Enhancing Operational Efficiency in a Multi-Specialty Hospital

A Comprehensive Business Analytics Project

Course:
IBM Business Analyst Professional Certificate

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Date:
October 2025

Description:
This project focuses on analysing hospital operations, identifying inefficiencies, and providing actionable recommendations to enhance operational efficiency. The project covers business analysis, stakeholder management, risk assessment, data insights, and visualization.

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Business Requirements Document (BRD)

Project Title: Enhancing Operational Efficiency in a Multi-Specialty Hospital

Date: 28-09-2025

Prepared by: Sahaja Reddy Sathi

Version: 1.0

Introduction:

This Business Requirements Document (BRD) defines the business needs, scope, and functional requirements for the Health First Care initiative. The project aims to reduce patient wait times, optimize resource allocation, and enhance communication across departments by implementing data-driven solutions.

Project Overview:

Health First Care is a multi-specialty hospital experiencing inefficiencies in operations that negatively impact patient experience and staff productivity. The key issues include:

- Long patient-wait times

- Inefficient scheduling and resource allocation

- Gaps in inter-departmental communication

- Outdated scheduling and record management systems

The project will leverage data analysis, automation, and system upgrades to address these challenges.

Background and Problem Statement:

Currently, patients face frequent delays, double-bookings, and lack of timely updates about their appointments. Doctors and nurses experience overbooked schedules, shortages of critical resources, and delays in diagnostic results. Administrative staff struggle with outdated systems that cause scheduling conflicts and billing discrepancies. The IT team reports fragmented systems, frequent downtimes, and limited integration capabilities.

These issues collectively hinder operational efficiency and reduce patient satisfaction, necessitating a structured solution.

Project Scope:

In-Scope:

- Automated and integrated scheduling system

- Real-time notifications to patients and staff

- Resource allocation dashboards

- Patient feedback monitoring and reporting

- Enhanced inter-departmental communication

Out-of-Scope:

- Expansion into new medical specialties

- Third-party healthcare system integrations

- Large-scale physical infrastructure upgrades

Stakeholders:

Stakeholder	Name	Profile	Key Needs
Patients	Sarah	Software Engineer	• Needs timely updates • Digital notifications
	Lak	Retired Teacher	• Prefers simple scheduling • Reliable support desk
Doctors	Dr. Khan	Cardiology	• Balanced schedules • Quick lab results
	Dr. Lee	Orthopedics	• Access to OR and equipment • Smooth referral process.
Nurses	Santa	Pediatric Nurse	• Even staff ratio • Better intake coordination
	Jessica	ER Nurse	• Adequate staffing • Fast-diagnostic communication
Administrative Staff	Maria	Scheduler	• Avoid double bookings • Modern record management
	Ivan	Billing	• Accurate billing linked to treatment records
IT Team	Rajesh	IT Manager	• Integrated HIS • Reduced downtime
	Laura	Developer	• User-friendly system • Security updates • Analytics tools

Business Objectives

- Reduce patient wait times by 20% within 6 months.

- Improve patient satisfaction survey scores by 15%.

- Minimize scheduling conflicts by 30%.

- Ensure real-time access to resources and diagnostic results.

- Strengthen communication and coordination across hospital departments.

Requirements

- **Patients:**
  - Simplified scheduling with online and offline options
  - Appointment notifications via SMS/Email
  - Post-consultation communication (instructions, prescriptions)

- **Doctors & Nurses:**
  - Balanced and conflict-free schedules
  - Real-time access to diagnostic results and equipment availability
  - Smooth patient transfers and handoff processes

- **Administrative Staff:**
  - Automated scheduling system with visibility into doctor availability
  - Modern record management for quick retrieval
  - Error-free billing and record reconciliation

- **IT Team:**
  - Integrated Hospital Information System (HIS)
  - Cloud-based scalable solution
  - Secure, user-friendly interface
  - Analytics tools to track patient and resource trends

Functional Requirements:

- Patients can book, reschedule, or cancel appointments online.
- Real-time appointment availability to prevent double-bookings.
- Automated SMS/Email reminders for patients.
- Dashboard for monitoring staff and resource utilization.
- Patient feedback capture and reporting functionality.
- Integration of scheduling, billing, and record systems.

Non-Functional Requirements:

- System uptime $\geq$ 99%.
- Data security compliant with healthcare standards (HIPAA/GDPR).
- Scalable system supporting growing patient volumes.
- Multi-device accessibility (desktop, mobile, tablets).

- Response time under 2 seconds for scheduling operations.

Assumptions

- Stakeholders will undergo training to adopt new systems.
- Patients have access to mobile devices or internet for online services.
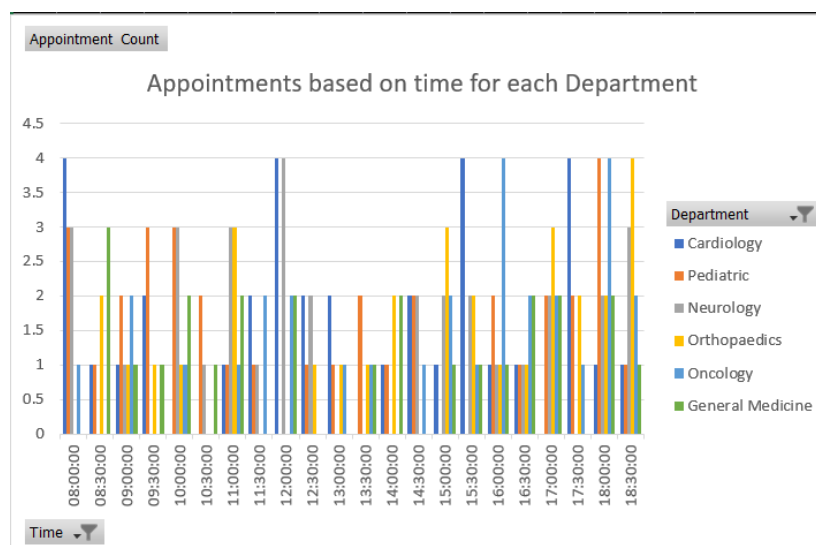- Existing data will be migrated to the new system successfully.

Constraints

- Limited budget for IT system upgrades.
- Existing infrastructure may restrict certain enhancements.
- Staff resistance to adopting new technologies.

Supporting Data Insights

- **Appointment Data:**

Count of AppointmentID	Doctor ID																														
Time	D23	D11	D14	D13	D17	D1	D7	D6	D25	D4	D12	D24	D5	D29	D27	D3	D26	D22	D16	D8	D10	D28	D9	D15	D30	D2	D19	D20	D18	D21	Grand Total
08:00:00	2				1									2	1	1		2											2		11
08:30:00			1	1					2			1											1					1			7
09:00:00						1			1	1		1	1	1									1	1							8
09:30:00		1				1					1		1				2									1					7
10:00:00		1				1		1		1									1	1	1					1	1		1		10
10:30:00	2										1			1																	4
11:00:00	1					1	1	1	1	1											2	1	1		1						11
11:30:00			1		2							1			1						1										6
12:00:00			1	1	2	2	1				1									1	1					1	1				12
12:30:00			1							1	1	1								1	1										6
13:00:00				1	1							1								1	1										5
13:30:00		1	1			1						1															1				5
14:00:00		1		1	1											3															6
14:30:00	2			1					1								1									2				7
15:00:00		2	1	1	1			1									2					1								9
15:30:00			1			1	1		1	1	1	1	1				1									10
16:00:00		2	2			1	1	1							2					1						10
16:30:00	2		1	1	1									1			1	1		8
17:00:00	2	1	1	1		1		1	1	1		1			1		11
17:30:00	2	1	1	1				1	1		1	1		9
18:00:00	1	1	1	3	1	1	1		1	1	1	1	1		15
18:30:00		2	1	1	2	1	1	1	1		12
Grand Total	10	10	9	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	3	189

Appointment Count

Appointments based on time for each Department

Department
- Cardiology
- Pediatric
- Neurology
- Orthopaedics
- Oncology
- General Medicine

Time

- o Peak booking times between 10 AM - 12 PM and 5 PM - 6.30 PM.

- o Frequent double-bookings in cardiology and pediatrics.

- o Most of the doctors were having double or triple bookings irrespective of department.
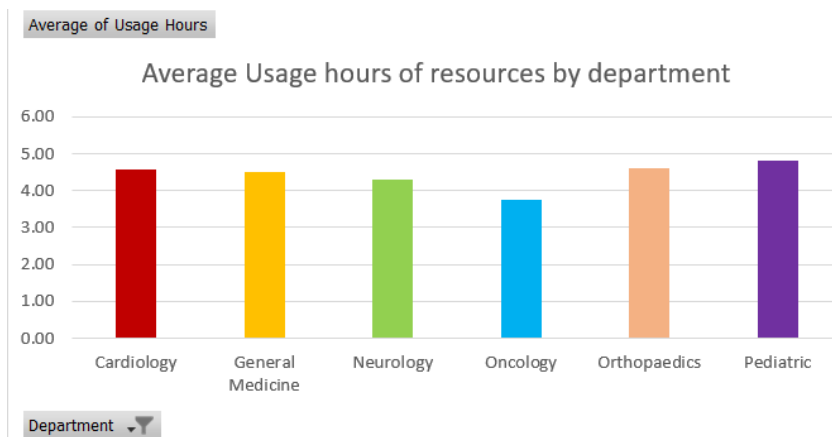
- **Feedback Data:**
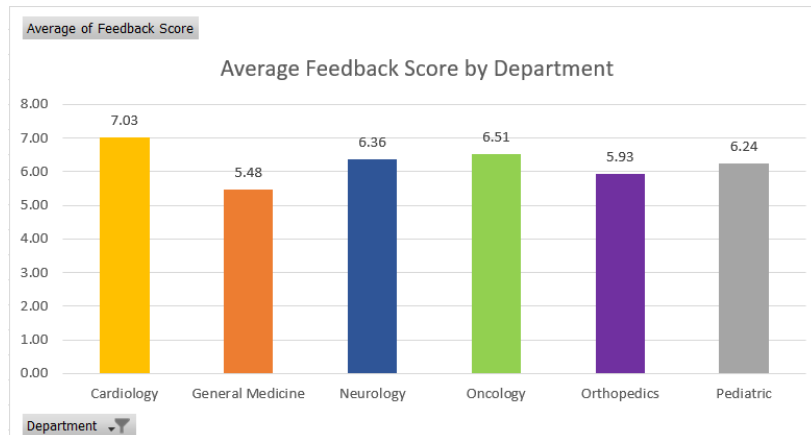
- o Common complaints: long waits, lack of timely communication, unclear follow-up instructions.

- o Low satisfaction scores linked to delayed appointments.

