

Title of dissertation:

"Evaluating the Performance of the Procurement Department and Its Impact on Overall Supply Chain Performance: An Analysis in the Medical Supplies Sector in Greece"

Student's name, AM: Kontoni Vasiliki, 525029

Supervisor's name: Despoudi Styliani

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Introduction

The research problem

The delivery of pharmaceuticals, surgical and medical supplies, equipment, medical devices, and other supplemental things required to support physicians, nurses, and hospital patients is known as medical logistics. Other alternatives are available for food and personal hygiene products. Medical logistics is unique in that it prioritizes improving efficacy above efficiency since end users are responsible for the lives and health of their patients. The healthcare system is significantly impacted by medical logistical processes. The cost of medical supplies is the second-highest healthcare expense after personnel costs. According to surveys, supplies, equipment, consumables, and outsourcing account for between 30% and 50% of hospital spending. Direct expenses associated with buying products and services account for half of the previously stated sum, with post-sales administration accounting for the other half. In the past, hospitals did not prioritize inventory and supply management, and these processes lacked a strategy (Bowersox and Closs, 1996). Thus, hospital expenses began to increase dramatically, and when they did, it seemed that centralized material management was the only workable solution (Hansen and Mowen, 1997). It seems that the healthcare industry was the last to use standardized methods for cost reduction. In the 1980s, centralized inventory management and large-scale buying were given top priority (Nickolson et al., 2004). Additionally, it has begun to become apparent that suppliers are increasingly being relied upon to provide extra services like internal inventory management and just-in-time delivery systems. This groundbreaking shift persisted throughout the 1990s, making it more challenging for hospitals to define the precise responsibilities of material/resource management (Simchi-Levi et al., 2003). In light of this context, several nations felt obliged to start a national dialogue in order to solve the issue. Given how almost out of control things were in Greece, this felt especially crucial. Notwithstanding the ongoing ambiguity around the responsibilities of materials managers, the primary focus of all discussions was the need to reduce hospital costs. This need gave rise to the concept of integrating the material/resource management process with the attainment of optimal economies of scale for all system entities. The conventional inventory management strategy controls the administration and supervision of products, services, and equipment in hospitals from the point of purchase to the point of distribution (Martin, 1999). This suggests that the processes of

obtaining, receiving, delivering, preserving, and distributing must be centralized. The fundamental elements of a material management program are as follows: a suitable plan that guarantees the most economical purchase of materials (items, services, and equipment); a related plan that guarantees the monitoring and control of costs and inventory; and, most importantly, the availability of all necessary materials. The purpose of this article is to evaluate the quantity of medication supplied, the method of delivery, and the degree of collaboration between Greek hospitals and their suppliers. Through an analysis of Greek state hospitals, this article emphasizes the need of a unique logistical strategy in private sector hospitals. We also evaluate the degree of authority, if any, granted to the logistical departments concerning procurement, inventory control, internal distribution to medical facilities, and management information systems.

The unquestionable necessity to improve medical logistics' efficacy within the global healthcare system—particularly in Greece—is what spurred this investigation. As a result of the problem's increased complexity, a serious economic crisis has emerged. There is an issue since previous research has shown that hospital resources are heavily allocated to outsourcing, supplies, equipment, and consumables.

Is it possible to objectively verify the opinions that Bowersox and Closs have promoted on the particular and difficult circumstances of Greek hospitals? Did Hansen and Mowen's proposal for unified material management provide a means of controlling growing expenses?

Despite the ongoing debate over the precise responsibilities of a material/resource manager, all previous surveys, including Nickolson's, stressed the critical importance of central inventory management for effective cost control and the concurrent use of just-in-time techniques (Simchi-Levi, 2003).

Due to their need for a variety of goods and services to carry out their value-added activities, many modern businesses have established vast networks of suppliers and customers (Sukati et al. 2012). Many networks, including as those of buyers, suppliers, vendors, distributors, retailers, transportation companies, and other middlemen, are often linked to these networks. These supply chains also make it easier for goods, knowledge, and financial resources that are essential to the industrial process to travel. The supply chain's connection with customs, airlines, shipping businesses, ports,

warehouses, governmental organizations, international trade agreements and treaties, and terrestrial transportation corporations further adds to its complexity. Markets and the growing demand of the supply chain have been the focus of much research and analysis due to this complexity, which has created a competitive environment. According to experts, companies need trustworthy supply chain design models that take into account new and modern elements like globalization and performance metrics in order to stand out from the competition (Cedillo-Campos et al 2006, 2012; DINU 2014). However, some experts argue that the quality of information shared, the use of information technologies, and supply chain management strategies are the main factors that determine the success of large corporations (Zhang and Dhaliwal 2009; Su and Yang 2010; Ranganathan et al. 2011; Nativi and Lee 2012; Fadzlan 2010). In the context of a globalized economy and deregulated market conditions, as noted by Gastelum and Ruiz (2017), the rapid development of information flows, the growth of international trade, and the emergence of electronic commerce (e-commerce) have resulted in a more thorough integration of all activities that comprise a supply chain. Currently, a product's production process is disjointed. During different stages of the production process, such as acquiring raw materials and presenting a product to a customer, different kinds of operational capital are used. As a result, modern supply chain industrial processes confront several obstacles while also providing a wealth of chances for expansion and improvement. In a market where competition is fierce, businesses use economies of scale to save expenses. As a result, these possibilities and difficulties present themselves. Many methods, strategies, and approaches have been put forth to accurately and successfully assess corporate supply chain management in response to the growing public awareness of environmental issues and the significance of sustainable and socially responsible practices (Gastelum and Ruiz 2017). Similarly, the study of supply chain dynamics faces new problems as a result of the growing interest in sustainable operations (i.e., operations that use reusable components and/or materials) and carbon footprint reduction among academics and industry experts. Any supply chain study, however, would inevitably need to take into account elements like market competitiveness, supply chain integration and coordination, and strategic, knowledgeable, and progressive customers. All of these elements have an impact on how supply chain operations are managed (Choi et al. 2016). The reduction of expenses and the production of value in every activity are ultimately the goals of a supply chain, which raises sales and profits relative to its rivals. Since

there is no time lost in between processes, prompt and automated information may be leveraged to improve efficiency and nimbleness in each production step (Vilana Arto 2011).

The benefits of a synchronized supply chain are shown by the coordinated order submissions made by all supply chain players in a centralized logistics system. Participants in the supply chain share real-time data on sales, inventory levels, and things in route. In addition to managing the chain's stockpiles as a single stock, the supplier issues a production order that is dependent on demand. Agreements on the distribution of technical, financial, and physical resources are necessary for the coordination and consolidation of the production process. Such agreements imply a commitment to efficiency aimed at enhancing the performance of every supply chain participant (Zerón Felix 2012). An integrated supply chain may save costs, create value for the final customer, and gain a competitive edge thanks to the information flow between distributors, manufacturers, and suppliers. This illustrates how the value chain becomes a crucial component of the process and how the phenomena are inextricably tied to management and logistics (Gastelum and Ruiz 2017). In conclusion, it is crucial to stress that the new global economy is characterized by manufacturing, financial, and commercial networks that span many countries and regions worldwide. Capital flows that move across national economies in a segmented or fragmented fashion are included in transnational value chains. As a consequence of the emerging global order, the driving force behind international economic growth has switched from national economies to transnational corporations and from public policy to strategic management (Pantojas-García 2014).

Moreover, it is important to note that the supply chain is made up of a network of producers, retailers, wholesalers, intermediates, and consumers that work together to maximize total profitability. In order to avoid lowering overall profit outcomes and undervaluing the importance of interconnections within the chain, the success criteria are based on the profitability of every link in the chain rather than just one (such as sales).

The modern production environment is becoming more complicated as customers want a bigger variety of goods to be provided more quickly and with higher quality. To guarantee customer satisfaction, manufacturing units aim to shorten delivery times, optimize performance, and save costs. The capacity of a corporation to react quickly

has a big impact on its success. The company has the power and flexibility to successfully negotiate consumer markets by quickly adjusting to changing customer needs.

Production systems are thus forced to deal with unpredictability, which often takes the form of uncertainty. According to Koh (2004), uncertainty is characterized as an unforeseen circumstance that interferes with a manufacturing system's ability to function and produce. Decision-making and production procedures become more complicated as a result. Uncertainty might result in incorrect results and less than ideal economic performance. As a result, businesses work to create strategies for anticipating and controlling it. This approach lessens the adverse impact on results and the amount of time needed to react to unpredictability. In the supply chain, demand and delivery schedules are both uncertain.

Aim of the research

Having taken the aforementioned into consideration, the aim of the present research constitutes the analysis of methods used to evaluate the performance of the procurement departments and the impact on the overall supply chain performance especially regarding the medical supplies in the Greek healthcare sector.

The rationale hidden behind the aim of the research involves the fact that supply chain pertaining the public sector is highly regulated, and it creates interest to analyze the way it is done and/or evaluated.

As such, the research questions that need to be answered are the following:

- 1) How is medical supplies' logistics work in Greece
- 2) How and in what way they are evaluated

Structure of the present research study

The present research is developed in five sections. More specifically, in the present introductory section, there has been an initiation to the problem under scrutiny.

Section 1 describes aspects involving uncertainty of demand which are a basic factor involving supply chain and logistics especially to what pertains the medical supplies

Section 2 analyzes the cost analysis method and most specifically Monte Carlo simulation which is a method for the evaluation of cost in supply chains

Section 3 Evaluated the supply chain performance in public sector

Section 4 Provides the methodology the present research is based on

Section 5 Presents the dominant situation in Greece

Finally, the present study ends by presenting the conclusions drawn and the reference list.

Section 1: Uncertainty of demand

Demand uncertainty may be caused by the firm's inherent qualities, its customers, and outside factors. Even though seasonal swings are inherently questionable, companies that are vulnerable to them may often use prior data to predict and assess the present seasonal change. Businesses that provide highly creative goods or services may have significant demand uncertainty as their uniqueness makes it impossible to get previous data necessary to forecast demand. Customer tastes, however, might change suddenly and drastically. This is sometimes the outcome of a new trend in the industry. Changes in customer demand might arise from technological breakthroughs that make existing items outdated. The rise of new rivals may have an impact on the sector's demand. Both the domestic and international economies have an impact on consumer demand. Whereas a shaky economy lowers demand, a strong economy increases it. Natural or man-made disasters and political unrest are examples of external factors that create uncertainty in both supply and demand. Unpredictable demand makes it difficult to accurately estimate how much inventory and other products to buy for continuing sales. A business that expects normal or high sales may find itself with inventory that has to be stored, returned, or disposed of if demand declines. Every one of these situations leads to extra expenses. Customers could get unsatisfied and shop at rivals if demand rises and the company is unable to keep an appropriate reserve of inventory. Due to their reluctance to go back to their original supplier, some customers would keep buying from their rivals, which would reduce revenues for the business.

