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Evaluation of the Supply Process in Public Hospitals: A Qualitative Study

Uğur Uğrak[1], Şafak Çınar[1], Fırat Seyhan[1], Demet Kavak[2]

ABSTRACT

***Purpose*:** The purpose of this qualitative study is to examine the healthcare supply process in public hospitals in a multi-dimensional manner and to reveal the weaknesses and strengths in this process.

***Method*:** This qualitative study was conducted among stakeholders with sufficient knowledge and experience about healthcare supply processes in public hospitals. Within this research scope, semi-structured interviews were conducted with 14 participants determined using purposeful and snowball sampling methods. The data was analyzed using the thematic coding method with an inductive interpretive phenomenology approach. Nvivo 2020 software was used during the analysis process.

***Findings*:** The current legislation in Türkiye was observed to allow for various supply methods. The open tender method was determined to be the best cost-advantage one in terms of economy of scale. However, it may cause a decrease in material quality. Therefore, well-designed specifications and qualified human resources play an essential role in the supply process.

***Originality*:** This study reveals the possible negative effects of a cost-oriented approach in the supply process on quality in public hospitals. Additionally, the necessity of quality human resources in the supply process of healthcare was identified as an important problem. Informal structures were also emphasized among suppliers, which may disrupt the competitive environment.

***Key Words*:** Health Management, Hospital Logistics, Supply Process.

***JEL Codes*:** M1, I11, I15.

Kamu Hastanelerinde Tedarik Sürecinin İncelenmesi: Nitel Bir Çalışma

***Amaç*:** Bu nitel çalışmanın amacı kamu hastanelerindeki sağlık tedarik sürecini çok boyutlu olarak incelemek ve bu süreçteki zayıf ve güçlü yönleri ortaya çıkarmaktır.

***Yöntem*:** Bu nitel çalışma, kamu hastanelerindeki sağlık tedarik süreçlerine ilişkin yeterli bilgi ve deneyime sahip paydaşlar arasında gerçekleştirilmiştir. Bu araştırma kapsamında amaçlı ve kartopu örnekleme yöntemleri kullanılarak belirlenen 14 katılımcıyla yarı yapılandırılmış görüşmeler gerçekleştirilmiştir. Veriler tümevarımsal yorumlayıcı fenomenoloji yaklaşımıyla tematik kodlama yöntemi kullanılarak analiz edilmiştir. Analiz sürecinde Nvivo 2020 yazılımı kullanılmıştır.

***Bulgular*:** Türkiye'de mevcut mevzuatın çeşitli tedarik yöntemlerine izin verdiği görülmüştür. Açık ihale yönteminin ölçek ekonomisi açısından en iyi maliyet avantajına sahip yöntem olduğu belirlenmiştir. Ancak bu yöntem malzeme kalitesinin düşmesine neden olabilmektedir. Bu nedenle, iyi tasarlanmış teknik şartname ve nitelikli insan kaynağının kullanımı tedarik sürecinde önemli bir rol oynamaktadır.

***Özgünlük*:** Bu çalışma, kamu hastanelerindeki tedarik sürecinde maliyet odaklı yaklaşımın kalite üzerindeki olası olumsuz etkilerini ortaya koymaktadır. Ayrıca sağlık hizmetlerinin tedarik sürecinde kaliteli insan kaynağına duyulan ihtiyaç da önemli bir sorun olarak tespit edilmiştir. Tedarikçiler arasında da rekabet ortamını bozabilecek gayrı resmi yapılar ön plana çıkmaktadır.

***Anahtar Kelimeler*:** Sağlık Yönetimi, Hastane Lojistiği, Tedarik Süreci

***JEL Kodları*:** M1, I11, I15.

[1] University of Health Sciences Gülhane Health Vocational School, Ankara, Türkiye
[2] Health Institutes of Türkiye (TUSEB), Ankara, Türkiye

Corresponding Author: Fırat Seyhan, firat.seyhan@sbu.edu.tr
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1. INTRODUCTION

Supply Chain Management (SCM) is known as "purchasing" and "logistics management." In the 1990s and 2000s, it was considered a whole and coordinated system with the flow process from raw materials to reaching the customer (Jinesh et al., 2010). SCM is also explained as the facility and distribution network that ensures the supply of needed materials and their delivery to customers who demand intermediate goods or final products (Ganeshan, 2007). Within SCM, not only manufacturers and suppliers but also transfer providers, retailers, and customers play an essential role (Jinesh et al., 2010). In addition to being a long-term strategic management, SCM is a complex and dynamic process (Kim and Kwon, 2015). Every supply chain aims to maximize the total value produced, which is the difference between the value of the final product and the costs incurred in the supply chain (Sunil, 2013:3-22).

