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Qualitative Article

# Evaluation of Supply Chain Distribution of Consumable Medical Materials at PMI Central UDD 2023

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## Abstract

**Background:** The distribution of Disposable Medical Equipment (BMHP) is vital to ensuring the availability and quality of supplies. However, challenges such as stock shortages, expired products, inappropriate orders, and delivery delays persist, hampering effective distribution.

**Objective:** This study aims to evaluate the implementation of BMHP supply chain distribution at the PMI Central Blood Donor Unit (UDD), identifying its challenges, supporting and inhibiting factors, and efforts to improve the process.

**Design and Methodology:** A descriptive qualitative design was employed, with data collected through observations, in-depth interviews, and document analysis. Six informants were selected using purposive sampling based on their roles and involvement in BMHP distribution at the PMI Central UDD. Data validity was ensured through triangulation methods.

**Findings:** The study revealed several issues, including untrained personnel, misaligned Standard Operating Procedures (SOPs), inadequate stock levels, and poorly designed warehouse facilities located near staff toilets. Despite clear SOPs and technology integration through the Logistics SIM, the implementation remains suboptimal. Contributing factors include inconsistent adherence to SOPs, limited access to training, and poor warehouse management.

**Conclusion and Implications:** The BMHP distribution at PMI Central UDD is functional but requires significant improvements. Addressing these issues entails conducting specialized training, revising and enforcing SOPs, reorganizing warehouse layouts, and ensuring exclusive access to logistics areas. These actions are critical for enhancing the availability and timely distribution of medical supplies, ultimately supporting better healthcare service delivery.

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## Introduction

The distribution of Consumable Medical Materials (BMHP) is a critical component in ensuring effective healthcare service delivery. BMHP is essential for supporting medical operations, maintaining patient safety, and preventing disruptions in service provision. However, significant challenges persist in

the BMHP supply chain, including stock shortages, expired products, mismanagement of inventory, and inefficient distribution systems (Negari, 2022; Burhan et al., 2018). These issues not only compromise the availability and quality of medical materials but also threaten the sustainability of healthcare systems, particularly in resource-constrained environments. Addressing these challenges is essential to strengthening health systems and ensuring resilience in the face of emergencies and routine demands.

Research on BMHP distribution has largely focused on hospital and community health settings, leaving gaps in understanding centralized logistics operations such as those managed by the Indonesian Red Cross (PMI). The PMI Central Blood Donor Unit (UDD) plays a pivotal role in supplying BMHP to regional Blood Donor Units and Blood Banks. However, inefficiencies in distribution processes, inadequate storage facilities, and misaligned Standard Operating Procedures (SOPs) hinder optimal performance (Aditya et al., 2019; Rusdiana et al., 2015). These challenges highlight a need for tailored strategies to enhance the resilience and sustainability of healthcare logistics.

This study aims to evaluate the implementation of BMHP distribution at PMI Central UDD, focusing on identifying challenges, supporting factors, and opportunities for improvement. By addressing these gaps, the study contributes to building resilient and sustainable healthcare systems, ensuring the availability and reliability of critical medical materials in Indonesia.

## Methods

### Design

This study utilized a descriptive qualitative design to evaluate the implementation of Consumable Medical Materials (BMHP) distribution at the PMI Central Blood Donor Unit (UDD). The qualitative approach allowed for an in-depth exploration of distribution processes, challenges, and factors influencing the effectiveness of BMHP distribution.

### Setting

The research was conducted at the PMI Central UDD in Jakarta, Indonesia, from August 2023 to December 2023. This setting was selected due to its pivotal role in managing the logistics and supply chain of BMHP for regional Blood Donor Units and Blood Banks throughout Indonesia. The PMI Central UDD represents a centralized operation, making it a key site for understanding the complexities of BMHP distribution.

### Sampling Procedures

Participants were selected using a purposive sampling method, focusing on individuals directly involved in BMHP distribution processes. The inclusion criteria required participants to have at least one year of experience in logistics or related roles and to provide informed consent. Participants unavailable during the study period or with less than six months of experience were excluded. This approach ensured the selection of participants with relevant expertise to provide valuable insights into the distribution process.

