



## ROLE OF PROCUREMENT IN INVENTORY RISKS: CASE STUDY OF IRAQI PHARMACEUTICAL SUPPLY CHAIN

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**Abstract:** Procurement is one of the main activities of supply chain management which plays the main role in the efficiency of the supply chain, however, this role has to be highlighted in the pharmaceutical supply chain. The objective of this paper is to clarify the contribution of procurement in supply chain risks in a special case – in the pharmaceutical supply chain in Iraq. The study was conducted in the State Company for Drug Marketing and Medical Appliances (Kimadia) by conducting interviews with the directors and using secondary data prepared by official institutions such as the Office of Financial Supervision. The main aim of choosing Kimadia as the study subject is because it is the sole supplier for government health institutions in Iraq, which have different problems like surplus, shortage and expiration. In addition, medicines and pharmaceutical supplies have a relationship to human life, therefore, any problem in supply chain activities may affect the health service. The results of the survey highlighted the present problems of the examined supply chain, and confirmed that the long and complicated procedures of procurement affect the accuracy of demand forecasting and increase the inventory risks, which create waste and reduce the efficiency of supply chain activities of the Iraqi pharmaceutical supply chain. The recommendations of the study may support forthcoming decisions of the company directors in the future.

**Keywords:** expiration, pharmaceutical sector, shortage, supply chain risks, surplus

**DOI:** 10.17512/znpcz.2019.3.01

### Introduction

Inventory risks are among the most common problems of the supply chain all over the world. In well-developed and well-planned circumstances, inventories are predictable, the procurement process is planned and the supply process is smooth. A well-working supply chain is highly important in the pharmaceutical industry. Our paper introduces the problems of the Iraqi pharmaceutical supply chain.

The initial information was gathered from two main sources, the primary research was conducted in Diyala Province health institutions and Kimadia, the State Company for Drug Marketing and Medical Appliances. The secondary data was gathered from official websites. The data indicated that on one hand, there is a significant amount of waste due to the inventory surplus of some medicines and

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waste of others because of expiry, which cost millions of dollars. On the other hand, there is a shortage in other types of medicines due to inaccurate need estimations, and there are delays in receiving pharmaceutical goods as well. Regarding the administrative procedures, there is a long series of administrative procedures between different management levels and traditional procurement methods are used, which are limited by contracts and temporary purchase periods.

The most important problems were revealed after conducting different in-depth interviews with the different players in the supply chain. This paper focuses on the problems of inventories and the procurement processes. The general goal of the paper is to reveal the present problems using primary data and secondary data, and to make recommendations for future activities based on the experiences and good practices described in the literature sources.

### **Literature review and research background**

There is a difference between the concept of supply chain management and the concept of logistics in that supply chain management refers to many members or companies coordinating their work together, whereas, the logistics concept means all the activities such as procurement, distribution, maintenance and inventory management which happen within companies' borders (Hugos 2011).

A supply chain is the sequence of organizations whose facilities, functions, and activities, are involved in producing and delivering a product or service. The sequence begins with the basic suppliers of raw materials and extends all the way to the final customer. The facilities include warehouses, factories, processing centres, distribution centres, retail outlets, and offices. The functions and activities include forecasting, procurement, inventory management, information management, quality assurance, scheduling, production, distribution, delivery, and customer service (Stevenson 2012, p. 4).

The top priority for any health system is to provide medicines for patients. The pharmaceutical supply chain like any supply chain can be exposed to many risks and it is more sensitive than other supply chains because it is related to human life. These risks affect medicine supplies or resource waste but also can threaten people's lives by impeding access to medicines, therefore, the factors which affect the supply chain should be selected and appropriate solutions should be found to address the risks (Jaberidoost et al. 2013).

