



RETROSPECTIVE EVALUATION OF IV SOLUTION PURCHASES IN JRMS: TRENDS, COSTS, AND SUPPLY CHAIN RESILIENCE.

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ABSTRACT

1. Introduction: Intravenous (IV) solutions are crucial to patient care, especially when prompt and accurate fluid and medication administration is needed. Efficient procurement and management of medical supplies is essential for the Jordanian Royal Medical Services (JRMS) to provide healthcare to the Jordanian Armed Forces and their dependents. However, the procurement process has become more difficult due to the exceptional obstacles and changing requirements for military healthcare. Gaining insight into JRMS's IV solution procurement management is essential to enhancing strategies and guaranteeing the supply chain's resilience. This study intends to examine JRMS's IV solution purchases from January 2020 to May 2024 to detect trends, problems, and areas that could use improvement.

2. Objective: This study's principal goal is to assess JRMS's IV solution procurement practices from January 2020 to May 2024. With a focus on four essential products (Ringer Lactate Solution 500ml, Ringer Lactate Solution 1000ml, Ringer Solution 500ml, and Ringer Solution 1000ml) the study specifically aims to analyze trends in the quantity and cost of IV solutions purchased. It additionally will evaluate the influence of demand variability and external factors on JRMS's procurement strategies and pinpoint possible areas for enhancement in supply chain resilience, cost management, and demand forecasting within JRMS.

3. Methodology: This research will employ a retrospective, quantitative methodology, relying on Microsoft Excel Spreadsheets Software to analyze data collected by JRMS's Purchasing Department and Main Medical Stores between January 2020 and May 2024. For the four IV solutions under investigation, the data set consists of the total amounts purchased as well as the associated costs. To identify key challenges faced by JRMS in managing IV solution procurement, the analysis will evaluate purchasing patterns over the study period to identify trends, analyze changes in the total costs associated with IV solution procurement over time, and provide actionable recommendations for improving supply chain resilience and procurement practices.

KEYWORDS: Jordanian Royal Medical Services (JRMS), IV solutions, Ringer Lactate Solution, Ringer Solution, procurement, supply chain management, military healthcare, demand forecasting, cost management, retrospective analysis.

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1. INTRODUCTION

Intravenous (IV) solutions are essential to the management of an array of different medical conditions, and they are a key component in current healthcare. These solutions are crucial for administering medication, preserving fluid and electrolyte balance, and supporting patients' nutrition when they are unable to ingest food or liquids ^[1]. IV solutions are essential to any healthcare system because of their basic role in patient care and the need for their availability and appropriate management ^[2]. This significance is increased in the context of government and military healthcare services, where cost and logistical effectiveness are critical factors.

One of Jordan's main healthcare organizations, the Jordanian Royal Medical Services (JRMS) is responsible for providing medical care for beneficiaries which include families and members of the Jordanian Armed Forces and others. The JRMS faces particular challenges, among them the requirement to remain prepared for both regular medical care and emergency medical situations. Therefore, it is crucial that medical supplies including IV solutions are obtained and managed effectively if JRMS is to continue meeting its patients' needs.

Within JRMS, the IV solution procurement process involves thorough planning and coordination. To prevent overstocking or waste, it is necessary to accurately forecast demand to guarantee that the correct quantities of each type of IV solution are available when needed. Cost control is also a major concern because JRMS must maintain a balance between the financial constraints of public healthcare and the requirement to obtain high-quality medical supplies. Crucial elements include supplier dependability and the supply chain's resilience, especially in light of global concerns including the COVID-19 pandemic, which has caused disruptions to medical supply chains across the globe ^[3].

This study is a retrospective analysis that investigates JRMS's IV solution purchases of four distinct forms between January 2020 and May 2024. These solutions include 500 ml and 1000 ml volumes of Ringer Lactate Solution and 500 ml and 1000 ml volumes of Ringer Solution. The study's objectives are to identify trends in purchasing behavior, evaluate the cost implications, and identify potential areas for improvement in procurement strategies by analyzing data gathered from JRMS's Purchasing Department and Main Medical Stores.

This study's time frame is especially noteworthy because it includes the years leading up to, during, and following the COVID-19 pandemic's peak. The pandemic has caused significant disruptions to supply chains, variations in the demand for medical supplies, and modifications to procurement strategies in healthcare systems throughout the world ^[4]. The purpose of the study is to offer insights into how JRMS responded to these challenges and how those responses might influence procurement practices in the future by examining the organization's purchasing patterns during this period.

