## Medical Inventory Optimization

### Introduction

Managing medical inventory is a critical aspect of healthcare operations. Efficient inventory management ensures that medical facilities are well-equipped to provide care without interruptions, avoid overstocking, and minimize waste. With vast amounts of data generated daily from inventory usage, procurement, and supply chain activities, effective visualization is essential to derive actionable insights. This project aims to develop dashboards that provide comprehensive insights into medical inventory management, helping to optimize stock levels and streamline operations.

### Overall Design Strategy

The dataset comprises extensive records detailing inventory usage, procurement, and supply chain information across multiple medical facilities over several years. To extract meaningful insights, the data is aggregated and visualized through multiple dashboards. The design involves:

1. **Data Aggregation:** Raw data at the item level is aggregated to different levels, including department and facility levels, to provide various perspectives.
2. **Visualization Techniques:** Color codes are used to highlight critical metrics, such as stockouts and overstock situations. Green indicates optimal stock levels, while red signifies potential issues.
3. **Consistent Formatting:** Fonts and colors are standardized for consistency. Titles and subtitles use Trebuchet MS, numerical axis labels use Cambria Math, and textual axis labels use Calibri.
4. **Interactive Elements:** Dashboards include interactive elements to allow users to drill down into specific data points for more detailed analysis.

### Data Overview

Data is sourced from the internal inventory management systems of medical facilities, which track usage, procurement, and stock levels of medical supplies. The dataset includes:

* **Inventory Usage Records:** Detailed logs of item usage across different departments.
* **Procurement Data:** Information on purchase orders, delivery schedules, and supplier performance.
* **Stock Levels:** Current inventory levels and historical stock data.
* **Supply Chain Information:** Details on the supply chain, including lead times and logistics.

### Users

The primary users of the inventory optimization dashboard are:

* **Inventory Managers:** To monitor stock levels, identify potential shortages, and make informed procurement decisions.
* **Department Heads:** To track inventory usage within their departments and ensure adequate supply for patient care.
* **Supply Chain Managers:** To analyze supplier performance and optimize the supply chain.

### Questions Addressed

The visualization aims to answer several critical questions:

* **Stock Levels:** What are the current stock levels of essential items?
* **Usage Trends:** What are the trends in inventory usage over time?
* **Procurement Efficiency:** How efficient is the procurement process, and are there delays in delivery?
* **Supplier Performance:** Which suppliers are reliable, and which ones frequently cause delays?
* **Overstock and Stockout Analysis:** Are there any items that are consistently overstocked or frequently run out of stock?

### Visualization Description

#### Stock Levels

A bar graph displays the current stock levels of essential items, color-coded to indicate optimal, low, and high stock levels. This visualization helps inventory managers quickly identify items that need attention.

#### Usage Trends

A line graph shows the usage trends of key inventory items over time. The graph helps identify seasonal patterns and usage spikes, enabling better forecasting and inventory planning.

#### Procurement Efficiency

A scatter plot visualizes the efficiency of the procurement process by comparing order dates with delivery dates. This helps identify any delays and their frequency, providing insights into procurement process improvements.

#### Supplier Performance

A bar graph compares the performance of different suppliers based on delivery times and order accuracy. This helps supply chain managers choose the most reliable suppliers and negotiate better terms.

#### Overstock and Stockout Analysis

Two separate graphs show the items that are frequently overstocked or run out of stock. This analysis helps optimize stock levels, reduce waste, and ensure the availability of critical supplies.

### Conclusion

Managing medical inventory efficiently is crucial for the smooth operation of healthcare facilities. With over a million records of inventory data, traditional methods of analysis fall short. Visualization provides a powerful tool to gain quick and actionable insights. By leveraging these dashboards, healthcare facilities can optimize their inventory levels, streamline procurement processes, and ultimately improve patient care.

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