### **Medicine and pharmaceutical supply systems**

Bennett, Quick, Velásquez (1997, p. 45) described five pharmaceutical supply systems whose aim is to provide needed medicines and supplies to government and private health institutions, enhance the rational use of medicines, and ensure the quality, safety, and efficacy of medicines. There is a considerable variation in these systems based on the government's role, the private sector's role, and incentives for efficiency. The countries that take advantage of the capacities in both the public and

private sectors usually have systems that are more effective; they also tend to be more resistant to shock from disaster events (Al-Zaidi 2018, p. 16).

**Table 1. Comparison of basic pharmaceutical supply systems**

Systems	Responsibilities		
	Contracting suppliers	Storage & delivery	Monitoring drug quality
Central medical stores	CMS	CMS	CMS, DRA
Autonomous supply agency	Autonomous agency	Autonomous agency	PPO, autonomous agency, DRA
Direct delivery system	PPO	Suppliers	PPO, DRA
Primary distributor (or prime vendor) system	PPO	Primary distributor	PPO and Primary distributor
Fully private supply	Procurement and distribution by private enterprises		DRA
Notes: <b>CMS:</b> Central medical stores; <b>DRA:</b> Drug regulatory authority; <b>PPO:</b> pharmaceutical procurement office (Ministry of Health or other government offices).			

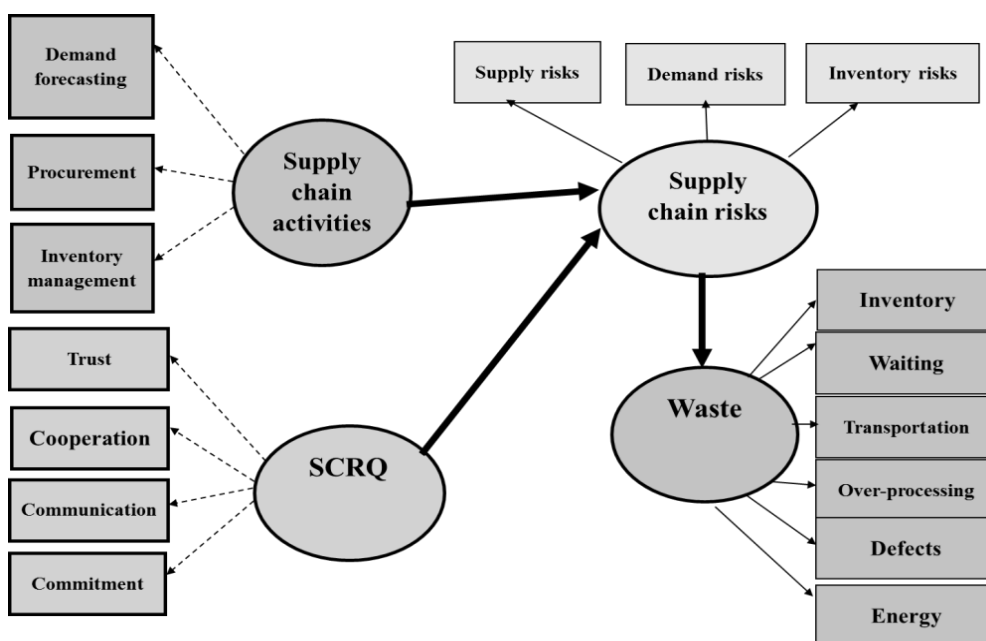
Source: Authors' own compilation based on (Dias 2012, p. 138; Al-Zaidi 2018, p. 17)

1. *Central medical stores (CMS)* is a traditional system where a centralized government unit is responsible for procurement and distribution. Decentralization is possible in this system by establishing pharmaceutical stores at the provincial or state level. In this system, the government is responsible for managing the whole system and, financing, procuring and distributing medicines by a unit related to the Ministry of Health.
2. *Autonomous supply agency* is managed by an autonomous or semi-autonomous pharmaceutical supply agency. It can be an alternative to central medical stores (CMS).
3. *Direct delivery system* is decentralized, which is different from CMS. In this system, the medicines are delivered by suppliers to districts and major facilities directly. The government pharmaceutical procurement office chooses the suppliers and establishes the price for each item, but the government does not store and distribute medicines. The direct delivery system requires a sole-source commitment.
4. *Primary distributor (or prime vendor) system* is similar to the direct delivery system where the government's pharmaceutical procurement office has a contract with one or more primary distributors as well as separate contracts with pharmaceutical suppliers. The primary distributor receives medicines from the suppliers and then stores and distributes them to districts and major facilities.

