2022

Cost-Containment Strategies Used by Hospital Business Leaders for Pharmaceutical Inventory

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Abstract

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MBA, University of Newcastle, 2011

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

Ineffective strategies to contain the costs of medical supply inventory can result in financial loss and are a significant challenge for hospital leaders. Grounded in complex adaptive systems theory, the purpose of this qualitative single case study was to explore the cost-containment strategies that private hospital business leaders use to reduce the expense of pharmaceutical inventory. The participants comprised six private hospital business leaders in one healthcare organization in Myanmar. Data were collected from semistructured interviews, internal company documents, and publicly available annual reports. Four themes emerged from Yin's five-step data analysis method: (a) management controls, (b) specialist engagement and compliance, (c) supplier management, and (d) centralized systems. A key recommendation is for hospital business leaders to use the themes to develop a framework and identify what strategies they already have in place and what strategies they may not have yet defined. Once developed, the framework may facilitate system change and support monitoring processes. The implication for positive social change includes the potential for hospital business leaders to support the affordability of pharmaceuticals by passing savings onto their patients so that they are more likely to purchase the medications they require to remain healthy.

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Dedication

This doctoral study is dedicated to my wonderful, patient husband, Brad; my eldest daughter Zoe, who lights up a room with her smile and energy; and my caring and generous youngest daughter Paige. The completion of this intensive program would not have been achieved without your complete understanding of me as a person and my thirst to learn and grow. When I was weary, when obstacles presented, it was the three of you, through your different ways of support, whether they be words, gestures, or just standing beside me, that kept pushing me forward and towards the light. I count my blessings every day for you, my family.

I also dedicate this study to my calm and courageous dad, Harold; my adventurous brother Ed; and my inspirational sister Kate. My late vivacious mum, Rhonda, and brother Steven have been standing beside me all the way as I completed this project. I attribute my positive spirit to the strong family unit we had growing up and the way we always marched through turbulent times together and came through them stronger.

Acknowledgments

First, I give praise to my Lord and Savior, Jesus Christ, for his guidance throughout my life and the multiple blessings he has bestowed upon me and my family. To my committee chair, Dr. Edward Paluch, it has been a long journey and my deepest gratitude goes to you for your tireless reviews and for sticking by me and believing in me every step of the way. To my second committee member, Dr. Edgar Jordan, I thank you for your patience, guidance, and support over the past few years. To my URRs, Dr David Blum and Dr. Deborah Nattress, I am grateful for the discipline you expected of me through the review process. To my effervescent coach, Dr. Lyn Walden, you helped me through some dark times, demanding I do more and do better. I have a grateful heart for all the times that you encouraged me with your amazing stories.

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Section 1: Foundation of the Study

Healthcare is a multifaceted, complex system constantly challenging leaders to seek system and process efficiencies (Braithwaite et al., 2017). Between 2010 and 2017, Asia-Pacific countries experienced a 4.7% growth in healthcare spending per capita, exceeding the 3.6% average growth in the gross domestic product (Organisation for Economic Co-operation and Development & World Health Organization [OECD/WHO], 2020, p. 112). Throughout this same period, medical goods accounted for an average of 17% of the total healthcare spending (OECD/WHO, 2020, p. 118). Inventory management is a significant factor in healthcare cost-containment and comprises pharmaceuticals, medical and surgical supplies, and instruments (Basri et al., 2018). This study focused on exploring the cost-containment strategies used by some hospital business leaders to reduce the expense of pharmaceutical inventory.

Background of the Problem

Globally, hospitals depend on an efficient, well-managed inventory system for sterile instruments and supplies, pharmaceuticals, and medical devices (Moons et al., 2019). Rising healthcare expenditure and the influence of physicians on their desired supplies place organizational leaders under pressure to seek operational and system efficiencies (Fibuch & Ahmed, 2015). McGrail (2017) identified possible healthcare expenditure drivers as increasing patient complexity, healthcare reforms, innovations in technology, and the rising cost of pharmaceuticals. Bohme et al. (2016) explained that healthcare business leaders have typically not realized the strategic importance of medical supplies in relation to healthcare expenses. There has been increasing

government focus throughout the Asia-Pacific region on the rising pharmaceutical costs (Verghese et al., 2019). Prescription drugs require careful monitoring of expiry dates to minimize waste, a loss of funds from inefficient usage, and a negative impact on the pharmaceutical inventory budget (Clubb et al., 2018). Pricing reviews, implementing reorder systems, controlling the storage, and ensuring formulary restrictions are only some of the strategies healthcare business leaders use to optimize pharmaceutical inventory (Kelle et al., 2012; Verghese et al., 2019).

Researchers have recommended that business leaders work together to monitor inventory for the changes and unplanned events that negatively impact hospital performance (Basri et al., 2018). Hospital business leaders need to stay alert to the multiple influencing factors that alter operational inventory requirements (Saha & Ray, 2019). Healthcare organizations need strategies to ensure cost-containment of their medical inventory while monitoring any adverse impacts on patient care delivery (Moons et al., 2019).

Problem Statement

Medical supply inventory is a critical area of expense that requires effective cost-containment strategies to avoid financial loss (Moons et al., 2019). Hospital medical supplies can represent up to 15% of a hospital's total expense (Abdulsalam & Schneller, 2017, p. 240). The general business problem is that healthcare business leaders often overlook medical supply inventory critical to cost-containment. The specific business problem is that some private hospital business leaders lack cost-containment strategies to reduce pharmaceutical inventory expenses.

Purpose Statement

The purpose of this qualitative single case study was to explore the cost-containment strategies that some hospital business leaders use to reduce the expense of pharmaceutical inventory. The targeted population consisted of six private hospital business leaders who successfully demonstrated the reduction of pharmaceutical inventory expense by implementing cost-containment strategies within a single healthcare system consisting of two hospitals and the corporate office, located in the Republic of the Union of Myanmar. The implications for positive social change include the consideration that pharmaceuticals provided to local residents at an affordable cost may increase residents' positive health outcomes, enabling them to remain productive in their community.

Nature of the Study

To choose the methodology for a study, researchers may select from certain options, including qualitative, quantitative, and mixed methods (Gravetter & Forzano, 2018). For this study, I chose the qualitative method to answer the research question. The qualitative method enables the researcher to explore the meaning and significance of data, construct astute and logical conclusions (Yin, 2018), ask open-ended questions, and focus on the particular phenomenon (Merriam & Tisdell, 2016). Quantitative researchers measure variables and test hypotheses about variables' relationships or group differences to address the research question (Rutberg & Bouikidis, 2018; Sheperis et al., 2017). I determined that a quantitative research method was not appropriate for this study, as I did not use numerical data to determine cause and effect or make predictions. Mixed methods

researchers use quantitative and qualitative methods in the same study (Shorten & Smith, 2017). As testing of hypotheses did not occur, a mixed methods approach was not appropriate for this study.

Researchers may choose from different design options when considering qualitative studies, including ethnography, phenomenological, and case studies (Merriam & Tisdell, 2016). Ethnography involves researchers using extensive observation of an intact group of people to gain in-depth knowledge of their culture, actions, and behaviors (Patton, 2015; Wolcott, 1999), which was not the purpose of this study and would not have answered the research question. Researchers use phenomenological design to focus on understanding the meanings and interpretations of the participants' lived experiences and views (Merriam & Tisdell, 2016). The phenomenological method was not appropriate for this study, as I did not explore the participants' lived experiences.

Yin (2018) described a case study as an empirical method that researchers use to study a specific phenomenon bounded by time and place and occurring in real life. As Yin described, this qualitative research method focuses on the meaning and significance of the data. A single case study was appropriate for this study, as it allowed me to use semistructured and open-ended questions to collect the data and provide insight into the fundamental aspects of the phenomenon. A single case study allowed me to explore the participants' perspectives, knowledge, and experiences in addressing the business problem of cost-containment strategies for pharmaceutical inventory.

Research Question

What cost-containment strategies do some hospital business leaders use to reduce the expense of pharmaceutical inventory?

Interview Questions

1. What cost-containment strategies did you use to reduce the expense of pharmaceutical inventory?
2. How did you measure the effectiveness of your cost-containment strategies to reduce the expense of pharmaceutical inventory?
3. What were the key barriers to implementing your cost-containment strategies to reduce the expense of pharmaceutical inventory?
4. What were the key factors that positively influenced your cost-containment strategies to reduce the expense of pharmaceutical inventory?
5. How did you address the key challenges to implementing your strategies for each of the cost-containment strategies?
6. How do you monitor your pharmaceutical inventory to determine if the cost-containment strategies to reduce inventory expense are successful?
7. What other information can you share relating to the successful cost-containment strategies of your healthcare organization's pharmaceutical inventory system?

Conceptual Framework

The framework for this study was the complex adaptive systems (CAS) theory. Scientists of the Sante Fe Institute in New Mexico founded the CAS theory (Dooley,

1997). The key tenets of CAS are identifying the connectedness of interacting agents (Cohen & Axelrod, 1984) and the various systems and processes that lead to different decision pathways and outcomes, often referred to as systems thinking (Golding, 2018; Kuziemsky, 2016). Additional key tenets are the concepts of emergence, adaptation, and feedback loops (Rutter et al., 2017). CAS complements the process of inventory management by providing a broad perspective of system and process review options (Far et al., 2019). As I expected, CAS enabled me to understand my study's findings on what cost-containment strategies hospital business leaders use to reduce the expense of pharmaceutical inventory.

Operational Definitions

Big data: The technology and analytical methods required to process large volumes and a variety of information, as well as the velocity and variety of the information, and transform it into valuable data (Abouelmehdi et al., 2017; de Mauro et al., 2016).

Inventory management: An integral part of supply chain management and the optimization of the processes and policies that define the classification method, type, volume, location, distribution, restocking, monitoring, and reporting of supplies and products within an organization (Hugos, 2018).

Process mapping: The process of mapping general or specific organizational activities to define the current practices, responsible persons, and standards to determine ways to improve the efficiency and effectiveness of the business activity (White & Cicmil, 2016).

Systems thinking: The analysis of any type of system to determine how to develop it to run more efficiently by understanding the consequences of the existing and evolving components (Golding, 2018).

Assumptions, Limitations, and Delimitations

Assumptions

Assumptions are the study's aspects that the researcher accepts as accurate, although no available supporting empirical evidence exists (Ellis & Levy, 2009). My first assumption was that the participants would answer the research questions honestly and openly. A second assumption was that the interview questions were clear and unambiguous. A third assumption was that participants would be knowledgeable and could provide information related to the research question. The final assumption was that I had chosen the appropriate research method and research design to answer the research question.

Limitations

Limitations are those aspects of the study not under the researcher's control and that could present a risk to the study's credibility and validity (Ellis & Levy, 2009; Shapiro & Naughton, 2015). A limitation of the study was that it may not be replicable to nonhealthcare industries. A second limitation was that I may not know if I was informed of all pharmaceutical inventory management systems, which may result in a gap in the study findings. A third limitation was that the findings may not generalize to other healthcare organizations in geographical areas outside of Myanmar.