The effects of demand uncertainty extend beyond the storage of commodities. Maintaining enough employment, for instance, may be challenging when demand varies significantly, and other expenses, like the purchase of equipment or the development of a facility, may also be impacted.

1.1 Adaptability of delivery time

The volatility of an organization may also be inferred from delivery timings. The period of time in buying systems between determining the requirement for an order and receiving it; in production systems, this comprises the time needed to manufacture each component, the order, the waiting period, the transportation, the queuing, and the setup (Heizet et al. 2017). The literature regularly looks at various stochastic demand systems with fixed supply periods. Delivery timings are seldom set in stone in practice. Unexpected incidents in the supply chain result in erroneous delays. Demand volatility and lead time variations have a big impact on performance. Eight uncertainties were highlighted by Koh and Saad (2003) as having the potential to impact customer delivery performance. These include: labor shortages, manufacturing equipment failures, demand lot growth, customer-initiated adjustments, internal and external late procurement, overtime assembly, and the lack of tools and techniques. Businesses must prioritize achieving supply and demand equilibrium because it boosts profitability (Christopher, 2008). Product availability must perfectly align with customer demand in order to maximize supply chain performance. Inventory management facilitates supply chain optimization. Despite the availability of cost-effective techniques and modern innovations like Just-In-Time (JIT), there are many reasons to keep inventory (Waters, 2011).

1.2 Management of Inventory

In every business or organization, all functions are connected to one another and often cross paths. Essential activities including supply chain management, logistics, and inventories form the basis of customer delivery. Customers are a business's most precious asset. Because of its potential to have a major effect on profitability, its link to inventory management, and its impact on customer relationships, depending on the firm's type, evaluating the service quality is crucial. While many businesses see inventories as an expense, others view them as vital resources that help them maintain market leadership by ensuring that products are available in the necessary amounts when customers desire them and by offering outstanding customer service. Reducing inventory and related costs are the main goals of better inventory management as well as retaining the clientele while raising the standard of service and facilitating the establishment of a new channel. Accessibility of the product (better service) increased market share. Inventory management is a crucial task that affects the balance sheet and

the effectiveness of the supply chain. Every firm must constantly work to maintain the right amount of inventory to meet its needs and avoid having too much or too little on hand, as poor management may negatively impact financial performance. The inventory is always changing. Continuous and careful evaluation of internal and external factors is essential to inventory management, as is control via planning and review. Most firms have a separate department that regularly monitors and controls inventory in coordination with the production, procurement, and finance departments.

A company stores materials in several divisions and stages. Basic supplies and consumables needed for production are kept in stock on a manufacturing site. Additionally, it keeps semi-finished product stocks for a range of industrial operations. Among other places, the unit's warehouses or distribution centers contain the inventory of finished goods.

There are benefits and drawbacks to inventory management. It shields businesses from the erratic swings in supply and demand. enhanced support for clients. During the manufacturing process, stocks provide supply chain stability and may help achieve economies of scale by producing completed goods or acquiring basic components in large quantities at a discount. On the other hand, the need for a large capital expenditure in inventory lowers the organization's economic effectiveness. One major worry is the decrease in storage capacity and the associated administrative expenditure (inventory management charges). The possible obsolescence of items poses a danger to the organization's financial standing. The considerations impact the intricacy and significance of efficient inventory management.

Measuring our goods is just one aspect of inventory management. Understanding company realities and making choices that strike a balance between present and future demands while cutting operating costs and overhead are the main goals (Muller, 2011)

1.3 Inventory materials

Most industrial plants manufacture their goods in phases. A standard unit that purchases input materials from a source and blends them with other components produces the finished product. During the production process, the company often creates its own intermediate product. Many businesses also sell their finished goods to other organizations, who then use them as inputs for their own operations. There are two main

reasons why it is dangerous to ignore the special dynamics that govern the handling of arriving commodities and, therefore, their stockpiles. The main rationale is conceptual: Input inventories form the basis of the manufacturing process. By differentiating between the receipt and use of input materials, input inventories are produced. To put it another way, businesses do not directly purchase and use resources throughout the production process. Furthermore, as the usage of input materials is a component of production, choices about inventory investment and production efficiency are closely tied to the management of incoming material supply. The company's relationships with domestic and international suppliers and their procurement costs—which depend on its capacity to control incoming materials—have an impact on the manufacturing decision-making process.

Input inventories are more significant than output stocks, according to the second, more empirical justification. Romer (1986) shows that the investment in the inventory of incoming materials is done at the pre-production stage. As a consequence, the manufacturing process and the acquisition and use of imported materials are not coordinated, which leads to expenses that are commensurate with the inventory imbalance.

Section 2: Cost analysis

The business landscape of today is evolving quickly and is becoming more competitive. Organizations need to establish their own core competencies to set themselves apart from rivals and achieve market domination in addition to cutting operating costs to stay competitive. Companies are increasingly competing globally, and the old divisions between industries are eroding. Organizations' main goals are to create added value throughout the transaction process and decrease overall costs by prioritizing market response certainty and speed. In order to maximize efficiency and successfully meet the growing needs of consumers—which are impacted by technology improvements and competitive pressures—supply chain networks must overcome significant challenges.

All supply chain stakeholders must collaborate to accomplish common goals, such as increasing profitability and creating a high-quality product faster, in light of the aforementioned market expectations and difficulties related to success in the global market. The accounting method used to assess a company's inventory worth is called

inventory valuation. Every item required for business operations, including those utilized in production and those connected to the finished goods that are sold, is included in a company's inventory. The value is dependent on the costs associated with purchasing and getting the product ready for sale. Inventories are the organization's most important current assets. Inventory reduction is often the most lucrative approach, because inventory upkeep often entails significant costs. Over time, inventories often experience depreciation. This is particularly true for sectors that stand out for their constant development and growth of products and services. These days, companies are forced to look at production processes to improve resource efficiency and, therefore, sustainability due to the need for innovation and technological improvements. To steer these tendencies toward financial success, early economic assessments are essential. One of the challenges in this quest is the rarity of cost information. Because the business may finally attain sustainability via the application of efficient cost management within the manufacturing process chain, it is beneficial to establish a complete knowledge management system.

2.1 The Method of Monte Carlo Simulation

Following the end of World War II, quantitative management techniques became much more common due to the rapid development of information technology and systems. In the 1960s and 1970s, operations research mostly used quantitative approaches and optimization models. From the beginning, a methodical approach to problem-solving was given priority. The management of material flow inside individual businesses is quickly giving way to the oversight of integrated material movement across extensive supply chain networks in the area of modern logistics management. Essentially, it represents a change from the piecemeal optimization of discrete tasks and procedures to the optimization of complete processes over whole supply chains. In almost every sphere of everyday life and the business world, quantitative approaches are used to aid in decision-making.

In the context of operational systems and technological decisions in the face of uncertainty, the literature has shown that traditional methods for assessing and valuing financial performance are inadequate. This can result in less than ideal financial performance and valuation outcomes (Savage, 2003; Brealey et al., 2008; deNeufville and Scholtes, 2011).

A conclusive strategy for integrating and measuring unknown factors that can have an uneven influence on financial performance outcomes is not provided by conventional valuation methods. The average rate of financial performance is thus not always reflected when assessing financial success under normal circumstances. In probability theory, this phenomenon is referred to as the "means error" and is a direct result of Jensen's inequality (Savage, 2003; deNeufville & Scholtes, 2011). Uncertainty and system variability are unavoidable and must be taken into consideration in risk analysis or forecasting. Even if there is a large dataset on the performance of past systems, the future is still unpredictable, and unanticipated circumstances might change a design's course.

Incorporating the methods' methodologies into the framework for evaluating economic performance may effectively address the possible issues related to "means error." At the same time, unlike traditional sensitivity analysis that only takes into account one model input at a time, it allows the addition of several random model inputs, which allows for the inclusion of a range of sources of uncertainty.

Therefore, in the situation of uncertainty, the distribution profiles of financial success are established. Instead of trying to minimize risk, the Monte Carlo simulation uses hundreds or millions of random variable changes to compute every possible result. The input variables or random variables are represented by the probability distributions. Through a sequence of simulations or iterations, pathways are created, and the outcome is ascertained using the proper numerical calculations. The Monte Carlo simulation strategy is regarded as one of the most dependable techniques when a model requires examination and contains confusing parameters. This method is widely used in many fields, such as statistics, computational biology, artificial intelligence, finance, and physical research. However, it employs a probabilistic method for predicting system risk as opposed to a deterministic one. Nevertheless, it is a helpful tool for approximating reality when taking into account the inherent risk or uncertainty of a system. It is still difficult to make any kind of accurate future predictions, even given a wealth of knowledge. The dynamic elements that might influence the outcome of a course of action could help to explain this. The Monte Carlo method encourages better decision-making in the face of ambiguity by making it feasible to see the consequences of a choice. It helps the person making the choice to comprehend the likelihood of the outcomes.

A range of probability distributions, including triangular, uniform, and normal, may be used to characterize the input variables. Sampled random values for each input variable are used in a simulation after probability distributions are included in order to spread uncertainty across the computational model. This process is used several times in order to get good outcomes. Decision-makers may use the important insights to make better choices about a range of stock policies and buying options. When compared to deterministic analysis, the Monte Carlo method offers better risk simulation. Information is given about the expected result and the likelihood that it will occur. Additionally, associated input variables may be modeled (2).

