



# Hospital Supply Chain Analytics

Optimizing inventory management, financial performance, patient flow, and staff utilization through data-driven insights

## Project Scope

# Comprehensive Healthcare Operations Analysis

This project analyzes hospital supply chain and operations data using Excel, SQL, and Power BI to drive operational efficiency. The analysis covers four critical domains: inventory management, financial performance monitoring, patient flow analysis, and staff utilization evaluation.

The dataset encompasses 500 rows across five interconnected tables: Financial Data tracking expenses, Inventory Data monitoring stock levels, Patient Data capturing admission details, Staff Data recording shift information, and Vendor Data managing supplier relationships.

5

Data Tables

Interconnected datasets

500

Records

Per primary table

3

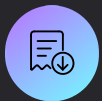
Tools

Excel, SQL, Power BI



# Critical SQL Analysis Findings

Five key queries revealed operational bottlenecks and cost drivers across inventory, expenses, and staffing



## High-Cost Inventory

IV Drip leads at \$19,984 per unit, followed by Gloves at \$19,913. Top 5 items represent significant capital investment requiring careful management.



## Expense Distribution

Supplies dominate at \$4.9M (39.7%), Staffing at \$3.8M (31.1%), and Equipment at \$3.6M (29.2%). Total expenses reach \$12.36M.

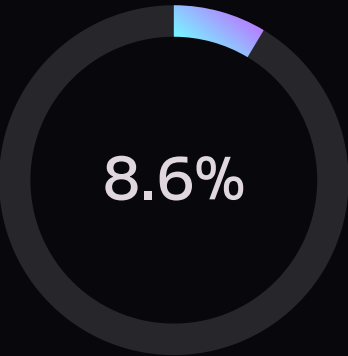


## Stock Gaps

IV Drip shows largest deficit of 654 units, followed by Surgical Masks (570) and X-ray Machines (525). Critical replenishment needed.

# Executive Overview Dashboard

The executive dashboard reveals critical supply chain health metrics. Total inventory value stands at \$12.87B, with 43 items below minimum stock and 186 overstocked items. Supplies category commands the highest expense share at 39.69%, followed by Staffing at 31.08%.



Items at Risk



Below Min Stock



Overstocked

A concerning trend emerged: total inventory peaked in October then suddenly decreased in November, suggesting potential demand fluctuations or supply disruptions. IV Drip, X-ray Machine, and Ventilator represent the top three items by inventory requirement, collectively accounting for \$8.1B in value.

# Inventory Health: Critical Gaps

Detailed inventory analysis reveals 43 items below minimum stock levels, representing 8.60% items at risk

1

## IV Drip Crisis

Multiple IV Drip entries show severe shortages, with the largest gap at -654 units (151 current vs 805 required). This consumable is critically understocked across the facility.

2

## Equipment Deficits

X-ray Machine (525 unit gap) and Ventilator (515 unit gap) face significant shortages. These high-value equipment items require immediate procurement attention.

3

## Consumable Concerns

Surgical Masks show 570 unit shortage. With only 221 units against 791 required, this essential PPE item poses operational risk.

Inventory distribution shows Equipment commanding 56.87% of total value (\$731.6M) versus Consumables at 43.13% (\$555.49M). Current stock by item reveals IV Drip leads at 146K units, followed by Gloves and Ventilators at 130K each.

# Patient Demand & Resource Utilization

●●●●● 500

Total Patients

Patient analysis reveals 500 total admissions with an average length of stay of 7.36 days. Daily patient counts fluctuate between 10 and 22, indicating variable demand patterns requiring flexible resource allocation.

●●●●● 7.36

Avg Days Stay

Primary diagnoses show balanced distribution: Fracture (133 patients), Diabetes (131), Appendicitis (120), and Pneumonia (116). ICU patients average 7.43 bed days versus 7.29 for General Ward, suggesting similar complexity across room types.

●●●●● 87.2%

Bed Utilization

Equipment Usage

MRI Machine, Surgical Table, and X-ray Machine represent primary equipment utilized across patient procedures.

Supply Consumption

Gloves, IV supplies, Gowns, and Masks constitute the most frequently used consumables across all patient types.

# Staff Utilization & Workforce Efficiency

Analysis of 500 staff members reveals critical insights into workload distribution, overtime patterns, and shift coverage



## Overtime Rate

Significant overtime indicating potential understaffing

Staff distribution shows balanced allocation: Nurses (173), Technicians (165), and Surgeons (162). However, average hours worked reveals concerning patterns with Nurses at 9.58 hours, Technicians at 9.55 hours, and Surgeons at 9.51 hours—all exceeding standard 8-hour shifts.



## Patients Per Staff

Average patient load across all staff types

Worked hours by assignment show ER consuming 27.46%, General Ward 38.17%, and ICU Surgery 34.37% of total staff time. Technicians demonstrate the highest overtime at 21.38%, indicating potential staff overload in technical roles.



## Avg Hours Worked

Daily working hours across all shifts

# Shift Coverage Analysis

Detailed examination reveals imbalanced workload distribution across staff types and assignments

- 1

Overloaded Staff

Surgeons handling 9 patients with 1 hour overtime represent overloaded status, requiring immediate workload redistribution.
- 2

Underutilized Resources

Nurses with only 3 patients assigned and 9 hours worked show underutilization, presenting reallocation opportunities.
- 3

Optimal Coverage

Technicians managing 6 patients with 8 hours worked plus 4 overtime hours demonstrate optimal but stretched coverage.

Patient load varies significantly across staff types and shifts. Better staff allocation can reduce the 20.55% overtime rate and associated costs while improving care quality and reducing burnout risk.



# Key Insights & Critical Findings



## Staff Overload Crisis

Technicians show 21.38% overtime rate, indicating severe staff overload. This pattern extends across all staff types with average hours exceeding standard shifts, creating burnout risk and increased operational costs.



## Critical Supply Shortages

43 items below minimum stock levels, with IV Drip showing 654-unit deficit. Inventory shortages identified for critical supplies including Surgical Masks (570 shortage) and Ventilators (515 shortage) pose immediate operational risk.



## Workload Imbalance

Patient load varies significantly across staff types and shifts. Some surgeons handle 9 patients while nurses manage only 3, revealing inefficient resource allocation and opportunity for optimization.



## Expense Concentration

Supplies category dominates expenses at \$4.9M (39.7%), with total operational costs reaching \$12.36M. Better demand forecasting could reduce waste and optimize spending across all categories.

# Strategic Recommendations

Four actionable strategies to optimize hospital operations and reduce costs

1

## Enhance Demand Forecasting

Implement predictive analytics for inventory replenishment to address the 43 items below minimum stock. Focus on high-risk items like IV Drip, Surgical Masks, and Ventilators to prevent stockouts and ensure continuous patient care.

2

## Optimize Staff Scheduling

Rebalance workload distribution to reduce 20.55% overtime rate. Redistribute patient assignments more evenly across staff types, moving from current imbalanced state where some handle 9 patients while others manage only 3.

3

## Implement Real-Time Monitoring

Leverage Power BI dashboards for continuous KPI tracking across inventory health, financial performance, patient flow, and staff utilization. Enable proactive decision-making through automated alerts for critical thresholds.

4

## Reduce Operational Costs

Target overtime reduction to minimize staffing expenses. Better shift scheduling and workload balance can significantly reduce the \$3.8M staffing costs while improving care quality and reducing staff burnout risk.