Delimitations

Delimitations are the specific, controllable boundaries of the study and the inclusion and exclusion criteria that the researcher determines (Ellis & Levy, 2009; John Smith et al., 2016). Delimitations of this study included the study's geographical location, the timeframe, the sample population, and the sample size. I conducted the study in one private healthcare system comprising two hospitals and the corporate office in Myanmar. The sample population included hospital business leaders responsible for the pharmaceutical supply and inventory decision-making. I used purposive sampling to locate participants for the interviews. The number of interviews conducted was contingent on achieving data saturation. In this study, the participant sample size was a minimum of six participants, which was the number I recruited.

Significance of the Study

Contribution to Business Practice

The study findings may be of value to hospital business leaders, as effective operating cost-containment of the pharmaceutical inventory could reduce the required stock levels in the hospital. A reduction of stock levels could increase storage space availability, reduce the number of wasted medications that expire before use, and relieve human resources for other tasks. Efficiency improvements in stock levels may increase profits and increase organizational growth, positively affecting job security and new job opportunities. Hospital business leaders could use the results to improve business practices. The development of pharmaceutical inventory cost-containment strategies may also positively impact other areas of the supply chain, including policies, process flows,

and procurement decisions, and increase the quality of supplies ordered. High-quality supplies may enhance patient safety by reducing adverse medical incidents and complication rates, which could mitigate business risks.

Implications for Social Change

This study may have implications for positive social change, as healthcare business leaders who implement cost-containment strategies for their pharmaceutical inventory may provide medications at an affordable cost and achieve increased positive health outcomes. Residents who trust that their local healthcare service provides affordable medications may be more likely to purchase the medications that they require to remain healthy. Residents who consume the needed medications may have better health outcomes and could remain productive in their society as students, parents, and workers. With the increased aging population (Fuster, 2017), a healthier elderly population may contribute to positive social change. As experienced and knowledgeable members who are in the workforce longer, they may have more opportunities to pass their skills onto the younger generation within their community.

A Review of the Professional and Academic Literature

The purpose of this study was to explore the cost-containment strategies that hospital business leaders use to reduce the expense of pharmaceutical inventory. The literature review formed the foundation for my qualitative case study. I aimed to provide a critical analysis and synthesis of CAS and hospital business leaders' application of this theory in achieving successful cost-containment strategies to reduce the expense of pharmaceutical inventory.

The review of the literature enables the researcher to develop a framework for the core topics of the research (Yin, 2018). Researchers have given substantial attention to identifying the operational challenges of pharmaceutical inventory management as it relates to the overall economic impact on healthcare expenditure (Cordina, 2019; Duong et al., 2019). The available literature has concentrated primarily on individual processes within the system that possibly contribute to the increasing pharmaceutical costs, including complex logistics management requirements (Kritchanchai et al., 2018), supply chain disruptions (Adobor & McMullen, 2018), changing patient needs and physician demands (Saha & Ray, 2019), and lack of formulary controls (Karel et al., 2017). Additionally, the literature has focused on the leadership decision-making of the system and how it plays an integral part in determining the efficiency and effectiveness of a medical supply system (Burns & Briggs, 2018; Duong et al., 2019). However, identifying pharmaceutical inventory efficiency strategies using a systemwide lens has received less research attention than the individual operational issues that impact costs (Settani et al., 2017). As Settani et al. (2017) described, the emphasis has been on fixing specific operational costs due to the complexity of the upstream and downstream components for the pharmaceutical supply chain and inventory management.

The literature review included a comprehensive overview of research studies related to cost-containment and expense reduction in healthcare and pharmaceutical inventory management. Under each subject heading, critical analysis and synthesis of the literature related to healthcare cost-containment, hospital inventory costs, and pharmaceutical inventory challenges helped me better understand the study topic. To find

relevant peer-reviewed research and information from seminal scholarly books, I searched the online Walden University Library, PubMed, MEDLINE with Full Text, ProQuest Health & Medical Collection, Emerald Insight, Google Scholar, Public Library of Science (PloS), the Education Resources Information Center (ERIC), SAGE Publications, the Social Science Research Network (SSRN), the Directory of Open Access Repositories (OpenDOAR), the Bielefeld Academic Search Engine (BASE), Business Source Complete, ProQuest, EBSCOhost, and ProQuest Digital Dissertations.

I routinely visited the home page of the following journals: *Supply Chain Management: An International Journal*; *Quality Management in Healthcare Journal*; *Journal of Operations Management*; *Production, Planning, & Control*; and *International Journal of Productivity and Performance Management*, among others. I searched databases using a combination of terms, including *hospital inventory management*, *supply chain*, *complex systems*, *complex adaptive systems*, *inventory*, *pharmacy expenses*, *medication waste*, *medication shortages*, *medication costs*, *pharmaceutical costs*, *medical inventory*, *healthcare costs*, *inventory software*, *inventory supply chain*, *supply chain management*, *healthcare costs*, *medical supply inventory*, *medical cost-containment*, and *inventory cost.* The literature review comprised 143 journal articles, seminal books, dissertations, and government websites, with 92% of sources peer-reviewed and 85% of all sources less than 5 years old. Table 1 summarizes the sources included in the literature review.

Table 1

Summary of Sources in the Literature Review

Reference type	Number reviewed	Date of publication	
		2017–2021	< 2017
Journal article	127 [a]	108	19
Book	8	5	3
Website	8	8	0
Total	143	121	22

[a] Of these articles, 92% were peer-reviewed.

For this literature review, I categorized topics into primary sections. In the first section, I discuss the CAS theory, which supported this research study. I also provide information on supporting and contrasting models and theories. Because hospital pharmaceutical inventory is a complex system and part of a supply chain, I discuss systems, supply chains, hospital inventory, and pharmaceutical challenges in depth. I provide research studies that include these concepts with CAS theory, when available.

Although many healthcare studies have identified CAS theory as the framework to explain specific areas of complexity within hospital settings, I could find no research study that used CAS theory and pharmaceutical inventory. However, I did find two dissertations that used CAS theory that focused on pharmaceutical drug shortages with supply chain disruptions and strategies to reduce financial loss from adverse drug events. I also discuss current peer-reviewed studies that are similar in any manner to the current study. I provide a narrative on the current global views of pharmaceutical inventory management, supply chains, and systems in general, and I synthesize the conceptual framework of CAS theory throughout the review.

CAS Theory

CAS is appropriate to use when studying pharmaceutical inventory management given that it is a nonlinear dynamic theory that refers to the continuous evolution and change of systems (Adobor & McMullen, 2018). Researchers have used CAS theory to guide decisions in various industries, including healthcare (Gomersall, 2018; Tan et al., 2005). In the 1940s, Turing and von Neumann (as cited in Jankowski, 2017) were especially interested in how complex systems change occurred by providing new information. They identified that systems requiring multiple interactions and components could emit expected behavior. In contrast, they noted that other systems could produce unpredictable behavior, even though they contained minimal interactions and components (as cited in Jankowski, 2017). In 1948, Weiner (as cited in Cordon, 2013), a follower of cybernetics, examined the common properties of a complex science system, a revolving system, and CAS. In the 1950s, Ashby (1962/2004) developed several theories and the general theory of adaptive systems. In the 1960s, von Bertalanffy (1968) introduced general systems theory and explained that researchers needed a theory that looked at the entire system and that could apply to most situations.

The origin of CAS evolved following several regular meetings between 1982 and 1986 amongst leading scientists such as Cowan, German, Gell-Mann, Holland, and others at the Los Alamos National Laboratory, New Mexico, United States (German, n.d.). Gell-Mann, a Nobel laureate for his work on elementary particle theory, founded the Santa Fe Institute in 1985 and focused on CAS (Thurner et al., 2018). Holland, well known for his work on evolution and adaptation processes, defined CAS as a network of agents

perpetually responding and reacting to other agents, resulting in continuous changes in the whole network (Holland, 1992).

Cohen and Axelrod (1984) detailed the theory of adaptive utility change and incorporated complexity theory by describing how agents make decisions to generate a change to effect improvements and continue to adapt the system changes when they see positive results. Cohen and Axelrod also identified how positive results impact behaviors and become a motivational force for accepting additional system change. Turner and Baker (2019) called for adopting new methods to better apply CAS given the dynamic environment of facing more unique challenges associated with globalization and information technology. As Turner and Baker described, systems respond to external forces and evolve and emerge into a new state, unable to revert to the previous state but continuously moving forward through feedback and adaptation.

The Key Tenets of CAS

It is useful to understand the foundational components of a system to comprehend the tenets of CAS fully. Systems can be open or closed, complex or simple (Golding, 2018). A review of the academic literature on systems and systems thinking revealed that changes within a system could produce new behaviors or patterns and that it was important to determine how each system may impact other systems (van der Heijden, 2020). As systems affect other systems, integration between systems is necessary (van der Heijden, 2020).

Complex systems, as Burns et al. (2012) described, include three subcategories: (a) macrosystems, (b) mesosystems, and (c) microsystems. According to Burns et al.,

macrosystems are those systems related to external forces, such as political and regulatory requirements, not controllable by the organization. In contrast, mesosystems refer to the interconnection of two or more microsystems, and microsystems are smaller units or single agents of delivery (Burns et al., 2012). The key tenets of systems that researchers have identified include systems thinking (Golding, 2018), multiple agent interactions (Cohen & Axelrod, 1984), emergence, feedback loops, and change and adaptation (Rutter et al., 2017).

Systems Thinking

Golding (2018) advocated that the success of CAS required systems thinking. Cordon (2013) found that to facilitate sustainable change, organizational leaders needed to be system thinkers. A study by Plack et al. (2017) revealed that many healthcare professionals saw systems thinking as a top-down approach required to achieve cost-containment and accreditation. In healthcare, systems thinking requires the collaboration and perspectives of stakeholders across different hospital departments willing to challenge assumptions, advocate for change, and evaluate the impact of applied interventions (Espinosa-Gonzalez et al., 2019). Ideally, the collective knowledge of systems thinking leaders and stakeholders helps them to consider the dynamic relationships between all related elements in the system and the impact that those relationships have on the entire system (van der Heijden, 2020).

Agent Interconnectedness

Dooley (1997), one of the first researchers to use CAS theory as the framework for a study, identified a system's key component as consisting of separate agents. Dooley

stated that the greater the system complexity, the greater the potential impact when issues occur within the system. Carmichael et al. (2019) referred to CAS theory as a tool and a robust framework made up of interacting agents. CAS is more likely to be successful when agents have autonomy and authority to deviate from the norm to make creative decisions that cause organized disruption, close to chaos (de Toni & Comello, 2013).

Emergence

Rutter et al. (2017) described one of the key tenets of CAS as emergence, defined as the different properties and parts of a system which, when joined together, result in an unpredicted sum of the whole. Emergence includes feedback, which enhances or stabilizes the evolving system, and adaptation occurs from behavior changes in response to interventions (Rutter et al., 2017). According to Galkina and Atkova (2019), CAS system emergence occurs following three phases. The three phases are (a) prenetwork, which refers to the availability of the means for change to occur; (b) formation, which refers to the communications required to establish connections and interactions; and (c) effectual network, where connections and commitment to the change are established (Galkina & Atkova, 2019).