In business environments where customer expectations increase, logistics and supply chain management are important to increase efficiency, reduce costs, prevent waste, and increase the provided service quality (Rolf et al., 2023). The specialized structure of healthcare institutions, the variety of required equipment and materials, and the unpredictability of supply needs make supply chain management much more complex and difficult (Bourlakis et al., 2011; Wieser, 2011). In addition, the high number of stakeholders, the unique characteristics of each patient, and the uncertainty of urgent needs make supply process management in healthcare different from other sectors. In this respect, an effective supply chain in healthcare institutions is a critical and life-saving element in the delivery of goods and services to end-user patients (Beaulieu and Bentahar, 2021; Rakovska and Stratieva, 2018).

Grigoroudis et al. (2012) defined the concept of "Health Logistics" as "a set of networks or systems that perform different activities, often aimed at providing services to patients with severe time constraints." The supply chain in healthcare was once perceived as cost-based, solely purchasing and contract management. In healthcare, the supply chain includes more than purchasing and supply (Kwon et al., 2016). In this field, performance evaluation, inventory management, lean and agile operations, communication and information technologies, drug tracking, cold chain, human resources, risk management, and waste management are among the main topics studied (Dixit et al., 2019; Kumar et al., 2023). The agility of supply chains in healthcare institutions is a crucial issue. Agility refers to how well companies and supply chains respond to customer needs when faced with changes in supply and demand (Swafford et al., 2006). The importance of supply chain agility increased significantly during the COVID-19 pandemic process, and SCM was at the center of activities for the continuity of healthcare

From a managerial perspective, the uninterrupted continuity of healthcare depends on effective and efficient supply chain management. An effective supply chain in healthcare can be explained to reduce costs, contribute to patient safety, and increase patient care quality and satisfaction (Arora and Gigras, 2018; Getele et al., 2020; Khorasani et al., 2020; Kwon et al., 2016; McKone-Sweet et al., 2005).

Disruptions in the healthcare supply chain, such as a lack of communication and coordination among employees in purchasing units, lead to the inability to supply the right product at the right time and in the right way (Yoldaş, 2022). The vital importance of effective supply chain management in healthcare is ignored (Kasula, 2023). Considering the challenges and importance of the supply chain in healthcare, many scientists emphasized the necessity and importance of the use of information and communication technologies in this field (Bag et al., 2023; Beaulieu and Bentahar, 2021; Fawcett and Waller, 2013: 183; Hu et al., 2023). In this context, technologically rational solutions such as Radio Frequency Identification (RFID), Enterprise Resource Planning (ERP), etc., are used to address problems in logistics, supply chain management, material supply, and hospital management processes (Kim and Kwon, 2015; Mathew et al., 2013). In light of current developments, the use of artificial intelligence and machine learning in healthcare supply chain management and forecasting systems is discussed (Hu et al., 2023; Kasula, 2023; Kumar et al., 2023). Positive results of blockchain technology usage in the healthcare supply chain were reported (Bag et al., 2023; Hu et al., 2023; Nanda et al., 2023; Vishwakarma et al., 2023). However, sufficient evidence is needed for the use of this technology in the healthcare supply chain (Fiore et al., 2023).

Public Supply Law No. 4734 is implemented in the purchasing process for goods and services of all public health institutions in Türkiye. In accordance with the Law, the supply process can be carried out with four purchasing methods: tender method, open tender method, negotiated method, and direct supply (Kamu İhale Kurumu, 2002). The justification of the Law is to ensure reliability, confidentiality, competition, inclusiveness, and control in the public supply of goods and services (Kamu İhale Kurumu, 2002).

In 2018, the health market application, which allows the supply of public hospitals to be made digitally through the State Supply Office (SSO), was launched. The health market supply-sharing platform, where purchases are made electronically, can be used with various digital applications such as product tracking systems. In this supply-sharing platform, where SSO is one of the main stakeholders, suppliers and hospitals coexist. The platform is to save time, personnel, and documents and to prevent waste (Arık and

Ertaş, 2021). In Türkiye, many legal and structural regulations were legislated for public institutions to enable logistics management and supply chains to be effective and efficient (Kamu İhale Kurumu, 2002). For this purpose, information and communication technologies are also actively used (Alsaç, 2017; Arık and Ertaş, 2021).

The starting point of this study is that healthcare supply management is complex and vital. This qualitative study aims to examine the supply processes in public healthcare hospitals with a multi-dimensional depth. In this context, the research question is *"What are stakeholder insights on the functionality of public hospital supply processes in public hospital?"*

Analyzing the supply processes of public healthcare hospitals from multiple angles is crucial due to the unique characteristics of health services and the high costs associated with goods and services. Effective management of these processes is essential, and the ideas, decisions, guidance, and knowledge of the personnel responsible play a significant role. A comprehensive approach helps in identifying strengths and weaknesses, improving quality and efficiency, and incorporating diverse stakeholder perspectives. Understanding the complex interplay between different components and perspectives, including those of health supply managers and employees, is critical for accurate, cost-effective management of scarce resources and overall process improvement so that the findings of this research are evaluated to contribute to health managers and academicians.