- **Resource Data:**

Department	Average of Usage Hours
Cardiology	4.57
General Medicine	4.51
Neurology	4.29
Oncology	3.76
Orthopaedics	4.62
Pediatric	4.80
Grand Total	**4.42**

Average of UsageHours	Availability				
Department	Available	In Use	Unavailable	Under Maintenance	Grand Total
Cardiology	4.33	8.50	4.60	2.00	4.57
General Medicine	3.94	3.20	5.45	5.29	4.51
Neurology	4.33	4.25	4.11	4.67	4.29
Oncology	4.56	2.50	4.00	2.83	3.76
Orthopedics	4.27	3.67	6.14	3.80	4.62
Pediatric	4.80	4.83	4.54	8.00	4.80
Grand Total	**4.38**	**4.17**	**4.70**	**4.13**	**4.42**

Average of UsageHours

Availability of resources by department
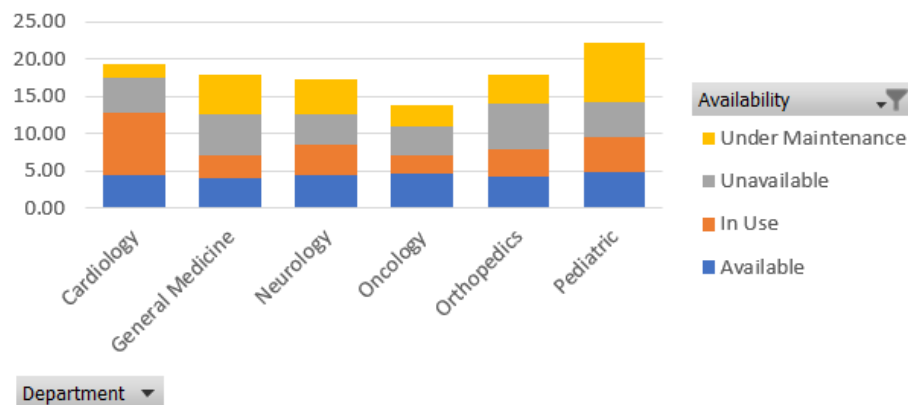
- o Oncology has less usage hours and equipment conflicts.
- o Supplies frequently understocked in general medicine and Pediatric units.

Conclusion

The proposed initiative will transform Health First Care by automating appointment scheduling, optimizing resource allocation, and enhancing communication systems. These improvements will directly reduce wait times, boost staff efficiency, and increase patient satisfaction. With integrated systems and real-time updates, Health First Care will achieve measurable operational efficiency while staying within budgetary and technical constraints.

Requirements Traceability Matrix (RTM)

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Requirement ID	Requirement Description	Priority Level (MoSCoW)	Stakeholder(s)	Project Objective	Related Data File	Status / Findings
FR1	Automate appointment scheduling to prevent double/triple bookings	Must have	Patients, Administrative Staff, IT	Reduce patient wait times and scheduling conflicts	appointment_data.csv	Pivot Table shows many double/triple bookings across departments
FR2	Send real-time SMS/Email notifications for appointment confirmations, cancellations, and reminders	Must have	Patients, IT	Improve patient communication and satisfaction	feedback_data.csv	Frequent complaints about missed notifications and lack of updates
FR3	Provide dashboard for doctors and nurses to view real-time resource availability	Must have	Doctors, Nurses	Optimize resource allocation and reduce delays	resource_data.csv	OR and equipment overbooked; nurses over-utilized during peak hours
FR4	Enable post-consultation communication with instructions and prescriptions	Should have	Patients, Doctors	Enhance patient experience and reduce follow-up confusion	feedback_data.csv	Patients reported unclear instructions after consultations
FR5	Integrate scheduling, billing, and patient record systems	Must have	Administrative Staff, IT	Ensure seamless data flow across departments	appointment_data.csv, resource_data.csv	Current systems are siloed; billing discrepancies observed
FR6	Provide analytics for monitoring patient trends and resource usage	Could have	IT, Management	Support data-driven decision-making	appointment_data.csv, resource_data.csv	Raw data available; requires dashboards for insights
NFR1	Maintain HIPAA/GDPR compliant data security	Must have	IT, Patients	Ensure compliance and secure patient data	N/A	Legacy systems have known security vulnerabilities
NFR2	Scalable cloud-based appointment system	Should have	IT, Management	Allow future expansion and reduce downtime	N/A	Current network experiences frequent downtime
NFR3	Modernize patient record management system for faster access	Must have	Administrative Staff	Reduce delays in retrieving patient histories	feedback_data.csv	Administrative staff reported outdated system causing delays
NFR4	Implement priority-based resource allocation during peak hours	Could have	Doctors, Nurses	Reduce overutilization and improve patient flow	resource_data.csv	Nurses and equipment often overbooked during weekends and night shifts
NFR5	Response time under 2 seconds for scheduling operations	Should have	Patients, IT	Ensure fast and efficient scheduling	appointment_data.csv	Delays observed during peak booking hours

Introduction / Purpose

The **Requirements Traceability Matrix (RTM)** for the Health First Care project is a critical tool for ensuring that all business and stakeholder requirements are clearly documented, prioritized, and linked to project objectives. This matrix provides a structured approach to:

- Track functional and non-functional requirements throughout the project lifecycle.

- Ensure alignment of requirements with stakeholder needs and project goals.

- Validate requirements using real-world data from appointment schedules, patient feedback, and resource utilization.

- Facilitate decision-making and prioritization using the MoSCoW method (Must Have, Should Have, Could Have, Won't Have).

The purpose of this RTM is to create a single source of truth for all requirements, enabling project teams to monitor progress, ensure traceability, and support the overall success of the Health First Care initiative.

Summary of Data Insights

Analysis of the provided data files has informed and validated key requirements for the project:

1. **Appointment Data (appointment_data.csv)**

➢ Multiple doctors across departments had double or triple bookings, contributing to long patient wait times.
➢ Peak appointment times were identified, highlighting the need for automated scheduling and real-time availability.

2. **Patient Feedback (feedback_data.csv)**

➢ Patients reported dissatisfaction due to missed notifications, unclear post-consultation instructions, and long wait times.
➢ Supports requirements for automated SMS/Email reminders and improved communication channels.

3. **Resource Data (resource_data.csv)**

➢ Equipment and staff shortages were observed during peak hours and weekends.
➢ Justifies requirements for resource monitoring dashboards and optimized allocation.

These insights provide real-world evidence for the RTM, ensuring that all requirements are relevant, justified, and aligned with project objectives.

Checklist of Prioritization (MoSCoW)

Priority	Description	Examples from RTM
Must have	Essential for project success; cannot be delayed	Automate appointment scheduling, Prevent double bookings, Data security (HIPAA/GDPR), System uptime $\geq$ 99%
Should have	Adds significant value but not critical	Dashboard for monitoring resources, Multi-device access, Scalable system
Could have	Desirable but not essential; can be included if resources allow	Analytics for patient trends, Optional advanced reporting

Won't have	Not feasible in current scope; deferred for future	AI-based predictive scheduling (future enhancement)

This checklist ensures that all requirements are **prioritized based on importance, feasibility, and stakeholder impact**, providing clear guidance for project execution.

Stakeholder Analysis and Engagement Plan

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Introduction / Purpose:

The purpose of this Stakeholder Analysis and Engagement Plan is to systematically identify, categorize, and prioritize stakeholders involved in the Health First Care project. By understanding stakeholder roles, influence, and interests, this plan ensures:

- Effective communication and collaboration across all stakeholder groups.

- Alignment of stakeholder expectations with project objectives (as defined in the BRD and RTM).

- Timely engagement and feedback to support decision-making and project success.

Stakeholder Identification and Categorization:

Stakeholder Group	Role / Profile	Influence Level	Interest Level	Category (Matrix)
Patients	• Sarah Ayvazyan • Lak Ayer	Low	High	Keep Informed
Doctors	• Dr. Aftab Khan (Cardiology) • Dr. Robert Lee (Orthopaedics)	High	High	Key Players
Nurses	• Santa Murmu (Pediatric) • Jessica Gomes (ER)	High	High	Key Players
Administrative Staff	• Maria Carter (Appointment Scheduler) • Ivan Walker (Billing Administrator)	High	High	Key Players
IT Teams	• Rajesh Singh (IT Manager) • Laura Simkow (Software Developer)	High	Low	Keep Satisfied
Hospital Leadership	Executive Management	High	Low	Keep Satisfied
Support Staff	• Maintenance • Clerical	Low	Low	Monitor

Stakeholder Matrix:

Stakeholder Influence vs. Interest Matrix:

	High Interest	**Low Interest**
High Influence	**Key Players** • Doctors (Dr. Aftab Khan, Dr. Robert Lee) • Nurses (Santa Murmu, Jessica Gomes) • Administrative Staff (Maria Carter, Ivan Walker)	**Keep Satisfied** • IT Teams (Rajesh Singh, Laura Simkow) • Hospital Leadership
Low Influence	**Keep Informed** Patients (Sarah Ayvazyan, Lak Ayer)	**Monitor** Support Staff (Maintenance, Clerical)

Engagement Strategies and Communication Plan:

Stakeholder Group	Method	Purpose of Engagement	Frequency
Key Players (Doctors, Nurses, Admin Staff)	Weekly meetings, detailed reports, dashboards	Gather feedback, monitor progress, ensure alignment	Weekly
Keep Satisfied (IT Teams, Leadership)	Periodic email updates, summary reports	Keep informed of progress, address concerns	Bi-weekly
Keep Informed (Patients)	Newsletters, dashboards, surveys	Provide updates, gather feedback on satisfaction	Monthly
Monitor (Support Staff)	Passive updates via reports, meeting notes	Inform about relevant changes without active participation	As needed

Alignment with Project Goals:

- **Reducing Patient Wait Times:** Engagement with Key Players ensures that doctors, nurses, and admin staff can provide input on scheduling improvements.

- **Optimizing Resource Allocation:** Dashboards and reports for Key Players and IT allow monitoring of resource usage and availability.

- **Enhancing Communication:** Regular updates and automated notifications ensure patients are informed, supporting satisfaction objectives.

- **System Integration & Compliance:** Engagement with IT teams ensures secure and scalable solutions that align with HIPAA/GDPR standards.

This document provides a **structured framework** for stakeholder engagement, ensuring all groups are appropriately involved, informed, or monitored to support the success of the Health First Care project.