Feedback Loops

Braithwaite et al. (2018) described feedback loops within CAS as recurring mechanisms in a system that alert stakeholders that responses and possible interventions are required. In feedback loops, a positive response may create a higher rate or direction of change, and a negative response may reduce the rate or direction of change (H. Khan & Wisner, 2019). Complex systems include the dynamic flow of information and

feedback loops within and between the hierarchical levels, which increases the integration of the different system components (Braithwaite et al., 2018). Stakeholder engagement in system change is imperative, and feedback loops are necessary to ensure that the momentum of change continues while the system adapts (Brainard & Hunter, 2016).

Adaptation and Change

CAS emerges through adaptation and change without one specific controlling force (de Toni & Comello, 2013). Small dynamic changes in a complex system can significantly impact the whole system (de Toni & Comello, 2013). Creating a sense of urgency and an environment that facilitates change is one of the change management principles and can be likened to a controlled chaos strategy (Sabbaghnia et al., 2018). Leaders can proactively use the key tenets of CAS to control the level of chaos and, therefore, the complex systems within their organization.

Business leaders use various decision-making methods to make timely responses to the changing environment and maintain a competitive advantage (Kamalluarifin, 2018). Adaptation to evolving efficient and effective healthcare systems requires leadership decision-making (Ahmadi-Javid et al., 2017). Best et al. (2016) determined that, in the healthcare environment, due to the multilevel stakeholder involvement needed, a CAS perspective was necessary to understand and align the potential impacts of multilevel areas in the hospital when even a single system change was required. Best et al. demonstrated that leadership was critical to the successful implementation of change and explained that considerations needed to include engaging stakeholders, enabling

strategies for local adaptation, understanding resource requirements, providing adequate communication touchpoints, and demonstrating the benefits to staff and patient safety. Best et al.'s study described some of the complex intricacies that leaders need to consider when managing change within a healthcare environment.

Tang et al. (2017) reviewed 32 healthcare organizations in China that used CAS theory to study policy reform achievement. The researchers demonstrated a lack of existing adaptation capability in the hospitals due to a lack of mutual trust and existing cultural norms and behaviors, which resulted in strong resistance to change and ultimate failure to implement the reform policies. Tang et al. demonstrated that, when attempting to lead complex changes that involve multiple departments, poor leadership drive and lack of stakeholder engagement may result in less than expected achievement.

Supporting and Contrasting Theories

Chaos Theory: A Supporting Theory

Lorenz (1963) first termed chaos theory in the early 1960s. This theory uses mathematical computerization to demonstrate that behavior is nonlinear, total impact predictability is not possible, minimal differences in approximations can have far-reaching effects, and there are often long-term impacts of change (Sabbaghnia et al., 2018). Chaos theory assumes continuous change and, in a complex environment like healthcare, constant disruption requires leaders to think ahead to control the level of chaos (Magner & Yadav, 2017).

Lorenz (1963) created the butterfly effect concept with the premise that the smallest event can set off a chain reaction that no one could predict. The butterfly effect

concept is that the flapping of a butterfly's wings could result in a tornado (Sadau & Capeles, 2019). Therefore, a small difference in projections from the present state will likely result in a completely different and unpredictable future (Sadau & Capeles, 2019). Chaos theory supports CAS theory as it relates to inventory management given that the supply chain is a complex system, and one event in a supply chain can set off a chain reaction that may have immense consequences (Dolgui et al., 2018).

Inventory Theory: A Supporting Theory

Inventory theory has evolved since its origin, when Harris (1990) introduced and published the first mathematical inventory model known as the economic order quantity formula. The original economic order quantity formula identified the quantity required to achieve the minimum cost to manufacture a single product (Harris, 1990). The economic order quantity formula helps service industry leaders understand the numerous variables that impact the supply chain and determine the most cost-effective ways to manage the inventory levels of multiple product types (Riza et al., 2018). Business managers use the economic order quantity formula to improve operational efficiency and maximize profit margins related to minimum and maximum inventory order and reorder requirements (Riza et al., 2018).

Inventory theory is complementary to CAS theory. Determining inventory requires an understanding of the processes involved, and CAS theory could help hospital business leaders determine each process related to inventory needs. Healthcare business leaders need to develop strategies and make decisions that ensure cost-containment and

product quality of all inventory while safeguarding any adverse effects to patient care and business outcomes (Basri et al., 2018).

Linear Systems Theory: A Contrasting Theory

Linear systems contrast with CAS theory. In linear systems, change or evolution is structured and predictable, resulting in cause-and-effect relationships (Bucknall & Hitch, 2018). The linear system can be broken into modules, examined separately, and then put back together to give the correct answer to the original problem (Vakili, 2018). For example, in algebra, a linear function is composed of lines, and a nonlinear function is composed of all other shapes. The slope is always constant in a linear system compared to a nonlinear or complex system, where the slope is always changing (Vakili, 2018).

In contrast, CAS is nonlinear, with potentially unpredictable outcomes (Bucknall & Hitch, 2018). Nonlinear systems are closer to chaos than to equilibrium (Vakili, 2018). Small changes in the system could have a significant impact, or a large change could have no effect at all, depending on how the change is managed (Bucknall & Hitch, 2018). A CAS is a nonlinear network that interconnects with other nonlinear networks to recombine and evolve with unpredictable outcomes (Vakili, 2018).

CAS in Healthcare

Healthcare is a prime environment in which to use the CAS theory. In healthcare, the focus on patient safety through sound decision-making at all levels and across all areas of the healthcare system influences the organization’s financial performance (Beauvais et al., 2019). Sturmberg (2018) identified four defined levels within a health system. According to Sturmberg, the macro-level refers to policy and governance set by

the leadership in the hospitals; the meso-level refers to the structure and infrastructure of the hospital—without one, the other cannot function; the micro-level refers to the departmental level delivery of service; and the nano-level refers to each individual in the organization, whether a patient or staff member, and their needs. Sturmberg found that from a CAS perspective, for a hospital to deliver quality care, the leaders need to understand the different levels and work to integrate them to ensure that all internal subsystems align with the health system as a whole.

Although I could find no studies involving healthcare cost-containment, hospital inventory, or pharmaceutical inventory and CAS theory, in a search using medical and business databases, I found two dissertations and multiple healthcare research studies wherein the researchers used this theory as their framework. I found one dissertation that used CAS theory to focus on pharmaceutical drug shortages and supply chain disruptions (Scioli, 2017). The other dissertation used CAS to explore strategies to reduce financial losses for adverse drug events (Rudden, 2020). Researchers who have studied pharmaceutical inventory have outlined chain complexity as a key challenging factor (Duong et al., 2019; Moons et al., 2019); however, these researchers did not specifically use CAS theory as their framework.

In a search using a medical database, I found studies in which the researchers used CAS theory and the hospital systems required to support specialty areas of patient care and management (Oosthuizen et al., 2018; Valeras, 2019), behaviors and teams (Lingard et al., 2017; Pype et al., 2018), communication and collaboration (Brainard & Hunter, 2016; Kitson et al., 2017), stakeholder and leadership influence (Gordon et al.,

2017; Therrien et al., 2017), business decision-making (Kuziemsky, 2016), and scaling up of health services (Paina & Peters, 2012). Braithwaite et al. (2017) described the four key elements that make up the complexity of healthcare organizations as follows:

- The involvement and interactions of numerous healthcare and nonhealthcare professionals involved in the system and decision-making processes.
- The aggregated connection of networks required to form the system so that the necessary stakeholders understand and comply with the requirements.
- The dynamic nature of the systems resulting from the number of people and connections involved.
- The bottom-up informal rules and orders created at the unit or department level. (p. 3)

S. Khan et al. (2018) discussed how CAS in healthcare exists because of the multiple connections between the macro, meso, and microenvironments. Tan et al. (2005) used CAS theory to investigate and understand the evolving healthcare system. Not only did Tan et al. use this theory to look at the intricacies of healthcare, but they also looked at delivery systems for healthcare systems. Tan et al. explained how a hospital system was complex and could adapt to the environment. Given the multiple variables within a system and the unknown impacts, CAS theory was not always predictable, nor was the healthcare system predictable (S. Khan et al., 2018).

Through the lens of CAS theory, Tan et al. (2005) looked at the intricate healthcare system for the severely ill elderly and children at one healthcare rehabilitation facility. These researchers explained that all complex systems, including humans and

organizations such as a healthcare system, share certain characteristics: (a) they can exchange properties with the environment, (b) they have many interrelated parts that work together, (c) they can organize themselves, (d) they show collaborative complexity, and (e) they are unpredictable (Tan et al., 2005). Brainard and Hunter (2016) outlined how in complex systems such as healthcare, consideration should be given to the many human elements involved, including the healthcare staff, the insurers, the patients, and even suppliers. They carefully examined each interconnection and the issues and consequences that may well be challenges for other healthcare organizations (Brainard & Hunter, 2016).

Tan et al. (2005) made a careful note that a healthcare organization could succumb to any number of unforeseen and unpredictable situations, such as a major flu epidemic, a full-scale healthcare system invader microbe, or something as innocuous as the natural evolution between a doctor and patient. According to Valeras (2019), the ability to maintain the essential components of the system depends on the ability to adapt or self-organize for a sustainable complex system. Paina and Peters (2012) used the lens of CAS theory to understand the challenges and barriers healthcare organizations faced when attempting to scale up health services and identified five CAS phenomena:

- Path dependence, whereby a continuing system's success was dependent on the processes and activities linked to it.
- Feedback loops that influenced behavior and actions dependent on whether the feedback was positive or negative.

- Scale-free networks in which the possible links into each network were unlimited.
- Emergent behavior, whereby order spontaneously formed and evolved in smaller entities.
- Phase transition, which referred to the continuous evolution of system change.

Paina and Peters (2012) found that the CAS phenomena explained why, in healthcare, small changes in direction could result in a rapid or extreme change, or large-scale change may have little or no impact. Marrelli (2018) gave the example of a palliative care unit with a multidisciplinary professional team providing care. Marrelli explained that palliative care professionals act as a team to support family members and to provide emotional, physical, and psychological care for people at the end of life. Marrelli also explained how, even in a small unit such as palliative care, the system used to ensure quality, safe care, and comfort for each patient was complex.

Hodiamont et al. (2019) found that palliative care was a system that involved complex, unpredictable situations characterized by changeable and intertwined but not always defined relations. They used CAS theory to provide the structure for their qualitative interview study on palliative care. These researchers interviewed 42 participants deemed expert professionals in palliative care (Hodiamont et al., 2019, p. 157). The participant agents then used a CAS framework to determine the palliative care members' status, who included the patient, the team, or a member of a social system (Hodiamont et al., 2019). The researchers explained that CAS, which provided a thorough understanding of all the nuances involved in palliative care, guided their

qualitative interview study. Hodiamont et al. explained that this framework helped them find and resolve problems in the complex world of palliative care.