In this study, the qualitative research method was chosen to thoroughly examine the public hospital supply process, which was the focus of the research question. The qualitative research methodology was discussed in detail in the subsequent section. The findings section presented the results obtained from interviews with stakeholders, analyzed through descriptive and content analysis. In the discussion section, the findings were interpreted in the context of the literature, and the research limitations were addressed.

2. METHODOLOGY

2.1. Research Method

Of the qualitative research methods, an inductive interpretive phenomenological study design was used (Creswell, 2013: 83; Creswell, 2014: 234-235; Erdoğan et al., 2014: 198; Merriam and Tisdell, 2015: 25; Saldana, 2011: 7; Van Manen, 1990: 362). This study aimed to examine the concept of the *"supply process in healthcare"* in a multi-dimensional way.

The phenomenological approach involves an effort to understand the personal experiences of individuals and the meanings of these experiences. This approach is used to develop a deeper understanding of the experiences, perceptions, and situations experienced by individuals. Therefore, phenomenology provides a suitable research ground for examining familiar phenomena, frequently encountered and with but not understood comprehensively (Creswell, 2013: 83-85; Saldana, 2011: 7-11).

This method is considered a tool for understanding the essence of the events and experiences individuals encounter within the framework of the researched case. The phenomenological approach can provide new and comprehensive information about the meanings and effects of such experiences through detailed and in-depth examination. In this respect, the phenomenological approach is considered the appropriate method for deeply examining the "supply process in healthcare" phenomenon in a multi-dimensional manner.

2.2. Participants of the Study

In qualitative studies, the focus of this research, theoretical framework, and amount of data are important criteria for determining the sample. Suggestions for the number of needed participants in qualitative studies is a minimum of 3-4 to a maximum of 19. Nevertheless, there is no restriction on the number in qualitative studies (Creswell, 2013: 76-77; Lapan et al., 2012: 90; Thomas and Pollio, 2002:3-20; Tracy, 2019: 138). In this study, a heterogeneous focus group was determined to examine the concept of the "supply process in healthcare" in-depth, based on the information in the literature. Participants were determined by purposeful and snowball sampling methods among individuals who had experience with the concept and worked in different aspects of the healthcare supply process. Interviews continued until the data obtained was saturated. Fourteen participants working in different areas of the healthcare supply process were selected and interviewed. Purposeful sampling criteria are listed below;

- Having at least three years of experience in the healthcare supply process,
- To still be on active duty regarding the healthcare supply process,
- Having sufficient knowledge about the healthcare supply process,
- Agreeing to participate in the study.

Table 1. Descriptive findings of the participants

No.	Participants	Tenure	Theme (n)	Quote (n)
1	Open Tender Officer	8	11	30
2	Unit Manager	25	9	16
3	Head of Department	25	13	31
4	Direct Supply Officer	6	9	23
5	Hospital Administrative Financial Affairs Manager	15	6	11
6	Hospital Administrative and Financial Affairs Deputy Manager_1	15	15	53
7	Hospital Manager_1	20	9	21
8	Hospital Manager_2	15	12	38
9	Hospital Administrative and Financial Affairs Deputy Manager_2	20	11	15
10	Inspection Commission Manager	4	12	21
11	Hospital Administrative and Financial Affairs Deputy Manager_3	6	7	10
12	Purchasing Personnel	6	10	15
13	Purchasing Officer	6	9	30
14	Movable Registration Officer	11	16	27

In Table 1, fourteen participants were interviewed. Interviews were held with senior managers such as the head of the department, hospital manager, administrative financial affairs manager, and deputy managers, as well as inspection commission manager, purchasing personnel, purchasing officer, movable registration officer, and unit managers, who manage the relevant supply process on a hospital basis.

2.3. Data Collection Tools and Data Collection

In accordance with the research purpose, data was collected using a semi-structured questionnaire with eight questions created by the researchers based on the literature review. This research data was collected from relevant employees working in hospitals providing tertiary healthcare in Ankara between 01 January and 29 February 2024. In order to conduct the study, ethics committee approval was received from Çankırı Karatekin University Health Sciences Ethics Committee dated 11.07.2023 and numbered 7. Different researchers carried out the data collection and analysis processes. The relevant participants were contacted via e-mail and/or phone; an appointment was made before the interviews were conducted. The interviews were held at a place and time the participants accepted. The data collection process was terminated at the point where the data reached saturation.

2.4. Analysis of Data

The data from the interviews were transcribed with MS Word 365 software and transferred to the MS Word environment. The Word texts were analyzed through coding and theme creation stages in Nvivo 2020 software. The data analysis process continued with steps: initial reading, creation of main themes, rereading of the texts within the theme, coding, and theme creation. The coding process was terminated when integrity was achieved (Creswell, 2014: 247; Erdoğan et al., 2014: 154; Leavy, 2017:124). Finally, the theme contents were reread, and the relationships between the themes were established. The analysis process was completed by reading and checking the main themes, sub-themes, relationships, and content created by another researcher. Necessary approaches to the validity and reliability of the data were taken throughout the entire process. A descriptive and interpretive qualitative analysis approach was used to present the findings.