### Participants

The study involved six participants, including the Head of Logistics, logistics staff, and personnel from the General Subdivision at the PMI Central UDD. These individuals were selected based on their roles in planning, execution, and monitoring of BMHP distribution, ensuring a comprehensive understanding of the logistics processes.

### Interview Questions and Tools

Data were collected through semi-structured interviews, complemented by observations and document studies. The interview questions explored participants' experiences with BMHP distribution, adherence to Standard Operating Procedures (SOPs), challenges faced in the logistics process, and suggestions for improvement. Observations were conducted to assess warehouse conditions, while document studies examined distribution records and relevant SOPs.

### Data Analysis

Thematic analysis was used to analyze the data, involving the transcription of interviews, coding, and categorization of themes. Recurring patterns related to the challenges, supporting factors, and opportunities for improvement were identified and interpreted. Observations and document studies enriched the findings by providing contextual evidence to support the analysis.

### Data Rigor

Data rigor was ensured through multiple triangulation methods, including theoretical, source, method, and time triangulation. Peer debriefing was conducted to confirm the accuracy and reliability of findings, while member-checking was used to validate participants' responses. A detailed audit trail documented all steps of the research process, enhancing credibility and trustworthiness.

### Ethical Consideration

Ethical approval for this study was obtained from the Ethics Committee of Universitas Pembangunan Nasional Veteran Jakarta (Certificate Number: 433/XI/2023/KEP). Informed consent was obtained from all participants before data collection. Confidentiality and anonymity were maintained throughout the study to protect the identity of participants, and all research activities adhered to ethical guidelines for qualitative research.

## Results

This section presents the findings of the study, beginning with a description of the demographic characteristics of the participants, followed by a thematic analysis of the data. The findings are organized according to the research questions and supported by themes, subthemes, and codes derived from the data. Tables and figures are included to enhance clarity and illustrate key points.

**Demographic Information**

The study involved six participants, including the Head of Logistics, logistics staff, and General Subdivision personnel from the PMI Central Blood Donor Unit (UDD). All participants had at least one year of experience in logistics operations, with an average tenure of three years. The demographic characteristics are summarized in Table 1.

**Table 1.** Demographic Characteristics of Participants

| Participant ID | Role | Years of Experience | Training Completed |
|---|---|---|---|
| **P1** | Head of Logistics | 5 | Risk Management, TOT |
| **P2** | Logistics Staff | 3 | Risk Management |
| **P3** | Logistics Staff | 2 | General Operations Training |
| **P4** | General Subdivision | 1 | None |
| **P5** | Logistics Staff | 4 | Trainer of Trainers (TOT) |
| **P6** | Logistics Staff | 3 | Basic Logistics Training |

**Research Findings**

Thematic analysis identified two main themes and several subthemes that address the research questions on challenges, supporting factors, and opportunities for improving BMHP distribution.

**Theme 1: Operational Challenges in BMHP Distribution**

The implementation of BMHP distribution at PMI Central UDD faces several operational challenges that hinder its effectiveness.

Subtheme 1.1: Inadequate Training

Participants consistently highlighted the absence of specialized training tailored to BMHP distribution. One participant expressed,

*"We only receive general training, which doesn't prepare us to handle the specific demands of medical supplies logistics."*

This lack of targeted capacity-building has led to inconsistent adherence to Standard Operating Procedures (SOPs), particularly in handling and storage processes. For instance, one logistics officer admitted to frequently bypassing SOP guidelines during high-pressure situations, further compounding inefficiencies and errors in the distribution chain. The need for training on specific topics such as inventory forecasting, regulatory compliance, and risk management was emphasized as crucial for improving overall system performance.