Work Breakdown Structure (WBS) - Health First Care Improvement Initiative

WBS ID	Task Name	Task Description	Owner	Milestone / Deliverable	Estimated Duration
1.0	Health First Care Improvement Initiative	Root level of the project	Project Manager	Project Kick-off	-
1.1	Phase 1: Requirements Gathering	Define and document project requirements	Business Analyst	Requirements Document	1 week
1.1.1	Stakeholder Interviews	Collect requirements from patients, doctors, nurses, admin staff, IT	Business Analyst	Stakeholder Feedback Report	2 days
1.1.2	Data Analysis	Analyse appointment, feedback, and resource data files	Data Analyst	Data Insights Document	3 days
1.2	Phase 2: System Design	Design system for automated scheduling and resource tracking	Solution Architect	System Design Document	1 week
1.2.1	Functional Specification	Document system features, modules, and workflows	Business Analyst	Functional Specs	2 days
1.2.2	Technical Specification	Define technical requirements, integrations, and database design	IT Team	Technical Specs	3 days
1.3	Phase 3: Development & Integration	Develop and integrate software modules	Development Team	Working System Modules	2 weeks

1.3.1	Appointment Module Development	Build automated appointment scheduling & notification system	Software Developer	Appointment Module	5 days
1.3.2	Resource Dashboard Development	Develop dashboard to monitor staff and equipment utilization	Software Developer	Resource Dashboard	5 days
1.3.3	System Integration	Integrate scheduling, billing, and patient record systems	IT Team	Integrated System	4 days
1.4	Phase 4: Testing	Test all system modules and end-to-end processes	QA Team	Test Reports	1 week
1.4.1	Unit Testing	Test individual modules for functionality	QA Team	Unit Test Report	3 days
1.4.2	System Testing	Test integrated system for performance and reliability	QA Team	System Test Report	3 days
1.4.3	User Acceptance Testing (UAT)	Conduct testing with key stakeholders	Business Analyst / Key Users	UAT Sign-off	2 days
1.5	Phase 5: Deployment & Training	Deploy system and train users	Project Manager / Training Team	Go-live, Training Completion	1 week
1.5.1	Deployment	Deploy system in hospital environment	IT Team	Go-live	2 days
1.5.2	User Training	Conduct training sessions for	Training Team	Training Completion	3 days

1.6	Phase 6: Monitoring & Support	Monitor system performance and provide support	IT Team / Project Manager	Monitoring Reports	Ongoing
1.6.1	Post-deployment Monitoring	Track system usage, performance, and issues	IT Team	Performance Reports	2 weeks
1.6.2	Issue Resolution & Support	Address system bugs and user issues	IT Team / Support Staff	Support Log	Ongoing

Project Scope Statement:

Objectives: Reduce patient wait times, improve appointment scheduling, and optimize resource allocation.

In-Scope Activities:

- ➢ Automating appointment scheduling
- ➢ Implementing resource tracking dashboards
- ➢ Developing real-time notification systems

Out-of-Scope Activities:

- ➢ Hospital construction projects
- ➢ Hiring additional clinical staff

Assumptions: Stakeholder availability for reviews, accuracy of provided data.

Constraints: Budget limits, project timelines, regulatory compliance (e.g., HIPAA).

Scope Change Management Process:

- ➢ **Scope Change Request Process:** Defines steps for submitting, reviewing, and approving changes to project scope.
- ➢ **Approval Criteria:** Evaluates changes based on alignment with project objectives, budget impact, and feasibility.
- ➢ **Stakeholder Roles:** Identifies approvers, such as Project Manager and Hospital Leadership.
- ➢ **Scope Monitoring and Validation:** Ensures that all changes are documented, communicated, and aligned with the BRD and RTM.

These deliverables provide a **comprehensive framework** for managing the project scope, ensuring that the initiative remains focused, measurable, and aligned with stakeholder expectations.

Business Process Model

Summary of Analysis and Findings:

Key Challenges Identified from Current Workflows (As-Is):

From the analysis of the existing processes at Health First Care, the following inefficiencies were observed:

1. **Appointment Scheduling**

   ➢ Manual booking processes lead to frequent **double or triple bookings**.

   ➢ Lack of real-time conflict detection results in delays and patient dissatisfaction.

   ➢ Notifications to patients are manual, delayed, and inconsistent.

2. **Patient Check-in**

   ➢ Heavy reliance on **paper-based forms** causes long wait times.

   ➢ Verification of patient details by staff is slow, leading to bottlenecks.

   ➢ Repetition of tasks (e.g., re-filling incomplete forms) adds to inefficiency.

3. **Interdepartmental Communication**

   ➢ Requests for resources (e.g., IT support, equipment) are handled via **emails or calls**, which are prone to miscommunication.

   ➢ No centralized tracking system for issue resolution leads to delays.

   ➢ Lack of accountability and visibility into the status of requests.

Rationale for Proposed Solutions (To-Be):

1. **Automated Appointment Scheduling**

   ➢ Introduces **real-time availability checks** to eliminate double bookings.

   ➢ Provides **automated SMS/Email confirmations** for transparency.

   ➢ Reduces administrative workload and improves patient satisfaction.

2. **Streamlined Patient Check-in**

   ➢ Implementation of **self-service kiosks** or online pre-check-in reduces manual paperwork.

   ➢ Immediate verification speeds up the process, reducing waiting times.

   ➢ Enhances patient experience by providing faster, seamless entry.

3. **Centralized Communication & Resource Allocation**

➢ A **dashboard/task management system** ensures requests are logged, tracked, and auto-notified to the right department.

➢ Improves accountability, reduces delays, and ensures timely issue resolution.

➢ Enhances collaboration between administrative staff and IT teams.

Expected Impact on Efficiency

- **Reduced Wait Times:** Automated scheduling and faster check-ins streamline patient flow.

- **Improved Resource Utilization:** Centralized communication enables better tracking of staff and equipment usage.

- **Higher Patient Satisfaction:** Timely updates, reduced errors, and shorter delays enhance overall experience.

- **Operational Transparency:** Dashboards and automated alerts give leadership and staff visibility into ongoing activities.

- **Scalability:** Optimized workflows can support a growing patient base without proportional increases in manual workload.

As-Is Process Models:

Appointment Scheduling Process
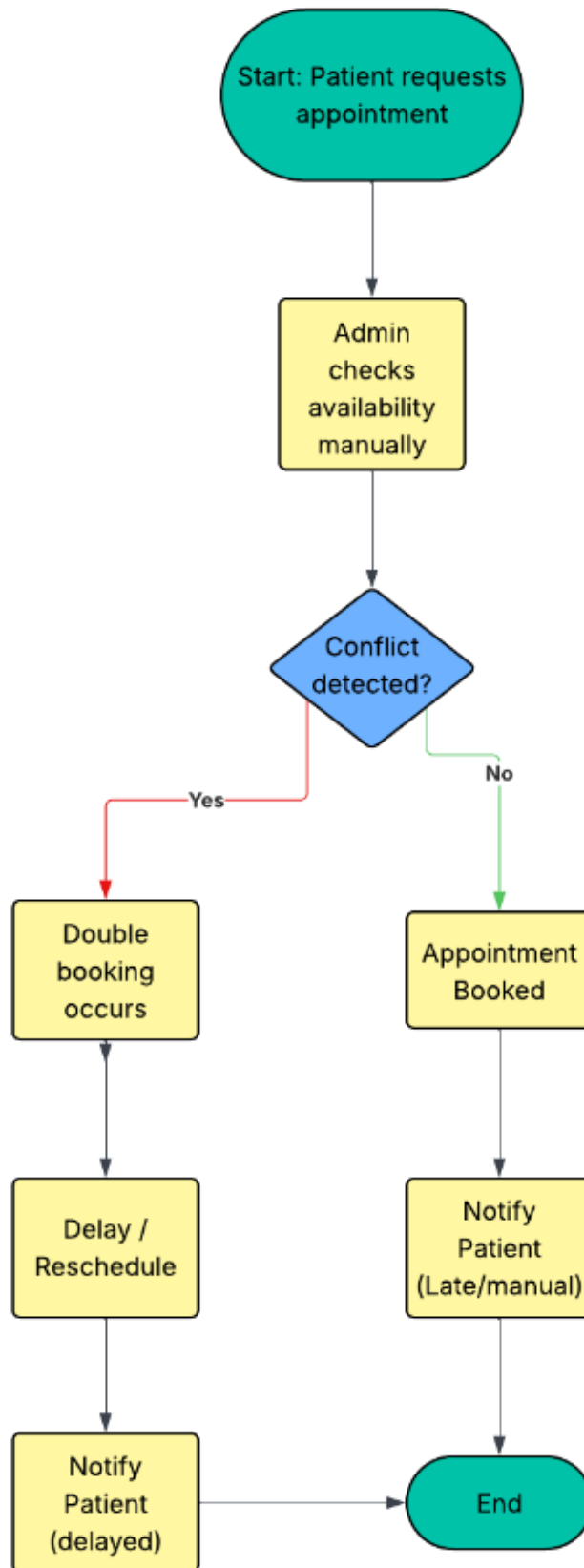
Patient Check-In Process:

Interdepartmental Communication:

```mermaid
flowchart TD
    A([Start: Admin Identifies resource need]) --> B[Fill manual paper work]
    B --> C[Admin sends manual request email/call]
    C --> D[IT/Resource team receives request]
    D --> E[Delay in response]
    E --> F[Task completed manually]
    F --> G([End])
```

Start: Admin Identifies resource need

Fill manual paper work

Admin sends manual request (email/call)

IT/Resource team receives request

Delay in response

Task completed manually

End

To-Be Process Models:

Automated Appointment Scheduling:

Streamlined Patient Check-In:

```
        ┌─────────────────┐
        │  Start: Patient │
        │     arrives     │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │   Uses self     │
        │ service kiosk   │
        │   or online     │
        │ pre-check-in    │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │  Verification   │
        │    system       │
        │   validates     │
        │    details      │
        │   instantly     │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │  Notification   │
        │    sent to      │
        │   relevant      │
        │  department     │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │    Patient      │
        │   check-in      │
        │   complete      │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │      End        │
        └─────────────────┘
```
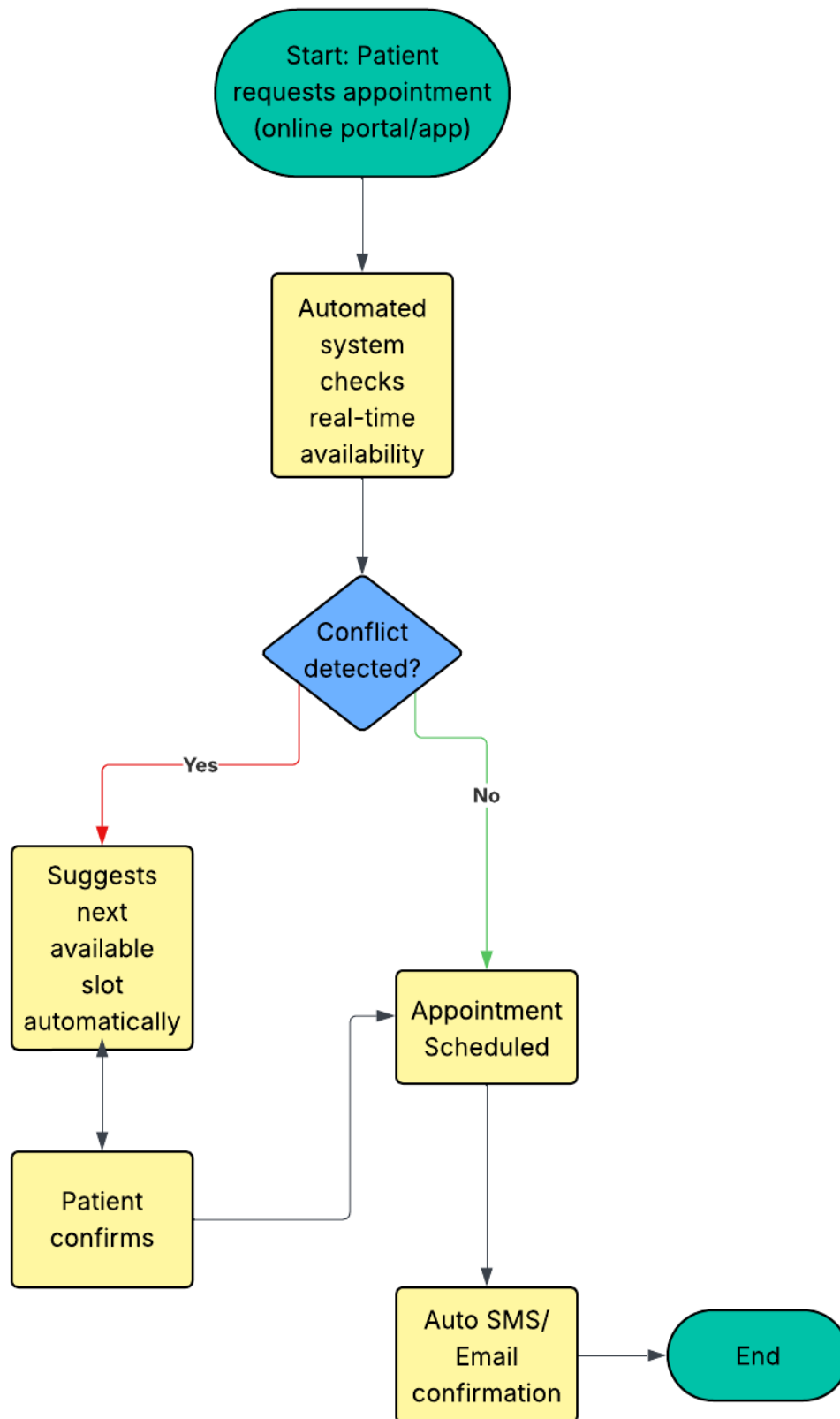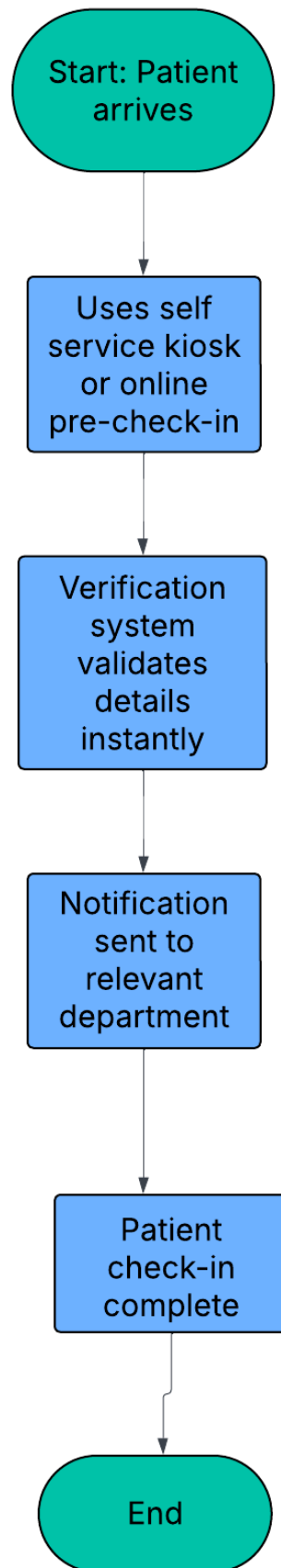
Improved Interdepartmental Communication:

```
┌─────────────────────┐
│   Start: Admin      │
│   Identifies        │
│   resource need     │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Input into        │
│   centralized       │
│   system /          │
│   dashboard         │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Auto              │
│   notification      │
│   sent to           │
│   IT/Resource       │
│   team              │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Task assigned     │
│   and tracked in    │
│   system            │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Resolution        │
│   updated in        │
│   dashboard         │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│       End           │
└─────────────────────┘
```
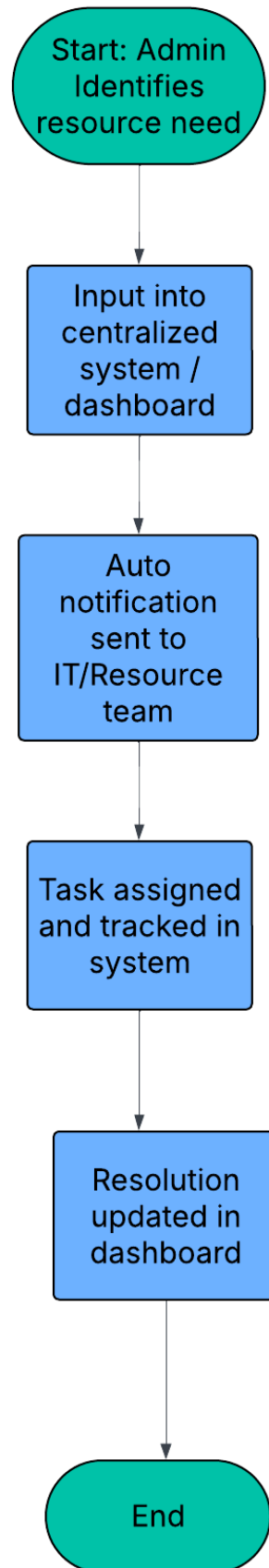
Health First Care – Detailed Process Maps Report - Swimlane

Introduction:

The purpose of this report is to analyse and optimize workflows at **Health First Care** using **BPMN (Business Process Model and Notation)** and **Swimlane Diagrams**. This analysis focuses on **multi-stakeholder processes**, identifying inefficiencies, clarifying roles, and proposing improvements to enhance operational efficiency and patient satisfaction.

By studying the current "As-Is" workflows and proposing optimized "To-Be" workflows, this report ensures better alignment with the hospital's goals of reducing patient wait times, streamlining appointment scheduling, and improving resource utilization.

Processes Analysed:

Patient Appointment Scheduling:

- **Stakeholders:** Patient, Admin Staff, IT Team

- **Current Challenges:**

  - Double or triple bookings irrespective of department

  - Delays in appointment confirmation

  - Manual entry errors

- **Proposed Improvements:**

  - Automated scheduling system with real-time availability

  - SMS/Email notifications for confirmation and reminders

  - Conflict detection to prevent double bookings

- **Expected Impact:**

  - Reduce wait times for patients

  - Minimize administrative errors

  - Increase patient satisfaction

Patient Check-In & Resource Allocation:

- **Stakeholders:** Patient, Front Desk, Nurse, Doctor

- **Current Challenges:**

  - Long wait times due to manual paperwork

  - Resource bottlenecks during peak hours

  - Poor coordination between departments

- **Proposed Improvements:**

- o   Self-service kiosks or online check-in system

- o   Automated notifications to relevant departments

- o   Dashboard for real-time monitoring of resources

- **Expected Impact:**

  - o   Faster check-in process

  - o   Optimized resource allocation

  - o   Reduced patient dissatisfaction
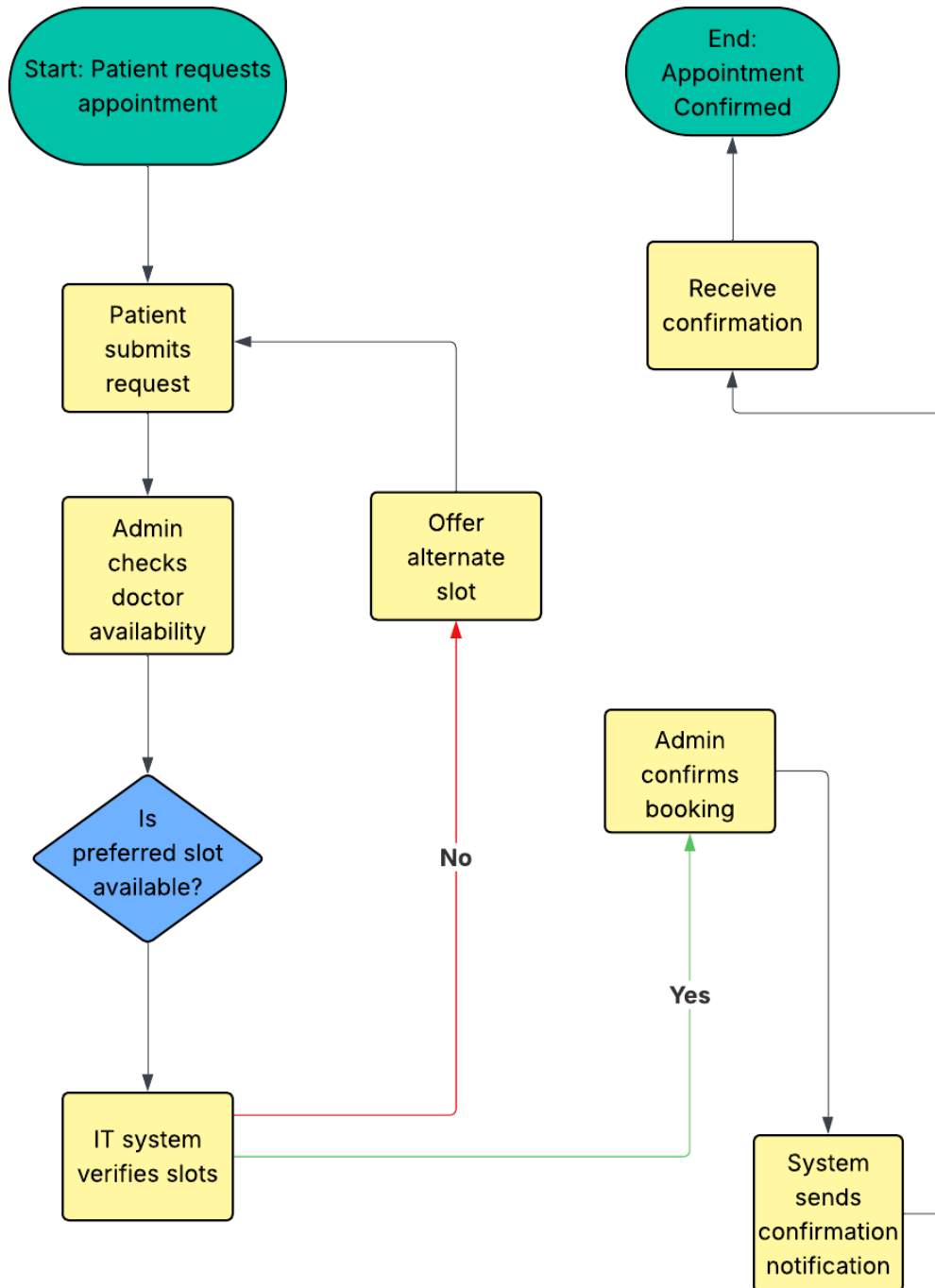
Discharge Planning Process:

- **Stakeholders:** Doctor, Nurse, Admin/Finance, Patient

- **Current Challenges:**

  - o   Delays in discharge due to unclear handoffs

  - o   Incomplete documentation

  - o   Dependency on manual approvals

- **Proposed Improvements:**

  - o   Automated workflow from doctor approval → nurse preparation → billing clearance → patient feedback

  - o   Decision gateway for "Fit for Discharge" (if rejected, continue treatment and notify patient)

  - o   Event trigger: "Discharge request initiated"

- **Expected Impact:**

  - o   Streamlined discharge process

  - o   Reduced errors and delays

  - o   Clear accountability across roles
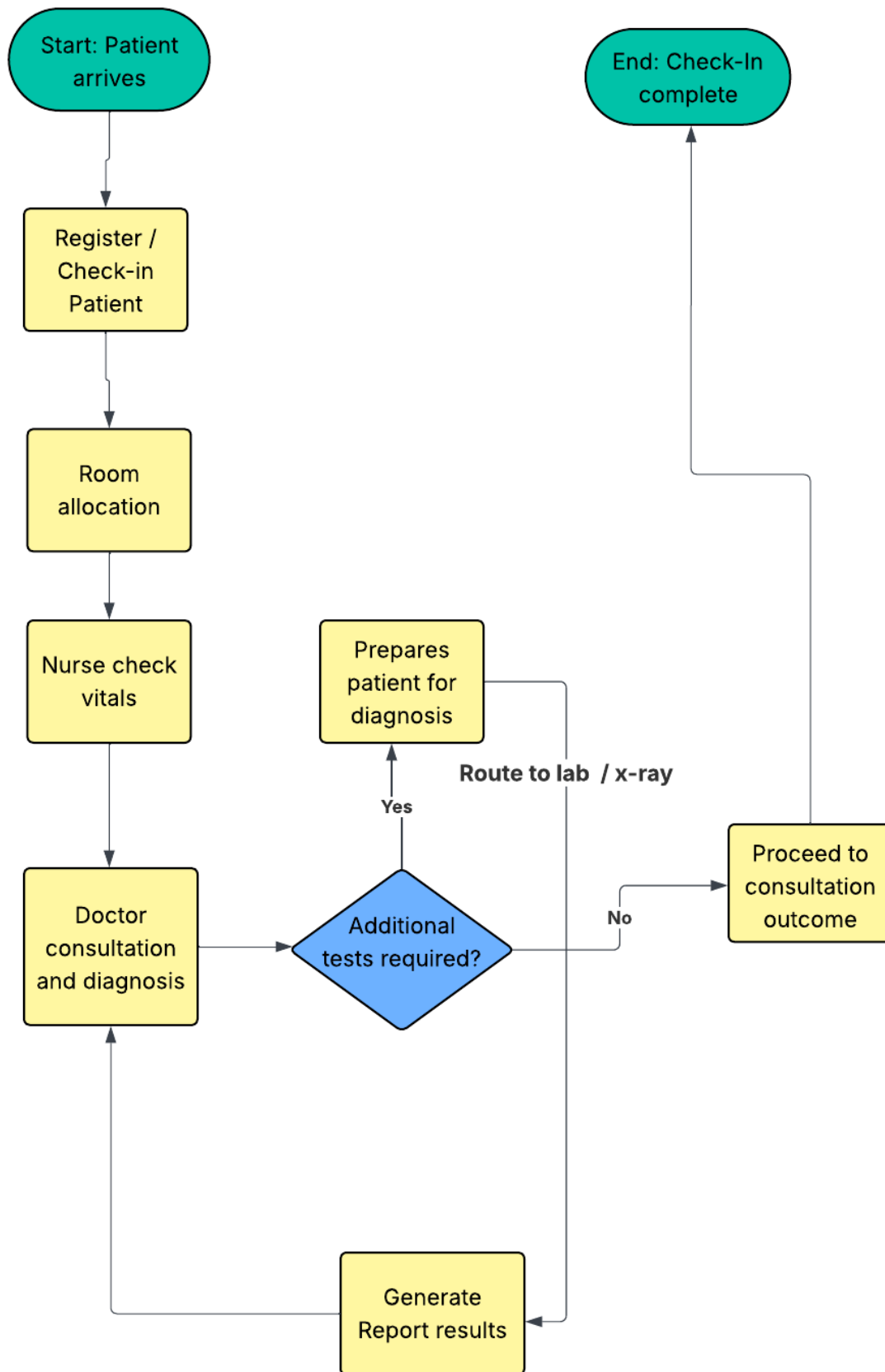
BPMN Diagram Summary:

- **Purpose:** To visually represent complex workflows with tasks, decision gateways, subprocesses, and event triggers.

- **Key Highlights:**

  - o   Event triggers defined (e.g., "Patient requests appointment", "Discharge request initiated")

  - o   Decision gateways included for alternate paths (e.g., "Discharge approved?" → Yes/No)

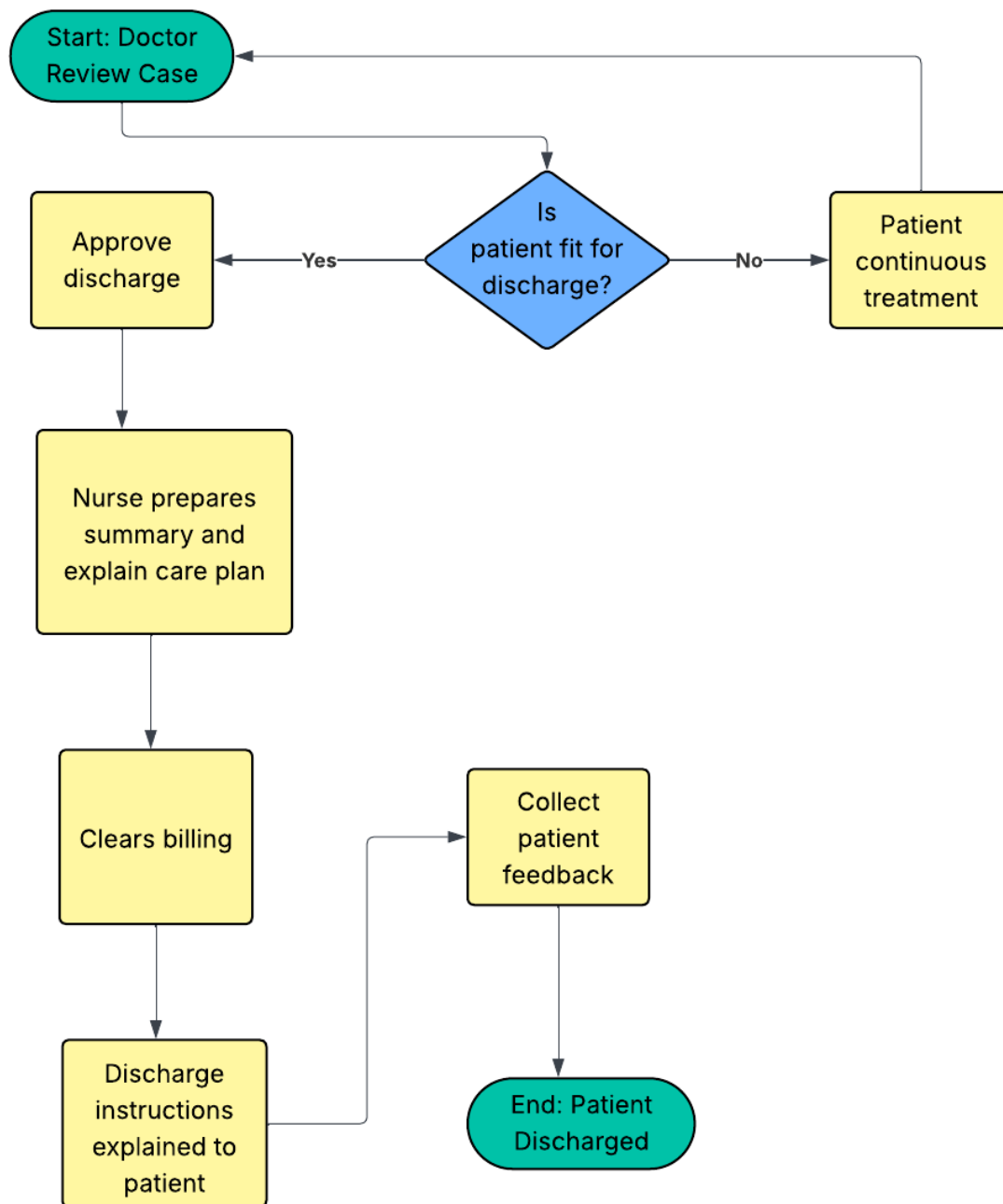o Subprocesses mapped for repetitive tasks like billing, notifications, and feedback collection

Appointment Scheduling Process and Confirmation:

Patient Check-In and Resource Allocation:
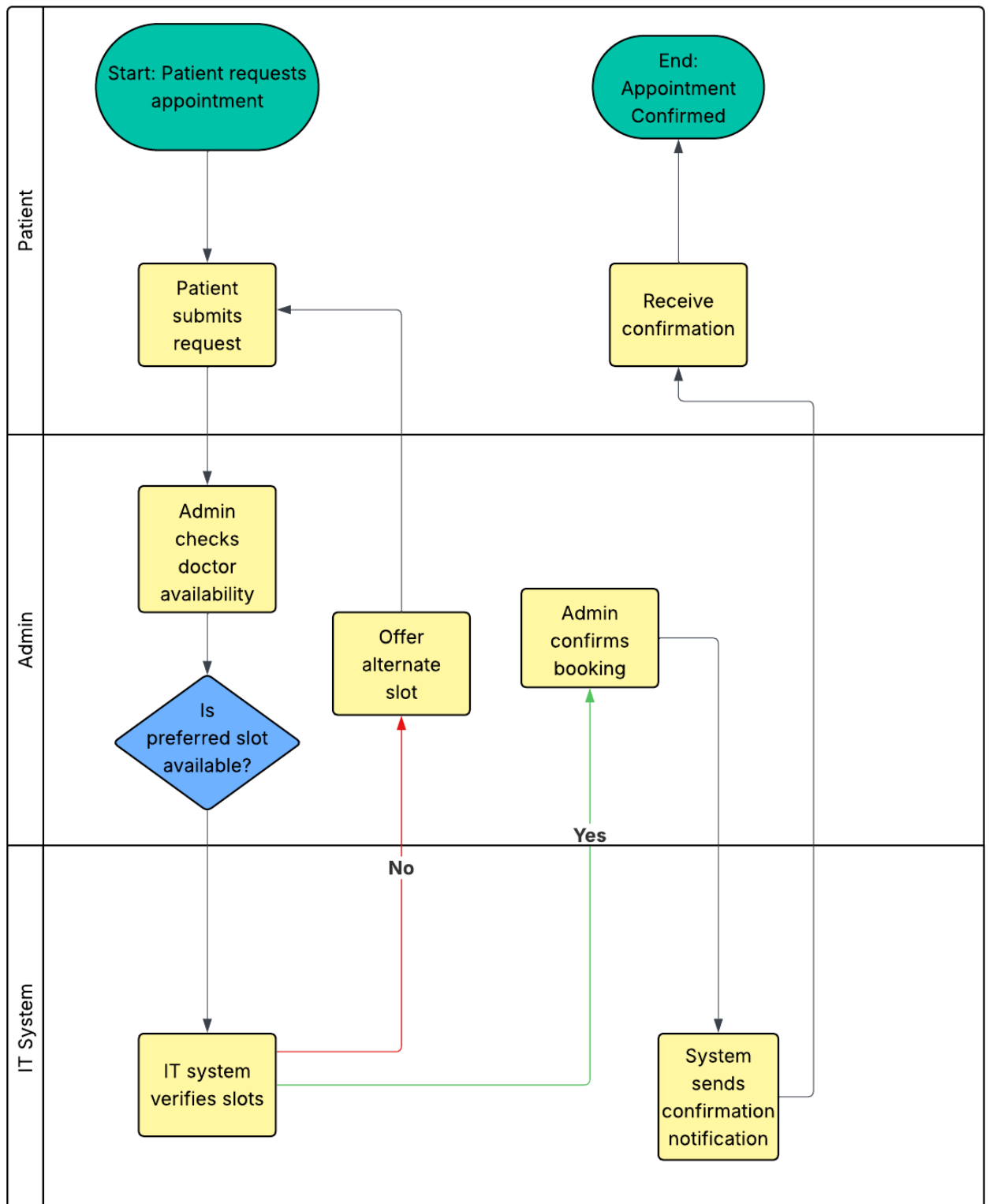
Discharge Planning Process:

Swimlane Diagram Summary

- **Purpose:** To segregate tasks clearly across roles or departments, highlighting responsibilities and handoffs.

- **Key Highlights:**

  o   Lanes represent each stakeholder: Patients, Doctors, Nurses, Admin Staff, IT Team

  o   Tasks assigned to correct lanes to reduce ambiguity

o   Handoffs, bottlenecks, and delays clearly visible for improvement areas

<u>Appointment Scheduling Process and Confirmation - Swimlane:</u>

Patient Check-In and Resource Allocation - Swimlane:
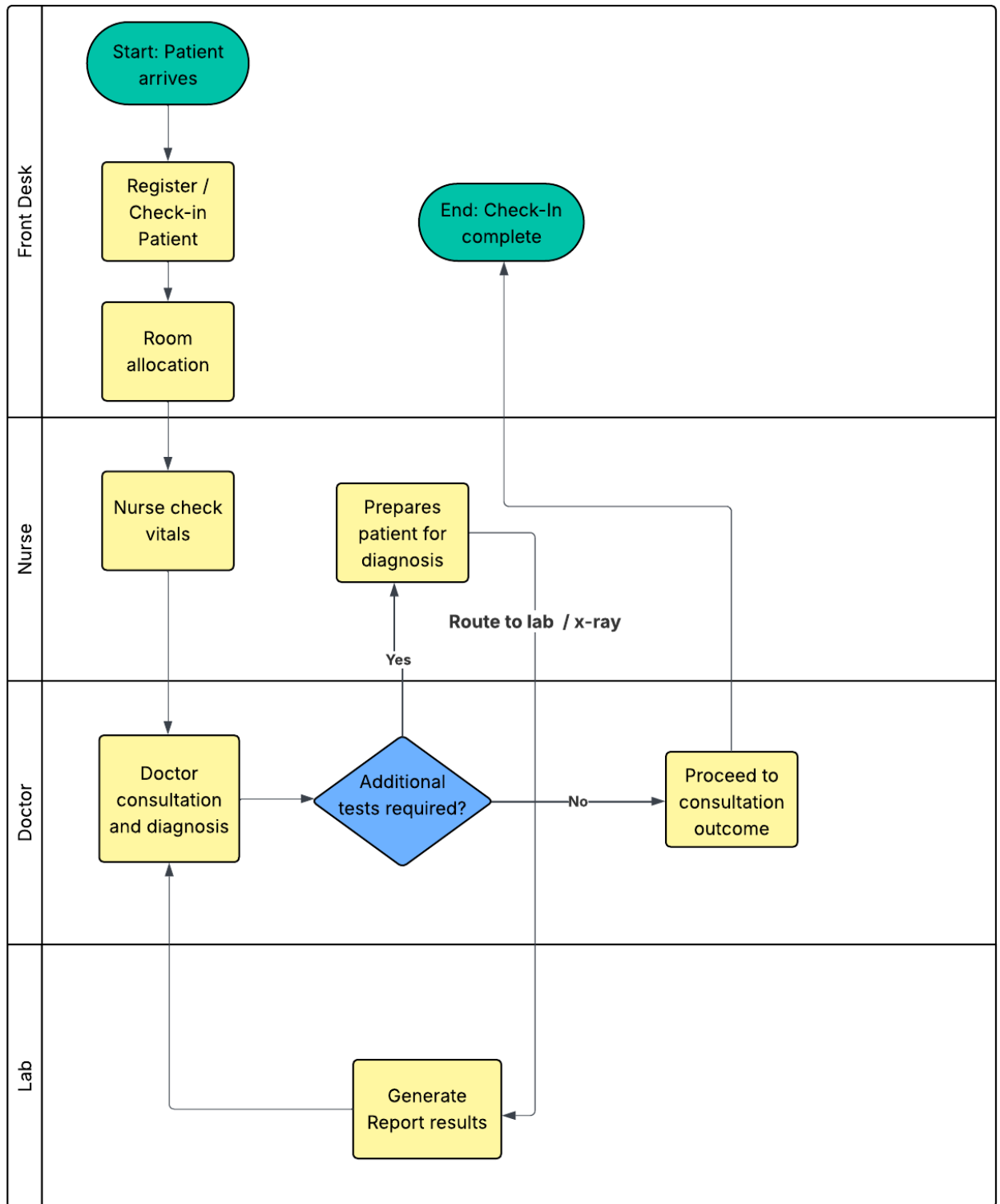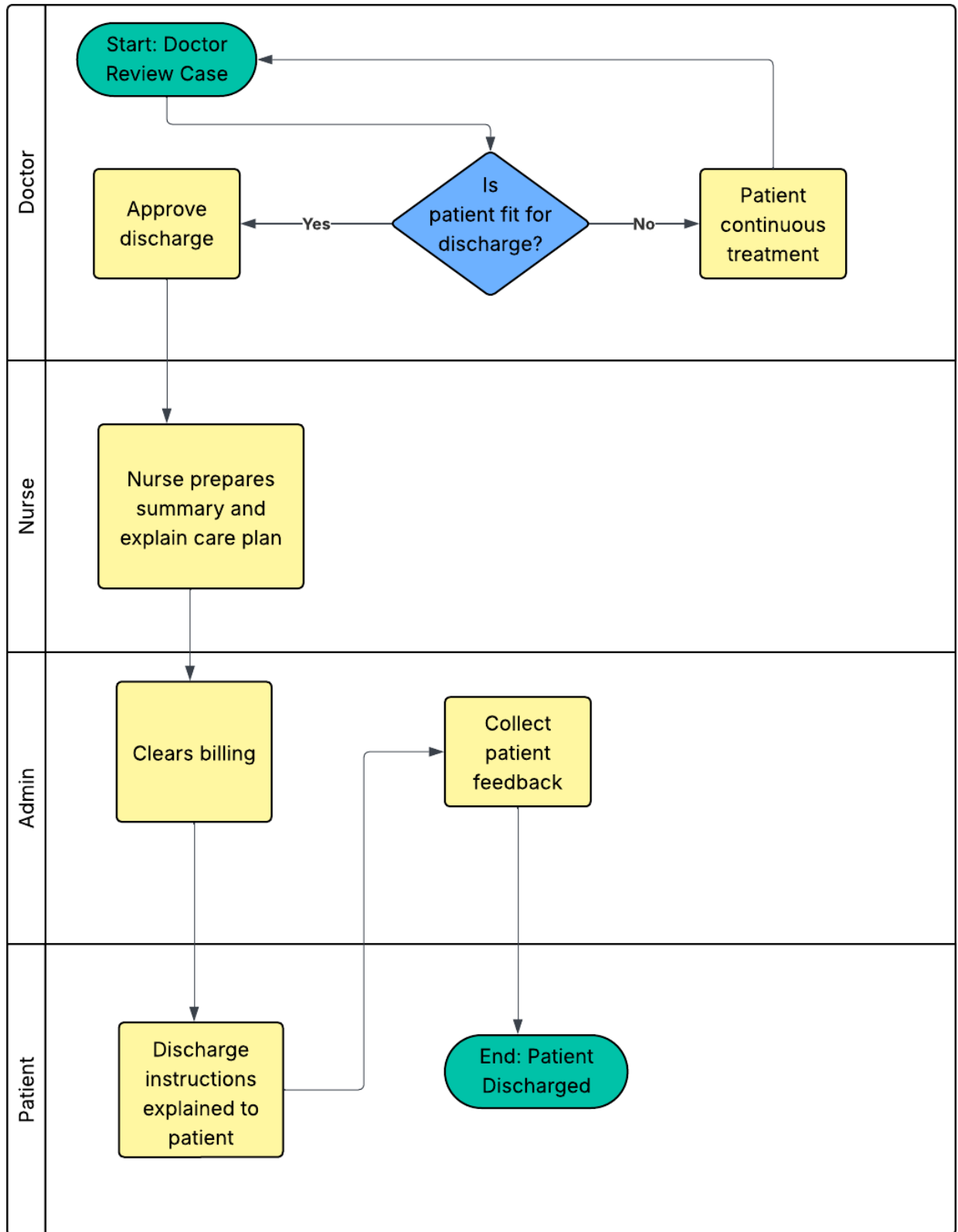
Discharge Planning Process - Swimlane:

Key Findings & Proposed Improvements:

Process	Current Challenges	Proposed Solutions	Expected Impact
Appointment Scheduling	Double bookings, delayed notifications	Automated scheduling, real-time notifications	Reduce wait times, minimize errors
Patient Check-In	Manual paperwork, long waits	Self-service kiosks, automated notifications	Faster check-in, optimized resources
Discharge Planning	Delays, unclear handoffs	Automated workflow, decision gateways	Efficient discharge, fewer errors

Conclusion:

The BPMN and Swimlane diagrams provide a detailed view of **current inefficiencies**, **role responsibilities**, and **workflow gaps**. By implementing the proposed "To-Be" processes:

- Appointment scheduling becomes automated, reducing delays and conflicts

- Check-in processes are streamlined with self-service options and better coordination

- Discharge planning is clear, accountable, and faster

These improvements are expected to **enhance operational efficiency, improve patient satisfaction, and optimize resource utilization** across Health First Care.

Summary of Insights:

Insights from Patient Feedback (Average Scores by Department):

- **Highest satisfaction:** Cardiology (7.03) scored above the hospital average (6.31).