5. *Fully private supply* is used in some countries that allow private pharmacies in or near-government health facilities to provide medicines for public-sector patients. With such a system, measures are required to ensure equity of access for the medically needy, poor, and other targeted people (Bennett, Quick, Velásquez 1997, p. 45). A comparison of the supply systems for government and institutional health services is presented in *Table 1*.

### Supply chain risks

Supply chain risk is defined by many authors with different points of view. Jüttner, Peck, Christopher (2003) defined supply chain risk by focusing on information, material and product flow risks from the original suppliers to the delivery of the final product to the end user. Supply chain risk can be defined as “the potential variation of outcomes that influence the decrease of value added at any activity cell in a chain” (Bogataj, Bogataj 2007, p. 291). According to Ho et al. (2015, p. 5035), supply chain risk is “the likelihood and impact of unexpected macro and/or micro level events or conditions that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures or irregularities”. The concept of supply chain risk is multi-faceted, which differs according to the type of industry or service. The relationship (interactions and flows) between the dimensions of the supply chain studied in this research are summarized in *Figure 1*.



**Figure 1. Theoretical relationship between study dimensions**

Legend: SCRQ – Supply Chain Relationship Quality

Source: (Al-Zaidi 2018, p. 48)

To provide medicines and pharmaceutical supplies, pharmaceutical companies should depend on outsourcing. Although the companies recognize the importance of the global supply chain, they also find that global supply chains have extra complexities which are either slight or non-existent in a local supply chain. These complexities include cultural differences and language, currency fluctuations, armed conflicts, increased transportation costs and lead times. In addition, the factors which can impact the supply chain's success – including local capabilities, transportation, financial and communication infrastructures, governmental, environmental and regulatory issues as well as political issues – must be analysed and identified by managers to avoid risks.

The risks can relate to supply (for example supplier failure, sustainability issues, quality issues, transportation issues, pirates, terrorism), costs (e.g. increasing commodity costs), and demand (e.g. decreasing demand, demand volatility, and transportation issues). Waste could be reduced by using quality assurance systems and implementing lean management methods (Illés, Szuda, Dunay 2017), but in Iraq, these practices are rarely used due to the unfavourable economic and political circumstances (Dunay, Shaban 2017).

Of course other risks can also be determined such as intellectual rights issues, contract compliance issues, forecasting errors, competitive pressure, and inventory management (Stevenson 2012). Because of the high cost of keeping inventory, companies try to reduce inventory levels. It can be achieved by focusing on raising supply chain efficiency, quality management and reducing uncertainty at various points along the supply chain (Szegedi, Illés 2007).

Gupta and Gupta (2016) classified pharmaceutical risk into two main factors: (1) external supply chain risks: demand risks, stock risks, environmental risks, corporate risks and physical plant risks; and (2) internal supply chain risks: manufacturing risks, corporate risks, planning and control risks, mitigation and contingency risks as well as cultural risks. According to Hasija, Puranik, Mithun (2017), there are four kinds of risk affecting the pharmaceutical supply chain: regulatory risk, counterfeit risk, inventory risk and financial risk.

This paper focuses on the contribution of procurement to inventory risks, hence, we have to clarify the concept of inventory risks and procurement.

### **Procurement activities of the supply chain**

Procurement is the function that ensures identification, sourcing, access, and management of the external resources that an organization needs or may need to fulfil its strategic objectives (Kidd 2005, p. 5). Procurement activity has several benefits, namely the security of supply, lower costs, reduced risks, improved quality, greater added value, increased efficiency and innovation.