In a similar study on team behavior in healthcare, Pype et al. (2018) argued that by using CAS as the framework for their study, they could see either parts of the whole or single members of the healthcare team, as well as the whole or the team itself. In another study, Gomersall (2018) declared CAS as a new approach in healthcare studies. This researcher found that interactions between team members could cause both unpredictable behaviors and new behaviors (Gomersall, 2018). Notarnicola et al. (2017) conducted a 10-year (2005–2015) review of studies on nurses and the nursing occupation. These researchers used CAS theory for their theoretical framework and declared that complex systems could adapt and process information. Because nursing is also a CAS, Notarnicola et al. predicted that this theory could provide new ways to look at support systems in the nursing profession.

Other researchers from other disciplines have used CAS theory as the framework for their research. Rooney and Cao (2019) used CAS to study interoffice relationships; specifically, management and the environment of newly established firms. As there was minimal available research specific to the complexity of interoffice relationships, Rooney and Cao's study helped fill a gap in the literature on management behaviors and newly established businesses. Espinosa et al. (2019) examined product returns. At the conclusion of their multiple case study involving five different organizations, the researchers recommended training certain employees to handle the more expensive returns and providing employees in charge of processing returns more freedom to work

with other employees to generate new ideas for the handling of returns. Espinosa et al. also recommended applying CAS theory to different supply chain parts to process returned products.

Factors Impacting Cost-Containment of Hospital Inventory

In healthcare, driving down inventory costs, increasing transparency, and mitigating the threat of counterfeit products across the healthcare supply chain add pressure on business leaders who seek ways to improve the safety and efficiency of an already complex inventory system (Haq & Muselemu, 2018). With pressure on healthcare system leaders to adapt to the changing environment and inventory allocation requiring up to 50% of a hospital's capital investment (Basri et al., 2018, p. 262), the focus on adaptation and innovation of systems within a hospital enables a business to remain viable and competitive (Arunmas et al., 2019). The term *inventory turn* refers to calculating the rate at which inventory is sold and replaced over a given period (Clubb et al., 2018). Freeing up inventory costs increases an organization's ability to use those funds elsewhere (Clubb et al., 2018). Clubb et al. (2018) found that hospitals that increased their inventory turn by one freed up 4% of their total inventory costs (p. 410). According to de Toni and Comello (2013), inventory systems are CAS characterized by numerous elements and nonlinear connections, influencing agents to continuously seek optimization strategies; it stands to reason that this premise would apply to hospital inventory.

Trojanowska et al. (2017) found that, within an organization, contradictory strategies between different departments impacted system efficiency. Hospital systems

involve multiple departments and varying influencing factors that increase the system's complexity (Saha & Ray, 2019). Healthcare inventory needs are difficult to project because of hospitals' dynamic environment and the resulting inconsistent demands based on patient diagnosis, the number of patients, and physician recommendations (Saha & Ray, 2019). Modeling tools and techniques to manage stochastic demands include probability simulations, storage capacity, consideration of historical data, perishability of the specific supply, patient demographics, and supply lead times (Maestre et al., 2018; Saha & Ray, 2019).

I could find no literature where researchers used CAS to explore cost-containment within healthcare or healthcare inventory management. The existing research related to CAS and healthcare focused on the system and process change (Espinosa et al., 2019), service delivery (Notarnicola et al., 2017), and stakeholder and leadership influences (Gordon et al., 2017; Therrien et al., 2017). Researchers have explored factors impacting cost containment of hospital inventory including leadership and supply chain complexity, costs, and risks.

Leadership

According to Ikeziri et al. (2018), profit maximization requires system efficiency. Failure of hospital leadership to recognize the strategic value of focused and complete inventory system management could result in higher material costs, an increased risk of medical errors, inefficient processes, and unreliable supply availability (Bohme et al., 2016). A study by Sirisawat et al. (2019) demonstrated that because inventory is an asset, monitoring the system's performance for quality, time, cost, and productivity through

relevant indicators is imperative. According to Sirisawat et al., the most important indicators to help health leaders understand their inventory's value and performance level are patient safety, replenishment time, inventory cost, and inventory turnover.

Bohme et al. (2016) identified that when leadership does not view medical supply management as intrinsic to the organization's strategic goals, the results are often a poorly integrated system that might not perform to expectation. Modi et al. (2018) argued that system complexity increases when supply chain processes are not transparent or clearly defined. Burns and Briggs (2018) revealed that with the rising complexity of purchasing, value-add services, and patient safety related to cost control, healthcare business leaders need to invest time and resources in materials management strategies at multiple levels in the supply chain.

Customer expectations continue to rise, and healthcare leaders require smooth processes to manage their scarce resources more efficiently (Bohme et al., 2016). The complexity of healthcare inventory systems occurs because of the extensive interactions required to ensure effective processes (Iosim, 2016). The efficiency of inventory practices and reduction of costs can be affected by the complexity of the surrounding systems and other factors (Kwon & Kim, 2018). Leaders can succeed or fail at integrating sophisticated strategies into existing inventory practices (Teece, 2018).

Patient safety concerns increase healthcare risk and potential liability and costs to an organization (Joint Commission International, 2021). To obtain continuous quality improvement in inventory management requires hospital leaders to seek system improvement methods in and across the spectrum of the organization's departments

(Holm et al., 2015). Healthcare stakeholders have sought greater system efficiency by applying big data, evidenced by reduced errors, greater information exchange, and stronger coordination efforts (Dash et al., 2019).

S. Khan et al. (2018) used CAS to describe that system interconnections result in interdependencies throughout the system, with a disruption in one area potentially causing implications in other areas of the system. S. Khan et al. agreed that because of the interdependencies in the system, the system's level of adaptability was important if hospital business leaders expected a hospital to transform and achieve the expected levels of efficiency and effectiveness. Their study focused on how actors in healthcare systems needed to understand complexity thinking to guide system change through proactive management in the dynamic healthcare environment. Although not directly related to cost-containment of inventory, S. Khan et al.'s study helps business leaders identify how understanding CAS may assist them in making improvements that reduce their risks, potential liability, and expenses.

Supply Chain Complexity

Supply chain complexity occurs when dynamic and detailed systems, processes, and relationships are required to ensure the smooth delivery of products (Aitken et al., 2016). Although supply chain complexity can negatively affect a business, it may also create business expansion opportunities, competitive advantage, and increased profitability. Matthews and Marzec (2017) described how leaders need to implement continuous improvement, quality improvement, and performance improvement to attain the successful performance of complex systems. Aitken et al. (2016) demonstrated that

supply chain complexity results from either the business unit's needs or poor practices, the latter of which may cause the supply chain to become dysfunctional. These researchers found that organizational leaders needed to identify their supply chain processes, how their business strategies affected the supply chain, and whether dysfunctional areas existed in the supply chain.

I could find only one newly published non-healthcare-related journal article (Far et al., 2019) that included CAS theory and supply chain complexity control. Far et al.'s (2019) goal was to coordinate the inventory policies of all agents or units (e.g., manufacturers, distributors, suppliers, transportation) along the inventory chain of a petrol distribution system, National Guilan Oil Products Distribution, which the researchers defined as a CAS. Far et al. used the CAS framework and simulation software of the distribution organizations to show agent-based modeling to teach the agents' behaviors along the inventory or supply chain. They found that agents along the supply chain could fulfill customer needs and maintain sales if they did not have to pay extra inventory fees (Far et al., 2019).

In healthcare, organizational leaders need to decide the appropriateness of supply chain complexity reductions or absorptions and ensure they review the business strategy (Saha & Ray, 2019). Hospital business leaders need to take a holistic view of their supply chain to realize significant financial benefits (Moons et al., 2019). The application of a holistic system reduces the risk of errors (Moons et al., 2019). The greater the number of transactions required to deliver a supply, the greater the risk of a mistake occurring (Moons et al., 2019).

Supply Chain Costs

Understanding the controls and variables that affect timely and cost-effective inventory needs requires analysis of a product's existing supply and demand (Harris, 1990; Whitin, 1954). Timely financial reporting methods assist business leaders in making investment decisions (Kamalluarifin, 2018). For example, an extended cycle time of stock impacts a firm's profitability (Inegbedion et al., 2019). Efficient inventory management improves business performance, and the level of inventory is an important business measure identified in the balance sheet and the statement of cash flows in financial statements (Masudin et al., 2018). According to Alfieri and Zotteri (2017), inventory management involves complicated processes, and the practical, real-world setting often differs from the theoretical perspective.

Kritchanchai et al. (2018) researched 18 hospitals across Asia, including Myanmar, to identify areas of improved efficiency and cost reduction of the healthcare supply chain. The study results showed that 27% of those interviewed stated that inventory availability, visibility, and accuracy were vital to creating an efficient supply chain system by reducing logistics and storage costs (Kritchanchai et al., 2018, p. 60). Additionally, Kritchanchai et al. found that 27% of those interviewed agreed that information technology's capability to order and accurately track supplies substantially improved supply chain performance. From a survey conducted in the United States from 140 healthcare organizations, supply chain costs were the most significant trending concern of healthcare business leaders (Schneller, 2018, para. 4). The survey results included that 95% of respondents were concerned about managing supply costs, and 87%

of respondents expected to improve their performance through savings from supply chain management (Schneller, 2018, Table 1). These studies demonstrate how healthcare leaders across different countries have sought effective ways to reduce supply chain costs.

Supply Chain Risks

The goal of proactive risk management in the inventory and medical supply chain is to improve system maturity and reduce the level of uncertainty in the existing systems and processes (Bohme et al., 2016). Multiple risks along the supply chain can have adverse effects operationally, strategically, or tactically (Mital et al., 2018). There is extensive research on the risk management of supply chain and inventory demand with a key focus on upstream and downstream processes (Wu et al., 2019). Identified risks to supply chain costs and performance include stakeholders' behaviors, government regulations, political changes, and environmental uncertainty (Brusset & Teller, 2017). Mitigation of risks through clarity of processes and agreements form part of the supply chain integration strategy (Jajja et al., 2018).

Reduction in uncertainty occurs by understanding the primary drivers of supply, demand, controls, and processes (Bohme et al., 2016). The most common risks across a supply chain are the availability of materials and the continually changing needs of supplies (Mital et al., 2018). As Kwak et al. (2018) outlined, mitigating risks helps organizations maintain a competitive advantage and requires continuous evolution and adaptation of innovations. Supply chain risk management helps organizational leaders evaluate, mitigate, and monitor conditions that might result in an adverse event.

Mitigation strategies for supply and demand include reviewing demand volatility, implementing systems such as just-in-time replenishment, improving transparency in inventory, building strategic relationships, ensuring business continuity planning, and optimizing supplier agreements and partnerships (Jajja et al., 2018). Understanding the potential impact of disruptions along the entire supply chain network helps an organization build agility and flexibility as well as develop resistance to adverse events (Yaroson et al., 2019). Supply chain resilience aims to minimize inherent business risks by ensuring readiness, timely responsiveness, and a quick recovery when an event occurs (Dubey et al., 2019).