- **Lowest satisfaction:** General Medicine (5.48), Orthopedics (5.93), and Pediatric (6.24) are underperforming, indicating possible service quality or workload issues.

- **Moderate performers:** Neurology (6.36) and Oncology (6.51) are close to average but still show room for improvement.

Key Takeaway: Targeted improvement programs are required for General Medicine and Orthopaedics as their scores are significantly below average.

Insights from Resource Utilization

- **Highest utilization:** Pediatric (4.80) and Orthopedics (4.62) show the most effective resource usage.

- **Lowest utilization:** Oncology (3.76), indicating underutilized resources despite moderate patient flow.

- **Balanced utilization:** Cardiology (4.57), General Medicine (4.51), and Neurology (4.29) are around the average (4.42).

Key Takeaway: Oncology's low utilization may point to either overstaffing or lack of optimized patient scheduling.

Insights from Resource Availability vs Usage

- **General Medicine & Oncology:** Very high counts of Unavailable resources (60 each), showing frequent bottlenecks.

- **General Medicine:** 176 total hours with 60 unavailable and 37 under maintenance → over 55% of capacity is not active.

- **Pediatric:** 192 total hours, 96 available, 29 in use → strong balance, though 59 unavailable needs review.

- **Cardiology:** 52 available vs 17 in use → availability seems fine but demand may be lower than expected.

Key Takeaway: General Medicine and Oncology face critical inefficiencies in resource availability, contributing to low feedback scores.

Insights from Appointment Trends (by Time)

- **Peak appointment slots:**

  - 12 PM (12 cases), 6 PM (15 cases), and 6:30 PM (12 cases) are busiest.

    o   Consistently high traffic between 5 PM – 6:30 PM, likely due to post-work patient visits.

- **Moderate peaks:** 11 AM, 3:30 PM, and 4 PM also show higher loads.

- **Low slots:** Early morning (8–9 AM) has fewer appointments, showing imbalanced load distribution.

Key Takeaway: Consider load balancing by encouraging morning appointments through reminders, discounts, or rescheduling options.

Insights from Appointment Trends (by Day of Week)

- **Busiest days:** Monday (31), Saturday (31).

- **Slowest day:** Thursday (22), which is significantly lower.

- Appointments are otherwise fairly balanced across other weekdays (~26–27 each).

Key Takeaway: Consider shifting elective or routine checkups to Thursdays to balance workload.

Correlation of Satisfaction with Appointment Times

- **High satisfaction hours:** 10 AM (93% high), 12 PM (94%), 5 PM (89%), and especially 6 PM (77% high but highest patient load).

- **Low satisfaction spikes:** 4 PM (24% dissatisfaction) and 6 PM (6 patients dissatisfied).

- **Overall dissatisfaction:** Only 26 low scores vs. 154 high scores → patient sentiment is generally positive.

Key Takeaway: Dissatisfaction is correlated with peak evening slots (6 PM) where resource stress is highest. Improving staff allocation during evening hours could reduce negative experiences.

Final Summary:

1. General Medicine & Orthopedics underperform in feedback, strongly linked to resource unavailability.

2. Oncology resources are underutilized, suggesting mismatched scheduling.

3. Appointments are clustered in evening slots (5–6:30 PM), causing patient dissatisfaction during peak hours.

4. Thursdays have the lowest patient load and can be optimized to balance demand.

5. Patient satisfaction overall is positive (85%+ high feedback), but key stress points (4 PM & 6 PM) require targeted interventions.

Cleaned dataset: (Clickable link)

Cleaned_Excel_Workb
ook.xlsx

Visuals of Insights:

department	Average of Feedback Score
Cardiology	7.03
General Medicine	5.48
Neurology	6.36
Oncology	6.51
Orthopedics	5.93
Pediatric	6.24
Grand Total	**6.31**

Department	Average resource utilization
Cardiology	4.57
General Medicine	4.51
Neurology	4.29
Oncology	3.76
Orthopaedics	4.62
Pediatric	4.80
Grand Total	**4.42**

Sum of Usage Hours	Column Labels				
Row Labels	Available	In Use	Unavailable	Under Maintenance	Grand Total
Cardiology	52	17	23	4	96
General Medicine	63	16	60	37	176
Neurology	78	17	37	14	146
Oncology	41	10	60	17	128
Orthopaedics	47	11	43	19	120
Pediatric	96	29	59	8	192
Grand Total	**377**	**100**	**282**	**99**	**858**

Average Satisfaction Score by Department

Department	Score
Cardiology	7.03
General Medicine	5.48
Neurology	6.36
Oncology	6.51
Orthopedics	5.93
Pediatric	6.24
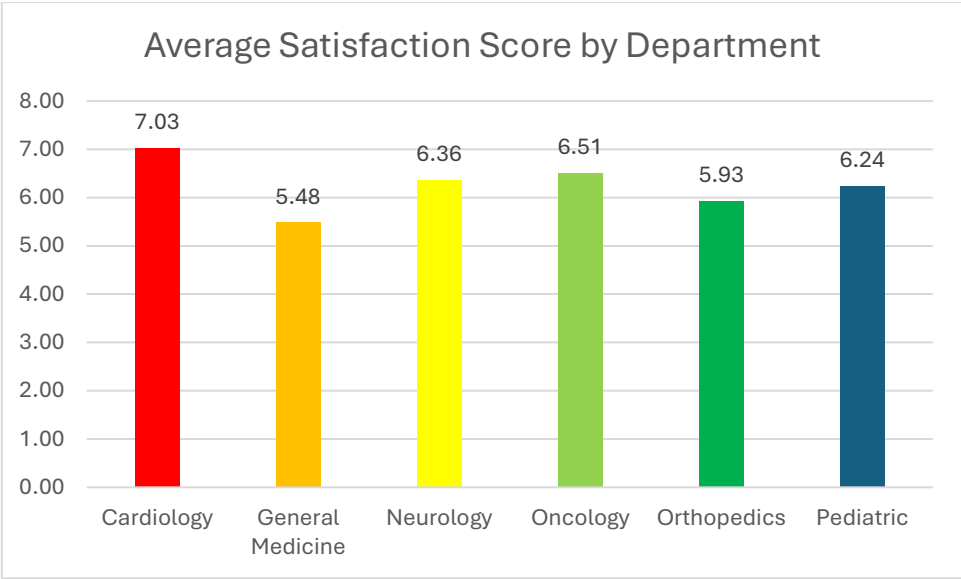
Count of AppointmentID	Department						Grand Total
Time	Cardiology	Pediatric	Neurology	Orthopaedics	Oncology	General Medicine	
08:00:00	4	3	3		1		11
08:30:00	1	1		2		3	7
09:00:00	1	2	1	1	2	1	8
09:30:00	2	3		1		1	7
10:00:00		3	3	1	1	2	10
10:30:00		2	1			1	4
11:00:00	1	1	3	3	1	2	11
11:30:00	2	1	1		2		6
12:00:00	4		4		2	2	12
12:30:00	2	1	2	1			6
13:00:00	2	1		1	1		5
13:30:00		2		1	1	1	5
14:00:00	1	1		2		2	6
14:30:00	2	2	2		1		7
15:00:00	1		2	3	2	1	9
15:30:00	4		2	2	1	1	10
16:00:00	1	2	1	1	4	1	10
16:30:00	1	1	1	1	2	2	8
17:00:00		2	2	3	2	2	11
17:30:00	4	2		2	1		9
18:00:00	1	4	2	2	4	2	15
18:30:00	1	1	3	4	2	1	12
Grand Total	35	35	33	31	30	25	189

Trends in resource usage

Department	Available	In Use	Unavailable	Under Maintenance
Cardiology	52	17	23	4
General...	63	16	60	37
Neurology	78	17	37	14
Oncology	41	10	60	17
Orthopaedics	47	11	43	19
Pediatric	96	29	59	8
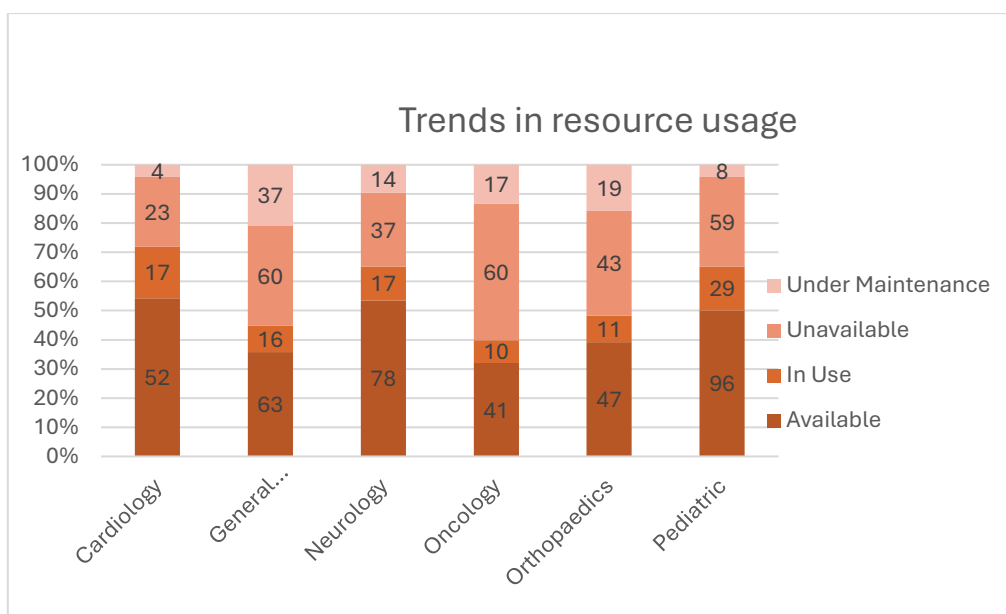
Day of week	Count of Day by Date
Sunday	26
Monday	31
Tuesday	26
Wednesday	27
Thursday	22
Friday	26
Saturday	31
Grand Total	**189**

Count of Feedback Score	Satisfaction Score		Grand Total
Hour of Time	High	Low	
8	15	3	18
9	12	1	13
10	13	1	14
11	15	2	17
12	16	1	17
13	8	2	10
14	10	2	12
15	16	2	18
16	13	4	17
17	16	2	18
18	20	6	26
Grand Total	**154**	**26**	**180**

