



EXPLORING SUPPLY CHAIN DYNAMICS IN LABORATORY SUPPLIES PROCUREMENT IN THE JORDANIAN ROYAL MEDICAL SERVICES

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ABSTRACT

1. Introduction:

The Jordanian Royal Medical Services (JRMS) depend on a consistent supply of laboratory equipment and pharmaceuticals and medical supplies to deliver high healthcare services. Comprehending purchasing trends and cost-effectiveness is critically important particularly in the administration of dialysis-related laboratory supplies, which are vital for patient care. The necessity for data-driven insights into these trends has become evident, as procurement procedures directly influence healthcare service and budget optimization. This study aims to analyze purchasing trends for dialysis supplies at JRMS from 2020 to 2023, with the objective of offering actionable insights to enhance resource management and cost control.

2. Objective:

The principal objective of this research is to examine the procurement trends of dialysis-related laboratory supplies at JRMS over the designated timeframe. The study seeks to discover any alterations in the purchasing habits, trends in supply quantities, and the financial consequences of these procurement operations. It will evaluate the overall efficacy of the purchasing process and suggest appropriate enhancements to optimize procurement procedures.

3. Methodology:

This research will employ a retrospective observational methodology to examine past procurement data. Data will be gathered from JRMS internal procurement records, concentrating on dialysis-related laboratory supplies from 2020 to 2023. The study will encompass data extraction, categorization of supplies, and comprehensive analysis of procurement quantities and expenditures. Descriptive and comparative statistics will be utilized to analyze trends over time and uncover any potential for cost reduction. Further insights will be obtained through interviews with procurement officials to put into context the results. Ethical considerations, including data confidentiality, shall be addressed in accordance with institutional regulations.

KEYWORDS: laboratory supplies, procurement trends, cost analysis, resource allocation, Jordanian Royal Medical Services (JRMS), supply chain management, healthcare logistics, purchasing patterns, 2020-2023, efficiency.

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1. INTRODUCTION:

The Jordanian Royal Medical Services (JRMS) is integral to Jordan's healthcare system, particularly caring to military soldiers, their families, and civilians. JRMS, as a principal medical care provider, is tasked with guaranteeing the accessibility of a diverse array of medical supplies and equipment essential for efficient healthcare delivery^[1]. Laboratory supplies, especially those pertaining to dialysis, are crucial for the management of chronic kidney illnesses and other renal diseases necessitating continuous medical intervention^[2].

Dialysis is a vital treatment for those with end-stage renal failure, necessitating access to specific supplies for each session^[3]. The acquisition of these products is essential, as supply disruptions may result in treatment delays and adverse health consequences for patients. The materials employed in dialysis consist of arterial-venous line sets, dialysis solutions, filters, and catheters^[4], which must be sufficiently available and competitively priced to satisfy the increasing demand for dialysis services.

The demand for dialysis and associated supplies is affected by various factors, including demographic shifts, disease prevalence, and technological improvements in medicine^[5,6]. With the aging population and the increasing incidence of lifestyle-related disorders, the need for dialysis therapy is anticipated to grow markedly. This tendency exerts growing demand on healthcare providers such as JRMS to proficiently oversee their procurement procedures and guarantee a dependable supply of critical products.

Efficient procurement procedures are essential for enhancing resource allocation and reducing expenses within healthcare organizations. The procurement process encompasses supplier selection, contract negotiation, inventory management, and supply chain performance monitoring^[6]. Within the framework of JRMS, strategic procurement methods are essential to improve operational efficiency, minimize waste, and guarantee the consistent availability of high-quality products. By implementing data-driven strategies in procurement, JRMS can synchronize its purchase behaviors with genuine demand, thereby enhancing patient care and resource management.