Section 3: Evaluation of supply chain performance in Public Health

Effective supply chain management is essential for every firm, especially given the significant global supply chain difficulties that are expected to persist. An organization's operations depend on supply chain management since it includes a number of crucial tasks that must be carried out effectively in order to meet the corporate goal. According to Cooper et al. (1997), it is basically the culmination of processes from the original suppliers that offer goods, services, and information, enhancing the value for customers and ending with the end user. From the acquisition of raw materials to the final delivery to the customer, the logistics of a particular product or service are covered by the principles of supply chain management. This extensive business network is made up of producers, distributors, retailers, and customers. The public healthcare supply chain includes patient treatment, sourcing, procurement, transportation, and storage, with a focus on better cost control and guaranteeing protocol security. Channel stakeholders, including lenders, suppliers, middlemen, third-party service providers, and customers, must coordinate and participate. Brazil's Unified Health System (SUS) and state institutions supply 70% of the country's hospital care (Brasil, 2017). Forty-seven of the 193 public teaching hospitals (THs) that have been approved are owned by the federal government. Because of its uniqueness and social and economic importance, the health process requires a significant flow of people, information, and resources. They also oversee the delivery of advanced healthcare services and the training of medical professionals as well as individuals (Barata et al., 2010). The fact that THs are responsible for more than 50% of medium and high complexity interventions under the Unified Health System (SUS) and up to 10% of hospital admissions nationwide

highlights their significant relevance. The increased demand for health services, especially in public institutions, calls for better management of the relationship between effectiveness and complexity in healthcare organizations, especially in light of the COVID-19 pandemic, which caused disruptions in global supply chains and harm to a variety of industries due to travel restrictions. adopted by several countries (Chowdhury et al., 2021; Chatterjee et al., 2023). The fact that 20% of healthcare spending has little to no beneficial effect on health outcomes is alarming (OECD, 2017). The World Health Organization (WHO, 2010) estimates that 20% to 40% of all health spending is wasted as a consequence of inefficiency. Furthermore, Miethke-Morais et al. (2021) highlight the widespread worry about how the COVID-19 pandemic is affecting health systems and the economy, which makes more funding and resources needed. Miethke-Morais et al. (2021) discuss investments. In order to strengthen public healthcare governance, maximize input utilization to reduce costs, minimize waste, remove product obsolescence, and meet customer demands for better service, this setting calls for the development of scientific tools to support supply chain management. This is important since, in Brazil, 50% of medical costs are related to consumption (Paschoal & Castilho, 2010). On the other hand, this percentage is around 30% in wealthy countries like the US (Minahan, 2007). It is feasible to achieve efficiencies and save costs in the hospital logistics sector to provide care at a reasonable cost. According to McKone-Sweet et al. (2005), the potential advantages of a well-managed healthcare supply chain have been calculated to be between 2% and 8% of hospital operating expenditures. The current study is set in a context of many health care stakeholders, including patients, caregivers, regulatory agencies, medical associations, insurers, and local, state, and federal governments, among many other organizations (Ryan, 2005). Due to competing economic frameworks and goals, there are many players in this setting, which makes it difficult to properly organize and administer healthcare delivery systems. Furthermore, the complexity and ambiguity of both make it much harder to coordinate supply and demand for services. To tackle this issue, decision-making tools like performance evaluation have been used to improve decision-makers' comprehension of the context of the choice and its consequences. Performance assessment is a continuous management process that includes the analysis and monitoring of organizational performance, the beliefs and values of decision-makers, and the environment of the organization (Bititci et al., 2012; Ensslin, L. et al., 2000; Roy, 1993).

Several domains, including Human Resource Management (Rolim Ensslin et al., 2013; Alshurideh et al., 2022), Finance (Ferreira et al., 2019; Yilmaz et al., 2019; Abdel-Basset et al., 2004), Agriculture (Taleb et al., 2023), Waste Management (Rodrigues et al., 2018; Agarwal & Singh, 2022), Urban Services (Thiel et al., 2017; Zhou et al., 2022), and Retail (Ozcan & Tuysuz, 2016). Performance evaluation is difficult because health care supply chain management is complex and dynamic (Burns et al., 2002).

Issue structuring methodologies and multiple criteria assessment procedures are deemed suitable performance evaluation tools in this particular scenario. The Measuring Attractiveness by a Categorical-Based Assessment Technique (MACBETH) and cognitive maps will be included into this framework (Bana e Costa et al., 2012). According to Eden (2004), cognitive mapping is a technique that improves comprehension of the relationships between criteria by reducing the number of criteria that are ignored in decision-making situations. One method that helps in assessing the trade-offs of evaluation criteria is called MACBETH. By developing and applying a multiple criteria decision support model that was established using an active learning method, the authors hope to enhance the existing body of knowledge in partnership with the supply chain management decision-maker within a public healthcare framework. The quality and effectiveness of healthcare delivery systems might be improved by using the suggested paradigm to help decision-makers optimize healthcare supply chain management.

One aspect of supply chain management in the public sector is the administration of supply chains and multi-tiered networks. Private companies that get direction from public sector representatives, accounting officials, and legislators make up this ecosystem. In addition to highlighting the cooperation of organizations in the production of goods and services, public sector supply chain management also illustrates how these organizations engage with entities at different levels. Consequently, collaboration inside and across networks is essential (Migiro & Ambe, 2008).

Governments are the main buyers of goods and services. To achieve their goals, their supply chain management (SCM) must guarantee excellent quality, cost-effective delivery, and efficiency. Up to 30% of the US gross national product may come from financial activity in the public sector. According to estimates, Europe's GDP is between 14% and 20% (Angelo Mori & Doni, 2010; Callender & Matthews, 2000).

Consequently, efficient supply chain management may result in significant cost reductions. The all-encompassing government effort to enhance the nature of present spending on goods and services.

The public sector needs to update its supply chain management system (Tridapalli et al., 2011). One of the biggest and fastest-growing industries in the world is the healthcare sector, which includes biotechnology, alternative medicine, pharmaceuticals, medical supplies, and equipment. In addition to materials and logistics, human resources and financial management are essential to the growth of healthcare operations and the operation excellence of healthcare companies (Neil, 2004). Given the enormous financial expectations placed on modern healthcare providers, providing high-quality medical care while lowering costs is a crucial strategic goal. To accomplish this goal, health care service providers have concentrated their efforts on removing clinical operational inefficiencies. Despite the fact that these strategies are valid and important for lowering healthcare costs, supply chain management (SCM) is a crucial management issue that can take up to 40% of a typical hospital's operating budget, making it the second-largest expenditure for hospitals after labor (Darling & Wise, 2010). Furthermore, by looking at supply chain management's coordination structure

Many supply chain management problems that hinder quality improvement at the executive and quality strategy levels have been recognized by Wang and Shang (2023). The problems include poor procedures and methods for controlling supplier quality, limited supplier control capabilities, and the prospective inspection department's inability to perform inspections as needed (Wang & Shang, 2023). Two groups make up the health care supply chain: i) producers, who make medical products including surgical supplies, medical equipment, and prescription drugs; and ii) buyers, who include wholesalers, distributors, and GPOs. Distributors and wholesalers keep inventory for producers in order to speed up product delivery. Group purchasing organizations (GPOs) negotiate with manufacturers to combine member providers' buying quantities in order to get economies of scale; iii) healthcare providers. The terminal segment of the supply chain, which is in charge of patient care, is made up of hospitals, integrated delivery networks (IDNs), doctors' offices, clinics, assisted living facilities, and pharmacies (Burns et al., 2002).

Because hospital resources are publicly available, there are less internal cost incentives and external efficiency motives, which causes a number of problems in the public healthcare supply chain. These problems include the sluggish forecasting of medical material demand and the insufficiency of patient-oriented response tactics. Suboptimal information interchange and coordination between the supply and demand of goods and services, excessive external purchase, storage, and distribution of resources, and inadequate standardization of management procedures (Chen, G.-s., 2010).

According to Neely et al. (1995), performance measurement is the quantification of an activity's efficiency and effectiveness, while a performance measure is a tool used to quantify the efficiency and/or effectiveness of an action (Neely et al, 1995). According to Melnyk et al. (2014), a performance assessment system consists of two components: a performance management system and a performance measuring system. The former works with the development of measurements and the collection and analysis of data, while the latter aims to evaluate the discrepancies between actual and anticipated outcomes, understand the underlying reasons of the anomalies, and implement corrective steps to improve performance. Melnyk et al. (2014) claim that the two methods combine to provide a "integrated system" for assessing organizational efficiency.

Accordingly, the evaluation and management of organizational performance are influenced by people's fundamental emotions, values, and beliefs as well as the social environment in which they operate (Bititci et al., 2012). Therefore, it is crucial to consider the corporate environment as well as the decision-maker's beliefs and opinions while creating a performance rating system. Consequently, the following has to be taken into account in the performance evaluation methodology: the decision-maker's perspective; stay in line with organizational strategies; and exhibit flexibility, since environmental factors must be taken into account and the strategies, goals, and metrics set up for environmental adaptation must be reviewed on a regular basis (Bititci et al., 2000; Bourne et al., 2000).

The assessment and measurement of organizational performance have drawn the attention of both scholars and practitioners. This is due to the fact that these measures and metrics affect how strategic, tactical, and operational actions are planned and managed. Setting goals, assessing performance, and using metrics and performance

evaluation to guide future activities are all crucial. However, performance assessments and indicators related to supply chain management have not been generated a similar level of attention from professionals or scholars (Gunasekaran et al, 2004).

Establishing a more unified Operations Management function throughout the supply chain is also essential, which calls for consistent performance evaluation across many dimensions. Determining and assessing the performance of the whole supply chain and analyzing a range of indicators at different levels of detail are essential to comprehending the reasons for notable differences between actual and planned performance (Lohman et al., 2004).

According to Kurien and Qureshi (2011), the main objective of supply chain management models and frameworks is to assist management in assessing company performance and enhancing operational efficiency. However, the lack of advice in the literature about the selection and implementation of Supply Chain Performance Measurement Systems makes it challenging to establish relevant performance measures (Kurien & Qureshi, 2011). Performance metrics that fall into broad categories including quality, financial, time, product flexibility, overall performance, and innovation are used by many companies in a range of industries (Elrod et al., 2013). In order to navigate this complex and changing environment, supply chain decision-makers require a process that enables them to learn about the context of the decision-making process, thereby facilitating the necessary enhancements to meet the performance expectations of the aspects deemed most significant by end customers. Implementing Performance Evaluation inside the constructivist framework may help meet this criterion (Ensslin, L. et al., 2010; Ensslin, L. & Vianna, 2008; Tasca et al. (2010); Giffhorn et al. (2009)

Therefore, in order to maximize resource usage in a situation of scarcity, it is essential to assess the supply chain. Investigating a range of approaches, performance indicator systems, and technology is essential for supply chain evaluation, monitoring, forecasting, and improvement of effectiveness. In order to determine their interdependencies, Soto Lopez et al. (2022) attempted to assess the internal hospital supply chain's performance metrics. Their goal was to determine the essential performance metrics for each and comprehend the connections between them.

Possible areas where the logistics process might be improved. By using flexible rough intervals that reflect the experts' subjective and ambiguous assessments, the authors' rough group DEMATEL technique successfully adapts DEMATEL in an uncertain setting according to Lopez Soto and associates (2022). Bhatti et al. (2015) created a model to evaluate the effectiveness of medical personnel in Punjab, India, using analytical modeling (Bhatti et al., 2015; Saaty, 1980).