Adobor and McMullen (2018) used a CAS perspective in their study on supply chain resilience. The authors found that building supply chain resilience requires a multidimensional approach to include all three dimensions of efficiency, adaptability, and collaborative capabilities. Adobor and McMullen also found that when there is a supply chain disruption, the supply chain needs to have all three capabilities built into the system for organizational leaders to respond effectively.

In pharmaceutical inventory management, growth in resilience capability from the previous experience of disruption is important to building resilience (Sabouhi et al., 2018). Resilience assessment is multidimensional and multidisciplinary (Dubey et al., 2019). Resilience identifies vulnerabilities in an organization's systems and processes, and leaders develop strategies to determine the capability, vulnerability level, agility, and robustness of an organization in case of disruptive events (Pettit et al., 2019).

Identifying the risk to medication integrity is critical to patient safety (Maxwell & Webb, 2019). Related to pharmaceutical inventory, hospital leaders need to ensure they have secure systems in place to protect against the risks of loss, theft, fake medication procurement, and maintenance of integrity, which requires extensive planning, policies, processes, and resourcing (Haq & Muselemu, 2018). Innovations in information technology systems and blockchain security (Clauson et al., 2018; Gilbert et al., 2017) may support healthcare business leaders in implementing more efficient and effective monitoring of their pharmaceutical inventory and mitigating risks.

Hospital Information Systems

Healthcare leaders have turned to technology to help them streamline processes, improve transparency and security, and build more robust communication channels and collaboration throughout their supply chains (Zhou & Piramuthu, 2017). Implementing business intelligence in healthcare builds momentum as leaders recognize the benefits of obtaining accurate data to provide clinical and administrative decision support and determine the performance levels of service delivery, quality of care, and cost-containment (Holm et al., 2015). Researchers have shown the importance of the healthcare industry to effectively collect, prepare, store, and mine inventory data effectively (Holm et al., 2015). Many healthcare leaders have turned to software to increase inventory efficiency levels by automating the reordering system and minimizing stock levels (Clubb et al., 2018). Software programs help leaders analyze high-cost medications and determine what stock levels are required to increase their turns and contain costs by decreasing the inventory cost on hand (Clubb et al., 2018).

The basic starting point of hospital inventory data management is to install system improvement measures through standardization of clinical systems and data sharing among healthcare organizations (Holm et al., 2015). The growing access to big data helps leaders identify new ideas, understand the market demands, and provide value to their customers (Sati, 2017). The application of big data is transforming inventory management as leaders use the information to optimize their operations (Jain et al., 2017). As Dash et al. (2019) described, hospital leaders, pressured to implement interorganization systems, need technology support to enable them to break from the isomorphic state that exists within the healthcare industry to remain competitive. Information systems enable healthcare leaders to benchmark with counterparts, develop different specifications at different levels of the supply chain, and instill trust in the information the system provides (Dash et al., 2019). Underinvestment in information systems and supply infrastructure results in gaps in information and time inefficiencies, costing the organization money (Balaji & Prasathkumar, 2020).

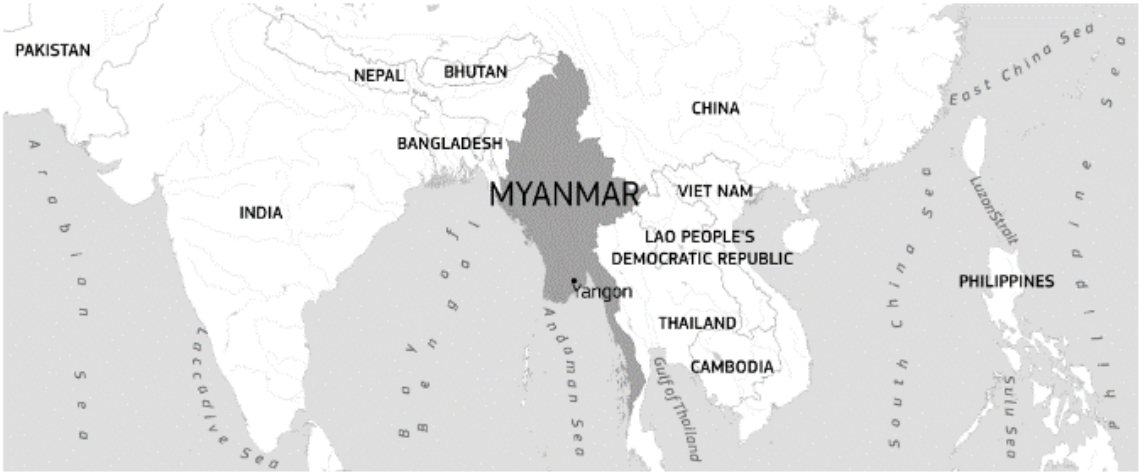
Introduction to Myanmar and Its Healthcare System

The Republic of the Union of Myanmar, formally called Burma, is in Asia and shares borders with India, China, Bangladesh, Thailand, and Lao People's Democratic Republic (Nations Online, n.d.). The capital of Myanmar, formerly Yangon, is now Naypyidaw (Millington, 2017). As of 2022, Myanmar's population was approximately 55 million (Worldometer, 2022). In 2020, Myanmar had 1,120 public hospitals, and the government was driving to implement an additional 12 hospital projects to cover 76 towns across the country (Lwin, n.d.). There were 249 private hospitals with planned

further growth of over 5,000 private specialists and general clinics (Lwin, n.d.). A map of Myanmar is shown in Figure 1.

Figure 1

Map of Myanmar



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Myanmar has a heterogeneous population of approximately 135 different ethnicities; the largest group, Bamar, makes up about 70% of the population (British Broadcasting Corporation, 2018). Previously ruled by British India, Burma became an independent nation in 1948 (British Broadcasting Corporation, 2018). In 2017, the amount per capita reportedly spent on healthcare was USD $58, or 4.7% of Myanmar's gross domestic product (GDP), compared to $10,246 or 17.1% of the GDP in the United States, and $1,061 or 9.9% of the average GDP globally (World Bank, 2017).

In 2018, the World Health Organization ranked Myanmar as one of the worst countries in international healthcare based on the percentage of GDP spent on healthcare

(Cronin, 2019). The World Bank (2019), as part of the planned support for the development of Myanmar's infrastructure, and in liaison with the Myanmar Ministry of Health, commenced the Essential Health Services Access Project in 2014 to improve the level of health service delivery and build governance through systems strengthening and capacity building across the health sector. Poor medical supply chain procurement and transportation infrastructure and a lack of best practice guidelines for the use of pharmaceuticals are only a few of the challenges facing the Myanmar health system (Verghese et al., 2019). The ongoing support to develop infrastructure and provide healthcare resources by external agencies such as the World Bank demonstrates that the Myanmar healthcare environment continues to develop (Cronin, 2019).

Pharmaceutical Inventory

According to The Joint Commission International (2021), the pharmaceutical inventory system in a hospital is a complex system made up of processes to manage (a) procurement, (b) storage, (c) prescribing, (d) dispensing, and (e) administration. Understanding the logistics systems and processes that form a hospital's pharmaceutical supply chain helps decision-makers seek opportunities to lower costs without compromising patient safety and care (Moons et al., 2019). Healthcare organizations are under pressure to reduce medication spending by creating innovative ways to reduce medication inventory costs (Clubb et al., 2018).

In the United States, medication costs increased by 100% between 2011 and 2018 (Heindel & McIntyre, 2018, p. 556). According to Verghese et al. (2019, p. 1), pharmaceutical expenditure rises 9% annually and accounts for 31% of public health

sector expenditure across the Asia-Pacific region. Rising costs could affect the decisions made by hospital leaders, influenced by budget constraints, to seek ways to reduce medication inventory, particularly high-cost items (Heindel & McIntyre, 2018).

The storage of pharmaceutical supplies in many areas within a hospital may lead to overstocking and increase the risk of compromising product integrity when stored under incorrect conditions (Lifang & Yan, 2019; Moons et al., 2019). The challenges in achieving an efficient pharmaceutical supply chain system are created by limited resource availability, conflicting stakeholder goals, physician demands, and differing patient needs (Moons et al., 2019). Hospital systems involve multiple departments to provide various services to patients, all of which require inventory management of supplies, including medication ordering, stocking, prescribing, dispensing, administration, and recording systems (Saha & Ray, 2019). The administration of safe medications to patients requires integration and communication between multiple departments: Therefore, all relevant hospital systems need to be operationally effective and efficient (Saha & Ray, 2019). Verghese et al. (2019) outlined how the lack of infrastructure, policies, and supervision in Myanmar has led to multiple issues, including drug quality, stock levels, and misuse.

S. Khan et al. (2018) described the relevance of CAS theory to healthcare in that patients' changing needs require an environment that adapts according to system pressures. For example, hospitals stock thousands of different medications, and on any given day, the total volume, type, and dose of medications required are uncertain (Clubb et al., 2018). Therefore, leaders need to ensure that systems have the right medications, are always stocked, and meet changing patient needs (S. Khan et al., 2018).

The Challenges of Pharmaceutical Inventory

The pharmaceutical inventory management system is interdependent from a hospital's total inventory management system and the overall supply chain (Basri et al., 2018). Zahiri et al. (2017) identified the complexity of a pharmaceutical department by calculating the total number of processes within the department itself, the process links, and their corresponding processes that were external to the department. They found that there might be multiple interactions occurring within each process, further increasing the whole system's complexity. Further, Zahiri et al. identified that risk increased, and resilience decreased, with the increase in the total number of interactions occurring within each process. The challenges of pharmaceutical inventory management include medication safety, pharmaceutical waste and expiry, communication feedback loops, stakeholder influence, integration, and leadership.

Medication Safety

The treatment and outcomes of hospitalized patients can be highly dependent on the effective use of medications (Austin & Halvorson, 2019). The multiplicity of available medication types, brands, and doses makes it mandatory that a sound program of medication usage be developed within the hospital to ensure that patients receive the best care and protection possible (Austin & Halvorson, 2019). Pharmacy personnel and therapeutics committee members play an important role in integrating and effectively managing medication selection and procurement while improving patient safety and decreasing costs (Leonard et al., 2018).

Leaders within the World Health Organization have taken significant steps to improve medication management safety by educating health professionals and providing resources for additional training (World Health Organization, 2017). Cordina (2019) described the economic impact of inappropriate medication management and unsafe medication practices on patients and organizations. The complexity of the pharmacy and medication systems in hospitals is often fragmented, is inflexible, and presents barriers and limitations to healthcare professionals, leading to unsafe practices, errors, and waste in both medications and human resource efforts (Cordina, 2019). Healthcare systems are often known for their operational silo approach, with limited integration and communication between departments that reduce the multidisciplinary treatment approach to the detriment of patient care (Cordina, 2019).