Subtheme 1.2: Suboptimal Warehouse Facilities

The warehouse infrastructure poses significant challenges to effective BMHP storage. Observations revealed that the facility is located adjacent to staff toilets and serves as a passageway for non-logistics

personnel, compromising the sterility of the storage area. Increased humidity due to these conditions raises the risk of material degradation. As noted by a participant,

*"The warehouse design is not suitable for storing medical supplies; the environment doesn't align with the required sterile standards."*

These deficiencies not only jeopardize the quality of stored materials but also violate the minimum requirements for healthcare warehouses, as stipulated by regulations.

Subtheme 1.3: Stock Shortages and Expired Products

The study found recurring issues of stock shortages and expired products, with 94 out of 280 BMHP items frequently unavailable. Critical supplies such as blood bags were reported to have expired, leading to delays in fulfilling user requests. These issues stemmed from supplier delays, insufficient forecasting, and inadequate monitoring of inventory turnover. One logistics officer stated,

*"We often struggle to anticipate demand, which results in either overstocking or critical shortages."*
This inefficiency reflects gaps in integrating demand forecasting into the supply chain process and the lack of real-time monitoring tools.

**Theme 2: Supporting Factors for BMHP Distribution**

Despite the challenges, certain supporting factors have contributed to maintaining the functionality of BMHP distribution processes at PMI Central UDD.

Subtheme 2.1: Integration of Logistics SIM

The Logistics SIM system has significantly improved the accuracy of inventory tracking and data recording. Participants acknowledged its role in reducing manual errors and streamlining stock management. One participant explained,

*"The system allows us to monitor stock movements in real-time, ensuring accountability and transparency in the distribution process."*

The integration of this technology has also facilitated periodic reporting and compliance with inventory protocols, enabling the logistics team to identify and address discrepancies more effectively.

Subtheme 2.2: Commitment to Adherence to Standards

Despite infrastructural and procedural limitations, logistics officers demonstrated a strong commitment to maintaining best practices in stock management. The consistent application of FIFO (First In, First Out) and FEFO (First Expired, First Out) methods was observed to mitigate the risks of product expiration and accumulation of outdated supplies. As noted by one participant,

*"We always prioritize issuing older stocks first to ensure optimal use and minimize wastage."*

This practice reflects a proactive approach to addressing challenges within their control.

**Table 2: Challenges in BMHP Distribution and Proposed Solutions**

| Challenge | Detailed Explanation | Proposed Solution |
|---|---|---|
| Inadequate Training | Lack of specialized training results in inconsistent SOP adherence, errors in handling, and inefficient workflows. | Conduct specialized training tailored to BMHP logistics, including topics on forecasting, regulatory compliance, and risk management. |
| Suboptimal Warehouse Facilities | Warehouse conditions, including proximity to staff toilets and non-exclusive access, compromise sterility and material safety. | Redesign warehouse layout to ensure sterility, relocate facility if necessary, and implement controlled access to logistics areas. |
| Stock Shortages | Frequent stock-outs due to poor forecasting and supplier delays lead to unavailability of critical supplies. | Implement real-time inventory monitoring systems, improve demand forecasting accuracy, and establish stronger supplier relationships to ensure timely delivery. |
| Expired Products | Inefficient stock management leads to expired supplies, causing wastage and delayed service delivery. | Strengthen adherence to FIFO and FEFO methods, conduct regular audits, and integrate expiration tracking into the Logistics SIM system for proactive management. |

**Theme 3: Recommendations for Improvement**

Participants provided valuable suggestions for addressing the identified challenges and improving BMHP distribution processes.

Subtheme 3.1: Enhanced Training Programs

The need for specialized training was a recurring recommendation. Participants suggested designing targeted training modules covering inventory forecasting, warehouse management, regulatory compliance, and emergency logistics. As emphasized by a participant,

*"Training tailored to our specific needs will empower us to work more efficiently and reduce errors."*

Collaborations with external experts or institutions specializing in healthcare logistics were also proposed to enrich the training experience.