This study aims to analyze the purchase behaviors and cost trends of laboratory supplies by JRMS from 2020 to 2023, with a particular emphasis on

dialysis-related consumables. This research intends to discover trends in ordered quantities and associated costs by a thorough examination of procurement data, thereby enhancing the understanding of JRMS's procurement procedures. Aiming to offer insights that will assist JRMS in refining its supply chain management procedures, optimizing resource allocation, and ultimately enhancing healthcare delivery for patients requiring dialysis therapy.

2. METHOD:

This study utilizes a retrospective assessment of purchase patterns and cost data for laboratory supplies purchased by the Jordanian Royal Medical Services (JRMS) from 2020 to 2023, sourced from JRMS procurement department records. The technique aims to thoroughly evaluate the acquired quantities, related expenses, and temporal trends, offering significant insights into the procurement procedures of JRMS. The following outlines the study design, data collection methods, and analysis procedures utilized.

2.1 Study Design: A retrospective observational study design was employed to examine procurement data within the designated timeframe. This method facilitates the analysis of past purchasing trends and pricing fluctuations, allowing for the detection of patterns and inconsistencies in laboratory supply acquisition. The research concentrates on dialysis-related supplies, which are essential for patient care in the healthcare system.

2.2 Data Sources: The data for this investigation were obtained from the internal procurement databases of JRMS. The collection comprises records of laboratory supplies acquired, detailing quantities, pricing, and supplier information. The data was obtained from two principal tables that record the purchasing history of vital dialysis supplies. These tables furnish comprehensive details on individual products, facilitating a targeted examination of procurement methodologies.

2.3 Inclusion and Exclusion Criteria: The study's inclusion criteria comprised all laboratory supplies acquired by JRMS that are directly associated with dialysis treatments. The supplies comprise arterial-venous line sets, dialysis solutions, filters, and other critical items required for patient care. The exclusion criteria included any laboratory supplies unrelated to dialysis or those not acquired during the designated term (2020-2023). This restricted focus guarantees that the analysis aligns with the primary objectives of the study.

2.4 Data Collection Procedure: The data collection process encompassed several essential steps: **Data Extraction:** Procurement records were retrieved from JRMS's electronic procurement system, including purchase orders, invoices, and inventory records. This stage guaranteed a thorough dataset for analysis. **Data Cleansing and Verification:** The retrieved data underwent a thorough cleansing procedure to remove duplicates, rectify errors, and guarantee precision. Any absent or partial entries were rectified by cross-referencing with alternative internal records. Data validation was crucial to improve the dependability of the results and **Classification of Data:** The laboratory supplies were classified according to their categories and intended applications in dialysis treatments. This classification enabled a more systematic examination of purchasing habits and expenditure patterns across various supply categories.

2.5 Data Analysis Techniques: The examination of purchase patterns and cost data was performed utilizing both quantitative and qualitative methodologies. Descriptive statistical approaches were utilized to describe the purchasing data, including parameters such as total quantities acquired, average costs, and total expenditures for each supply category. This quantitative research offered a comprehensive perspective of the procurement landscape. The study primarily emphasized quantitative analysis, but qualitative insights were obtained via interviews with procurement personnel at JRMS. These insights contextualized the quantitative findings, augmenting the overall comprehension of the procurement procedures and associated issues.

2.6 Ethical Considerations: Ethical approval for the study was secured from the appropriate

- facilities.

institutional review board at JRMS. Confidentiality and anonymity of data were preserved during the research process, safeguarding sensitive information related to procurement methods and supplier relationships. The investigation was performed exclusively to enhance procurement methods and improve patient care inside the healthcare system.