In 1978, the World Health Organization developed a framework for access to safe and affordable medications and has worked globally since that time to educate organizational leaders on how medication shortages create risks to patient safety, especially when the medications are critical (Duong et al., 2019). Decision-making in the medication supply chain often involves different stakeholders who may not fully understand the consequences and impact on patient safety if the medications are unavailable. Control mechanisms put in place by organizational leaders have often increased the pharmaceutical supply chain system's complexity, which has increased the risk of shortages of essential medications (Duong et al., 2019). Issues related to medication stock management have included inadequate tracking systems and

fragmented handling with storage in multiple locations that decreased transparency of stock levels and increased the stockpiling and expiry of medications (Duong et al., 2019).

Education of the relevant stakeholders and those who influence the pharmaceutical inventory management decision-making will help develop an efficient and effective system (Duong et al., 2019). Bucknall and Hitch (2018) used CAS theory to understand practice change in the healthcare setting and developed a knowledge translation complexity network model. The researchers identified the disparity between knowledge translation and real-life clinician behavior mainly because of the nonlinear and chaotic way in which change occurs. Bucknall and Hitch also described how change often occurs in isolation; for example, in a department. However, complex healthcare systems are interconnected and influence more than one department. If leaders of change do not recognize interrelationships, the results may be chaos and adverse outcomes (Bucknall & Hitch, 2018).

Pharmaceutical Waste and Expiry

Waste of pharmaceutical products because of short expiry or oversupply is a reality in a hospital pharmacy and is difficult to resolve (Clubb et al., 2018). The systems required for hospital patients to receive medications pass through multiple agents and processes (Alhomoud, 2020). These activities include physicians writing the prescriptions; staff entering the medication into the pharmacy information system; pharmacists preparing the required medication, including checking and labeling; staff transporting the medication to the respective unit; the receiving staff further checking systems at the unit level; and finally, the administration process (Alhomoud, 2020).

Expiry of medications is an identified issue in Myanmar, with poor distribution, long delays, and incorrect storage conditions contributing to the problem (Verghese et al., 2019).

In many countries, including Myanmar, regulations exist whereby medications cannot be returned and used by other patients once dispensed from the pharmacy (Bekker et al., 2017). In many instances, the prepared medications are mixed in doses specific to an individual patient's needs and cannot be used for someone else, as once reconstituted, the perishability rate of the medication is high (Bekker et al., 2017). A recent study on pharmaceutical supplies wastage for cataract surgery revealed wastage of 45.3% of pharmaceuticals (Tauber et al., 2019, p. 1156). Studies on pharmaceutical supplies wastage in Middle Eastern countries revealed between 25.8% and 41.3% wastage (Alhomoud, 2020, p. 14). Understanding the cycle time of stock is important as nonmovement of stock equates to nonvalue add time and waste (Inegbedion et al., 2019). Analysis of waste audits has indicated that wastage of medications occurs because of sudden changes in patient needs resulting in the cancellation of prepared medications; although prepared and dispensed, these medications are not given (Alhomoud, 2020).

Medication expiry, the perishability rate of medications, and the potential scarcity of access negatively affect inventory costs and present some pharmaceutical inventory management challenges (Bray et al., 2019; Weraikat et al., 2019). Pharmacists aim to stock the right type and doses of medications, as any shortage could lead to a patient's death in the most severe cases (Weraikat et al., 2019). Weraikat et al. (2019) studied the benefits of hospital pharmacies implementing a vendor-managed inventory system

whereby the vendor accessed the inventory supply and took full responsibility for replenishment to reduce the adverse impacts, such as the bullwhip effect, for both the vendor and the pharmacy. The bullwhip effect is a phenomenon where the required stock amplifies as it passes up the supply chain and results in unnecessary order variance (Bray et al., 2019). Weraikat et al.'s simulation study results achieved zero waste in 93% of the scenarios without any impact on stock requirements.

Clubb et al. (2018) discussed the need to monitor automated dispensing machines for nonmoving medications or those with a short expiry date to ensure that expiry date management is part of system checking. Healthcare organization leaders have demonstrated a 21% to 28% decrease in inventory levels when managing automated dispensing machines and expiry dates (Clubb et al., 2018, p. 409). Hospital leaders need to monitor wastage and expiry as part of their pharmaceutical management system to improve cost control and maintain patient safety.

Communication Feedback Loops

H. Khan and Wisner (2019) found that firms with a learning culture and strong internal communication in the form of information and knowledge sharing amongst the different internal stakeholders have greater potential for positively impacting firm performance. The feedback loop of the pharmaceutical supply chain system may be found in the form of financial inventory reports and reported incidents. This loop helps to determine the system's effectiveness or if the system requires adaptation to achieve a more positive outcome. The feedback loop is important in driving agent behavior to evolve system adaptation through timely intervention (Braithwaite et al., 2018).

Unfortunately, the time to receive feedback may be lengthy depending on the complexity of the system, or lack of transparency within the system, causing a delay in information transfer and feedback if stakeholders are unaware of the need for intervention or response (Brainard & Hunter, 2016; Braithwaite et al., 2018).

Stakeholder Influence

Concerning stakeholders (agents) and CAS, Chandler (2018) demonstrated how the stakeholders' engagement and behaviors determine the success of change and system evolution. Given that each agent in a complex system is unlikely to have an overview of the whole system, realizing the system's expected outcomes is difficult to achieve (Chandler, 2018). Complex systems evolve due to the aggregated behavior of different agents, who work on adapting the system by anticipating the rules required to maintain it (Chandler, 2018).

Implementing effective and lean supply chain and inventory management practices requires alignment and participation of the medical and nonmedical stakeholders (Almutairi et al., 2019). Saha and Ray (2019) purported that the board of directors and inventory managers focused on minimizing expenditures, the departmental directors were more concerned with ensuring adequate stock levels, pharmacists focused on ensuring the right therapeutic medications in the formulary, whereas nursing and other medical staff were concerned with quick access to the required medications. The various stakeholders' interests may result in different decision-making and outcomes (Saha & Ray, 2019). Grudniewicz et al. (2018) found that a bottom-up approach improves outcomes to effect systems change when using a CAS theory perspective. This view by

Grudniewicz et al. may not apply to pharmaceutical inventory management, given that it involves major decisions that may significantly impact patient care and hospital costs. Hospitals seek a balanced approach to managing pharmaceutical inventory through a pharmacy and therapeutics committee's expertise consisting of all levels of subject matter experts (Austin & Halvorson, 2019). The committee oversees the pharmaceutical formulary system, sets standards for best practice, promotes evidence-based prescribing, and reduces the variation in the level of treatment provided to patients (Vázquez-Mourelle et al., 2019). An effective formulary will help inventory controls and, therefore, contain medication costs (Austin & Halvorson, 2019; Keren et al., 2018).

The medication formulary in a hospital is an intricate system to navigate because of the multiple stakeholders demands, from organizational leaders who need to monitor the inventory budget, to doctors and specialists who expect all types and doses of medications to be available for patient needs, to pharmacists who are responsible for the purchasing, storage, and dispensing of medications (Karel et al., 2017). In the study by Leonard et al. (2018, p. 455), the realized cost savings of the coordinated integration and management of the formulary across the two hospitals in the healthcare system was approximately $11.5 million. Complex systems require multiple points of integration to function effectively (Cordon, 2013). Determining cost-effective medication selection without compromising patient safety increases the complexity of the pharmacy and therapeutics committee's scope (Leonard et al., 2018).

A healthcare organization's complexity needs a robust system to manage the requirements (Austin & Halvorson, 2019). It is particularly important in medication

management where demand variation, procurement regulations, inventory budgets, and space constraints are part of the whole system (Austin & Halvorson, 2019). Hospital pharmacists are subject matter experts when determining medication needs and managing demands, so it is pertinent to include pharmacy leaders in the decision-making process for procurement, supply chain logistics, and patient needs (Duong et al., 2019). Researchers found that multiple stakeholders in the medication supply chain require integrated systems and processes to facilitate collaboration, communication, and effective leadership decision-making (Duong et al., 2019).

Integration

Xu et al. (2020) defined supply chain integration as the extent to which activities within an organization are connected and integrated through a network of upstream and downstream systems and processes. Companies integrate and manage their supply chain operations with internal, external, upstream, and downstream stakeholders (Leksono et al., 2019). Leksono et al. (2019) studied supply chains in Indonesia and, through the use of tools such as the balanced scorecard, demonstrated a positive correlation between internal and external relationship integration and firm performance. Performance improvement through integration occurs through greater collaboration and communication, improved data and information flow, and all stakeholders' efforts to implement lean processes and quality control (Leksono et al., 2019).

Supply chain integration in healthcare systems improves the firm's performance; however, it is difficult to achieve (Mandal, 2017). Cost-effective healthcare supply chain partnerships and successful integration require trust between internal and external parties

involved in the supply chain system (de Almeida et al., 2017; Kwon & Kim, 2018). Drupsteen et al. (2016) identified the three fundamental aspects of integration in a healthcare environment as initiating, which refers transparency in processes; facilitating, which refers to information technology; and inhibiting, which refers to uncertainty and variability. One method to improve integration and, therefore, efficiency is to review ways to reduce system complexity and review the business in tandem before deciding on change (Aitken et al., 2016). Achievement of integration requires a holistic and systematic review of the supply chain to include safety, security, access, flexibility, and scalability (Yao, 2017). Integration gains improved efficiency and cost performance, and reduced resource slack, leading to business flexibility and responsiveness (Aitken et al., 2016).

Healthcare supply chains are complex, and integration adds to the complexity necessary if hospitals are to continuously improve their performance (Drupsteen et al., 2016). One single transaction within a hospital system is interdependent with the wider system (S. Khan et al., 2018). For example, receiving medications from the hospital pharmacy requires a patient to interact with multiple healthcare personnel, such as communicate with administration staff, get assessed by the nurse, get checked by the doctor, and be educated by the pharmacist. These interactions involve specific processes with each set of healthcare personnel, who operate under specific department policies and systems. Without each of these systems functioning properly, patients may not receive the required medications or education about their medications. The use of CAS theory enables leaders to recognize the macro and micro interdependencies of systems operating

in healthcare, which helps them determine the management of patient health (S. Khan et al., 2018).

Leadership

Ahmadi-Javid et al. (2017) found that senior leadership commitment to system change and combined trust between the organization's internal and external stakeholders were significant factors to business success. The appointment of an experienced leader to focus on the supply chain can result in improved supply chain performance through higher levels of integration, promote the development of strategic partnerships, and enable the contribution of additional knowledge to the executive team (Bohme et al., 2016; Roh et al., 2016). Day et al. (2018) identified the difficulty of driving change in healthcare organizations and distinguished some of the main factors of successful emergent change in healthcare organizations: the degree of management support, collaborative decision-making, grassroots inclusiveness of personnel, and the learning culture within the organization.

Braithwaite et al. (2017) claimed that hospital leaders' historical attempts to control complexity occurred through the development of policies, regulations, performance indicators, and standardized processes. They stated that many control mechanisms fail because leaders assume a linear line between a directive from the leadership and compliance at the grassroots. Braithwaite et al. (2017) found that healthcare leaders need to spend more time on the staff's inclusive engagement to understand the local contexts and allow greater self-organization and adaptive responses at the grassroots with continued guidance through feedback loops.

