

IDEATION PHASE – DOCUMENT 2:

DEFINE PROBLEM STATEMENT

Date	06 November 2025
Team ID	NM2025TMID04603
Project Name	Medical Inventory Management
Maximum Marks	4 Marks

Title: Problem Definition for “*Medical Inventory Management*”

1. Objective

The objective of medical inventory management is to ensure that the right medical supplies, drugs, and equipment are available at the right time, in the right quantity, and at the right cost, while minimizing waste, stockouts, and excess inventory.

2. Context and Background

1. Introduction to Inventory Management in Healthcare

Inventory management is a crucial function in healthcare institutions, involving the planning, ordering, storing, and controlling of medical supplies, equipment, and pharmaceuticals. It ensures that the necessary items are available when needed to support effective patient care. In hospitals and clinics, inventory includes a wide range of items — from medicines and surgical instruments to laboratory reagents and disposable supplies.

2. Importance in Healthcare Delivery

Efficient medical inventory management directly affects the quality of healthcare services. Shortages or stockouts of essential medicines can delay treatment, compromise patient safety, and damage institutional credibility. Conversely, overstocking leads to waste, especially for items with limited shelf life, and ties up financial resources that could be used elsewhere.

3. Challenges in Medical Inventory Management

Managing medical supplies is complex due to factors such as:

- High diversity of items.
- Variable demand patterns.
- Limited storage capacity.
- Risk of expiration and obsolescence.
- Inaccurate recordkeeping or manual systems.
- Budget constraints and procurement delays.

These challenges highlight the need for efficient systems and trained personnel to manage inventory effectively.

4. Evolution and Modern Approaches

Traditionally, inventory management in healthcare relied on manual methods like ledgers and stock cards. However, with technological advancements, many health facilities now use computerized systems such as **Hospital Information Systems (HIS)** or **Inventory Management Software** that track stock levels in real time, generate reports, and support data-driven decision-making.

5. Role in Cost Control and Efficiency

Medical supplies often account for a significant portion of a hospital's operating budget. Effective inventory management minimizes waste, reduces unnecessary purchases, and ensures optimal use of resources — all of which contribute to financial sustainability.

6. Policy and Regulatory Context

Many health institutions operate under national or international guidelines that promote rational use of medicines and standardized inventory control procedures (e.g., First-Expiry-First-Out or FEFO methods, and essential drugs lists).

3.Problem Observation

1. Background

Hospitals, clinics, and pharmacies rely heavily on the availability of medical supplies, equipment, and medicines to ensure uninterrupted healthcare services. Efficient inventory management is critical to maintaining optimal stock levels, reducing waste, and ensuring patient safety. However, many healthcare facilities

still rely on manual record-keeping or outdated systems, leading to inefficiencies and errors.

2. Observed Problems

a. Overstocking and Understocking

- Some medicines and consumables expire due to overstocking and poor monitoring.
- Critical supplies sometimes run out unexpectedly due to lack of automated alerts or inaccurate data.

b. Manual Record Keeping

- Inventory tracking is often done on paper or spreadsheets, which are prone to human error.
- Difficulties in updating stock records in real-time lead to inaccurate stock counts.

c. Lack of Real-time Monitoring

- Staff are unaware of current stock levels across different departments.
- Delays occur when locating items or verifying availability.

d. Expiry and Wastage

- No systematic method to track expiry dates leads to wastage of expensive medicines and reagents.
- Outdated or expired items might accidentally be used, posing risks to patients.

e. Inefficient Procurement Process

- Purchases are often made reactively when items run out rather than proactively.
- Lack of demand forecasting results in inconsistent ordering and supply chain issues.

f. Limited Accountability

- Difficulty tracking who used or issued certain medicines or equipment.
 - Poor audit trails make it hard to identify discrepancies or theft.
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3. Impact of the Problem

- Financial losses due to expired or unused stock.
 - Delays in treatment due to stockouts.
 - Increased workload for staff managing inventory manually.
 - Reduced quality of patient care.
 - Difficulty in maintaining regulatory compliance (e.g., with FDA or hospital accreditation standards).
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4. Core Problem Statement

“Healthcare facilities often face significant challenges in managing their medical inventory efficiently. The absence of an automated and centralized inventory management system leads to issues such as inaccurate stock records, overstocking or stockouts of critical medical supplies, and increased wastage due to expired items. Manual record-keeping and lack of real-time tracking make it difficult for staff to monitor stock levels, forecast demand, and ensure timely procurement. These inefficiencies not only result in financial losses but also compromise the quality and timeliness of patient care”.

Therefore, there is a need for an intelligent, automated medical inventory management system that can provide real-time stock updates, track expiry dates, generate alerts, and optimize procurement decisions to ensure the availability of essential medical resources and enhance overall operational efficiency in healthcare institutions.

5. Project Goals

the main goals such as:

1. Ensuring availability of medical supplies
2. Reducing waste and expired stock
3. Improving patient safety
4. Saving costs and time
5. Tracking and reporting efficiently

6. Scope and Constraints

In-Scope

The Medical Inventory Management System will include the following features and functions:

Category	Description
Inventory Tracking	Manage and monitor medical supplies, drugs, equipment, and consumables in real-time.
Stock Management	Record stock levels, set reorder points, and automatically generate purchase orders when stock is low.
Supplier Management	Maintain a database of suppliers, track deliveries, and manage purchase histories.
Batch & Expiry Management	Track batch numbers and expiry dates of medicines and consumables to prevent usage of expired items.