Furthermore, this study's retrospective design enables a thorough examination of previous procedures, which can be very helpful in enhancing future procurement plans. It can assist the organization in creating more reliable and resilient supply chain procedures in the future by having a better understanding of how JRMS handled the acquisition of IV solutions in the past, especially during times of crisis. This is crucial for an organization like JRMS, which has to keep up a high standard of operational readiness to handle both regular and urgent medical needs.

In conclusion, the objective of this study is to present a thorough examination of JRMS's IV solution purchasing trends during a crucial four-year period. Through the analysis of data from JRMS's Main Medical Stores and Purchasing Department, the study will identify patterns, evaluate the financial effects, and recommend strategies to strengthen procurement tactics. The results should help JRMS manage medical supplies more effectively and efficiently, which will ultimately support the organization's goal of providing its beneficiaries access to high-quality healthcare.

2. METHOD

Retrospective analysis has been employed in this study to examine data from the Main Medical Stores and the Purchasing Department of JRMS, spanning the months of January 2020 through May 2024. Two primary components of data were included in this analysis: the annual total cost of each type of IV solution purchased and the corresponding quantity purchased. Two tables provide a summary of the data: Table 1 demonstrates the total annual costs, and Table 2 demonstrates the annual quantities purchased.

Table 1: Total Annual Costs

Name	2020	2021	2022	2023	2024
Ringer Lactate Solution, 500ml	42,435.00	45,339.00	63,293.00	79,097.00	36,000.00
Ringer Lactate Solution, 1000ml	17,291.53	22,667.33	20,129.75	22,275.00	5,880.00
Ringer Solution, 500ml	31,923.38	31,923.38	56,934.50	53,667.50	20,038.75
Ringer Solution, 1000ml	9,806.88	9,806.88	0.00	0.00	9,517.50

Table 2: Annual Quantities Purchased

Name	2020	2021	2022	2023	2024
Ringer Lactate Solution, 500ml	103,500.00	95,250.00	141,250.00	166,500.00	72,000.00
Ringer Lactate Solution, 1000ml	22,764.00	30,586.00	27,575.00	33,000.00	7,500.00
Ringer Solution, 500ml	81,750.00	81,750.00	112,000.00	90,500.00	36,250.00
Ringer Solution, 1000ml	11,050.00	11,050.00	0.00	0.00	9,000.00

In order to examine trends and changes over time, a time-series analysis was performed. Additionally, correlations between quantity and cost were observed in order to evaluate the relationship between these variables. Because the study was retrospective in nature, the analysis was restricted to the available data, and no additional external factors were added to what JRMS had recorded during the designated time frame.

3. RESULTS

3.1 Total Cost Analysis:

Figure 1 details the total cost of the four types of IV solutions purchased by JRMS from January 2020 to

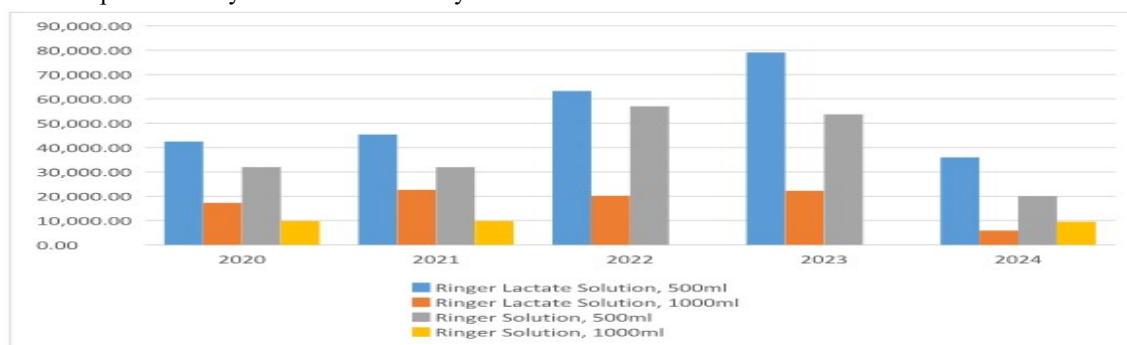


Figure 1: The total cost of the four types of IV solutions purchased by JRMS from January 2020 to May 2024

3.2 Quantity Analysis:

Figure 2 shows the quantities of IV solutions purchased over the same period. The quantity of Ringer Lactate Solution 500ml increased annually until 2023, peaking at 166,500 units, before declining to 72,000 units in the first five months of 2024. The quantity of Ringer Lactate Solution 1000ml similarly

peaked at 33,000 units in 2023 and then decreased to 7,500 units by May 2024. For Ringer Solution 500ml, the quantity purchased peaked in 2022 at 112,000 units and subsequently declined. The quantity of Ringer Solution 1000ml showed no purchases in 2022 and 2023, with a slight resumption in 2024 at 9,000 units. For Ringer Lactate Solution 500ml, the total cost increased steadily from 42,435 JOD in 2020 to 79,097 JOD in 2023, before dropping significantly to 36,000 JOD in the first five months of 2024. A similar trend was observed for Ringer Lactate Solution 1000ml, which peaked at 22,667.33 JOD in 2021 and then decreased to 5,880 JOD by May 2024. Ringer Solution 500ml showed a peak in cost at 56,934.50 JOD in 2022, followed by a decrease in subsequent years. The cost for Ringer Solution 1000ml remained relatively low, with no purchases recorded in 2022 and 2023, and resumed at 9,517.50 JOD by May 2024.