Fan and Zhang (2016) argue that in order to gain an understanding, the supply chain performance assessment process entails applying an analytical approach, using particular performance indicators, adhering to a specific protocol, and conducting quantitative or qualitative comparison analysis. An accurate and impartial evaluation of a supply chain. The literature has a large number of research that provide methods and systems for performance indicators to assess the supply chain (Fan & Zhang, 2016). According to Lega, Marsilio, and Villa (2013), there isn't a thorough conceptual framework in the literature for assessing supply chain management in public health facilities. The authors then develop a model for assessing the supply chain's effectiveness in an Italian city. Starting with the SCOR model, the authors include other performance indicators that are relevant to the healthcare industry, such as supply costs for financial benefits and safety under organizational benefits (Lega et al., 2013). Malik et al. (2016) used the analytical hierarchical method to assess the environmental performance of suppliers in the hospital supply chain in the United Arab Emirates. The purpose of this technique was to convert the qualitative assessments of supply chain specialists into a quantitative framework (Malik et al., 2016). Additionally, Dotoli et al. (2015) provide a methodology for assessing the performance of healthcare systems' decision-making units in ambiguous situations. In a case study of the Italian Apulian health system, the authors used cross-efficiency fuzzy data envelopment analysis (Dotoli et al., 2015). Supeekit et al. (2016) evaluated a hospital's internal supply chain using an Analytical Network Process (ANP). The DEMATEL multiple criteria decision analysis methodology was used to modify the method. The research looks at the link between performance categories and establishes the weights of performance components using the model that was referenced (Supeekit et al., 2016). Khaldi et al. (2017) examine the feasibility of using the Adaptive Neurofuzzy Inference System (ANFIS) in conjunction with Data Envelopment Analysis (DEA) to evaluate supplier performance. According

to Khaldi et al. (2017), their study mainly focuses on assessing and predicting the performance of certain pharmaceutical suppliers in a hospital setting. In their work, Chorfi et al. (2015) developed a KPI classification and selection model using MCDA. The model uses AHP to identify and assess relevant KPIs for the pharmaceutical industry criterion. Chor et al. (2016) evaluated the effectiveness of the public pharmaceutical supply chain using a two-step DEA approach. The model was developed to give a set of aggregate indicators that accurately reflect the performance of the public pharmaceutical supply chain, as well as to compare other public supply chains and estimate relative efficiency (Chorfi et al., 2016; Chorfi et al., 2015).

In order to identify the statistical characteristics of effectiveness assessments, Mitropoulos et al. (2015) used Bayesian analysis and stochastic DEA on data from 117 Greek public organizations. To determine the efficiencies under the following conditions, a sensitivity analysis was conducted using the Bayesian-CCDEA model: The problem of DEA sensitivity for bad data, together with the various probabilities of stochastic outputs, is especially relevant in the context of cross-sectional data gathering (Mitropoulos et al., 2015). Yazdani et al. (2020) used a modified version of Evaluation Based on Distance from Average Solution (EDAS), a decision-making model that incorporates the Decision-Making Trial and Evaluation Laboratory (DEMATEL), and the Best Worst Method (BWM) to solve a supplier selection problem in a public procurement framework meant to achieve sustainable development goals.

Performance evaluation in the public sector and in a university setting has been studied before by Longaray and Ensslin (2014) and Longaray et al. (2015). Both the present study and the earlier ones use a shared hospital setting to carry out their research. The focus and technique of the present study, however, vary greatly from those of previous investigations. In contrast to earlier research that focused mainly on creating models to help Brazilian Federal University Hospitals identify, implement, and measure particular requirements necessary for obtaining or reaffirming certification from the ministries of Health and Education. Gaining a more thorough grasp of the elements influencing supply chain management in a hospital context was the aim of the present research. Its goal is to make clear how many important elements interact and contribute to the supply chain's overall performance. These components go beyond the traditional criteria that

were highlighted in earlier versions. For this reason, the complex aspects of hospital supply chain management should be assessed, acknowledging that it is influenced by variables beyond financial performance, material management, and operational effectiveness. It considers a number of interrelated areas that are pertinent to the supply chain, including education, human resources, and legal considerations. The intricacies and interdependencies that are hidden in the hospital's supply chain operations should constantly and thoroughly be examined.

The goal of Longaray et al. (2015) is to define, describe, and measure the relevant standards for assessing university hospitals in connection with the contractualization of goals set with the SUS. On the other hand, Longaray et al. (2018) outline the steps necessary to create a performance appraisal pertaining supply chain. To make it easier to identify and provide solutions for the logistical problems facing a public teaching hospital, a performance evaluation methodology for internal logistics operations is put forward. The latter's main goal is to provide direction on matters pertaining to planning and resource allocation in addition to supply chain management. The thorough literature review carried out and published by Longaray et al. (2023) has highlighted the use of performance evaluation techniques to examine the overall effectiveness of supply chain management in public healthcare. Clarifying the use of MCDA models was made possible by the study, especially in certain areas of the supply chain including internal operations, logistics, procurement, supplier selection, and pharmaceutical distribution. The study found that many studies use questionnaires distributed in the workplace or pre-existing literature as its indicators. These findings led the authors to use an MCDA model that considers the decision maker's context and circumstances.

The review's findings also indicated that there was insufficient integration between the supply chain and other operational areas at a teaching hospital, which had an indirect effect on supply chain management as well as departments like human resources, education, and law. This realization has guided the current study, highlighting the importance of different industries in efficient supply chain management.

3.1 Evaluating supply chain management performance in public health care

According to Fallahnezhad et al (2024) hospitals and other healthcare systems are complex organizations with distinctive features, where many departments work together to carry out a broad range of duties. Because of the unpredictability of their operating environment, hospitals are inherently complex. Compared to industrial settings, healthcare services exhibit a variety of patient needs and treatment results [1]. The internal hospital supply chain has a number of operational difficulties, such as the unpredictable demand for medical supplies, the high price of surgical instruments and medical items, and the particular and complicated inventory management issues brought on by emergencies. Through the management of data, materials, and funds related to the procurement and delivery of services from suppliers to end users, the hospital supply chain (HSC) seeks to accomplish both clinical and non-clinical goals. To ensure the efficient provision of care, this supply chain integrates clinical and logistical activities inside the hospital [2]. Because healthcare systems enable hospitals to compete in the market, performance evaluation based on HSC infrastructures is essential for enhancing a range of performance factors, such as clinical results and financial management. The necessity to improve hospital operations' effectiveness and efficiency in a rapidly evolving healthcare environment is what spurred this investigation. The need for comprehensive performance evaluation tools is even more critical given the additional challenges hospitals are facing, including shifting patient expectations, budgetary constraints, and regulatory changes. Through performance review, which also identifies strengths and weaknesses and indicates areas for improvement, hospital management may get a comprehensive understanding of their institution's effectiveness. To adapt and thrive in fiercely competitive healthcare environments, hospitals need to implement a thorough performance monitoring system. This may be achieved via the use of efficient tools such as Key Performance Indicators (KPIs), which provide a quantitative basis for performance evaluation [3]. Key Performance Indicators (KPIs) are metrics that are used to assess how well a business is doing with respect to certain operational and strategic objectives. To make sure that performance assessment supports the hospital's overall objectives, it is crucial to choose KPIs that are in line with the organization's goals, purpose, and rules. To guarantee safety, effectiveness, efficiency, quality, higher patient and provider

satisfaction, and eventually better clinical outcomes, a hospital's key performance indicator (KPI) is a tool for managing, tracking, monitoring, assessing, modifying, and improving the performance of the healthcare process. Hospital managers may use key performance indicators (KPIs) to analyze both quantitative and qualitative data in order to make strategic and operational decisions [5, 6]. A number of factors, including an aging population, a lack of funding, a shortage of healthcare professionals, a shortage of qualified staff, declining reimbursement rates, a lack of financial incentives, and issues with strategic planning and administration, will unavoidably cause changes in healthcare settings. This implies that contemporary healthcare organizations need to be sufficiently cognizant of their intangible assets, which include clinical practices, staff competencies, patient satisfaction, and financial outcomes.

In response to these changing problems, it is essential to use key performance indicators (KPIs) for continuous performance monitoring in order to improve operations and get better results [5]. KPIs, or key performance indicators, are essential for monitoring, planning, and evaluating. They help managers make decisions, back them with facts, and provide them clarity. They assist daily operational choices, help hospital management create action plans, and provide a framework that is connected to factors that determine long-term performance [7].

Even if several KPIs for hospital administration and healthcare have been identified via case studies, cross-sectional research, or expert interviews, the findings are still inadequate [8]. A set of key performance indicators (KPIs) was created by Shawahna et al. [9] to evaluate pharmacists' contributions to epilepsy treatment in clinics. Performance metrics for Iranian hospital pharmacy were divided into three categories by Mahmodabadi et al. [4]: financial (revenue, expenses, and financial utilization), clinical (patient safety), and management [4, 9]. A cross-sectional observational research evaluated six key parameters to determine the effectiveness of Primary Health Care in Oman: safety, outcomes, burden, accessibility, timeliness, and satisfaction [10].

Despite the availability of several evaluations, there isn't a thorough systematic research that focuses only on key performance indicators (KPIs) for the hospital supply chain. There is evidence that essential performance measures for digital health treatments may be established, according to a recent feasibility study [11]. Efficiency, effectiveness,

patient-centeredness, safety, responsive governance, staff orientation, and timeliness were among the criteria used to characterize hospital performance indicators in a thorough research [12].

As it can be understood, the evaluation of hospital supply chain performance necessitates taking into account a wide range of factors and dimensions, each of which may have a different definition of "performance," due to the organizational structure and procedural complexity of these institutions as well as the diverse stakeholders involved in service delivery. Finding internationally relevant KPIs that effectively indicate performance across a variety of aspects, including financial, managerial, and clinical results, is very difficult due to its complexity. Therefore, the findings of this study suggest that, even if there are certain commonalities, the environment and the particular emphasis of the research may have a substantial impact on the choice and use of KPIs. Considering the basic attributes of hospitals (e.g., size, ownership, degree of specialty, location, and public or private status) makes this very complex [12].

A significant obstacle in the creation of hospital supply chain KPIs is also choosing the right tool (scale) to get agreement on the elements to be included in the final set of indicators. While it is acknowledged that a range of specialists are crucial in determining key performance indicators (KPIs), a more thorough cooperation with subject-matter experts is required to emphasize the relevance of developing KPIs for the hospital supply chain. A Delphi study might be used to get agreement on the hospital supply chain's top priority KPIs. The Delphi methodology offers a straightforward, efficient, and economical method while maintaining the respondents' anonymity. It may include a range of options and products and is often used with international and multidisciplinary expert groups [11]. In this regard, academics and universities are essential. The significant lack of evidence-based knowledge in this subject is also highlighted by this study. By providing managers and policymakers with timely, accurate, and relevant information, the implementation of key performance indicators (KPIs) for the hospital supply chain facilitates the assessment of hospital performance in both clinical and non-clinical domains, guarantees progress evaluation against predefined objectives, and aids in decision-making [42]. Hospital performance evaluation is crucial nowadays for efficient financial resource allocation, asset management, and investment strategy. By measuring inputs, outputs, processes,

organizational costs, and financial performance, key performance indicators (KPIs) are often used by managers in this setting to support decision-making [43]. Key performance indicators (KPIs) for the hospital supply chain can be divided into three groups: clinical, managerial, and financial. In our analysis, the financial category is the one that is most conspicuously emphasized and represented (n = 37 indicators). The administrative (n = 15 indicators) and clinical (n = 12 indicators) categories are also significantly included in the included study. Understanding the budget, revenue, expenses, attrition, cash flow, net profit margin, debts, and other financial data is crucial for managers to make effective decisions. Although it may not be the main factor in determining a healthcare facility or hospital's success, financial performance is essential to achieving its goals and priorities. To determine the hospital's financial health, financial indicators must be evaluated. Administrators may use it to examine financial patterns over time and contrast them with those of other organizations [44].

