient has been added to the doctor's queue successfully.

Step 4: Queue Progression by Hospital Staff
The doctor or staff at the pharmacy/test counter updates the queue by simply pressing the "Next" button on their interface. This moves the queue forward and ensures that the next patient is called in an orderly way.

Step 5: Scanning Again at Pharmacy or Lab
After seeing the doctor, patients need to scan their barcode once again—this time at the pharmacy or diagnostic counter. This registers them into a new queue for medicines or lab tests. Patients can check their position in the queue on the QMS app or on the LED display screens located in those departments.
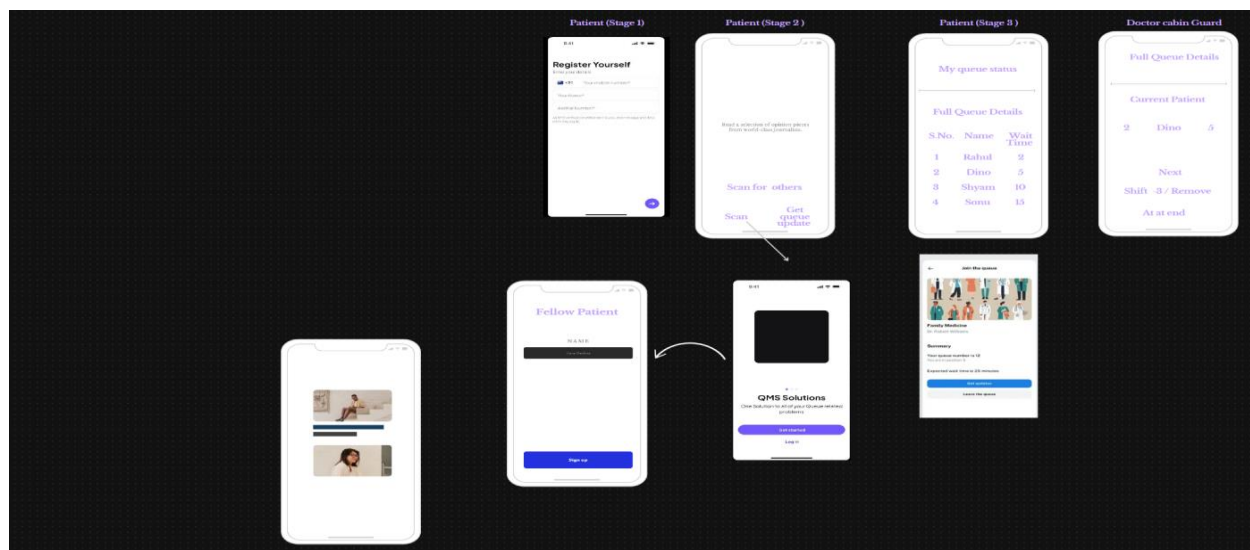

Step 1: Registration with few basic details

Step 2: Scan barcode on your prescription slip through **QMS** app **initially** and then get it scanned by **barcode reader** at waiting locations (doctor's chamber , pharmacy , etc)

Step 3: Check your **queue status** , current **queue position**, estimated **wait time**, and **full queue details** (serial number + patient names).

VI. FUTURE SCOPE

The Real-Time Queue Management Software already offers a solid base for improving hospital workflows and patient experiences. However, there is still a lot of scope for further development and innovation. As healthcare continues to evolve and patients become more aware and demanding, this system can grow both in terms of technology and its practical use in different kinds of hospitals.

One exciting future upgrade is the use of Artificial Intelligence (AI) and Machine Learning (ML). These technologies can help the system predict how many patients might come in at different times of the day, during different seasons, or during a health emergency—by analyzing past data. This can allow hospitals to automatically schedule more doctors or support staff during peak hours. ML can also help make triage smarter by learning from symptoms, waiting times, and past outcomes, so that serious cases are identified and prioritized more accurately.

Another important direction is better connectivity with other healthcare systems. While the current version works with Hospital Management Systems (HMS) and Electronic Medical Records (EMR), future versions could connect with national health databases, insurance systems, and telemedicine platforms. This would allow smoother data flow, faster eligibility checks, and better coordination between departments or even between different hospitals.

A big step forward would be adding features like remote queueing. Imagine a patient joining a queue using their phone even before reaching the hospital. This could save time and reduce crowds at the hospital gate. It would be especially useful in busy cities or for patients in rural areas using teleconsultation services. A hybrid queue model could allow patients to choose between an in-person visit or an online consultation, depending on their needs.

In terms of hardware and technology, IoT (Internet of Things) devices can be added to the system. For example, smart wristbands or sensors could track patient movement inside the hospital and help staff manage crowd flow, reduce delays, and guide patients to the right place. Also, voice-based features and support for multiple regional languages could make the system easier to use for elderly people or those who are not comfortable with smartphones or digital apps.

Operationally, the system can be expanded beyond just outpatient queues. It can include modules for bed allocation, pharmacy queues, diagnostic test scheduling, and even discharge planning. This would make the software a complete hospital flow management tool that handles everything from the time a patient enters the hospital to the time they leave. Looking ahead, this software can also be introduced in hospitals across different countries—especially in developing nations where crowd control and time management are still major issues. A cloud-based version can be made to fit local needs, healthcare rules, and language preferences, making it easier to deploy at a larger scale.

Finally, to keep the system improving continuously, patient feedback can be collected regularly. With tools like AI-based sentiment analysis, hospitals can better understand patient satisfaction levels and make changes based on real experiences. This will help the software grow not only as a technical tool but also as a system that truly responds to patient needs.

VII. CONCLUSION

The Real-Time Queue Management Software marks an important move towards modernizing how hospitals manage patients and deliver care. By replacing outdated manual processes with a digital and automated system, it helps reduce long waiting times, improves coordination among hospital staff, and creates a smoother, more comfortable experience for patients. The software directly tackles everyday issues like overcrowded waiting rooms, poor communication about queue status, and mismanagement of hospital resources by offering a smart, centralized, and user-friendly platform.

With key features such as self-registration through QR codes, real-time updates on queue position, emergency-based priority handling, and detailed performance tracking, the system empowers both patients and hospital staff. Patients can feel more informed and less stressed, while healthcare professionals can manage their work more efficiently. The thoughtful and research-based design of the system ensures that it can be adapted easily to different hospital settings—whether it's a busy outpatient department, a fast-paced emergency room, or a small specialty clinic.

The software is built to scale and can integrate with existing hospital technologies like Hospital

Management Systems (HMS) and Electronic Health Records (EHR). It also has the potential to grow in the future with technologies like Artificial Intelligence (AI) and the Internet of Things (IoT), making it a long-term solution as the healthcare industry becomes more digital and patient-focused.

To sum up, the Real-Time Queue Management Software not only solves current hospital management problems but also opens the door for future innovation in healthcare. It is a practical, reliable, and forward-thinking tool that improves service quality, helps staff work better, and makes the entire hospital experience more satisfying for patients. For any modern healthcare center aiming to improve efficiency and care, this software stands out as a valuable and necessary asset.

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