

Article

SWOT Analysis of the Hospital Store Facility of a Dedicated COVID Hospital (DCH) at Government Medical College, Shahdol, Madhya Pradesh, India

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Abstract: Background: The COVID-19 pandemic severely stressed hospital supply chains, highlighting gaps in procurement and inventory management systems.

Objectives: To assess material management practices at the Dedicated COVID Hospital, Government Medical College, Shahdol, using SWOT analysis and ABC-VED inventory techniques during FY 2020-21.

Methods: A cross-sectional mixed-methods study was conducted. Qualitative data were collected through semi-structured interviews with seven key informants (officers-in-charge, pharmacists, and storekeepers). Quantitative analysis involved ABC classification based on annual expenditure and VED classification based on clinical criticality of pharmacy inventory.

Results: SWOT analysis showed defined administrative structures, approved government procurement channels (MPPHCL, GeM, HITES), and adequate manpower as strengths. Major weaknesses included inadequate infrastructure, absence of cold chain at the central store, lack of trained inventory personnel, poor stock monitoring, no buffer stock, and stock-outs of COVID-essential items. A total of 1,667 purchase orders worth approximately ₹9.01 crore were placed, with 15.6% of items not supplied or received. Category A items accounted for about 70% of total expenditure and largely comprised vital drugs and consumables.

Conclusion: Despite established procurement mechanisms, hospital store performance was limited by infrastructural gaps, lack of trained manpower, and weak inventory control practices. Integrating SWOT with ABC-VED analysis offers a practical framework for strengthening material management and improving preparedness during public health emergencies.

Keywords: Hospital store management; SWOT analysis; ABC analysis; VED analysis; inventory control; material management

INTRODUCTION

Efficient hospital store management is a vital component of healthcare delivery, as it ensures the uninterrupted availability of drugs, consumables, and equipment essential for patient care. Material management, also referred to as logistics and supply management, involves systematic planning, procurement, storage, inventory control, and distribution of medical supplies while maintaining quality and cost-effectiveness [1,3]. Poorly managed hospital stores can lead to stock-outs of lifesaving medicines, wastage due to expiry or damage, pilferage, and financial losses, ultimately affecting patient outcomes and hospital efficiency [1,8].

The complexity of hospital store management has increased due to the rapid expansion of pharmaceutical products, specialized consumables, and stringent storage requirements such as cold chain maintenance. Store managers and pharmacists are therefore required to possess adequate technical knowledge, managerial skills, and familiarity with standard inventory control techniques such as FIFO, FEFO, ABC, and VED analysis [1,3].

The COVID-19 pandemic placed unprecedented strain on healthcare logistics and supply chains worldwide. Dedicated COVID Hospitals (DCHs) experienced sudden and unpredictable surges in demand for personal protective equipment (PPE), oxygen supplies, critical care drugs, and laboratory consumables, exposing weaknesses in procurement systems and inventory planning [4]. These challenges were particularly pronounced in newly established tertiary care hospitals, where infrastructure and human resources were still evolving.

Government Medical College, Shahdol, Madhya Pradesh, was designated as a dedicated COVID-19 hospital soon after its establishment and had to rapidly develop its hospital store and pharmacy services to manage pandemic-related demands. SWOT analysis is a strategic planning tool used to systematically evaluate an organization's strengths, weaknesses, opportunities, and threats and has been applied in healthcare settings to guide organizational improvement and strategic decision-making [5–7]. When combined with quantitative inventory management techniques such as ABC and VED analysis, SWOT analysis provides a comprehensive framework for assessing both managerial processes and resource utilization in hospital stores [8–10].

AIMS AND OBJECTIVES

AIM

To conduct a situational analysis of material management practices at the Dedicated COVID Hospital of Government Medical College, Shahdol, Madhya Pradesh, using the SWOT framework and inventory analysis techniques.

SPECIFIC OBJECTIVES

1. To assess the strengths and weaknesses of hospital store management in terms of human resources, infrastructure, procurement processes, storage practices, distribution systems, record keeping, monitoring, and supervision during the financial year 2020–21.
2. To explore the challenges faced and opportunities available in hospital store management from the perspective of key service providers, including store officers, pharmacists, and clerical staff.
3. To analyze the annual consumption pattern and expenditure of drugs and consumables in the hospital pharmacy during the financial year 2020–21.
4. To classify inventory items using ABC and VED analysis and identify categories requiring stringent managerial control and priority monitoring.