Subtheme 3.2: Warehouse Redesign

Reorganizing the warehouse layout was highlighted as a critical step to improve BMHP storage conditions. Participants recommended relocating the facility away from high-humidity zones and creating exclusive access for logistics personnel to maintain sterility. One participant suggested,

*"A dedicated and secure warehouse area is essential to ensure compliance with health regulations and protect the integrity of medical supplies."*

Implementing climate-controlled storage solutions and pest management systems were additional recommendations to enhance the warehouse's functionality.

## Discussion

The findings of this study revealed significant challenges in the implementation of BMHP distribution at the PMI Central Blood Donor Unit (UDD), including inadequate training, suboptimal warehouse facilities, and recurring stock shortages. These issues resonate with prior research, which emphasizes the critical role of capacity-building and infrastructure in effective supply chain management (Negari, 2022; Burhan et al., 2018). The lack of specialized training in BMHP distribution led to inconsistent adherence to Standard Operating Procedures (SOPs), a finding supported by Rusdiana et al. (2015), who noted that skill gaps are a major barrier to logistical efficiency. Additionally, the warehouse's proximity to non-sterile areas compromises the quality of medical supplies, aligning with regulatory concerns outlined in Permenkes No. 14 of 2021.

On a positive note, the integration of Logistics SIM and adherence to FIFO and FEFO methods demonstrated the system's potential for mitigating risks associated with inventory mismanagement. This aligns with research highlighting the value of technology and best practices in optimizing healthcare logistics (Miller et al., 2021). However, the study underscores the need for more proactive measures, such as enhanced forecasting techniques and stronger supplier relationships, to address stock shortages and expired products effectively.

This study is limited by its focus on a single organization, the PMI Central UDD, which may reduce the generalizability of the findings to other healthcare settings. Additionally, the qualitative approach provides in-depth insights but may lack the quantitative metrics required for broader policy recommendations. Future studies could include a mixed-methods approach and a larger sample size to provide a more comprehensive understanding of BMHP distribution challenges across different contexts.

The results of this study contribute to the body of knowledge on healthcare logistics and behavioral practices in organizational management. From a theoretical perspective, the findings reinforce the importance of aligning human resource capacity with logistical demands, emphasizing the behavioral implications of training and adherence to operational standards. Future research could explore the psychological aspects of training efficacy, focusing on how tailored educational interventions influence compliance and performance in logistics personnel.

From a practical perspective, this study highlights actionable strategies for policymakers and healthcare organizations. Enhancing training programs, redesigning warehouse facilities, and integrating advanced forecasting methods are critical for achieving resilient and sustainable healthcare supply chains.

Policymakers should prioritize investments in logistics infrastructure and workforce development to ensure compliance with regulatory standards and improve service delivery. These recommendations align with broader goals of strengthening health systems to support universal health coverage and pandemic preparedness.

## Conclusion

In conclusion, the implementation of BMHP distribution at the PMI Central UDD demonstrates both strengths and areas for improvement. While the integration of technology and adherence to standard practices show promise, challenges related to training, infrastructure, and inventory management highlight critical gaps that need to be addressed. By adopting the recommendations outlined in this study, PMI Central UDD can enhance its logistics processes, ensuring the availability, quality, and safety of BMHP. These findings contribute to the development of resilient and sustainable health systems, with implications for improving logistics management in similar healthcare settings globally.

**Authors' Contributions**

Conceptualization, H.P.F. and R.W.; methodology, H.P.F.; software, H.P.F.; validation, H.P.F., R.W., and A.H.I.; formal analysis, H.P.F.; investigation, H.P.F.; writing—original draft preparation, H.P.F.; writing—review and editing, H.P.F., R.W., A.H.I., and E.K.; visualization, H.P.F.; supervision, J.M.; project administration, H.P.F.; funding acquisition, J.M. All authors have read and agreed to the published version of the manuscript.

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**Conflicts of Interest:**

The authors declare no conflicts of interest.

**Ethical Approval Statement:**

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Universitas Pembangunan Nasional Veteran Jakarta (protocol code 433/XI/2023/KEP, approved on November 2023).

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