2.5. Role of Researchers

All of the researchers in the study are health management experts, and they used to work actively in hospitals. One of the researchers worked as a unit manager in a tertiary hospital for nearly thirteen years. Another one, with four years of hospital experience, has been working in the field of quality and accreditation in healthcare for approximately 15 years. The other two were academics who worked as elements of purchasing and supply chain management in healthcare institutions and had expertise in health management.

2.6. Validity and Reliability of This Research

Independent researchers carried out the data collection, transcription, and analysis process to ensure the research validity. The themes and coding were finalized by joint control. The transcriptions were sent to the participants and confirmed for the research reliability. The final coding and text contents were checked theoretically. Additionally, information was given about the role of the researchers.

2.7. Assumptions and Limitations of This Research

The participants are assumed to give correct answers to the questions in the interviews in this research. Qualitative research findings cannot be generalized to people or regions outside the scope of this research (Creswell, 2014: 253). The findings of this research are limited to the answers of the 14 participants to the questions asked regarding the phenomenon of the *"Supply process in healthcare."* The role of researchers in the findings should be taken into account.

3. RESULTS

3.1. Descriptive Findings

The mean professional experience of the participants in this research was 13 years. The themes as a result of the analyses in this research are shown in Table 2.

Table 2. Descriptive findings regarding research themes

Themes	*Source*	*Reference*
Supply Process	14	92
• Inventory Control	9	9
✓ Physical Control	4	5
✓ Hospital Management Information System (HMIS)	9	9
• Supply Methods	6	13
✓ 19 Open Tender	11	15
✓ 22-A Direct Purchase	4	4
✓ 22-D Direct Supply	9	12
✓ 22-F Bedside Reception	7	7
✓ State Supply Office (SSO)	7	10
• Strengths	14	74
✓ Qualified Human Resources	8	9
✓ Online Infrastructure	13	19
✓ Technical Specifications	5	9
• Need for Improvement	11	25
✓ Effective Supply System	5	5
✓ Legislation-Technical Specification	4	4
✓ Qualified Human Resources	3	7
✓ Competitive Environment	3	9

This research's findings were grouped under four main themes: inventory control (9/14), Need for Improvement (11/14), Strengths (14/14), and Supply Methods (6/14). Research findings were collected under these headings.

Table 3. Most frequent words in coded data

Word	Frequency (n)	Weighted (%)
Material	324	2.04
Tender	203	1.27
Purchase	188	1.18
Technical	111	0.70
Health	92	0.58
Material Resource Management System	86	0.54
Peak	76	0.48
Public	70	0.44
System	67	0.42
Medical	64	0.40

As seen in Table 3, the most frequent words in the coded data were material 2.04% (n=324), tender 1.24% (n=203), and supply 1.18% (n=188).