Category	Description
User Management	Define user roles such as Admin, Pharmacist, Store Manager, and Doctor, with access control and permissions.

Out-of-Scope:

Category	Description
Clinical/Patient Records	Managing patient medical history, prescriptions, or treatment records.
Billing & Accounting System	Integration with hospital billing, financial accounting, or ERP systems.
Human Resource Management	Tracking staff schedules, attendance, or payroll.
Equipment Maintenance System	Scheduling or tracking medical equipment servicing or calibration.
Third-party API Integrations	Connections with external pharmacy networks or government health databases (unless later approved).
Mobile App Development	Separate mobile applications for inventory management (web-only in initial phase).
AI-based Demand Forecasting	Advanced predictive analytics using AI/ML beyond standard reporting.

2. Constraints

Constraint Type	Description
Budget	The project must stay within the allocated financial limits for software, hardware, and training.

Constraint Type	Description
Time	Must be completed within the defined project timeline (e.g., 3–6 months).
Technology Stack	Limited to approved technologies (e.g., SQL database, web-based front-end).
Regulatory Compliance	Must comply with healthcare data regulations (e.g., HIPAA, GDPR if applicable).
User Training	Training limited to key staff only during rollout.
Infrastructure	Dependent on existing hospital network and server capabilities.
Data Migration	Limited to available and clean legacy inventory data.

7. Technical Relevance

Salesforce was chosen as the foundation for its **low-code platform** and **scalability**.

The project utilizes:

Automation and Accuracy

- **Problem:** Manual inventory tracking using spreadsheets or paper records is error-prone and time-consuming.
 - **Technical Relevance:** The system automates stock recording, updates, and reordering processes, significantly reducing human errors and ensuring data accuracy.
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2. Real-Time Data Management

- **Use of Databases:** A relational database (e.g., MySQL, PostgreSQL, or SQL Server) ensures structured, secure, and real-time data storage and retrieval.
- **Relevance:** Enables staff to view current stock levels, expiry dates, and reorder needs instantly, improving responsiveness in critical medical environments.

- **3. Integration and Scalability**

- **Integration:** The system can integrate with barcode/QR code scanners, hospital ERP systems, and procurement modules.
 - **Relevance:** Ensures smooth interoperability between departments (e.g., pharmacy, surgery, and stores).
 - **Scalability:** Cloud-based or modular architecture allows easy expansion across multiple branches or hospitals.
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4. Data Analytics and Reporting

- **Relevance:** Built-in analytics provide actionable insights such as usage trends, wastage analysis, and supplier performance metrics.
 - **Technology Used:** Business Intelligence (BI) tools and dashboards for visual reporting.
 - **Outcome:** Supports data-driven decision-making and financial optimization.
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5. Security and Compliance

- **Relevance:** Healthcare data is sensitive and must be protected.
 - **Technology Used:** Role-based access control (RBAC), data encryption, and audit trails.
 - **Compliance:** Aligns with healthcare data protection standards such as **HIPAA**, **GDPR**, or national health regulations.
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6. User Interface and Experience

- **Technology Used:** Web technologies (e.g., HTML5, CSS3, JavaScript, React, or Angular).

- **Relevance:** Provides an intuitive, user-friendly interface for hospital staff with minimal training requirements.
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7. Success Criteria

Criterion	Description
System Performance	The system should handle concurrent users efficiently, with fast response times and minimal downtime.
Data Security	Sensitive data must be encrypted, protected by authentication, and compliant with healthcare data regulations (e.g., HIPAA, GDPR).
System Reliability	The system must maintain uptime of at least 99% under normal operating conditions.
Integration Capability	Should integrate smoothly with barcode scanners, hospital management systems, and procurement modules if applicable.

8. Expected Impact

The implementation of a Medical Inventory Management System is expected to bring major improvements in the efficiency, accuracy, and reliability of healthcare inventory operations. By automating and digitizing inventory control processes, the system will help hospitals, clinics, and pharmacies manage medical supplies more effectively

1. Operational Impact

- Improves efficiency by automating stock tracking, reordering, and reporting.
- Reduces human errors in inventory management and documentation.
- Provides real-time visibility of stock levels, expiry dates, and usage trends.
- Ensures timely availability of critical medical supplies and equipment.

2. Financial Impact

- Minimizes losses due to overstocking, stockouts, or expired medicines.
- Optimizes procurement and storage costs through accurate forecasting.
- Improves budget planning and resource allocation for medical supplies.

3. Clinical and Patient Care Impact

- Enhances patient safety by preventing the use of expired or unavailable medicines.
- Supports continuous and uninterrupted healthcare services.
- Reduces treatment delays caused by missing or misplaced items.

4. Administrative and Compliance Impact

- Simplifies audits and compliance with healthcare regulations through accurate records and traceability.
- Strengthens accountability and transparency across departments.
- Provides analytical data for better decision-making and policy development.

4. Strategic and Technological Impact

- Promotes digital transformation in healthcare inventory management.
 - Lays the foundation for integration with hospital management and supply chain systems.
 - Encourages sustainable, paperless, and data-driven operations.
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