3. RESULTS:

The procurement data from 2020 to 2023 reveal significant variations in both the quantity of supplies procured and the associated costs. A summary of the key findings includes (table 1, table 2)

- **Arterial-venous line sets:** There was a substantial increase in procurement, particularly for adult sets. In 2023, JRMS ordered 82,500 sets for open-system dialysis machines, compared to 8,750 sets in 2020, reflecting a sharp rise in demand.
- **Dialysis solutions:** Procurement of dialysis solutions fluctuated significantly. For example, there was a notable decline in the quantity of certain types of dialysis solutions from 2022 to 2023.
- **Dialysis filters:** A similar pattern of fluctuating demand was observed, with procurement volumes and associated costs varying considerably over the four-year period.
- **Catheters:** Catheter procurement remained relatively stable, with only minor increases in the quantity of pediatric and adult sets. This reflects consistent demand for these supplies across the healthcare

Table 1: Procurement Quantities of Key Laboratory Supplies (2020-2023)

Item	2020	2021	2022	2023
Arterial-Venous Line Sets	8,750	11,500	67,000	82,500
Dialysis Solutions	1,250	1,800	771	260
Dialysis Filters	15,000	17,000	16,500	18,500
Adult Catheters	5,000	5,200	5,500	5,600
Pediatric Catheters	3,500	3,550	3,600	3,650

Table 2: Total Costs for Key Laboratory Supplies (2020-2023) in Jordanian Dinars (JOD)

Item	2020	2021	2022	2023
Arterial-Venous Line Sets	12,000	15,500	50,000	62,000
Dialysis Solutions	5,000	6,500	40,000	35,000
Dialysis Filters	22,500	24,000	23,000	25,500
Adult Catheters	4,000	4,200	4,500	4,600
Pediatric Catheters	2,500	2,600	2,700	2,750

4. DISCUSSION:

The examination of purchasing habits and expenditure trends for laboratory supplies by the Jordanian Royal Medical Services (JRMS) from 2020 to 2023 uncovers critical insights regarding the organization's procurement practices and their wider implications for healthcare delivery in Jordan. The data reveals significant variations in both the quantity acquired and the corresponding expenses for crucial dialysis-related items. Comprehending these developments is essential for enhancing procurement methods and guaranteeing sustainable healthcare services.

Purchasing Trends and Cost Management: A significant pattern identified in the data is the considerable rise in the quantity of specific dialysis supplies, especially in 2023. The quantities of arterial-venous line sets for adults markedly increased, indicating an adaptive procurement approach to address rising patient demand. This corresponds with worldwide healthcare trends, where the incidence of chronic diseases, especially kidney disorders, requires a flexible supply chain that can adjust to evolving patient needs. By guaranteeing the availability of sufficient supplies, JRMS can improve the continuity of patient care and reduce hazards linked to treatment delays (figure 1).