Metrics known as managerial key performance indicators (KPIs) evaluate how well organizational procedures and administrative activities work in healthcare organizations [45]. These key performance indicators (KPIs) highlight things like resource use, staff productivity, financial performance, and regulatory compliance. Although there are often fewer management indicators than clinical indicators, they have a significant influence on the provision of healthcare. Hospital occupancy rates and average length of stay are examples of management KPIs that have a direct impact on resource allocation and operational efficiency. Effective resource management may lead to better patient outcomes and reduced expenses. Funding high-impact regions in a tertiary care center is made simpler by the use of management KPIs in strategic decision-making, according to a study by Khalifa et al. [37]. For healthcare businesses to remain viable over the long run, financial KPIs such as operating margins and revenue per patient are crucial. Effective financial indicator management ensures healthcare providers' viability and allows them to continue providing essential services. The research by Amos et al. [34] demonstrates how facilities management services in public hospitals may be improved via the use of financial performance metrics. Management's use of key performance indicators (KPIs) helps facilitate compliance with healthcare regulations and standards. Clinical governance and risk management metrics are critical to ensuring the safety and quality of healthcare. Businesses may find areas for improvement and lower patient safety risks by using performance indicators

for clinical governance, according to Azami-Aghdash et al. [17].

Clinical key performance indicators (KPIs) prioritize the quality of patient care and have a direct correlation with patient outcomes [46]. These variables evaluate therapy protocol adherence, treatment efficacy, and patient satisfaction. The efficacy of healthcare services is assessed using clinical key performance indicators (KPIs), such as readmission and mortality rates. They provide timely feedback on patient outcomes and point out areas that need improvement. A consistent framework for clinical KPIs is necessary to improve emergency department performance, according to Núñez et al. [35]. They show that improved patient outcomes and indicator monitoring are directly related. Additionally, clinical key performance indicators (KPIs) often include patient safety measurements like as infection and prescription error rates. Healthcare providers may implement rules that enhance patient safety by monitoring these variables. De Mendonça Lima et al.'s research [36] emphasizes the value of KPIs in reducing adverse events, highlighting its significance in outpatient medication management. Improving the quality of care requires metrics that assess the effectiveness of clinical procedures, such as the time required for diagnosis or therapy initiation. Christodoulakis et al. [38] claim that healthcare organizations may improve their understanding of performance dynamics and reduce procedures by evaluating clinical burden indicators in addition to KPIs.

A range of financial metrics for certain hospital or healthcare environment sectors have been presented by earlier study.

In a mixed-methods research, eight financial performance metrics were ranked using the SAW technique. Consequently, the Council of Specialists selected the five prime indicators as key performance indicators. The ratio of total revenue to total cost, the percentage of staff expenses in total costs, the hospital discount rate (%), the average daily expenses per bed, and the prices of materials and medicines were the key performance indicators (KPIs) that were developed [47]. The financial performance of Poland's public hospitals was examined by Dubas-Jakóbczyk et al. [48], who focused on ownership and organizational structure in particular. They also looked at the relationship between the criteria they discovered and financial success. The financial

elements of each hospital group were assessed, including total assets, total revenues, total costs, gross profit or loss, and arrears. Our research indicates that the proliferation of financial indicators throughout the hospital supply chain may be attributed to the need for a more comprehensive assessment of financial and operational performance. These measures have a direct influence on the hospital's supply chain's efficacy, assisting managers in more accurately executing management strategies and more efficiently allocating resources. This invention enhances patient satisfaction and service quality by optimizing procedures and reducing expenses. Managers may make educated decisions that improve performance and the quality of healthcare services by balancing clinical and financial issues. Our analysis indicates that additional information is needed before hospital supply chain key performance indicators (KPIs) may be created.

A comprehensive approach to healthcare performance management requires the integration of managerial KPIs with clinical KPIs since there aren't many managerial KPIs [8]. By using management key performance indicators (KPIs), which contextualize and reinforce clinical indicators, healthcare organizations may effectively satisfy patient expectations while maintaining operational efficiency. When hospital managers use both KPI sets to guide their data-driven decision-making, clinical outcomes and management practices may be improved. This synergy is supported by the findings of Dolatabad et al. [20], which demonstrate how KPI analysis may enhance the performance of the healthcare industry's circular supply chain and hence directly impact service delivery.

Clinical and managerial key performance indicators (KPIs) are used to promote a culture of continuous improvement in healthcare organizations. By connecting management practices with clinical outcomes, businesses may find inefficiencies in care processes and work to improve organizational performance and patient happiness. By highlighting the significance of cooperation between clinical and management efforts, Yung et al. [29] have shown that the stratification of performance indicators has the potential to enhance clinical pharmacy services in cancer.

Of the thirty-two investigations cited, six were carried out in Iran [1, 2, 3, 5, 6]. Dashboards and other IT-based solutions are regularly assessed as a way to enhance the hospital supply chain, therefore resolving the significant supply and demand issues in

healthcare in both developed and developing nations. Many nations throughout the globe have quickly embraced clinical dashboards in recent years as lawmakers and governments have realized how useful they are as timely visual aids for showcasing an organization's performance. On a single screen, these displays provide the most current KPIs in an easy-to-understand format [7, 8]. Iran has been implementing more health initiatives in recent years, according to our study [9, 10], and many studies have highlighted the significance of key performance indicators for the hospital supply chain. To improve comprehension of the significance of key performance indicators (KPIs) in hospital supply chain management, further study on dashboard design and dashboard tool development is advised.

Employees at the hospital have a range of informational demands related to their duties, and the facility has a complicated and distinctive culture. Therefore, it is essential to focus on choosing appropriate performance measures for the interface to track [11].

Section 4: Methodology

A literature study gives a certain academic subject crucial background information. It gathers published research on a subject, evaluates several research sources, and conducts a critical analysis of them. Reviews of the literature might be argumentative, integrative, historical, methodological, systematic, or theoretical, and the technique used will depend on the specific analysis conducted in a given research. Because they provide a theoretical study of significant subjects, narrative reviews are regarded as an indispensable teaching tool. Narrative reviews use a less formal approach than systematic reviews since they do not need the strict elements of systematic reviews, such as comprehensive documenting of methodology, search terms, databases consulted, and inclusion and exclusion criteria (Chaney, 2021)

In situations when the stringent requirements of systematic reviews could obscure the narrative continuity, a narrative review is a kind of analysis that charts the evolution of a scientific principle or therapeutic notion, especially those that need further research. Consolidating prior research, summarizing, identifying gaps or omissions, and gaining new insights by identifying previously unidentified, non-obvious connections are some of the benefits of a narrative review, which encourages the creation of creative ideas. One of the shortcomings of narrative reviews is their possible inability to maximize

breadth or properly assess the data gathered. A failure to critically assess the validity of the claims or conclusions made, or the likely absence of important literature, might be the cause of the produced results' possible bias. Furthermore, the writers are unable to choose anything that contradicts their preconceptions, which gives a preferred theory an excessive degree of legitimacy. In line with the general movement toward evidence-based medicine, academic biomedical journals have shifted from favoring narrative reviews to favoring systematic reviews in recent decades. Three Once again, the pendulum seems to have swung in favor of accommodating both kinds of assessments in acknowledgment of their distinct contributions to the overall scientific project (Chaney, 2021).

Section 5: The case of Greece

Since Greece has a universal healthcare system, its citizens may get treatment from both public and private providers. The country's public healthcare system comprises over 130 general and specialist healthcare facilities. There are two university hospitals and thirteen military hospitals in Greece. When it starts its second term in June 2023, the Mitsotakis administration has committed to enacting a number of important healthcare reforms. Health spending will account for \$10.9 billion, or 10.4% of the overall budget, in 2023. With a focus on childhood obesity, cardiovascular diseases, and breast, cervical, and colon cancers, it emphasizes early identification and prevention. Eighty hospitals and 157 medical institutions will be built or renovated thanks to the scheme. The budget includes funding for 6,000 new recruits and a 10% pay rise for doctors in an attempt to attract and retain talent in order to solve the acute understaffing in the healthcare industry. \$255 million has been set aside for the healthcare system's digital transformation, which offers significant prospects for IT and data solution providers. After years of underfunding the healthcare system due to the financial crisis, Greece's health spending is expected to increase at a compound annual growth rate (CAGR) of 4.2% in 2023. Experts predict that by 2027, health expenditure will equal the European average of 10.7% of GDP. Government expenditure would grow more steadily, while private spending would rise more sharply. Greek citizens may also get private healthcare. Private healthcare often provides better care and shorter wait times than public healthcare. In Greece, which has 139 private

hospitals, the private sector mostly operates small clinics. There are several well-known companies in this industry, many of which have partnerships and production sites in the area. Close international ties exist between Greek and American healthcare institutions. In 2021, Pfizer opened an innovation center in Thessaloniki, while Jansen, Merck, and Lilly have regional production facilities spread out around the nation. Greece's pharmaceutical industry is predicted to expand by 8.2% in 2023, from \$7.5 billion in 2022 to \$7.8 billion. The market is expected to grow to \$9.8 billion by 2027. To ensure long-term market growth, the Greek pharmaceutical sector must solve serious structural issues. Compared to before the financial crisis, market spending has significantly decreased. For new drug makers, the pharmaceutical sector is difficult due to Greece's stringent laws and pricing restrictions. Greece instituted the pharmaceutical clawback system in order to balance the budget after the 2010 financial crisis. Over the last ten years, the sums that businesses pay have significantly climbed. Clawback amounts for new items may sometimes surpass 70% of the final product's cost. Under the EU's Recovery and Resilience Plan, the Greek government has pledged to gradually reduce clawbacks by 2025. The government has also taken steps to lower pharmaceutical spending clawbacks via investment and R&D expenditures. Although this lessens some of the industry's strain, major adjustments are still needed to allow for the release of novel, cutting-edge medications. It is expected that the government would continue to rationalize pharmaceutical spending by imposing price caps on proprietary medications to encourage the use of less costly generic substitutes. With a minimum price of \$6.60 for generics, Greece is one of the few EU nations with a comparatively high minimum pricing. There is currently a pharmaceutical shortage in Greece. This worldwide problem is made worse by supply chain interruptions caused by the energy crisis and the war in Ukraine, which are sparked by a shortage of raw and packaging materials. These problems have led to a serious shortage of over-the-counter drugs. Even though arrears have recently decreased, suppliers continue to face large payment gaps and delays.

Medical Devices and Diagnostic Tools

It is anticipated that the Greek medical device market will grow at a 5.1% yearly pace to reach a total value of \$1.4 billion by 2027. Inadequate domestic production will affect the country, and significant medical debt and excessive inflation will hinder market

performance. The medical device business will continue to face difficulties because of clawbacks, certification delays, and the intricacies and hold-ups in the reimbursement process.