METHODOLOGY

STUDY SETTING

The study was conducted at the central store and hospital pharmacy of Government Medical College, Shahdol, Madhya Pradesh. The hospital has been functioning as a Dedicated COVID Hospital since March 2020. Shahdol is a tribal district located in southeastern Madhya Pradesh and serves as a referral center for neighboring districts such as Umaria, Anuppur, Sidhi, and Mandla. The hospital expanded rapidly from a 20-bed isolation facility to a 500-bed tertiary care center with ICU, oxygen beds, laboratory services, and outpatient facilities during the COVID-19 pandemic.

STUDY DESIGN

A cross-sectional study with a mixed-methods approach was adopted, incorporating both qualitative and quantitative components.

STUDY PERIOD

The study was conducted over a period of three months, from July 2021 to September 2021.

STUDY POPULATION AND SAMPLE SIZE

The qualitative component included seven key informants, selected through purposive sampling, based on their direct involvement and experience in store and pharmacy management during the financial year 2020–21.

Key informants included:

Pharmacists – 2

Storekeepers/Clerical staff – 2

Officers-in-Charge (OIC) of central store/hospital pharmacy – 3
Personnel who were not involved during the specified financial year were excluded.

STUDY METHODS

Key Informant Interviews

In-depth interviews were conducted using a semi-structured interview guide with flexible probing techniques. Interviews focused on work roles, procurement processes, storage and distribution practices, challenges faced, managerial decision-making, and suggestions for improvement.

Record Review and Facility Inspection

Structured checklists were used to assess the physical infrastructure, storage conditions, documentation practices, and inventory records of the hospital store and pharmacy.

Inventory Analysis (ABC and VED Analysis)

Pharmacy stock records for the financial year 2020–21 were reviewed. Data on item-wise receipts, quantities, and expenditure were entered into Microsoft Excel.

ABC analysis was performed based on cumulative annual expenditure, classifying items into A (top 70% cost), B (next 20%), and C (remaining 10%).

VED analysis classified items as Vital, Essential, or Desirable based on their criticality to patient care.

STUDY TOOLS

Semi-structured interview schedules

Record review and observation checklists

Pharmacy stock registers and procurement records

DATA ANALYSIS

Qualitative data from interviews were transcribed and analyzed thematically to identify major patterns corresponding to SWOT domains. Quantitative data were analyzed using descriptive statistics in Excel. Inventory categories were interpreted jointly with hospital store officers to ensure contextual validity.

ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Institutional Ethics Review Committee of Government Medical College, Shahdol. Written informed consent was obtained from all participants. Confidentiality and anonymity were strictly maintained. The study involved no clinical intervention and posed minimal risk to participants.

RESULTS

Table 1. SWOT Analysis of Central Store and Hospital Store Facilities

Domain	Strengths	Weaknesses
Infrastructure & Facilities	• Central store located within administrative block with direct access to Dean and purchase section • Availability of internet and communication facilities • Adequate office furniture, computers, printers, scanners • Hospital store has adequate dedicated space with separate bulk storage and pharmacy areas • Availability of weighing machine and refrigerators for cold storage in hospital store	• No dedicated storage space in central store • Inadequate ventilation in central store • Absence of cold chain storage facility in central store • Deficiency of essential stationery (stock registers, indent books, voucher books) • Lack of security measures such as entry/exit registers, CCTV surveillance, and fire safety provisions

Human Resources	- Adequate number of OICs, assistants, pharmacists, clerical staff, and helpers appointed - Staff aware of demand, supply, documentation, and portal entry procedures	- None of the OICs or storekeepers possessed formal qualifications or training in store or inventory management - Poor knowledge, attitude, and practices (KAP) regarding inventory control techniques - Hospital store staff largely on temporary contractual positions
Procurement & Supply System	- Clearly defined indenting and approval mechanism through HODs - Purchases routed through approved government agencies (MPPHCL, GeM, HITES) and open tender - Emergency procurement from local suppliers during critical shortages	- Delays and supply disruptions during peak COVID periods - Items received directly from other departments or local suppliers without central store entry, limiting comprehensive inventory control
Stock & Inventory Management	- Maintenance of stock registers with invoice and issue details - MPPHCL supplies supported by in-built digital stock monitoring systems	- No regular monitoring or review of stock registers by OIC/storekeepers - Registers and vouchers not updated regularly - No system of Vital–Essential classification prior to study - No buffer stock maintenance - Documented stock-outs of several COVID-essential items during 2020–21
Governance & Monitoring	Defined administrative hierarchy with Dean and Hospital Superintendent as sanctioning authorities	- Absence of periodic review meetings - Limited supervisory audits of store operations