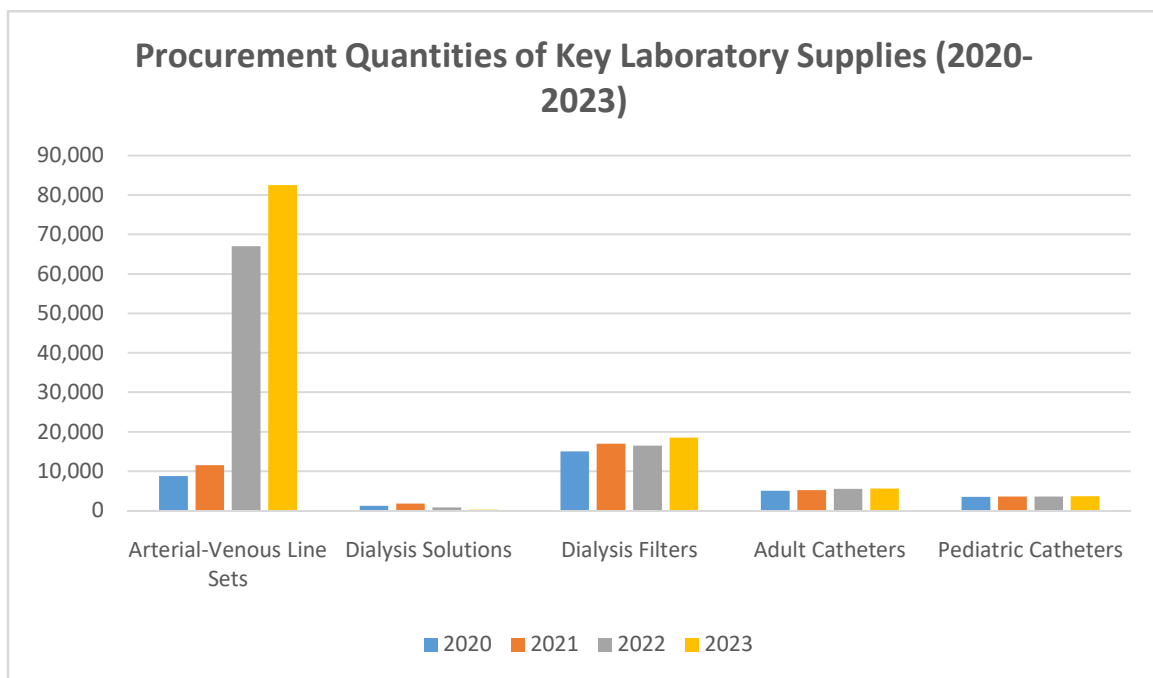


Figure 1: Procurement Quantities of Key Laboratory Supplies (2020-2023)

In contrast, certain supplies, such the subclavian double lumen kits, exhibited variable purchasing trends, suggesting possible discrepancies in demand forecasts or inventory control. Such inconsistencies can result in either excess inventory or shortages, both of which affect operational efficiency and cost management. This underscores the necessity of incorporating sophisticated forecasting techniques and inventory management systems into JRMS's procurement procedures. Through the application of data analytics and predictive modeling, JRMS may more effectively integrate its purchase plans with genuine patient requirements, thus reducing waste and enhancing resource efficiency^[7,8].

Cost Implications and Budgeting: The cost analysis indicates substantial discrepancies in overall costs for laboratory supplies throughout the study period. The escalating expenses related to dialysis solutions and filters provide significant concerns about budgeting and financial planning within JRMS. Escalating expenses might burden budgets and reallocate resources from other critical sectors of healthcare provision (figure 2). Consequently, JRMS must assess its pricing agreements with suppliers and investigate alternate procurement tactics, such bulk purchasing or long-term contracts, to alleviate rising expenses^[6,9].