Nearly 80% of expensive medical equipment is imported because local producers are unable to meet the required standards. Although there are chances for American medical equipment in Greece, there is fierce competition, especially from businesses in the European Union. The People's Republic of China (PRC) is the main non-EU provider of Greece's medical equipment, with the bulk coming from Germany, the Netherlands, and Belgium. The United States is the eighth-largest provider of medical equipment to Greece. Boston Scientific, Medtronic, and Johnson & Johnson are a few of the well-known American businesses that are now involved in the industry. Greece does not allow the supply of medical equipment unless the European Commission has given its approval. Additionally, the National Organization for Healthcare Provision (EOPYY) maintains a unique record for the accreditation of medical equipment. Companies are urged to work with regional distributors in order to efficiently handle both local and EU laws.

Possibility

- **Projects Started by the Government:** As of July 2023, \$3.4 million has been allocated to many Western Greek institutions for the purchase of contemporary medical equipment. The European Union Recovery and Resilience budget has allocated \$1.69 billion to the Greek healthcare system, which includes projected investments in the medical equipment and pharmaceutical industries. Hospitals purchase medical equipment, especially CT and MRI scanners, to significantly replace outdated technology. In order to manage the government procurement process and adhere to rules, entities interested in investigating these prospects must collaborate with a local partner. Our staff can connect potential local partners, distributors, and interested businesses.

- **Private Sector Initiatives:** A number of private organizations and non-profits are planning to conduct healthcare infrastructure projects in the near future, which is anticipated to encourage the purchase of medical equipment. In addition to supporting other educational and infrastructure projects aimed at enhancing the country's healthcare system, the Stavros Niarchos Foundation (SNF) has suggested building three new hospitals around Greece. The construction agreement was signed on August 4,

2023, by the SNF General Hospital of Komotini, the SNF University Pediatric Hospital of Thessaloniki, and the SNF General Hospital of Sparta. Please see the SNF's duties for further information. The Onassis Foundation is building the Onassis National Transplant Center, the first and only organ transplant facility in the country. Please visit Onassis Health to find out more. The rise in investments in the hospital sector, which aims to raise the standard and capacity of Greece's healthcare, is expected to provide opportunities for U.S. companies to sell medical equipment or oversee projects. Entities should confirm with the relevant parties that they are eligible to participate in future bids before announcing them.

- **Health Information and Communication Technology Opportunities:** The adoption of electronic health records (EHRs) and the standardization of healthcare systems are only two examples of the possibilities that will arise from the need to digitize the healthcare system. A fragmented healthcare system with regional differences has made it difficult to implement a national digitalization plan. About \$2.35 billion has been set aside for the digitalization of healthcare under the National Electronic Health Record initiative, which aims to digitize patient data. We hope it will be put into effect. Big data and artificial intelligence might be useful to Greece's healthcare sector. Please visit the Health ICT public sector website for more details on public sector procurement possibilities.

- **Telemedicine:** The Covid-19 pandemic has expedited the usage of telemedicine, which would have normally taken years, even if Greece's progress is still lagging behind other European countries. American providers of telemedicine solutions may be able to take advantage of these prospects.

Resources

The national agency in charge of regulating pharmaceuticals is the Greek National Institution for Pharmaceuticals (EOF). Act 1316 created the EOF as a public entity in 1983, and the Ministry of Health Social Solidarity is in charge of it. The objective is to enhance public health and safety by actively supporting the pharmaceutical sector and regulating medications, medical equipment, blood and tissue products, and biobanks. The trade of medical items is duty-free within the EU. Import taxes apply to goods originating from non-EU countries. Duties on US-imported medical equipment may range from 5% to 12%, depending on the product.

To optimize the use of public funds for the implementation of health policies related to the procurement systems of health units, a new legislation (L.3580/2007) was implemented. In order to create a unified supply program that meets hospitals' actual needs, the new procurement system:

- Provides contracts covering a variety of healthcare services and products;
- Permits direct payment to suppliers, allowing for price reductions and service quantity adjustments;
- Compiles hospital needs to create a register of suppliers that may be updated periodically.

The Procurements' Health Committee (P.H.C.) is a key organization responsible for developing tender terms and specifications, managing contract operations, and arranging financial transactions for hospitals. The new legislation established an integrated procurement system for the first time in the N.H.S. function in accordance with national and European norms. In theory, this system is intended to provide transparency, high-quality products and services, economies of scale, and fair competition. The primary administrative organization required by law to ensure the operational and financial consistency of the hospitals' supply program is the P.H.C. It is responsible for keeping an eye on the program and integrating the fragmented purchasing system. Each year, the committee is responsible for gathering 3,000 proposals from 289 NHS organizations for the acquisition of 11,000 drugs and 500,000 different kinds of medical items from 1,144 suppliers. According to the Health Minister, the new bill might save over 500,000,000 euros and resolve issues with the N.H.S. purchasing system. This figure is significant in light of Greece's current debt and deficit situation.

The P.H.C.'s management structure, which is responsible for managing the supply chain and implementing the unified supply program, is composed of six divisions and three materialization sections. Economic administration, supply and revenue administration, technical assistance, programming and evaluation, monitoring and control, specifications, pricing and quality, and technology and supply chain administration comprise the departments. The following three materialization units are the Biological Material Research Center, the Research and Technology Pharmaceuticals Institute, and

the Public Corporation for Building Hospitalization Units. The P.H.C., which oversees the three divisions, is responsible for conducting bids, issuing declarations, and carrying out contracts for the delivery of products and services. The Research and Technology Pharmaceuticals Institute handles tenders for reagents, blood collection supplies, cardiovascular surgical equipment, fuels, blood purification filters, and orthopedic and hygienic products. It is also responsible for coordinating and supervising the interactions. The Public Corporation of Building Hospitalization Units is in charge of receiving, installing, and running these units inside the N.H.S. as well as developing an internal network for handling biomedical contracts and supplies. The Biological Material Research Center is responsible for maintaining a database of suppliers and an inventory of technological, pharmaceutical, and medical items. In its capacity as the P.H.C.'s scientific advisor, it makes recommendations about the technical requirements for the acquisition of biomedical equipment and other medical supplies.

When the P.H.C. first started operating in 2008, it issued hospitals a relevant paper outlining its intention to be the only authority for all procurement procedures, conventional or non-traditional. Therefore, for a supply to be considered real, hospitals must get prior P.H.C. certification. This also includes new contracts or bids that took place between June 2007 and June 2008. As a result, the P.H.C. offices began receiving an increasing number of inquiries about permission. The 25-person committee was unable to handle a daily flow of more than 25 requests, despite the fact that the receiving rate was almost 45 requests per day. According to the former president of the P.H.C., institutions should take into account that the certifications take one and a half to two months to complete. The P.H.C. made the decision to address the issue and provide hospitals information for further clarification in response to the ensuing discussions. Hospitals were informed that permission would not be required for goods that are essential to patient safety and life. The P.H.C. allowed hospitals to buy low-budget products and services as long as they submitted monthly reports to the P.H.C. and established a monthly ceiling of 3000-5000 euros for non-traditional costs. Suppliers would fulfill orders outside of the framework without the P.H.C.'s consent. The system's improvement was greatly enhanced by this approach. In a completely unregulated environment, the price of these commodities was close to 200,000,000 euros.

Additionally, the P.H.C. spearheaded the development of uniform declaration forms and technical specifications for cleaning and security services in accordance with regional and federal regulations. As a result, the hospitals used the P.H.C. declaration forms in their bids for housekeeping and security services. The P.H.C. was compelled to eliminate all bids for the sake of transparency, order hospitals to develop new specifications in accordance with the most recent announcement, and exclude several Greek suppliers, leaving just two or three large companies eligible. It is evident from the evidence above that the new regime did not function as intended, which exacerbated issues and costs and increased the hospitals' deficit "black hole."

5.1 Presentation of the situation in Greek hospitals

From research the following have been recognized pertaining supply chain in Greek hospitals.

The supply or procurement department, as well as warehouse administrators or supervisors, were in charge of the activities that were being examined. A questionnaire was sent to gather data for description, interpretation, and qualitative and quantitative analysis.

This study includes all 133 of Greece's public hospitals. Seventy-one percent of Greece's hospital space is in public hospitals, which are managed and controlled by the National Health Service. Decision-making authority was delegated to the Scientific Council, while the hospital or Periphery Sanitary administration was responsible for obtaining the necessary documentation from the researcher. Under the direction of the Scientific Council and in accordance with its recommendations, the hospital administration acquired the materials. The researchers' final destination for approval was the Ministry of Health and Social Solidarity. The questionnaire was sent to 100 institutions and 133 hospitals in total. Of the 133 institutions originally questioned, 17 responded after 5 months. At the same time, in-person interviews were conducted with five prominent Athens institutions and suppliers.

Findings

The response rate was modest, at around 13 percent. Nonetheless, the result can be seen as favorable considering the circumstances and state of Greek institutions at the

moment. The poor response rate might be caused by a number of factors, including the over-management of the institutions' internal procedures.

The first question was to find out whether the hospital had an internal material management department and, if so, what it was named. Important results from the previously stated study indicated either a lack of knowledge (23.5% of respondents claimed to be ignorant) or, more concerningly, that a significant portion of hospitals were devoid of a department. 52.9% of respondents claimed to have material management departments. There was a broad variety of responses to the questions since every institution has a different architecture and intricate processes. There is enough variation in the approaches to imply that a centralized and stable organizational process is not being adhered to. In particular, 44.4% of respondents attributed responsibility to the material administration department, 22.2% mentioned the material administration department in conjunction with another department, 11.1% described the warehouse department as the special control of orders/warehouse department, 11.1% described the supplies/purchase department/office as the special control of orders/warehouse department, and 11.1% used the general term "Warehouse and purchase department." Key hospital supply chain departments' areas of authority were shown by the second question and its response. At the same time, the outcomes were both anticipated and contentious. The departments responsible for medicine supplies are the pharmacy in 41.2% of hospitals, the materials administration in 22.5%, the supply/purchases in 11.5%, and the specialized logistics in 11.5% of hospitals. Universities were unable to react at all in 11% of cases. 11.8% of those surveyed claimed to get their medicinal supplies from the drugstore. About 58.8% of the total is under the control of the purchase/supplies department, which is followed by the material administration department at 23.5% and the special logistics department at 5.9%. In our survey on reagent supplies, 17.6% of participants claimed the pharmacy department was in control, followed by the material administration department (29.5%), the purchasing department (41.2%), a specialized logistics department (5.9%), and a department that was unsure (5.9%). In reference to consumables, the purchasing/supplies department was mentioned by 70.6% of survey participants, followed by the material administration department by 23.5% and a specialized logistics department by 5.9%. A startling 94.1% of respondents said that the