The activities and events before and after signing a contract and some general management activities with a wide range of contracts are included in procurement activities, namely (1) pre-contract activities such as planning, needs identification and analysis, and sourcing; (2) post-contract activities such as contract management, supply chain management and disposal; and (3) general activities such as corporate

governance, supplier relationship management, risk management and regulatory compliance (Kidd 2005, p. 5).

The relationship with suppliers and risk management are among the main tasks for procurement.

Inventory risks can occur due to the lack of inventory planning and inaccurate demand forecasting. Inventory control might be a challenge for companies and the way by which inventory is managed can affect the performance of a company. Increasing the level of inventory in warehouses means extra costs and having too little stock reduces the level of service (Hasija, Puranik, Mithun 2017). Despite the fact inventory is considered to have a negative effect on companies' performance because of the large proportion of the total expenses it generates, having inventory is still important for many kinds of products.

## **Methodology**

In this study, primary and secondary data were used: the secondary data include official reports (OFS 2008, 2011, 2015a, 2015b, 2015c). The primary data of the study were collected by means of interviews with 4 directors who work in Kimadia in different positions involved in the procurement process, in order to understand the procurement procedures and which kind of inventory risks they face.

The researchers distributed 48 questionnaires to the directors and their assistants in Kimadia but the number of returned questionnaires, which was suitable for statistical analysis, was 42 which means that the response rate was 88%. In addition, the number of questionnaires which was distributed to the Diyala health institutions was 50, the returned questionnaires valid for statistical analysis was 42 representing 84%, which can also be considered a high rate.

Furthermore, additional unstructured interviews were carried out among 19 directors in different positions and health institutions in various provinces to describe and diagnose the main risks and waste in the pharmaceutical supply chain in general.

## **Research results: case study of Kimadia State Company (Iraq)**

### **Structure of Iraqi pharmaceutical supply chain**

The state company for drug marketing and medical supplies (Kimadia), established in 1964, is one of the main strategic companies in Iraq, which is owned by the government. The main headquarters are located in Baghdad. It is governed by the general companies law No. 22 of 1997 as amended and the rules of procedure No. 1 of 1999.

Kimadia is managed by a board of directors, which consists of the director general chairman and eight members, and it contains 17 departments, 4 divisions, 3 distribution centres and 5 warehouses in governorates.

The company is connected directly to the Iraqi Health Ministry. It supports the national economy by providing all Iraqi health institutions (both state and private sectors) products that are used for medical or other purposes, namely medicines and

pharmaceutical materials, laboratory materials, spare parts for medical and service equipment, as well as chemicals that are involved in preparing vaccines. The products and materials are imported by the company from abroad or are manufactured in Iraq, and the company is responsible for distributing these products to Iraqi health institutions.

Based on the interviews, it was concluded that the transactions can happen every year by announcing a tender to suppliers, after that the suppliers submit their bids to the company. Then the bids are opened by a special committee which conducts a thorough assessment to choose the appropriate offer for the company. After selecting the appropriate offer for the company, the committee examines samples of the prospective firm's products which will be chosen if they meet the specifications. All these procedures take a very long time, which might last more than one year.

Thus, the company requires the health institutions, which are committed to the company according to government legislation, to send their needs for given year at least two years earlier than they start the procedure. For instance, the health institutions had to send their needs for 2019 at the beginning of 2017 to finish all the procurement procedures such as the announcing tenders, contracting suppliers, checking goods etc., which take a long time. In the researchers' viewpoint, the procurement process has faced several challenges.

The company deals with many suppliers to provide medical supplies and drugs, which leads to a long process in each transaction because of new procurement procedures each time such as checking the goods, choosing suppliers, etc.

The company adopts the government policy in selecting suppliers, and it depends on the political and financial situation which can affect the company's strategies. As the company deals with different suppliers each time, it can affect the material flow especially in emergency situations. Dealing with too many suppliers may lead to purchasing a huge amount of materials that will result high inventory levels, which may increase inventory fluctuations in the supply chain like surplus and shortage.