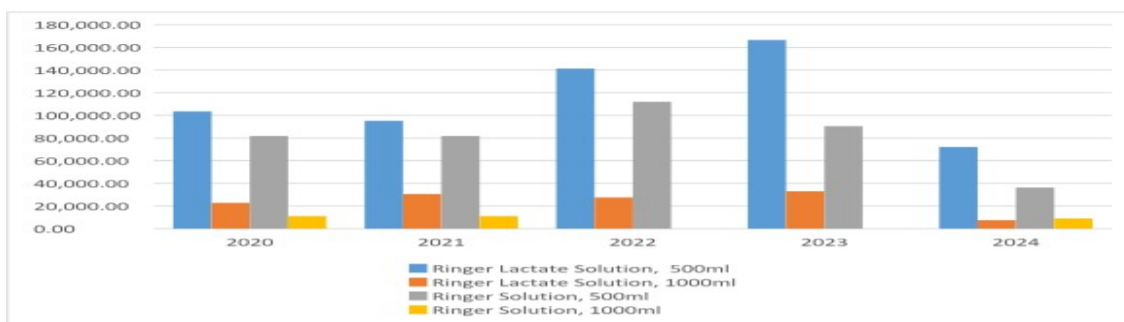


Figure 2: The quantities of IV solutions purchased over the study period

3.3 Correlation Between Cost and Quantity:

To determine the relationship between these variables, the correlation between quantity and cost for each type of IV solution over the period was examined. A moderately positive correlation between the total cost and the quantity purchased was noticed for Ringer Lactate Solution 500ml and Ringer Solution 500ml. The correlation between Ringer Lactate Solution 1000ml and cost was not as substantial, indicating that other factors might have played a role. The poor correlation for Ringer Solution 1000ml was indicative of the erratic purchasing patterns that were seen throughout that period.

4. DISCUSSION

The retrospective analysis of JRMS's purchasing patterns for IV solutions from January 2020 to May 2024 provides several key insights:

Demand Variability and Forecasting: The data shows notable fluctuations in IV solution demand, especially for 500ml of Ringer Lactate Solution and 500ml of Ringer Solution. The increasing purchase quantities through 2023 and the abrupt drop in early 2024 point to a possible overestimation of demand in previous years. This might have caused a stockpile, which would have reduced the need for additional purchases in 2024.

Cost Management Strategies: Costs may have been better managed by renegotiating supplier contracts or altering procurement policies, as evidenced by the rising costs seen until 2023 and the subsequent decline in 2024. For some solutions, it was possible to lower costs without sacrificing comparatively constant quantities, which implies that JRMS may have used more efficient procurement techniques during the study period.

Supply Chain Resilience: The lack of purchases of 1000ml of Ringer Solution in 2022 and 2023 points

to possible supply chain disruptions or changes in clinical demand. The fact that purchases started up again in early 2024 implies that these issues were probably handled, but the erratic nature of the purchases emphasizes the need for more effective supply chain management techniques to guarantee a steady supply of necessary medical supplies.

Insights from Retrospective Data: Retrospective data from Main Medical Stores and the Purchasing Department of JRMS presents significant insights into the organization's procurement procedures over time. Even though the analysis was restricted to the data that was recorded, the results show patterns and possible areas for development that could guide future procurement strategies at JRMS and other health care organizations.

5. CONCLUSIONS

The results of this retrospective analysis of the IV solution purchases made by the Jordanian Royal Medical Services (JRMS) between January 2020 and May 2024 have several significant ramifications for the organization's supply chain management procedures and procurement strategies. Four different IV solution types (Ringer Lactate Solution 500ml, Ringer Lactate Solution 1000ml, Ringer Solution 500ml, and Ringer Solution 1000ml) were analyzed to provide a comprehensive picture of the trends, challenges, and opportunities JRMS faced in overseeing these essential medical supplies.