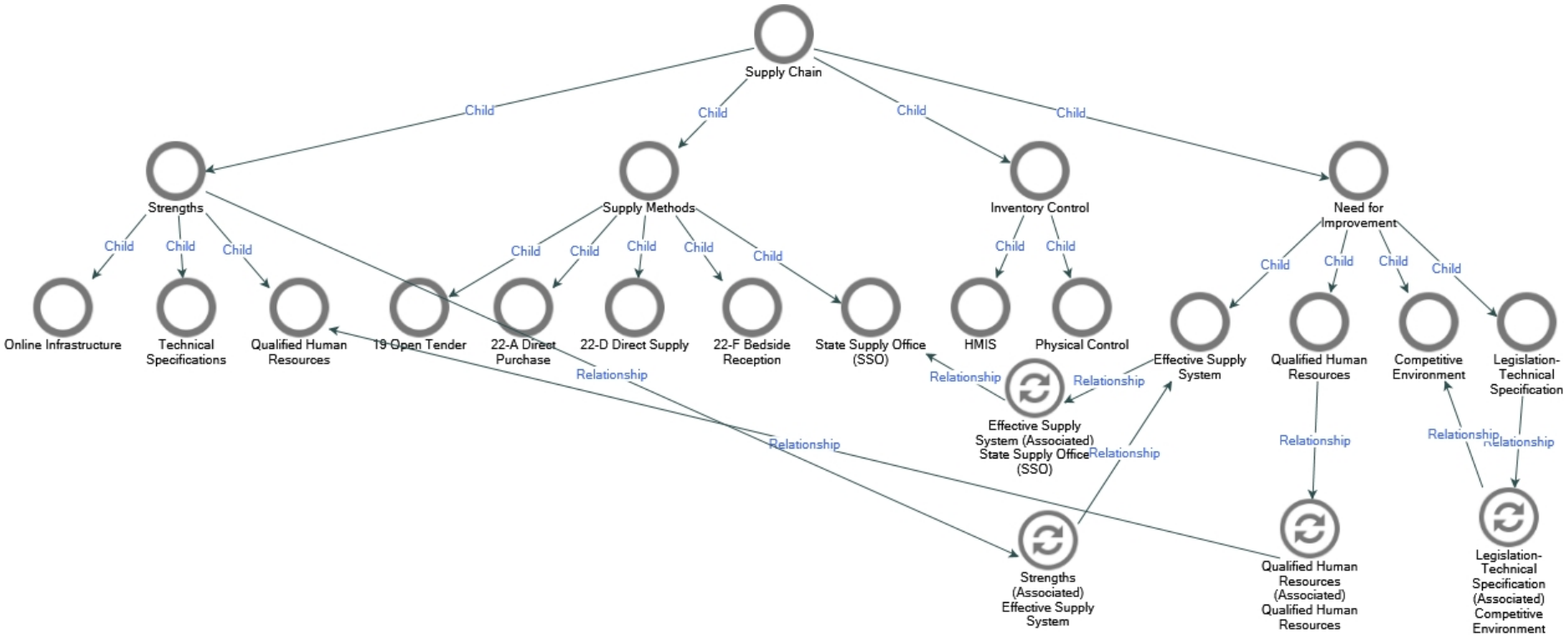

Figure 1. Findings regarding research themes and relationships

3.2. Theme I: Inventory Control

The findings revealed that senior managers followed inventory control through the information systems of the Ministry of Health and Hospitals (9/14). In this context, participant statements;

Head of Department: *"The stock tracking of medical supplies is monitored with the tracking system consisting of the integration of the Hospital Information Management System (HMIS) and (Material Control Management System) (MCMS) to track the main warehouse of the administration and the intermediate warehouses that use the materials."*

Deputy Director of Administrative and Financial Services: *"Stock tracking is carried out through the existing HMIS system and our ministry's MCMS."*

Hospital warehouse and unit managers mentioned the necessity of inventory control both through hospital information systems and physically (4/14). In this context:

Unit manager: *"I monitor the stock level and amount through the computer system we use. Twice a week, I check whether the materials in my physical warehouse are compatible with the materials in the computer system. I follow the consumption process to see if the materials in the main warehouse are sufficient."*

Movable Registration Officer: *"As I said, we have a Fonet system for stock tracking. We can see the remaining supplies on a daily basis in the hospital information system. We also physically count the warehouses at the end of the month."*

3.3. Theme II: Supply Methods

The findings indicated that four supply methods were used in the public hospital (Table 2; Figure 1). All supply methods addressed different needs in the supply process (13/14). In this context:

Open Tender Officer: "*So there are many different supply processes and many different supply methods. We purchase these according to the valid supply methods of the public supply Law No: 4734. These are the 22-D direct supply method and the 22-F bedside supply method. Article 19 discusses the open tender method. We use methods such as the 22-A for direct purchase."*

Head of Goods Inspection Commission: *"There are four different methods in the supply process. One is an open tender used in our hospital, two is a direct supply, three are through SSO, and the fourth one is a bedside supply, referred to as 22-F. They all serve a different purpose."*

Deputy Director of Hospital Administrative and Financial Affairs: *"Annual needs are planned and/or the next year's budget preparations are made accordingly, taking into account the previous year's consumption amounts. These purchases must be made with the State Supply Office (SSO). We continue to purchase materials that are not included in SSO, using the methods described in the public supply Law No. 4734."*

In general, the most efficient and effective supply method was the open tender method (12/14). For urgent and unforeseen purchases, the direct supply method was generally accepted. For such cases, the direct purchase method was also used. Direct supply and the 22-F method were stated to be more costly than the tender method. In this context:

Direct Supply Officer: *"The most effective one here is, of course, the tender process. Tender processes are uploaded to EPSP* (*Electronic Public Supply Platform) here. These are announced in the EPSP system. Companies send their offers to this purchasing platform, and purchases are made through the e-tender process. The most significant advantage of the tender here is that it is evaluated based on offers below the estimated cost during the purchasing stages, large quantities of products can be purchased, and services can be completed through tenders. However, direct supply has a certain limit. Since direct supply has a certain limit, significant purchases and large tenders meet the huge needs of the hospital."*

Deputy Administrative Financial Manager: "*Although the most effective method in supply methods seems to be the direct supply method because it is fast, I think that the open tender method, which provides both transparency and an equal competitive environment, is a more effective method."*

Inspection Commission Manager: *"The most effective is tender within the institution, open tender. A tender is held for a material so that it can be offered by more than one company, for example, an injector. Companies are making offers. I think it is more transparent this way, and being a tender is a plus for the SSO supply process. I think that the tender, that is, the tender made by the institution, is healthier and more effective than SSO in terms of eliminating poor-quality products at the tender stage. Purchasing via the SSO also has its advantages. When purchasing via SSO, the price drops almost much lower. In other words, it decreases at*

a minimum, but it also decreases slightly in quality. That is why our hospital does not like the materials coming from SSO, but the materials coming from the tender are more appreciated."