Bucknall and Hitch (2018) found that CAS was a continuously evolving system that requires leaders at all levels in healthcare to use their diverse perspectives and experiences. The researchers identified that the pooling of leadership information ensured effective decision-making by acknowledging and making sense of the forces of unpredictability and the need for adaptability to break from the traditional organizational models (Bucknall & Hitch, 2018). The researchers also found that using a knowledge translation complexity network model helped leaders form a change implementation framework involving multiple stakeholders in the change processes to gain a positive outcome (Bucknall & Hitch, 2018). The use of CAS theory has supported the implementation of complex leadership best practices for supply chain management by providing organizational leaders with guidance on understanding and improving systems through change management (Giannoccaro et al., 2017; Hugos, 2018).

Decision-making in the healthcare environment requires complex thinking to transform systems (Kuziemsky, 2016). Historically, decision-making in healthcare has been top-down and linear, resulting in poor outcomes (Kuziemsky, 2016). Using CAS as the lens helps healthcare leaders to develop system models that incorporate the processes, concepts, and relationships to achieve the desired outcomes (Kuziemsky, 2016). S. Khan et al. (2018) described the importance of complexity leadership in healthcare given that human decision-making may have a resounding impact on the safety and quality of care provided, and any decision may be potentially lifesaving or life-threatening to patients.

One key example of a constantly evolving system is the hospital formulary, which may test organizational leaders' decision-making strength due to the multiple

stakeholders involved in the decision-making process (Karel et al., 2017). Decision-making by the pharmaceutical committee members, who are considered subject matter experts, may engender what Austin and Halvorson (2019) termed the *expert halo effect*, whereby nonexperts view a specialist's opinion as infallible and completely trust that viewpoint. Other influences of committee members are psychosocial factors that may occur when members want to please colleagues and peers with specific requests (Austin & Halvorson, 2019). As Austin and Halvorson described, the organizational leaders need to ensure that the committee expertise does not rely purely on personal agendas or experiences.

Issues With Pharmaceutical Inventory in Myanmar

In 2015, the OECD identified in a fiscal healthcare sustainability report a few key areas of focus in developing countries. The recommended focus areas included a review of drug purchasing methods, the development of preferred drug lists, the implementation of gatekeeping systems, and the implementation of direct controls on pharmaceutical drugs. The OECD report identified pharmaceutical systems as a financial burden that required coordinated management and robust systems to control costs (OECD, 2015).

Healthcare infrastructure and governance challenges identified in Myanmar by World Bank representatives included the lack of waste management systems, including pharmaceutical waste management from expired and unfinished drug solutions representing a chemical risk to the community and the environment (World Bank, 2019). The Myanmar government's attempts at regulating pharmaceuticals require further work,

as there is a lack of pricing regulation, resulting in significant price variation along the supply chain (Latt et al., 2016).

The Myanmar people also face medication allocation inefficiencies, counterfeit medications, and substandard drug availability (Latt et al., 2016). The Government of Myanmar has listed certain diseases, conditions, and syndromes where, due to a lack of quality drugs, the government has required international help, including for vaccines, diabetes medications, prenatal and new baby care, diarrhea, and pneumonia (Ministry of Health and Sports, 2017). In Myanmar, the residents are dependent on nonprofit organizations, other nations, and the federal government for prescription drugs and other healthcare necessities (Lwin, 2019). Lwin (2019, para. 7) predicted that Myanmar's required pharmaceutical spending would increase by 11% per year, from $840 million in 2017 to approximately $1.1 billion by 2023.

Poor infrastructure creates supply and distribution challenges, and the private healthcare sector supports creating a sustainable healthcare system by attempting to provide high-quality medications and implement controls within supply chain governance (World Bank, 2017). The International Finance Corporation (IFC), a member of the World Bank Group, stated that governments in emerging markets would benefit from focusing on pharmaceutical regulation and quality control (IFC, 2017). The IFC (2017) also stated that outsourcing manufacturing, supply, and distribution to private businesses might increase the quality, availability, and affordability of drugs. Given the healthcare infrastructure and pharmaceutical challenges outlined in Myanmar, private hospital

groups may benefit from cost-containment strategies related to pharmaceutical inventory to ensure quality medication availability for patient management.

Transition

The consequences for the lack of cost-containment strategies of medical supply inventory include the inefficient use of resources (Bohme et al., 2016) and the inability to create a competitive advantage (Beheshti et al., 2020). Additionally, poor cost-containment represents a risk to business performance (Basri et al., 2018). In Section 1, I described the foundation of this qualitative single case study by presenting the problem statement, the background, the purpose of conducting the study, the study's nature, the research question, and interview questions. I concluded Section 1 by elaborating on the conceptual framework, operational definitions, assumptions, limitations, delimitations, the study's significance, and a review of the professional and academic literature. A comprehensive review of the literature identified the challenges healthcare business leaders faced in determining successful cost-containment strategies of their pharmaceutical inventory and helped confirm the problem and ascertain the need for this study.

Section 2 outlines the role of the researcher and the selection of participants. I include the rationale for choosing the research method, design, population, and sampling method. I also review the requirements to ensure a robust ethical framework, data collection technique, data organization techniques, and data analysis. To address the study's rigor, I outline the methods I used for maintaining reliability and validity throughout the research process.

In Section 3 of this study, I present the study findings, including the themes and how they tie to the conceptual framework and the literature. I include a detailed discussion on the application of the findings to professional practice. I also express the implications for social change improvement. I list recommendations for actions and further research. Finally, I reflect on my experience and discuss possible personal biases, ideas, and values before closing with a concluding statement.

Section 2: The Project

Purpose Statement

The purpose of this qualitative single case study was to explore the cost-containment strategies that some hospital business leaders use to reduce the expense of pharmaceutical inventory. The targeted population consisted of six private hospital business leaders who successfully demonstrated the reduction of pharmaceutical inventory expense by implementing cost-containment strategies within a single healthcare system consisting of two hospitals and the corporate office located in the Republic of the Union of Myanmar. The implications for positive social change include pharmaceuticals provided to local residents at an affordable cost may increase residents' positive health outcomes enabling them to remain productive in their community.

Role of the Researcher

As the researcher, I selected the research method and research design and reviewed the existing literature. The researcher's role is to be the primary instrument for collecting, preparing, analyzing, and interpreting interview responses conducted through direct meetings with relevant stakeholders (Bahrami et al., 2015; Dikko, 2016). In the researcher's role, I was the primary instrument to conduct the necessary processes before, during, and after I met with hospital business leaders. After approval from the Institutional Review Board (IRB), I analyzed and interpreted archival records made available from company documents, including existing policies, protocols, and processes. I scheduled a time to observe the pharmaceutical inventory processes at the study hospital site and arranged a time to interview participants.

Yin (2018) recommended six forms of data for a case study and that researchers keep a database for the recording of all activities. The six forms of data Yin recommended are (a) documents, (b) archival records, (c) interviews, (d) direct observations, (e) participant observation, and (f) physical artifacts. Of the six forms of data, I requested documents and archival records, kept reflective notes from my observations during Zoom information-gathering sessions, and conducted interviews. I kept a case study database to document appointments and all data sources. A case study database helped me maintain a chain of evidence of identifying, collecting, and storing each piece of data gathered in sequence and maintaining an orderly data management system. I used the database along with an interview protocol (see Appendix A) to help me prepare for each interview. An interview protocol guides researchers to state the same questions in the same order to help ensure data reliability and validity (Patton, 2015).

Yin (2018) suggested that a researcher uses prudence with electronic data sources, especially social media. I did not use social media as part of the data collected. I kept reflective notes on my observations from information-gathering sessions. With written permission, I recorded the Zoom information-gathering sessions. For triangulation and to enhance this case study's rigor, I followed Yin's advice and used multiple sources of data, including interviews, company documents, and reflective notes. Additionally, I used relevant extant literature and the CAS theory to confirm emergent findings for triangulation.

Reflection of any conflict of interest also means understanding ethical principles and the potential for personal bias (Sheperis et al., 2017). I have worked in the healthcare

environment for more than 30 years and have been an end-user and evaluator of medical supply and product choice. I am not involved in management decision-making related to cost-containment strategies of medical supplies or inventory. I have limited medical supply chain and pharmaceutical inventory management experience, and I do not participate in professional supply chain groups. No conflict of interest existed, as I am not an employee in this organization in Myanmar.

Throughout this study, I followed the principles outlined in the *Belmont Report* (National Commission for the Protection of Human Subjects in Biomedical and Behavioral Research, 1979) to ensure the observance of the three ethical principles (a) respect for persons, (b) beneficence, and (c) justice. Miracle (2016) described respect as an acknowledgment that people have the right to make their own decisions, and those who are unable to decide for themselves should be considered vulnerable and, therefore, be protected. Miracle interpreted beneficence as aiming for the protection of persons from harm or adverse outcomes. The author depicted justice as the treatment that affords equality and fairness without fear of reprisal or discrimination (Miracle, 2016). Related to ethical principles are the challenges of a researcher to recognize personal biases. I abode by the ethical principles outlined in the *Belmont Report*. I respected the participants, protected the participants' anonymity, and always treated the participants fairly and equally.

Researchers face the challenge of mitigating biases related to their values, beliefs, personal interests, and past experiences (Fusch & Ness, 2015; Joanna Smith & Noble, 2014). Decisions on the study topic and topic parameters, location of study, target

population for the interviews, and method of conducting the interviews will affect the analysis outcome (Hansman, 2015). During data collection, I took care to be aware that personal biases may occur. To mitigate the risk of personal bias, I used strategies such as not generating implicit verbal and nonverbal cues and using an interview protocol. I am aware that I have values and beliefs that potentially influence the research process. I ensured that my interests and experiences did not bias the study by using techniques such as not expressing my thoughts during the interview process. Buetow (2019) identified that qualitative researchers often have unconscious cognitive biases and that proactive self-reflection may bring these to full awareness. As a further technique to minimize bias, I reflected on my values and experiences before the data collection to raise self-awareness of possible cognitive bias.

It is important to design the collection parameters to mitigate bias from the researcher's worldview (Kivunja & Kuyini, 2017). I remained impartial by not expressing my thoughts during the interview process. Strategies to mitigate bias include developing an interview protocol (see Appendix A), audio recording the conversations, transcribing the interviews word for word, incorporating member checking of the interviews, and ensuring data saturation. I used an interview protocol, as this technique supports the researcher in conducting a quality interview and remaining focused on the interview (Patton, 2015).

Participants

The selection of participants who represent the research population might enhance the study's reliability and validity (Gravetter & Wallnau, 2007; Marshall & Rossman,

2016). I selected six participants from two hospitals and the corporate office of one healthcare system in Myanmar for a single case study analysis. From the middle to the executive level in the healthcare system where I conducted my study are English-speaking with all policies and documents written in the English language. Therefore, I did not require translators for interviews or translation of documents. The eligibility criteria for study participants included hospital employees from one of the two hospitals or corporate offices. They were hospital business leaders in the management, pharmacy, or procurement divisions, with a minimum of 2 years of experience in decision-making responsibilities for pharmaceutical inventory.