### **Problems of the pharmaceutical supply chain in Iraq**

In this section, the real data which are given in the annual reports of the Office of Financial Supervision are summarized. This office has the power to access most of the information in the government's ministries and institutions.

According to the Annual Report for 2008, there was a shortage in some kinds of medicines, whereas there was a surplus in other kinds of medicine due to them being sent by the company to the health institutions without the need for them (OFS 2008).

The 2011 Annual Report prepared by the Office of Financial Supervision revealed the following problems:

1. There was a shortage of medicines and pharmaceutical supplies because hospitals are not equipped with sufficient quantities when compared to the annual needs in many provinces such as Baghdad, Al-Rusafa, Kirkuk, Basrah, Muthanna, Salaheddine, Babylon, and Ninevah. This problem requires the health departments to coordinate with the General Company for the Marketing of Medicines and Medical Supplies on this matter.

2. There were surplus medicines for hospitals in large quantities e.g. at the Baghdad Health Department and Basra Health Department. The necessary procedures had not been taken to transfer them to other health institutions to use them.
3. There were medicines and medical supplies that had expired or were close to the expiry date in most hospitals. The necessary procedures had not been taken to dispose of them until the date of preparation of the report, including the health departments in Baghdad-Al-Rusafa, Basra, Diyala, Dhi Qar, Muthanna, Wasit.
4. A huge amount of medicines and pharmaceutical supplies was past the expiry date in the warehouses of the company; its value on 31/12/2010 was up to 28 000 000 USD.
5. There were very large quantities of medicines and pharmaceutical supplies in the Kimadia warehouses which failed in the test, without getting any compensation from the supplying companies or withdrawing them, which resulted occupied spaces in the warehouses.
6. Some medicines supplied by Kimadia were used at the Baghdad Teaching Hospital, despite the fact the Ministry of Health had prevented their use because they cause health problems.
7. 1378 syringes were returned which were used for treating cancer after using 1046 syringes on patients because they did not meet the required specifications.
8. The quantities of radioactive iodine capsules discarded during the year 2010 for non-use during the validity period cost 31-1043 USD per capsule (OFS 2011).

The First Quarter Report for 2015 prepared by the Office of Financial Supervision showing the delay of some companies, which were contracted with Kimadia, in supplying or fulfilling the contract of medicines and pharmaceutical supplies is shown in the *Table 2*.

**Table 2. Delay time of different contracts**

<b>Contract number and date</b>	<b>Implementing company</b>	<b>Delay time (days)</b>
(19/2014/34) on 29/5/2014	(ARD (unifert) SAL)	50
(95/2012/191/R1) on 17/11/2013	Aicon	159
(92/2013/37/1) on 16/6/2014	Aesculap AG	114
(40/2013/739)	F.HOFFMAN - La Roche Ltd	53
(40/2014/18)	Sanofi	108
(40/2014/13)	ARD	162

Source: Authors' own calculations based on OFS (2015a)

The Second Quarter Report for 2015 of the Office of Financial Supervision indicated a shortage in some essential and non-essential medicines and pharmaceutical supplies in the health institutions of the Diyala health directorate and Al-Dewania health directorate. Moreover, the company did not put some essential medicines on the essential list, causing a shortage in these kinds of medicines which



are very important for patients. Some types of medicines and pharmaceutical supplies were expired (OFS 2015b).

The Fourth Quarter Report for 2015 of the Office of Financial Supervision revealed that the shortage of medicines for chronic diseases was because of the lack of supplied quantities, whereas there was a huge quantity of expired medicines stocked in the stores of public clinic departments from previous years. The health service was affected badly due to a lack of some kinds of medicines and pharmaceutical supplies which should be provided by Kimadia.

With regards to Medical City, there was surplus of medicines and pharmaceutical supplies in the stores which should be transferred to the other health institutions if they are in need (OFS 2015c).