Based on these findings, purchase prices can be reduced considerably due to the high level of competition in the supply processes with the open tender method. Especially in purchases via SSO, the higher quantity allows for cheaper purchases. However, efforts to reduce prices might sometimes result in compromising material quality. Regarding this topic:

Inspection Commission Manager: *"The materials we received from SSO regarding the supply process are the ones we have the most trouble with. SSO and the Ministry of Health made a protocol between themselves. SSO purchases health and medical consumables and goes out to tender. SSOs have a good system; they invite relevant companies and get their products accepted. However, they include these products in the system with the reports provided by the companies without much testing by the user, and therefore, very poor quality products are bought by SSO."*

Unit Manager: *"We can purchase large quantities of materials cheaply through open tender and purchases from SSO. This process sometimes causes us to buy bad quality material, even in very small quantities. In such cases, we finish the job with cheap ones instead of high-quality ones. What was cheap in the first place ends up costing more."*

3.4. Theme III: Strengths

These research findings revealed institutional strengths in the supply process under the headings of online infrastructure (13/14), qualified human resources (8/14), legislation, and technical specifications (5/14). In particular, technological developments, the online infrastructure within the Ministry of Health, and hospitals were put forward as strengths. In this context, the statements are presented below:

Open Tender Officer: *"Computers have great benefits. We have the Internet and hospital information system. FONET is available in other places and different companies. Plus, the Ministry of Health has what we call MCMS. During the purchasing process, there is a smart management system where the purchasing units can see which purchase will be procured throughout Türkiye, which hospital last purchased the material, at what price, and how much it purchased. These types of technological things support and provide benefits."*

Head of Department: *" MCMS allows stock control and financial analysis by different units of our Ministry."*

In addition, social sharing platforms created by informal groups were also seen to be used in supply processes, as well as formal information systems.

Unit manager: *"The FONET system provides great convenience in material tracking, and apart from that, communicating with other hospitals via WhatsApp groups makes it technologically easier ."*

The findings indicated that individuals working in the supply processes should be knowledgeable and experienced on the subject. At the same time, the lack of qualified personnel was expressed as an important problem. The statements are below:

Movable Registration Officer: *"Generally, from time to time, we encounter people working in these areas, people who I have observed have not been able to hold on to a job, who have not been able to hold on to any of them, they give them to these places, but there is money and embezzlement involved. Since it is a process that requires good follow-up, it is important to have qualified personnel. It is vital to train qualified personnel who can work in this field through certification training that can be developed in schools, health management, etc. "*

Deputy Director of Administrative and Financial Affairs: *"In these units, it takes a significant amount of time to train personnel on purchasing, expense, income, fiduciary, archive operations, correspondence, and procedural principles, and when the sense of commitment decreases, or frequent changes are made, the memory of the unit and the institution disappears. Accordingly, continuity and quality in operations are disrupted."*

In addition, well-prepared technical specifications and legislation were mentioned as critical elements that strengthen the institution in the supply process (5/14). Relevant participant statements are presented below:

Hospital Manager_1: *"We can say that the strength of the supply of medical supplies is to start the process by checking whether the prepared technical specifications are competitive in compliance with the legislation."*

Direct Supply Officer: *"More accurate studies can be done while preparing technical specifications. Preparing different specifications for the same type of material inevitably affects the purchasing process*

negatively. Technical specifications are prepared based on certain needs. If the purchase is made with these technical specifications, a healthier purchase will be made."

Chairman of the Goods Inspection Commission: *"There is a good regulation. Goods inspection, let me tell you its full name; there is a Regulation on Goods Purchases, Inspection, Inspection and Acceptance Procedures. According to the principles of this Regulation, these three people have the right to reject this material due to an issue stated or not specified in the technical specification."*

3.5. Theme IV: Need for Improvement

In this research, the Need for Improvement *in the "supply process in healthcare"* was determined as an effective supply system (5/14), legislation-technical specifications (4/14), qualified human resources (3/14), and competitive environment (3/14). The findings presented that the current supply system should be improved to be more effective (5/14). Related mentions:

Deputy Manager: *"There should be a single HIS system throughout Türkiye, and stock tracking should be possible from all over Türkiye; SSO companies not only disrupt the operation but also disrupt the system with poor quality products; The products do not arrive on time, etc."*

Purchasing personnel: *"Quality choices should be made when purchasing materials. High efficiency and usability should be achieved from the selected product."*

The current system was criticized in terms of quality, especially in material selection in the findings. The participants question the quality of the materials coming from SSO. In this respect, SSO was considered an essential tool in establishing an effective supply system and should be improved to enable the purchase of appropriate quality products. Participants also mentioned legislation and specifications as areas that need improvement. In this context:

Head of Department: *"I believe that this will be achieved by preparing a primary legislation within a framework that will not be subject to frequent changes, and by making purchases by enacting secondary legislation in line with the framework legislation prepared by the administrations."*

Deputy Director of Administrative and Financial Affairs: *"Material standardization must be ensured by preparing a common technical specification at both the Ministry and primary health institutions. Information pollution in creating material specifications for each user and the user-company relationship will be prevented to a large extent."*

In addition, the research findings indicated that public authorities should provide a controlled competitive environment in healthcare. The initiatives of companies and informal organizations in this regard should be controlled. In this context:

Deputy Director of Administrative Financial Affairs: *"Companies with commercial legal entities (joint stock companies, limited companies, etc.) form associations and collaborate on the distribution of markets and/or how the price will be. Relevant institutions of our Ministry should not address these associations. This situation is against the relevant institutions of the Ministry of Health, which is the major buyer, and appears as an unfair transaction both in accordance with the principle of competition and in free market conditions."*

Purchasing Manager: *"I will talk about it from time to time, but where I work, it's a confidential matter among the companies. This is my personal opinion; I don't want to blame anyone. I felt like the companies were making a secret agreement. What do I mean? When we were going to buy item A or item A products, a company was offering the best offer. When we were going to buy Group B materials, another company was offering the best offer."*

4. DISCUSSION

The study findings revealed that inventory management incorporates hospital information systems and traditional methods in these hospitals. Even if hospital information systems were used in the supply process of public hospitals, other current technologies were not widely used. In the traditional hospital supply process, materials from various suppliers are placed in the main warehouse(s), which can result in bloated inventory and high rates of stockout (Darling and Wise, 2010). In addition, clinicians allocate their time to patient care and are not directly involved in material management, which leads to disruptions in supply and inventory management in traditional inventory control (Rivard-Royer et al., 2002). Traditional inventory control is unable to provide accurate inventory information, and it is challenging to manage real-time inventory. Innovative inventory control models such as stockless systems, vendor-managed systems, and automatic point-of-use systems that aim to reduce inventory and stock levels and focus directly on patients with smaller measurement units are being developed around the world (Beaulieu and Bentahar, 2021; Darling and Wise, 2010; DeScioli, 2005; Mathew

et al., 2013; Nicholson et al., 2004; Rivard-Royer et al., 2002)., Hospitals can operate almost stockless inventory with instant distribution, storage requirements are minimal due to these modern methods for inventory control (Darling and Wise, 2010), and all material inventories can be easily tracked (DeScioli, 2005). The hospitals where this study was conducted are tertiary public hospitals. So, the large type of materials and the large number of suppliers necessitate traditional methods. In addition, the hospitals' obligation to keep stock due to the high volume patient load and diversity makes it challenging to apply advanced supply methods for all materials. The motivation to benefit from economies of scale causes stock holding as well. In this study, rapid supply methods that do not require stock, such as 22-F and 19-A provided by the Public Supply Law, were also used for urgent and rare cases that cannot benefit from economies of scale.

This research indicates that public regulations in Türkiye provide different and sufficient supply methods for all needs. The open tender method, where competition is at the highest level, is an effective and efficient supply method. However, in purchases where competition is high, low-cost motivation might lead to the purchase of poor-quality products. Cost change is expected as a result of changes in the healthcare supply process. Just in Time (JIT) supply method is deemed more useful in high-competition markets (Gary Jarrett, 1998). Legal regulations are determined to be important precautions in minimizing healthcare costs (Gaynor and Haas-Wilson, 1999; Giancotti et al., 2017). Consistent with the literature, medical needs can be supplied through tenders, bulk contract purchases, and bulk purchases to be more effective in public hospitals in Türkiye. The web-based management systems of the Ministry of Health provide information about who purchased what, from whom, when, and for how much in the supply transactions carried out by hospitals to the hospital administrations before the purchase process. So, the decisions on tenders can be made based on more reliable data (Sağlık Bakanlığı Strateji Geliştirme Başkanlığı, 2011). Similarly, in the United States of America, group purchasing organizations were established to make healthcare material supply activities more effective so as to use economies of scale and to ensure that hospitals procure materials at the best prices (Cheng and Whittemore, 2008:126).