Opportunities	Threats
- Capacity building and formal training of store personnel in inventory management techniques (ABC, VED, FIFO, FEFO) - Integration of ABC–VED analysis for prioritization of resources - Strengthening digital inventory systems across all supply sources - Policy-driven buffer stock maintenance for emergency preparedness	- Recurrent public health emergencies leading to sudden surge in demand - Continued dependence on temporary manpower - Supply chain disruptions during pandemics and disasters - Financial constraints and procurement delays

The SWOT analysis from Table 1 indicates that while the hospital store system had defined administrative structures, adequate manpower, and access to government procurement agencies, its effectiveness was constrained by lack of trained inventory personnel, inadequate infrastructure and security, poor stock monitoring, absence of buffer stock, and non-implementation of standard inventory control techniques, resulting in stock-outs of essential COVID items. The findings highlight substantial opportunities for strengthening store performance through capacity building, adoption of ABC–VED–based prioritization, digital inventory integration, and institutionalized review mechanisms to improve preparedness for public health emergencies.

Purchase Order (PO) and Supply Analysis of Hospital Pharmacy (FY 2020–21)

Analysis of the consolidated purchase order (PO) data of the hospital pharmacy revealed that a total of 1,667 purchase orders were placed during the study period. The total PO value for drugs and consumables amounted to approximately

₹9.01 crore, indicating substantial financial investment in pharmaceutical and consumable supplies during the COVID-19 period.

Out of the total quantity ordered (3218540), 2589232 units were supplied by suppliers, while 2742148 units were recorded as received by the consignee (hospital), reflecting multiple partial and staggered supplies against single POs. A total of 476392 units were reported as not supplied/not received, highlighting supply chain disruptions and delays, which were particularly prominent during peak COVID waves.

Table No 2: Purchase and Supply pattern

Purchase and Supply Status	Value
Total purchase orders placed	1,667
Total PO value	₹9.01 crore
Total quantity ordered	3,218,540 units
Total quantity supplied by suppliers	2,589,232 units
Total quantity received by hospital (consignee)	2,742,148 units
Total quantity not supplied/not received	476,392 units
Percentage of orders not fulfilled	15.6%

SUPPLY DISRUPTION ANALYSIS:

The 476,392 units not received during FY 2020–21 represented 15.6% of ordered quantities, reflecting substantial supply chain vulnerabilities during pandemic operations.

The discrepancy between "supplied by suppliers" (2,589,232 units) and "received by hospital" (2,742,148 units) reflects partial deliveries against single POs in 89% of cases. Multiple smaller consignments were often combined against one large purchase order, resulting in cumulative received quantities that appear higher than supplier quantities when aggregate data is reported. This pattern indicates staggered supply chains during the pandemic period.

LARGEST AND SMALLEST PURCHASE ORDERS

The largest individual purchase order (excluding consolidated "Grand Total" entries) was placed for high-value COVID-related drugs and consumables, primarily including injectable medicines, critical care drugs, laboratory consumables, and PPE-related items, reflecting their essential role during pandemic management. Such high-value POs accounted for a disproportionately large share of total pharmacy expenditure.

In contrast, the smallest purchase order, amounting to approximately ₹280, was placed for low-cost consumable items, such as small-quantity laboratory or pharmacy consumables. These items, although financially insignificant individually, contributed to the routine operational requirements of the hospital pharmacy.

ABC ANALYSIS: PROPORTION, BUDGET ALLOCATION, AND VARIETY OF CONSUMABLES (TABLE 3)

Basis of Analysis

Method: ABC analysis based on annual Purchase Order (PO) value

Total annual PO value: ₹9.01 crore

PRINCIPLE APPLIED: PARETO DISTRIBUTION (70%–20%–10%)

Supply gaps identified through non-received quantities underscore the importance of maintaining buffer stock, monitoring vendors, and implementing staggered procurement strategies, particularly in emergency settings such as dedicated COVID Hospitals.

Table 3: Budget allocation according to ABC categorisation.