### **Problems in procurement**

The State Company for Drug Marketing and Medical Appliances (Kimadia) is involved in importing pharmaceutical products of a wide variety: medicines, vaccines, medical supplies, laboratory equipment and materials. This is done through departments specialized in the import of medicines, import of medical supplies, engineering import, and laboratory division. The contracting process takes about one year from receiving the needs and requirements through signing the contract and providing the materials to the health institutions. The procurement procedures consist of 23 steps:

1. Receiving the needs of materials (drugs, equipment, laboratory materials) from the Department of Technical Affairs, and vaccines from the Department of Public Health.
2. Receiving the estimated cost of materials from the same authorities above.
3. Receiving clear technical specifications for materials for the purpose of attaching them when declaring needs.
4. Determining the declaration mechanism of materials by Kimadia, namely: public announcement, direct invitations and the direct purchase method, from national factories.
5. The period of public invitation is 10-60 days and the period of direct invitation is 7-14 days.
6. Offers are received from foreign, Arab and national companies by the receiving committees specially formed for this purpose.
7. The received offers are referred to study and analysis committees, which shall be renewed annually and consist of members from various professional committees.
8. The received offers received are studied and conformed to the legal conditions, the existence of official authorization, incorporation certificates, final accounts and product certificates from companies.
9. In terms of medicines, the offers are analyzed based on their comparison with the estimated cost prices, the position of the companies on registration, their classification, and comparison of the prices for each item, then they are compared with the prescribed standard issued by the National Drug Selection Committee.

10. In terms of medical equipment or devices, the offers are analyzed based on comparison with the estimated cost and corresponding it with the technical specifications, all items must be subjected to laboratory or clinical evaluation.
11. The referral is recommended by the concerned study committees and submitted to the import committee in Kimadia.
12. The Importation Committee approves the recommendations.
13. The import committee in Kimadia can approve materials that cost less than 10 million dollars, whereas materials which cost more than that must be submitted to the approval committee of the central ministerial contracts.
14. The import department is responsible for preparing a referring fax to the supply company. It is delivered by email and delivered to the representative of the company in Iraq by hand.
15. In the case of receiving an answer from a supply company with approval, the contract procedures are started; these procedures should be completed within 14 days.
16. In the event of objection by the supplier on the conditions or assigned price, the objections shall be studied and discussed by the concerned department to make a decision either for the benefit of Kimadia or for the benefit of the supply company.
17. The contract is delivered to the supplier for the purpose of signing and stamping it by the supplier exclusively and shall be returned to Kimadia within 15 days accompanied by a performance guarantee equal to 5% of the contract value, which must be submitted within 21 days before the signing the contract by Kimadia.
18. After the contract is signed by Kimadia, it is submitted to the Ministry of Finance for the purpose of obtaining financial allocation for this contract. These procedures take about 3-6 weeks depending on the availability of funds in the Ministry of Finance.
19. After receiving the financial allocation and transferring it by the Ministry of Finance to the Trade Bank of Iraq (TBI) and receiving the performance guarantee, the Department of Appropriations in Kimadia starts the process of opening a line of credit.
20. The bank notifies Kimadia about the opening of the line of credit. The standard time for this process is 3-4 weeks in the event of absence any problems related to the performance guarantee and intermediary banks.
21. After informing the supplier about opening the line of credit, the company manufactures and ships the materials during the time periods stipulated in the contracts, which vary according to the type of material, manufacturing time and shipping, as agreed in advance during contract preparations.
22. Kimadia's warehouses are notified of the expected dates for the arrival of the first shipment of the contract, preparing customs facilitation letters and the tax exemption for these contracts and materials, as well as informing the health institutions regarding equipment requiring special places to prepare places for installation.

23. The import departments should release the suppliers' receivables after arrival (Kimadia website N.D.).

According to the interviews, the main problems of the supply chain were related to inaccurate estimation of needs and demand forecasting. There are many reasons: The company asks health institutions to estimate their annual and monthly needs, but according to the present process, they have to estimate their needs two years earlier for a given year as mentioned before. There is no integrated electronic data exchange system linking the health institutions with each other and the equipped company, therefore it is difficult for authorities to follow the consumption accurately.