purchasing department was in charge of purchasing medical equipment, compared to 5.9% who stated that the special logistics department was in responsible. 64.7% of the institutions under investigation manage physical supplies concurrently. According to the purchasing department and 5.9% of respondents, this function is managed by a dedicated logistics department; nevertheless, 29.4% of respondents were unaware of this. Receiving activities are handled by the majority of the sample (82.4%), although 17.6% said that a logistics department is explicitly in charge of this duty. Furthermore, 82.4% of hospitals believe that the material administration department is responsible for warehouse material administration, 17.6% believe that a different logistics department is in charge of it, and 5.9% are not sure. Furthermore, 82.4% of the clinics utilize the material administration department for internal product distribution, whilst 17.6% employ a specialist logistics department. The material administration department is responsible for managing hospital information systems; 17.6% of respondents said that they are in charge of this, whilst 11.8% stated that the supply department is. Additionally, 29% of hospitals claim to be aware of the issue, and 36.3% claim that another logistical department should handle this administration. The purchasing/supply office accounted for 23.5% of the replies, the material administration department for 17.6%, and another specialized department for 47.1%. The task of executing nutrition supply operations falls to these responders. The explanation given by 11.8% of respondents for not responding is awareness. The material administration department handles 23.5% of the sample characteristics processes in the distribution-transportation services, followed by the purchasing/supplies department (17.6%), the specialized logistics department (29.4%), and the uninformed department (29.4%). The material administration department in the sample of hospitals handles 41.2% of the clothing supplies, followed by the purchase/supply office with 23.5%, a specialized logistics department with 23.5%, and an unresponsive 11.8%. Furthermore, 5.9% of hospitals have a dedicated logistics department, whilst 29.4% have a supplies/purchase office that oversees care services. A noteworthy 64.7% of hospitals are unaware of these agreements. This proportion implies that the structure and development of care services are constrained. The majority of those surveyed (76.5%) claimed to be unaware of what telemedicine services were. Nonetheless, 5.9% said that the procurement office was in control of telemedicine operations, but 17.6% stated that a specialized logistics department was. This suggests that public hospitals may not be aware of telemedicine services. The

material administration department is in charge of the substantial task of equipment maintenance, which is completed at a rate of 11.8%. Oversight is provided by the procurement/supplies office.

17.6% of respondents could not describe the logistics department, despite 35.3% of respondents stating that there was a separate one. Of the respondents, 47.1% said that environmental administration services are provided by the supplies/purchase department, 29.4% claimed that a specialized logistics department does, and 11.8% claimed they knew nothing at all.

The third question was crucial to our study because it would enable us to pinpoint the supply chain element that has the most impact on the distribution process. The distribution strategy is crucial to logistics as it impacts the purchasing and supply chain processes overall. As a result, we may evaluate the effectiveness of the distribution route and see the kind of control implemented upon receiving the suppliers' products. 5.9% of hospitals reported that 26-50% of purchase value is sent directly to clinics, 5.9% reported that 51-75% of supply value is sent directly, 5.9% stated that they were unaware of the distribution percentages, and 70% of hospitals stated that 0% of supply value is sent directly from suppliers to clinics. Regarding the proportion of Before transferring the items directly to the departments or clinics based on their demands, including value, distribution centers first store them in the central warehouse. Our research showed that 5.9% of hospitals said they used this method to distribute 0% of the supply value. Additionally, 11.8% of respondents said that between 1% and 25% of their supply value used this specific strategy, 5.9% reported that between 26 and 50% did, 17.6% cited between 51 and 75%, 5.9% reported between 76 and 99%, and 41.2% confirmed that 100% of their supply value did. In addition, 11.8% of the sample reported not knowing the subject. Some of the things that were initially stored in the central storage were included in the distribution plan that was ultimately examined. The distribution center subsequently sent these items to the destination clinics' separate warehouses, where they were used to fulfill the generated demands. The statistics showed that 17.6% of people shared this viewpoint. This proportion was between 1 and 25%, according to 5.9% of hospitals, and between 26 and 50%, according to another 5.9%. Of hospitals, 17.6% did not reply, 11.8% reported a range of 76-99%, and 41.2% reported a 100% ratio. Consequently, this method is used to administer 0% of the supply value. A range of techniques and methodological inconsistencies were observed. Nonetheless, it was generally agreed

that the primary entity responsible for material distribution is the central warehouse. The size of the hospitals included in the study had a significant impact, and the distribution strategy exposed the disparity. The researchers offered four recommendations to enhance hospitals' material procurement practices in response to the following question. The receivers may choose just one of the five potential replies. The options were entire disagreement, disagreement, neutral viewpoint, total agreement, and e). insufficient awareness. Of hospitals, 5.9% expressed clear disagreement, 11.8% objected, 52.9% were indifferent, and 29.4% seemed to agree with the statement that hospitals should reduce their inventory. The alarming 52.9% of respondents who believe that their hospital's inventory should not decrease suggest that supply chain operations are not being well managed and that logistics strategies are not being carried out correctly. The interviews revealed that inadequate logistical procedures and a lack of a Management Information System, which makes it challenging to accurately monitor stock, are the main causes of hospitals' excessive inventory levels. This reality worries the administrators and employees who oversee the management of orders, supplies, and resources. They can only feel at ease if they have a substantial inventory that can provide the clinics with the essential items needed for the hospital's efficient operation. The second recommendation, which called for fewer providers, was met with significant opposition from 23.5% of the public, while 35.3% disagreed. This suggests that the public is unquestionably in favor of maintaining the current level of competition, which lowers prices. Meanwhile, 29.4% of respondents claimed to be agnostic. It seems that the concept of strong supplier relationships is very narrow based on the lack of a favorable response to the question. This tendency seems to foster opportunism since it is feasible to get cheaper prices by creating a more integrated partnership with fewer suppliers. Better quality and better terms for delivery or payment might come from this strategy. The third recommendation for strengthening supplier connections was the most widely approved, with 58.8% of hospitals agreeing with it and 29.4% fully agreeing. Of the population, 11.8% were neutral. The fourth idea, which urged hospitals to establish new partnerships with other groups, was widely accepted. Of those surveyed, 41% agreed with the advise, 17.6% fully agreed, 11.8% were unsure, and 11.8% disagreed. In conclusion, the majority of survey participants concurred that in order to enhance their procurement practices and logistical operations, public hospitals should fortify existing agreements with suppliers and establish new

alliances with other medical facilities. Consequently, spending will decrease. Meanwhile, they categorically disapproved of the notion that The number of suppliers is maintained to a minimum via careful attention to the reduction of material stockpiles. The next question asked the authorized managers to assess the total stock value and the total value of their hospital's inventory, which included medications, medical supplies, and general consumables. The aforementioned question was designed to assess the size of the hospitals that took part in our survey and their capacity to collect the data required for strategic planning and internal statistical analysis.

Management Information Systems (MIS), which are necessary for the most accurate and effective retrieval of this data, were not used successfully by the majority of hospitals that participated in the study. Our findings imply that this is the case. Our questioning approach revealed a lack of understanding about the capabilities of the MIS. Telephone reports indicate that a number of hospitals have implemented and are the owners of a Management Information System (MIS). However, they are not fully aware of the capabilities and functioning of the system (Vagelatos and Sarivougioukas, 2003). Surveys are inadequate for providing a thorough examination of public hospitals due to their low response rate. The theory was created based on our survey data. The proportion of pharmacy stock value was not specified in 47.1% of the surveys that were filled out throughout the examination of the data gathered. The same proportion applied to medical disposables (consumables) as it did to the total stock value. Additionally, 58.8% of respondents were unable to determine the amount of disposable stock that each institution had. This implies that the data extraction procedure was challenging or the retrieval technique was intricate. In both situations, the outcome is the same. It is no longer possible to monitor logistics. The institutions were categorized by size in infographics using a scale and numerical identifiers. The proportion of pharmacy stock, the percentage of general consumables, the percentage of total stock value, and the percentage of medical disposables were all reported by nine (9) hospitals in answer to this inquiry. Central distribution and storage provide the solution to the issue of how the whole stock value is allocated.

By examining the center, clinics, and other locations, we were able to identify which department had the majority of the hospital's supplies. This allowed us to concentrate our study on the department that should implement the necessary strategies to enhance

supply chain operations. The divisions and medical facilities, together with the main warehouse, have been determined to have the largest concentration of stock value. Although the outcome was as anticipated, discussions with hospital employees—particularly administrators—showed that there was no standard policy since so many discrepancies were discovered. Reducing hospital inventory is necessary to boost financial performance. As part of our study, we asked the participating institutions to score how much inventory management had improved over the preceding three years. To address this issue and monitor both trends and actions, we have created a set of six potential reaction options. Our data suggests that improved control practices may have had a role in the significant decline seen in 23.5% of institutions. Furthermore, 29.4% of respondents said that their stock levels had fallen, while 47.1% stated that they had remained mostly stable. The number of suppliers in hospitals has either remained constant (58.8% of respondents said so), expanded, or increased greatly, according to responses to the question about comparing the number of suppliers now with that of three years ago. This suggests a decline in the longevity of long-term alliances but an increase in competition.

In addition to examining the presence of a strategic partnership among hospitals in the context of critical issues, the analysis covered procurement, medical staff, telemedicine, medical departments/clinics, laundry services, nutritional services, environmental management, and warehousing. Participants were permitted to perform a broad variety of disciplines. 35.3% of respondents stated that medical departments and clinics have strategic alliances, 17.6% stated that medical staff members have them, 41.2% stated that hospital alliances are used in supply procedures, and 11.8% stated that nutrition services, environmental administration services, and warehouse procedures have them, according to the survey's results.