Online infrastructure and technologies are deemed to be the strengths of institutions in the healthcare supply process. EPSP and MCMS were stated to be especially useful. Similarly, in the literature, overstock products in hospitals could be easily monitored with MCMS, and hospitals could quickly obtain the needed materials, for a fee or free of charge, from the provincial stock pool or institutions with excess needs/stock through MCMS, without going out to tender (Sağlık Bakanlığı Strateji Geliştirme Başkanlığı, 2011). EPSP was stated as an effective method for organizations in terms of perceived usefulness, online trust, and trust in the government (Yıldız et al., 2018). In addition, this research finding presents that lower-level managers used informal communication channels during the supply process. The importance of the unique collaborations established by successful organizations with their customers and suppliers cannot be denied in today's dynamic competitive environment. The success of technological and organizational changes by businesses largely depends on the development of mutual trust and collaborative relationships with suppliers and customers. Relationships based on this cooperation can offer additional tactics to businesses and contribute positively to the supply process. However, if informal communication is not managed well, it may lead to situations such as the formation of unpredictable different groups and the emergence of uncontrollable results (Bektaş and Erdem, 2015).

The findings indicate that attention should be paid at the ministry level to the suppliers' informal groups to ensure a competitive environment. These informal structures were stated to make agreements that eliminate competition in tender processes. In this respect, this situation can be likened to a cartel structure in healthcare (Fellman and Shanahan, 2020; van der Schors and Varkevisser, 2023). In this context, countries focus on preventing unfair competition with antitrust laws (Hellinger, 1998; Kiss et al., 1995; van der Schors and Varkevisser, 2023). The Law on the Protection of Competition is in force in Türkiye for this purpose (Türkiye Büyük Millet Meclisi, 1994).

In this research, whereas the presence of qualified human resources in the healthcare supply process was revealed as a strength, its deficiency was described as a significant problem. Even if attention is drawn to the use of advanced models in supply management in the literature (Beaulieu and Bentahar, 2021; Darling and Wise, 2010; DeScioli, 2005; Mathew et al., 2013; Nicholson et al., 2004; Rivard-Royer et al., 2002), effective production and supply were claimed to be achieved through the interactive work of "Industry 4.0" with smart-innovative systems, new technologies, advanced computers, software technologies, and qualified human resources (Dengiz, 2017).

This research revealed that technical specifications must be developed to obtain quality and suitable products. In the literature, one of the indispensable main steps of a tender was the existence of a well-prepared technical specification (Şentürk et al., 2020). In a study examining the supply process in public hospitals, improper technical specifications were pointed out as among the reasons for the cancellation of tenders. Experts in the field were recommended to prepare technical specifications, and if there was no expert within the institution,

support should be provided from equivalent institutions, or the specification should be prepared by outsourcing services (Çabuk, 2014:119).

In this research, frequent changes should not be made to the legislation. Even if legislative changes were legally predictable, frequent changes might cause a situation contrary to legal stability (Özdemir, 2018). In the literature, problems arising from legislation in the supply process in public hospitals were rare (Çabuk, 2014:119).

5. CONCLUSION

Effective and efficient supply processes for healthcare institutions are essential for cost reduction, improving the quality of medical care, and increasing operational efficiency and patient safety. Traditional supply processes face many challenges, such as uncertainty, high costs, complexity, and fragility. For this reason, new approaches and technologies are being developed in studies in the field of supply and logistics processes.

The findings of this study indicate that the current legislation in Türkiye allows for a sufficient variety of supply methods. The open tender of the supply methods is the most cost-effective in terms of using economies of scale. However, the cost advantage through the open tender method might cause a decrease in material quality. At this point, well-designed specifications and the use of qualified human resources in this field play an important role. Another conclusion of the study is that since modern supply and storage technologies are not standard in public hospitals, the institution uses traditional inventory control methods and informal communication channels.

Based on the results of this research, the opinions and suggestions of all stakeholders about the process are important for an effective supply process and performance maximization in healthcare. Researchers are advised to investigate;

- the reasons that limit the use of modern supply and storage technology in public hospitals,
- the effects of a cost-advantage-focused approach on product quality in public supply processes in healthcare,
- the impact of specification features on the supply process in healthcare,
- the impact of informal processes on the supply process in healthcare.

The findings and results of this research, in which the supply processes in healthcare are examined in depth in a multi-dimensional manner, can enable policymakers and healthcare providers to raise awareness and improve the supply processes in needed areas.

The findings of this study are limited to the perspectives of the 14 participants interviewed and the responses provided to the research questions. When interpreting the research findings and results, it is important to consider the role of the researchers. All researchers are health professionals with academic roles, and the principal investigator is actively involved in the health supply chain.

Author Contributions

Uğur Uğrak: Literature review, Conceptualization, Methodology, Data Curation, Analysis, Writing-original draft Writing-review and editing *Şafak Çınar*: Literature review, Conceptualization, Methodology, Writing-review and editing *Fırat Seyhan*: Literature review, Conceptualization, Methodology, Writing-review and editing *Demet Kavak*: Literature review, Conceptualization, Methodology, Writing-review and editing

Conflict of Interest

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Compliance with Ethical Standards

For this study, the approval of the Ethics Committee (University of Çankırı Karatekin) was obtained with the decision dated 11-07-2023 and numbered 7.

Ethical Statement

The author(s) declared that scientific and ethical principles were followed in this study and that all the sources used were cited correctly.

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