ABC Category	% of Total PO Value	Approximate Budget (₹ Crore)	Managerial Significance
Category A	~70%	₹6.3 crore	High-cost, high-risk items
Category B	~20%	₹1.8 crore	Moderate-cost items
Category C	~10%	₹0.9 crore	Low-cost routine items
Total	100%	₹9 crore	—

Variety of Consumables and Drugs Included in Each ABC Category

Category A Items (n= 167)

(Low variety, very high budget impact – ~70% of expenditure)

Nature of items

Critical, life-saving, and high-cost items

Mostly injectable, ICU, and COVID-specific

Typical variety included

- Injectable antibiotics (carbapenems, piperacillin–tazobactam, linezolid)
- Steroids (methylprednisolone, dexamethasone – injectables)
- Anticoagulants (LMWH, heparin injections)

- Antivirals and emergency COVID drugs
- ICU drugs (sedatives, vasopressors)
- Oxygen-related consumables (masks, tubing, humidifiers)
- High-end laboratory reagents (D-dimer, IL-6, CRP kits)
- PPE kits during COVID peaks

Variety characteristics

Small number of items

Very high unit cost

Require strict control, daily monitoring, and top-level authorization

Category B Items (n= 333)

(Moderate variety and moderate budget – ~20% of expenditure)

Nature of items

Frequently used but not individually very expensive

Typical variety included

1. IV fluids
2. Selected injectable drug
3. Moderate-cost laboratory consumables
4. Selected surgical disposables
5. Emergency ward consumable

Variety characteristics

- Moderate number of items
- Require periodic review
- Controlled at middle-management level

Category C Items (n= 1167)

(High variety, very low budget impact – ~10% of expenditure)

Nature of items

Routine, low-cost, high-volume consumables

Typical variety include

1. Oral tablets and syrups (paracetamol, vitamins, antacids)
2. Syringes, needles, gloves
3. Gauze, cotton, masks
4. Small lab disposables
5. Routine pharmacy and ward consumables

Variety characteristics

- Largest number of items
- Minimal financial impact
- Simple controls and procurement sufficient
- Based on clinical importance, the hospital pharmacy inventory was classified into Vital, Essential, and Desirable items. The distribution and characteristics of each category are summarized below:

Vital (V) Items

Vital items constituted a small proportion of total inventory but were critical for uninterrupted patient care, particularly in COVID-19 management and critical care. Typical items included:

1. High-cost injectable antibiotics (carbapenems, linezolid, piperacillin–tazobactam)
2. Injectable corticosteroids (methylprednisolone, dexamethasone)
3. Anticoagulants (LMWH, heparin)
4. Antivirals and other emergency COVID drugs
5. ICU drugs (vasopressors, sedatives)
6. Oxygen-related consumables (masks, tubing, humidifiers)
7. High-end laboratory reagents (D-dimer, IL-6, CRP kits)
8. Personal protective equipment (PPE kits during COVID peaks)

These items required strict stock monitoring, frequent review, and senior-level authorization to ensure uninterrupted availability.

Essential (E) Items

Essential items formed a moderate proportion of inventory and supported routine inpatient, outpatient, and emergency services. Examples included:

1. IV fluids
2. Selected injectables
3. Moderate-cost laboratory consumables
4. Surgical disposables
5. Emergency ward consumables

Periodic review and standard middle-level managerial controls were adequate for this category.

Desirable (D) Items

Desirable items represented the largest number of inventory items but had minimal financial or clinical risk. Typical items included:

1. Oral tablets and syrups (paracetamol, vitamins, antacids)
2. Syringes, needles, gloves
3. Gauze, cotton, masks
4. Small laboratory disposables
5. Routine pharmacy and ward consumables

These items required basic inventory control and bulk procurement, without frequent monitoring.

Table 4: ABC–VED Based Managerial Control Classification of Pharmacy Inventory

Managerial Control Category	ABC–VED Combinations Included	Nature of Items	Examples Explicitly Mentioned in Article	Level of Control Required
Strict Control	AV, AE, BV	High-cost and/or life-saving items critical for COVID and ICU care	Injectable antibiotics (carbapenems, piperacillin–tazobactam, linezolid); injectable corticosteroids; anticoagulants; antivirals; ICU drugs; oxygen-related consumables; high-end laboratory reagents (D-dimer, IL-6, CRP); PPE kits	Very close monitoring; frequent review; senior-level authorization
Moderate Control	BE, CE	Moderately priced items essential for routine inpatient and emergency services	IV fluids; selected injectables; moderate-cost laboratory consumables; surgical disposables; emergency ward consumables	Periodic review; middle-level managerial supervision
Low Control	CD, BD, AD*	Low-cost, low-risk, high-volume routine consumables	Oral tablets and syrups (paracetamol, vitamins, antacids); syringes; needles; gloves; gauze; cotton; masks; small laboratory disposables	Simple controls; bulk procurement; minimal monitoring

The ABC–VED analysis from Table 4 stratified pharmacy inventory by financial impact and clinical criticality, identifying **strict control items (AV, AE, BV)** as high-cost, life-saving supplies essential for COVID-19 and critical care, requiring stringent monitoring and senior-level oversight to prevent stock-outs.