Nonetheless, 23.5% of hospitals expressed uncertainty or said that no such collaboration exists (11.8%). The potential for strategic cooperation between institutions was investigated within the context of specific initiatives. Finding out if such strategic partnerships exist and their significance in relation to the following issues was the main goal of the investigation: a) Just-In-Time (JIT) initiatives; b) material shortages; c) electronic data exchange; and d) supplier certification. 23.5% of hospitals said that the JIT program implemented inventory reduction goals, while 11.8% of hospitals stated that they had JIT programs in place within collaborative frameworks with other hospitals. The supplier certification issue garnered 23.5% of the attention,

compared to 11.8% for the EDI concept. 5.9% of respondents cited another area where hospitals may collaborate, including cooperative procurement, whereas 47.1% of respondents said that there was insufficient information available. Additionally, by collaborating effectively with suppliers, hospitals may have earned revenue. The results were unambiguous, and the pertinent data showed that 70% of the hospitals surveyed were unable to reduce expenses and make a profit as a consequence of better supplier collaboration. Six percent claimed to have produced a definition, while twenty-four percent were unable to do so due to insufficient evidence. Only a single hospital provided a percentage response to the question concerning the precise monetary revenues. Regretfully, this was true. The answer accounted for 7% of the whole budget. We have drawn significant findings on hospitals' plans to use modern partnership techniques to enhance and optimize their supply chains while also reducing corruption and poor management in the medical field. This relates to the important question of how likely it is that hospitals will launch collaboration initiatives on certain topics in the next three years. By making the public national health system very costly, the issue made our country's current financial predicament worse. The findings may be adequately questioned due to the balance of responses. Half of the participants believed the hospital could implement a certain strategy over the next three years, while the other half said it was doubtful. To establish an effective supply chain, all of the previously listed tactics must be used within the context of strategic alliances between organizations. If a comprehensive network is constructed, information will be accessible to all relevant parties. Examining hospital outsourced operations and identifying the components of specific tasks that are really given were the goals of the subsequent investigation. Outsourcing is the process of employing a third party to provide a service that was previously managed internally. Outsourcing may sometimes include assigning management responsibilities for internal hiring and service provision to a third party. Sarpin and Weideman (1999) define outsourcing as a broad category of activities, including consulting, contract programming, professional services, staff augmentation, flexible employment, employee leasing, and contract services. Outsourcing is increasing, according to the pertinent schematics and hospital interviews. This expansion is being impacted by shifting shifts that are altering administrators' perceptions of their organizations. According to many managers in hospital procurement divisions, healthcare facilities could be allocated as a potential answer to market-driven demands.

the burden, the demands of managed care groups, and the rise in expenses. Furthermore, most hospital administration believe that outsourcing offers flexibility in a time when change is the only thing that is constant. Outsourcing is permissible at public healthcare facilities, according to every poll participant. It is one of the greatest methods for reducing hospital expenses without sacrificing quality, despite room for development. As a result, the supply chain function gains flexibility.

We requested the precise budget for the goods from the prior year from the groups we questioned in order to assess the feasibility of our investigation. In order to determine the precise amount of money hospitals spend annually on procurement, we also examined the response rate as a statistic. The response rate was sufficient. The precise amount spent on supplies in 2009 was disclosed by 47% of the institutions surveyed. Small, medium, and large hospitals were included in our research based on the total hospital budgets for the prior year. Our research found that 82.4% of the employees who completed the questionnaires were managers of the office or purchase/supply department, 5.9% were managers of warehouses, and 11.8% held other positions such as administrative tasks in the supplies department or administrators of the economics sub-department.

Conclusions - Discussion

In conclusion, the rivalry has forced companies to restructure several phases of their production processes. In this regard, supply chain management and logistics have been significantly impacted by business transformation, which enables firms to optimize every stage of the production process, lowering costs and optimizing resource use. By simplifying procedures, businesses may increase the value of their goods and services, speed up delivery, and strengthen their bonds with customers. Supply chains have garnered a lot of attention in recent years (Huo et al. 2010), which has enabled experts to examine the traits and activities that businesses need to have to stand out and become more competitive. For small, medium, and big businesses looking to maximize product value and boost customer satisfaction, the supply chain has become more important. The supply chain must be improved, mainly by examining the dynamics of communication and interactions between its participants, in order to achieve the

necessary competitive advantage (Bhatnagar and Sohal 2005). This section next explores the strategies used by some really successful companies to achieve notoriety and competitiveness via the use of efficient supply chain management. Technology has had a big influence on supply chain development since it has made it possible for businesses to predict demand, control and predict inventory levels, create creative and effective transportation routes, and manage logistics with amazing precision. Supply networks have an effect on cash flow, accounts receivable, and inventory levels, which in turn affect how working capital is used. Effective and efficient supply chains raise investment returns, enhance delivery procedures, provide significant resources, and boost shareholder value (Coyle et al. 2013). Because of this, a company's supply chain acts as an extension that transcends borders and requires constant management of resources, data, and goods in order to succeed. Businesses monitor their supply chains both internally and externally using their management methods and tactics. Globalization has made supply chains more complicated, leading to serious problems with products, suppliers, customer locations, transportation needs, trade laws, and international trade taxes. Businesses must work to improve the supply chain's phases and procedures in order to boost profitability and succeed, even if these difficulties are a natural part of the production process. In order to impact the company and ensure its survival and competitiveness, it is essential to implement creative business ideas that are tailored to the particulars of each supply chain. In conclusion, supply chains are a crucial component of many industries and businesses, making it necessary to eliminate any procedures that do not add value to a product or service. Because supply chains provide businesses a long-term competitive edge, which boosts corporate performance and the effectiveness and efficiency of their core activities, organizations must ensure that all of their processes are both efficient and effective (Popa and Vlasceanu 2014). In this regard, fiercely competitive businesses raise an industry's worth, and a competitive industry raises a country's level of competitiveness, which in turn spurs economic development (Cellini and Soci 2002).

64 Key Performance Indicators (KPIs) that are pertinent to the hospital supply chain were found and categorized in this systematic study, highlighting the need for a well-rounded approach that takes into account the management, clinical, and financial domains. Out of the many accessible research, only 32 satisfied the requirements to be included in this evaluation. Each research examined key performance indicators (KPIs)

in the hospital supply chain using a range of approaches that represented the unique viewpoints of the field. According to our thorough investigation, the financial category had the most performance indicators (37), followed by the management and clinical categories (15 and 12 indicators, respectively). A significant gap in the existing literature is highlighted by this distribution: there is a dearth of unique, substantial research on clinical and managerial key performance indicators (KPIs). To address serious gaps in the literature on Key Performance Indicators (KPIs) in the hospital supply chain, new research is desperately needed. This is especially true when it comes to creating a consistent methodology for KPI formulation that makes cross-study comparability easier. A thorough assessment of hospital performance is hampered by the focus on financial indicators and the lack of attention paid to clinical and management KPIs. In order to provide a thorough performance evaluation, future research should concentrate on the creation and validation of KPIs in these domains. To further understand the real-world difficulties and achievements, future studies should also look at how these KPIs are used, evaluated, and assessed in actual hospital settings. The creation of best practices that will raise the standard of patient care and advance clinical practice will be guided by this. In order to make informed decisions, healthcare managers must find and use the right performance metrics. This calls for studies that concentrate on the needs and viewpoints of healthcare managers with respect to the choice and use of key performance indicators (KPIs).

After the data has been completed and presented, our analysis must concentrate on the topics that were selected at the beginning of the survey. The following issues were discovered: (i) how much the logistics department is responsible for procurement and receipts; (ii) how the supplies are distributed; (iii) how much is distributed; (iv) how much is done to improve logistical processes; and (v) how well hospitals collaborate with their suppliers and with other hospitals. Our research indicates that in the Greek context, the procurement office or material administration department handles all logistical duties. In order to achieve supply chain management, the central warehouse department is essential, and sometimes the material administration department and the supplies office collaborate. It must be admitted that the questionnaire does not adequately reflect the logistics department. In the second question, the term "special department" was added to the list of departments that might be stated as being in charge of managing orders for distribution and storage. It was

found that this term, which denoted a new department (the logistics department), was unfamiliar to the Greek hospitals that were the subject of the investigation. It was discovered that, in terms of delivering items to clinics, the supplier only makes direct deliveries to a limited number of establishments. The vendors, however, conceal it behind formal responses and claim that the genuine percentage is far greater. This implies that changes are needed. There is less chance of losing control since the initial storage of products in the central warehouse is the same action in all three scenarios. As previously stated, other departments and processes are also engaged in order to give the necessary efficiency and transparency. The only issue is the lack of a department that oversees all company operations, from placing orders to delivering them. The distribution of supplies was carefully thought out in the past. Institution-specific procedures vary, and new legislation has had a big influence on public hospital procurement. However, it is important to understand that the most precious objects are stored in the central warehouse, as is common in hospitals. But a significant portion of the supplies are also sent to medical departments and clinics. This aligns with the hospital's policy and the newly enacted hospital procurement legislation that we previously discussed. Our study also revealed that the institutions were prepared to enhance their logistical operations based on the surveys. They were optimistic about the potential to improve delivery timelines, pricing, and service quality by collaborating with suppliers and establishing strategic collaborations with other businesses. Approximately 42% of those surveyed believed that medical divisions could collaborate, whereas 30% disagreed. The percentage of respondents who believe that medical professionals at institutions should form more alliances is equal to the percentage who believe that such arrangements are harmful. According to the responses, garment washing partnerships seem to be unpromising since these services are outsourced. Given that 48% of respondents believe such collaborations are very improbable, the nutrition services are also facing a similar dilemma. Twenty-four percent of respondents believe it will occur. Warehouse alliances and JIT systems seem to be opinionless. However, 42% of respondents anticipate the emergence of partnerships for stockless programs, whilst 30% believe this is improbable. According to Lim and Palvia (2001), 24% of hospitals think that EDI is a collaborative approach.

It is clear that more work is needed, since 47.1% of the hospitals surveyed said that their inventory levels have not changed over the last three years despite their efforts to optimize their supply chains and enhance logistical operations. Notably, 52.5% of respondents claimed to have decreased inventory in an effort to enhance supply chain efficiency. According to the findings, the number of suppliers has either increased (35.3% of answers) or remained constant (58.8% of replies) during the previous three years. Since there are many more suppliers today than there were three years ago, it is likely that 70% of hospitals were unable to make a profit as a result of having good connections with their suppliers. From one perspective, this makes sense since there are fewer connections due to the growing number of providers. Even if there may be greater competition, wholesale supplies or contracts do not allow the execution of any specific agreements.

The results of the research indicate that, despite the fact that logistics operations are still dispersed, there is a trend toward a more centralized logistics management system. The results of the study also lend credence to the notion that the development of interorganizational collaboration depends on logistics. Even with the introduction or improvement of partnerships and efforts like JIT to improve logistics departments or those who perform that position, the acceptance rate of these techniques is still low. Furthermore, a significant portion of hospitals do not see the pressing need to reduce inventory, even in spite of their efforts to continue their cost-cutting initiatives via the creation of new and existing partnerships.

Epilogue

The primary objective of our study was to examine the supply chain practices of Greek public organizations. The survey's objective was to provide a thorough grasp of the trends related to this significant issue. When it comes to good practices, public hospitals are very inefficient. The ineffective utilization of resources and the absence of organizational and strategic management processes are the primary characteristics of the findings of our research. We discovered that internal collaboration across hospital departments considerably slows down project submissions. A shortage of essential supplies or an unanticipated increase in healthcare costs may also result from inadequate interdepartmental coordination. In both cases, it is the end consumer who is

impacted. Our work adds to the abundance of literature on healthcare cost management while also providing fresh strategies for reducing costs. We propose that rigorous activity appraisal may lead to decreased inventory holding costs by eliminating or decreasing non-value-added duties. In the future, material administration and procurement will prioritize a number of issues, including economies of scale, hospital material shortages, the environmental impact of healthcare facilities, a scarcity of skilled personnel and specialists, material pricing, and import and export restrictions. Administrative expenses can be decreased, software capabilities can be expanded, EDI can be enhanced, inventory management can be enhanced, supplier performance can be optimized, delivery times can be shortened, and quality can be given more priority by combining material quantities and extending agreements with fewer suppliers.

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