The lead time is very long, due to the long annual selection process and contracting of suppliers, as well as due to centralized procurement and length of administrative procedures. These processes create delays in shipping and arrival time of different materials, which are frequently caused due to delays in the procurement procedures.

### **Conclusions and recommendations**

The main results of this study were concluded after conducting interviews with different directors in Kimadia as the primary research, and based on the discussion of secondary data. The main results indicated that the procedures of procurement start two years before the specific year, starting with the needs estimation of health institutions until the arrival of the medicines and pharmaceutical supplies, the long time of the procurement procedures affect the accuracy of needs estimations and cause numerous risks in inventory such as surpluses, shortages, and expiry in medicines and pharmaceutical supplies. These results were clearly confirmed by the secondary data and these problems generated huge costs.

The long procurement procedures which increase the lead-time, affect both the accuracy of demand forecasting/needs estimation and inventory management, which increases the risks of the supply chain and creates waste in the pharmaceutical supply chain in transportation, extra processes, waiting and inventory. This leads to an increase in inventory risks such as surplus and shortages; the long waiting time to receive orders placed by health institutions creates waste in the pharmaceutical supply chain (e.g. in transportation to transfer extra supplies to another place, extra processes and loss of medicines due to expiry).

The main recommendations to solve these problems is to shorten the lead time of needs estimation and strengthen the relationship with few good suppliers to buy small batches frequently. Kimadia should pay attention to enhancing the relationship with suppliers in order to reduce the supply chain risks and increase the efficiency of supply chain activities such as procurement and inventory management, which would consequently increase the accuracy of demand forecasting or needs estimation to eliminate waste.

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## **ROLA PROCESU ZAKUPOWEGO W RYZYKU ZAPASÓW: STUDIUM PRZYPADKU IRACKIEGO FARMACEUTYCZNEGO ŁAŃCUCHA DOSTAW**

**Streszczenie:** Proces zakupowy jest jedną z głównych czynności zarządzania łańcuchem dostaw, która odgrywa zasadniczą rolę w jego wydajności, ale rola ta musi być podkreślona w łańcuchu dostaw farmaceutycznych. Celem tego artykułu jest wyjaśnienie wkładu zamówień w ryzyko łańcucha dostaw w szczególnym przypadku – łańcuchu dostaw farmaceutycznych w Iraku. Badania dokonano w Państwowej Firmie ds. Marketingu Leków i Urządzeń Medycznych (State Company for Drug Marketing and Medical Appliances) – Kimadia, przeprowadzając wywiady z dyrektorami i korzystając z drugorzędnych danych przygotowanych przez oficjalne instytucje, takie jak Urząd Nadzoru Finansowego (Office of Financial Supervision). Główny cel wyboru Kimadii jako obszaru badań wynika z tego, że jest to jedyny dostawca dla rządowych instytucji zdrowia w Iraku, ale identyfikuje różne problemy, takie jak nadwyżka, niedobór i wygaśnięcie. Ponadto leki i materiały farmaceutyczne mają związek z życiem ludzkim, więc każde utrudnienie w działalności łańcucha dostaw może mieć wpływ na służbę zdrowia. Wyniki ankiety zwróciły uwagę na obecne problemy badanego łańcucha dostaw oraz potwierdziły, że długie i skomplikowane procedury zamówień wpływają na dokładność prognozowania popytu, jak również zwiększają ryzyko zapasów, które tworzą odpady, i zmniejszają efektywność działań irackiego łańcucha dostaw farmaceutycznych. Zalecenia z badania mogą wspierać przyszłe decyzje dyrektorów firmy w przyszłości.

**Słowa kluczowe:** przedawnienie, sektor farmaceutyczny, niedobór, ryzyko łańcucha dostaw, nadwyżka