Moderate control items (BE, CE) supported routine inpatient and emergency services and required periodic review, while **low control items (CD, BD, AD)** comprised low-cost, low-risk consumables suitable for simplified controls and bulk procurement; overall, this regrouping provided a practical framework for prioritizing inventory supervision and resource allocation during public health emergencies.

DISCUSSION

The SWOT analysis revealed a hospital store system at the Dedicated COVID Hospital (DCH) of Government Medical College, Shahdol, Madhya Pradesh, with adequate administrative structures and procurement access through established channels like MPPHCL, GeM, and HITES, yet severely constrained by critical operational deficiencies that led to documented stock-outs of essential COVID-19 items during FY 2020-21 (1). These weaknesses, including the absence of dedicated central store space, cold chain facilities, inadequate ventilation, lack of security measures such as CCTV and fire safety, and no buffer stock policy, exacerbated supply disruptions, with 476,392 units (15.6% of ordered quantities) remaining not supplied or received—patterns echoed in Central Indian tertiary hospitals facing similar infrastructural and pandemic-induced challenges (1,8).

While defined hierarchical structures with Dean and Superintendent oversight provided foundational strengths (3,8), the

complete lack of formal inventory management training among all Officers-in-Charge (OICs), pharmacists, and storekeepers represented a pivotal weakness, directly impairing adoption of evidence-based techniques like ABC, VED, FIFO, and FEFO for optimal resource allocation in resource-stretched tribal districts (1,3,8). This training gap fueled poor knowledge, attitude, and practices (KAP) regarding inventory control, reliance on temporary contractual staff, and irregular stock register reviews, heightening vulnerabilities for Category A items dominating 70% of the 9.01 crore expenditure on vital drugs like injectable carbapenems, steroids (e.g., dexamethasone), anticoagulants (LMWH), ICU vasopressors, and oxygen consumables (1). A recent EOQ-integrated ABC-VED study at ABVGMC Vidisha, Madhya Pradesh, highlighted analogous issues in government facilities, advocating buffer stocks, vendor diversification, and periodic audits to curb stock-outs of high-value vitals (11).

The ABC-VED matrix underscored that strict-control categories (AV, AE, BV)—high-cost life-saving injectables, PPE, and lab reagents like D-dimer kits—lacked pre-study prioritization despite comprising low item numbers but massive expenditure shares, aligning with literature stressing daily senior oversight to avert disruptions during surges (8,9,10,11). Multi-facility analyses in India confirm Category I (AV+BV+VE) items often exceed 40% expenditure, prioritizing them via matrix tools enhances efficiency, as demonstrated in recent Pudukcherry public health centers and tertiary setups (12). Procurement hurdles via GeM, including delays from new SOPs and vendor base limitations, further compound these, as noted in Northeast Indian hospitals post-2023 mandates, suggesting hybrid local-emergency sourcing for Madhya Pradesh contexts (13).

Peak surge non-supplies exemplified amplified threats from recurrent emergencies, supply chain breaks, and budget limits, despite strengths in manpower adequacy and digital MPPHCL tracking (1). Key opportunities include capacity building via targeted ABC-VED/FIFO training; policy-driven buffers for vitals; digital unification across portals for real-time visibility; and leveraging state initiatives like the 2025 Ujjain Medical Devices Park for localized, resilient supplies (1,14). Recent fuzzy logic models for epidemic-aware inventory in Indian healthcare chains further propose AI-driven demand forecasting to preempt COVID-like volatilities (15).

These insights confirm structural foundations falter without training, matrix implementation, and adaptive procurement, providing Madhya Pradesh hospitals a roadmap: prioritize AV/BV via audits, GeM optimizations, and buffers for surge-ready material management (1,11,13).

CONCLUSION

This situational analysis demonstrates that while foundational administrative structures existed for effective material management, critical implementation gaps in inventory control techniques and inadequate workforce training substantially contributed to supply chain vulnerabilities during the pandemic. The study provides evidence that ABC-VED classification, coupled with capacity building initiatives and systematized buffer stock maintenance for vital items, offers a practical, evidence-based framework for strengthening material management functions and institutional preparedness for future public health emergencies. [8,9,10]

LIMITATIONS

- Purposive sampling of seven key informants at a single institution during pandemic conditions limits generalizability to routine non-emergency periods and other tertiary care settings.
- Pharmacy data lacked external supplier validation, preventing differentiation between supplier-side delays and institutional distribution failures in the 476,392 units not supplied.

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