Peak hour by department

39
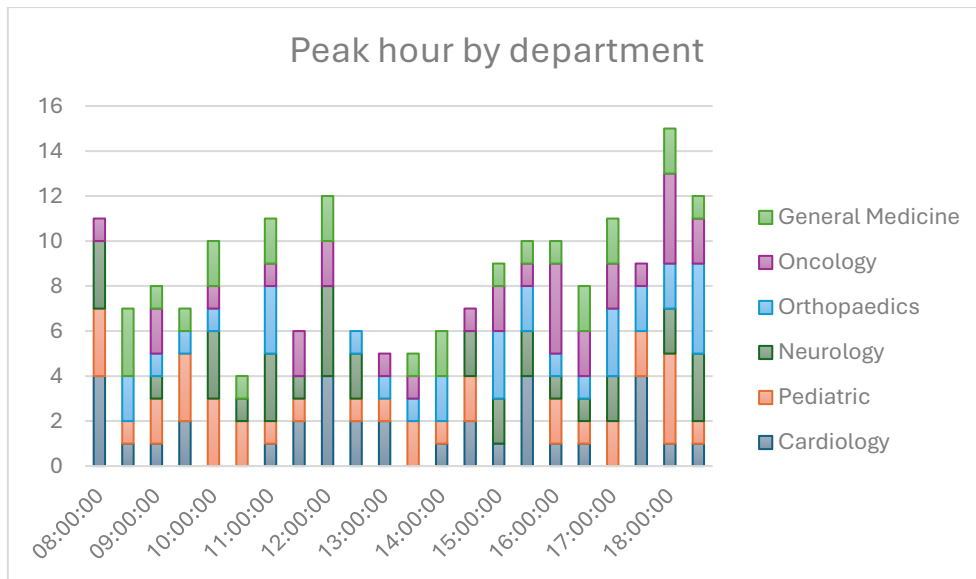
Data Visualization and Insights

Datasets and Variables Used

Used a healthcare dataset containing details such as:

- **Appointment Date** (time dimension for trends)

- **Department** (categorical grouping for resource and wait time analysis)

- **Patient Wait Times** (measure to evaluate efficiency)

- **Resource Utilization Rates** (measure to track departmental efficiency)

- **Patient Satisfaction Levels** (measure for quality of service)

These variables were chosen because they directly reflect operational performance and patient experience.
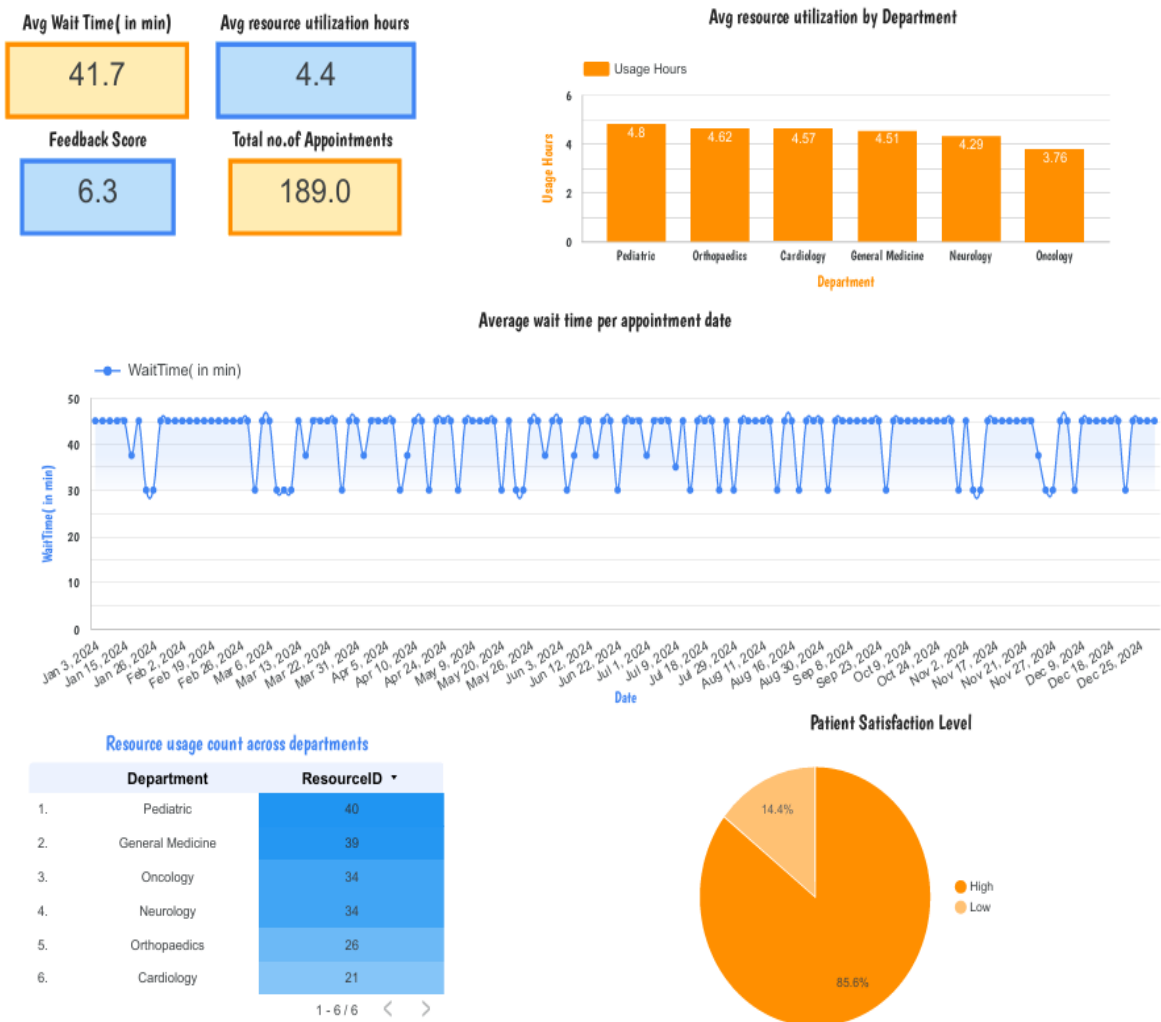
Design Process for the Dashboard:

- **Data Preparation:** Cleaned dataset in Excel (removed blanks, corrected data types for dates/times).

- **Chart Selection:**

   o **Line Chart:** Showed trends in patient wait times over appointment dates.

   o **Bar Chart:** Compared resource utilization across departments.

   o **Heatmap:** Highlighted resource usage patterns (over- vs under-utilization).

   o **Pie Chart:** Summarized patient satisfaction distribution (high vs low).

- **Filters:** Department-level filters were considered to allow focused analysis.

- **Formatting:** Ensured proper date ordering, readable labels, and visually clear chart designs.

Key Findings and Business Implications:

- **Wait Times:** Trends showed variations across dates, pointing to periods of higher delays that need staffing adjustments.

- **Resource Utilization:** Some departments displayed under-utilization while others showed signs of overload, indicating imbalance in workload allocation.

- **Heatmap Insights:** Clear hotspots where demand is consistently high, suggesting need for capacity planning.

- **Patient Satisfaction:** Majority satisfied, but dissatisfied patients correspond to high wait times and overloaded departments.

Business Implications:

- Optimize **staffing schedules** based on peak demand dates.

- Redistribute **resources across departments** to balance workload.

- Improve **patient experience** by reducing delays, which may directly enhance satisfaction scores and retention.

Avg Wait Time(in min)
41.7

Avg resource utilization hours
4.4

Feedback Score
6.3

Total no.of Appointments
189.0

Avg resource utilization by Department

Average wait time per appointment date

Resource usage count across departments

	Department	ResourceID
1.	Pediatric	40
2.	General Medicine	39
3.	Oncology	34
4.	Neurology	34
5.	Orthopaedics	26
6.	Cardiology	21

1 - 6 / 6

Patient Satisfaction Level

High
Low

14.4%

85.6%

Risk Register, Risk Assessment Matrix, SWOT Analysis:

Risk Register:

Risk ID	Risk Description	Category (Operational/Technical/Stakeholder)	Likelihood (L/M/H)	Impact (L/M/H)	Severity (L×I)	Mitigation Strategy
R1	Staff resistance to new system	Operational	High	Medium	High	Provide training & change management workshops
R2	System downtime during peak hours	Technical	Medium	High	High	Implement backup servers & maintenance schedules
R3	Data breach risk	Technical	Low	High	Medium	Enhance security protocols, regular audits
R4	Poor adoption by clinicians	Stakeholder	Medium	Medium	Medium	Involve clinicians early, gather feedback
R5	Misaligned expectations with leadership	Stakeholder	Low	High	Medium	Regular status updates & stakeholder reviews

Severity can be calculated as:

- High × High = High
- Medium × High = High
- Low × Medium = Low, etc.

Risk Assessment Matrix:

X-Axis = Impact (Low, Medium, High)
Y-Axis = Likelihood (Low, Medium, High)

- High Severity (Red) → Needs immediate attention

- Medium Severity (Yellow) → Needs monitoring

- Low Severity (Green) → Review periodically

	Low Impact	Medium Impact	High Impact
High Likelihood		R1	
Medium Likelihood		R4	R2
Low Likelihood			R3, R5

SWOT Analysis:

STRENGTH	WEAKNESS
- Strong leadership support - Reliable, cleaned operational data - Clear stakeholder requirements	- Manual workflows still exist - Departmental data silos - Limited staff technical training
OPPORTUNITY	**THREAT**
- Process automation through digital tools - Staff training & skill development - Improved patient satisfaction via reduced wait times	- Data breaches or compliance issues - Staff/stakeholder resistance to adoption - System downtime impacting service delivery

Summary/Conclusion:

➢ The register helps **track & mitigate risks**.
➢ The matrix helps **prioritize actions**.
➢ The SWOT gives a **strategic overview** for decision-making.

Developing a Risk Matrix and Mitigation Strategies and Contingency Plan:

Updated Risk Register:

Risk ID	Risk Description	Category (Operational/Technical/Stakeholder)	Likelihood (L/M/H)	Impact (L/M/H)	Severity (L×I)	Mitigation Strategy
R1	Staff resistance to new system	Operational	High	Medium	High	Provide training & change management workshops
R2	System downtime during peak hours	Technical	Medium	High	High	Implement backup servers & maintenance schedules
R3	Data breach risk	Technical	Low	High	Medium	Enhance security protocols, regular audits
R4	Poor adoption by clinicians	Stakeholder	Medium	Medium	Medium	Involve clinicians early, gather feedback
R5	Misaligned expectations with leadership	Stakeholder	Low	High	Medium	Regular status updates & stakeholder reviews

Severity can be calculated as:

- High × High = High
- Medium × High = High
- Low × Medium = Low, etc.

Contingency Plans Table:

Risk ID	Contingency Plan
R1 – Staff resistance to new system	If resistance persists, assign change champions within teams to support adoption, provide additional refresher training, and offer incentives for compliance.
R2 – System downtime during peak hours	Switch to backup servers immediately, notify users of temporary delays, and expedite system recovery with IT support. Schedule urgent maintenance if needed.
R3 – Data breach risk	Immediately isolate affected systems, notify IT/security teams, conduct root cause analysis, and implement emergency fixes. Communicate with relevant stakeholders as per compliance protocols.
R4 – Poor adoption by clinicians	Conduct one-on-one sessions or focus groups with clinicians, address their concerns directly, and adjust workflows based on feedback to increase adoption.
R5 – Misaligned expectations with leadership	Hold urgent review meetings, realign project deliverables with leadership expectations, and document agreed-upon adjustments for transparency.