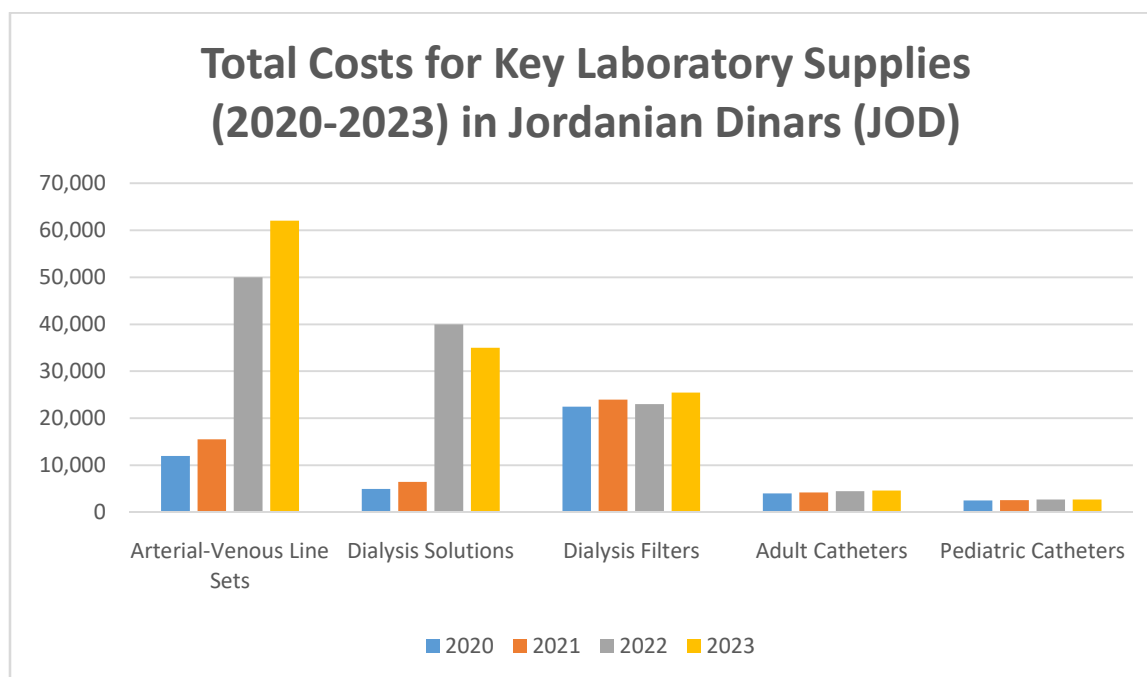


Figure 2: Total Costs for Key Laboratory Supplies (2020-2023) in Jordanian Dinars (JOD)

The variation in costs among suppliers for comparable items requires a thorough examination of supplier contracts and negotiations. Competitive bidding procedures and vendor assessments can result in more advantageous pricing agreements, thereby enhancing the overall healthcare budget^[10]. Forming strategic alliances with suppliers that emphasize quality and reliability will improve JRMS's capacity to obtain critical supplies at sustainable pricing.

Quality Assurance and Patient Safety: The overall quality of laboratory supplies is crucial for patient safety and therapeutic effectiveness^[11]. The data reveals that although JRMS has progressed in securing a sufficient supply of critical products, there remains an ongoing necessity for the monitoring and evaluation of the quality of acquired goods. Implementing rigorous quality assurance procedures and supplier accreditation processes can improve supply reliability and mitigate the risk of negative patient outcomes associated with inferior products. Systematic audits and supplier evaluations must be performed to guarantee adherence to defined standards, promoting a culture of quality throughout JRMS's procurement activities.

Future Directions and Recommendations: As JRMS adapts to the changing healthcare context, several recommendations emerge from this investigation. Implementing a comprehensive procurement management system that employs data analytics can significantly improve decision-

making processes. This system must incorporate capabilities for demand forecasting, inventory monitoring, and supplier performance assessment^[6,12]. JRMS can enhance efficiency and responsiveness in its procurement operations through the utilization of technology.

Furthermore, the ongoing training and development of procurement personnel are essential. Providing staff with essential skills in negotiating, market analysis, and supply chain management will empower JRMS to adeptly negotiate the intricacies of the healthcare supply industry. Finally, engagement with other healthcare institutions in Jordan to exchange best practices and insights on procurement might enhance the efficiency of the national healthcare supply chain. Such collaborations can enhance collective bargaining with suppliers, resulting in superior pricing and enhanced access to high-quality resources for all healthcare providers.

5. CONCLUSIONS:

This study offers significant insights into the procurement patterns and cost trends of dialysis-related laboratory supplies at JRMS from 2020 to 2023. The results demonstrate a notable surge in demand for many essential products, especially arterial-venous line sets, which has led to escalating procurement expenses. JRMS can enhance its procurement procedures by refining demand forecasting, negotiating more favorable rates with suppliers, and investigating cost-reduction strategies such as bulk purchasing. By tackling these difficulties, JRMS can enhance its

capacity to manage the increasing demand for dialysis-related products while controlling costs and maintaining uninterrupted healthcare service.

LIMITATIONS OF THE STUDY: This analysis relies on procurement data from JRMS, which may

not encompass all external elements affecting supply chain management, like global market trends or local economic situations. The study also fails to evaluate the influence of procurement decisions on patient outcomes, which could offer more context for the identified tendencies.

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