5.1 Evolving Demand and the Need for Enhanced Forecasting:

The study's essential finding is the noticeable fluctuations in IV solution demand throughout the investigated period. The data collected shows that from 2020 to 2023, purchases increased, but in the first few months of 2024, they sharply declined. This variation highlights the challenges that JRMS has in correctly estimating demand, especially in light of outside influences like the COVID-19 pandemic.

Improving the precision of demand forecasting is essential for procurement process optimization. Inaccurate projections may cause understocking, which may result in shortages that jeopardize patient care, or overstocking, which can tie up cash and raise the risk of waste^[5,6]. The study's conclusions indicate that JRMS would profit from making investments in more advanced forecasting techniques and tools that take a larger range of variables into account, such as past data, clinical trends, and outside variables. By doing this, JRMS will be able to better match procurement choices with real requirements, which will lower costs and guarantee a more consistent supply of IV solutions.

5.2 Cost Management and Procurement Efficiency:

The analysis also emphasizes how crucial it is to manage costs effectively when purchasing IV solutions. During the study period, costs generally increased until 2023, at which point they significantly decreased. This shows that JRMS has made progress in cost control, potentially as a result of improved procurement procedures, better supplier negotiations, or changes in purchasing priorities.

Nonetheless, the results also emphasize the necessity of a well-rounded approach to cost control. Although cutting expenses is a positive outcome, it's crucial that medical supplies remain available and of high quality during this process. While making sure that these tactics don't compromise the quality of patient care^[6,7], JRMS must keep looking for methods to cut costs, such as pursuing bulk purchasing or alternative suppliers. In order to preserve the organization's financial stability and uphold its dedication to providing high-quality healthcare, sustainable cost management strategies are essential.

5.3 Strengthening Supply Chain Resilience:

A significant finding of the study is the importance of improving supply chain resilience in JRMS. Unusual purchasing trends for some IV solutions, in particular the 2022–2023 procurement gap for 1000ml of Ringer Solution, highlight supply chain vulnerabilities that could have an enormous effect on patient care.

The COVID-19 pandemic has caused significant disruptions, which emphasize the necessity for healthcare organizations to construct more robust supply chains that can withstand external shocks. For JRMS, this entails acting proactively to guarantee a consistent and trustworthy supply of vital medical supplies. Diversifying the supplier base, creating backup plans in case the supply chain is disrupted,

and keeping sufficient supplies of vital items in reserve are among the possible strategies^[8]. JRMS can better defend itself against potential challenges and make sure that it is well-equipped to meet the healthcare needs of its beneficiaries by enhancing supply chain resilience.

5.4 Leveraging Retrospective Insights for Future Planning:

Given that this study is retrospective in nature, it has provided JRMS with important insights into its previous procurement procedures. These observations provide a strong basis for deliberating on future procurement strategies. JRMS can improve patient outcomes and operational efficiency by creating more efficient strategies for managing its medical supplies by taking lessons from previous trends and challenges.

In years to come, JRMS should be proactive about routinely reviewing its procurement data in order to recognize new trends and possible complications before they become serious. Furthermore, it will be crucial to carry out continuous improvement initiatives to guarantee that JRMS stays at the forefront of efficient supply chain and procurement management. Examples of these initiatives involve implementing the lessons learned from this study into practice and embracing best practices from other healthcare organizations.

5.5 Broader Implications for Military Healthcare Procurement:

Lastly, the study's conclusions have wider ramifications for the way military healthcare organizations generally handle procurement. Effective procurement and supply chain management are especially important for military healthcare providers because of the special demands they face, which include the requirement for operational readiness and the capacity to respond to both routine and emergency situations.

In order to improve their procurement strategies, other military healthcare providers can benefit greatly from the lessons that JRMS's experiences have provided. Military healthcare organizations can enhance their capacity to provide superior care while efficiently allocating their resources by implementing a comprehensive strategy that incorporates demand forecasting, cost management, and supply chain resilience^[1].

In conclusion, JRMS has now can gain a thorough understanding of its IV solution purchase patterns over a crucial four-year period with the help of this

study. The results highlight how crucial reliable supply chains, efficient cost control, and precise demand forecasting are to guaranteeing the availability of necessary medical supplies. Through the implementation of suggested strategies and resolution of the issues raised by this study, JRMS may strengthen its procurement procedures, thereby enhancing its capacity to provide beneficiaries with superior healthcare services while upholding operational and financial viability.

Limitations of the Study: The study's retrospective design and reliance on information from JRMS's

Main Medical Stores and Purchasing Department were its main limitations. External factors that could have influenced purchasing decisions, such as adjustments to medical protocols or overall economic circumstances, were not taken into account in the analysis. To provide a more thorough understanding of the factors influencing JRMS's purchasing patterns, future studies ought to attempt to incorporate a wider range of data, including qualitative insights from procurement officials.

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