The identification of the personnel to interview occurred after approval by IRB. It is paramount that the researcher is able to reassure the organization's leaders of their ability to maintain the confidentiality and security of the participant information and any data collected (Birt et al., 2016). I obtained the CEO's contact information through a professional colleague who introduced me to the CEO through email. I emailed an introductory letter to the CEO (see Appendix B). I explained the purpose of the study, the method of purposive sampling to select the participants, the information I required to conduct purposive sampling, and the method I would employ to protect the identity of participants and the organization. At the time of introduction, I also attached an example of a letter of cooperation (see Appendix C) to recruit potential participants from the organization. I received a signed letter of cooperation from the CEO of the organization (see Appendix D).

I used purposive sampling to find participants. Purposive sampling is a technique used to identify and select individuals with specific knowledge of the study topic and the ability to communicate their opinions and experiences (Palinkas et al., 2015; Taherdoost, 2016). If I did not recruit enough participants to reach data saturation, I aimed to employ snowball sampling. Snowball sampling identifies additional potential participants by the initially recruited study participants (Etikan et al., 2015).

To conduct purposive sampling, I needed to gain access to process flow information of pharmaceutical inventory management in the organization through documents such as the organizational chart and policies that identified the responsibilities of position holders of the pharmaceutical supply chain management. I was provided with the contact details of a resource person to communicate my requirements, and we met through Zoom on two occasions to clarify the information and for me to request additional data for process mapping. Through process mapping, I identified potentially suitable business leadership positions to conduct purposive sampling. Once I identified the potential position holders with decision-making authority and responsible for pharmaceutical inventory management, I emailed the CEO and requested the email addresses for all employees holding certain titles or positions. Once I received the email addresses, I approached potential participants and sought their willingness to participate in the study through an invitation email (see Appendix E) with an attached consent form. To alleviate the healthcare CEO's concerns, I included emailing information about the study to participants and interviewing outside work hours if the participants were agreeable.

I recruited participants based on Walden University IRB requirements to ensure participants' protection and ethical compliance. I shared the interview questions (see Appendix A) with the participants and responded to all participant queries before the interview. The process of providing information to participants before the interview increases the level of participant trust (Hampshire et al., 2014), and developing a positive rapport during the interview process is an important step in gaining a participant's in-depth perspective (Hampshire et al., 2014; Pelosi, 2015). I built rapport by engaging in informal discussions with the participants and using our mutual standing as medical professionals.

Research Method and Design

Research Method

Researchers typically choose from three methods: (a) quantitative, (b) mixed methods, or (c) qualitative (Sheperis et al., 2017). In a quantitative research method, the researcher (a) asks closed-ended questions, (b) collects data to quantify the phenomenon with numerical statistics, (c) collects data representative of the population under study to generalize the results to a larger population, (d) presents numerical results from surveys, and (e) measures variables or tests hypotheses to address the research question (Sheperis et al., 2017). Researchers use the quantitative method to examine relationships between variables and events using hypotheses, structured techniques, and measurements to generate statistical data (Walter et al., 2015) and to extract data and emphasize statistical results and outcome-based findings (Groeneveld et al., 2015; McCusker & Gunaydin,

2015). Generating statistical results, measuring variables, or testing hypotheses would not answer this study's research question.

Mixed methods research includes quantitative and qualitative methods in the same study (Halcomb & Hickman, 2015). Researchers may use mixed methods when recognizing both methods' inclusion will provide stronger evidence to answer the research question (Halcomb & Hickman, 2015; Shorten & Smith, 2017). The quantitative aspect of mixed methods was inappropriate for this study.

I chose a qualitative method to explore the strategies used by healthcare business leaders. Researchers use a qualitative method when the inquiry's fundamental nature cannot be expressed numerically (Roy et al., 2015). According to Merriam and Tisdell (2016), qualitative research results from constructed knowledge gained from the interpretations and meanings of those involved in the phenomenon under study. When studying a phenomenon, qualitative researchers attempt to understand the worldview and meaning that study participants have formed through their experiences, subjective social interactions, and interpretations (Merriam & Tisdell, 2016). Qualitative research helps the researcher understand the effectiveness, significance, and impact of real-life situations (Roy et al., 2015; Yin, 2018). I chose a qualitative method to ask participants open-ended questions and produce themes from the information they provided.

Research Design

When considering a qualitative research study, researchers may choose one of several designs, among them phenomenological, ethnographic, and case study. I first considered a phenomenological research design for this study. Phenomenological

research design is suitable when a researcher aims to deal with ideas and essences and gain in-depth knowledge to describe the experiences, perspectives, and interpretations of a single person or a particular group of people in a particular place (Moustakas, 1994). In a phenomenological study, the focus is on the understanding and meanings of the participants' lived experiences (Merriam & Tisdell, 2016) and the analysis of information through explication and interpretation (Moustakas, 1994). I chose not to use phenomenology, as I would not explore the lived experiences of the participants.

I next considered ethnographic research, which involves extensive observation and researcher involvement in an intact culture of a group of people (Patton, 2015). Ethnographic research also includes data collection over an extended period to gain in-depth knowledge of how the group's culture, actions, and behaviors affect the focus of inquiry (Fusch & Ness, 2015; Wolcott, 1999). Ethnography was not appropriate for this study as I did not plan to research a group's culture.

Finally, I considered case study. Merriam (2013) described a case study design as any specific bounded phenomenon that a researcher seeks to inquire about and analyze intensively. A case study design is appropriate when a researcher aims to explore a phenomenon in current and contextual situations and triangulates multiple data collection methods to answer *how* and *why* interview questions (Yin, 2018). According to Yin, with a case study, researchers describe, explain, or explore, or do all three, with a contemporary issue in which they have no or little control of the events or participants.

Case studies may be explanatory, descriptive, or exploratory. Researchers use the explanatory method with a more functional approach to learn the cause and effect of a

situation or determine how events happened (Yin, 2018). With a descriptive case study, the researcher seeks to describe a case from a functional or practical viewpoint in the case's natural environment and provide a complete description of a phenomenon within its context (Yin, 2018). With an exploratory method, the researcher studies a case where there is no clear, single set of outcomes (Yin, 2018). Yin (2018) explained that in exploratory case studies, the researcher asks questions that allow for further examination of the study phenomenon. Of the qualitative designs described, I chose exploratory case study, as that would best answer the research question.

To ensure data quality, I gathered information from those involved in the process and collected data using interviews by Zoom audio conferencing. If I did not reach data saturation from the collection of information from all the data sources, I would continue to interview additional participants until saturation of data occurred. Sheperis et al. (2017) found that saturation occurs when researchers continue to interview their chosen participants and get to the stage where the information collected from different participants is repetitive and provides no new insights. To achieve data saturation, the information collected needs to be meaningful, in-depth, and triangulated by reviewing multiple data sources (Fusch & Ness, 2015). Using a case study design, which includes triangulation of data, interviews, archival records, direct field observations, written notes, and member checking of the interviews, helps the researcher answer the *how* and *why* of the research question (Hyett et al., 2014; Joslin & Müller, 2016).

Population and Sampling

The private hospital group chosen for this study was in the Myanmar cities of Yangon and Mandalay. The scope of this qualitative single case study was limited to hospital directors, specific job-related managers, and other stakeholders, such as influential and experienced clinical personnel, who were all defined as business leaders. These leaders came from a single healthcare system, which consists of two private hospitals and the corporate office in Myanmar. The targeted participant population included decision-makers in supply chain and inventory related to product procurement, protocols, processes, and systems that influenced the implementation of cost-containment strategies of pharmaceutical inventory management. Choosing business leaders with a high level of healthcare-related knowledge and experience with successful medical supply and pharmaceutical cost-containment strategies was critical to the study.

The sampling method I used to select the participants, purposive sampling, helps the researcher achieve data saturation by identifying participants with knowledge of the phenomenon (Etikan et al., 2015; Roy et al., 2015). Purposive sampling is necessary for studies wherein the participants must meet specific inclusion criteria (Etikan et al., 2015). Purposive sampling can speed the process of finding eligible participants when relatively few individuals meet those criteria (Etikan et al., 2015; Palinkas et al., 2015). Researchers use purposive sampling to identify personnel with specific knowledge and experience on the topic of inquiry (Malterud et al., 2016). Participants who agreed to take part in the study were requested to share their background in inventory management with the interviewer with the expectation that they had expert knowledge and experience to

respond fully to the interview questions. This approach was integral to mapping the pharmaceutical inventory system. Process mapping of the medical supply system enables a researcher to classify the steps in each inventory management process to identify the various stakeholders involved at each point (White & Cicmil, 2016).

The number of participants needed to obtain data saturation in an exploratory case study can vary. According to Fusch and Ness (2015), data saturation occurs when the researcher reaches a point where there is no new information from further data, and to get to that point, the data needs triangulation through various data sources. Adler and Adler (1987) gave a vague answer regarding data saturation and sample size. After reviewing 50 qualitative studies, Mason (2010) identified differing numbers for saturation from 5 to 360. To answer the question of the right sample size to achieve data saturation, Baker and Edwards (2013, p. 4) asked 50 qualitative experts, who agreed the number was usually 14 to 15 interviews. Similarly, in a more recent study involving qualitative professionals, Hagaman and Wutich (2017, p. 23) found the number was usually less than 16.

My goal was to achieve data saturation; therefore, if I had not achieved data saturation from interviews of the initial number of selected participants, I would have used the case organization's CEO's original contact information to recruit additional participants and continue interviewing until saturation data occurred. Researchers have no definitive formula or standard approach to determine the correct number of interview participants (Malterud et al., 2016). Data saturation is possible in a qualitative interview-based study with as few as six participants if those participants meet the criteria (Morse, 2015). Additionally, data saturation requires sufficient availability of other forms of data,

such as documents, archival records, field observations, field notes, and photos (Morse, 2015).

This study's main data collection source was Zoom audio conferencing interviews with participants who met the study criteria. I identified suitable participants through purposive sampling and planned to interview a minimum of six participants. I expected to achieve data saturation from those six participants, given that they met the eligibility criteria and, therefore, would be able to provide in-depth responses to the interview questions. If I had not achieved data saturation following the six participants' interviews, I would have interviewed suitable participants until I received repetitive data or new information. However, I did achieve data saturation from the six interviews.

The interview setting was in a designated area that provided personal security at each participant's workplace. The most suitable location for a semiformal interview is a natural, comfortable, and quiet setting where the participant feels familiar; therefore, the workplace is often the most appropriate area (Brewster, 2014; Malagon-Maldonado, 2014). The most important aspects of a successful interview include creating an environment that ensures confidentiality and privacy and minimizes interruptions (Brewster, 2014; Majid et al., 2017; Yin, 2018). Using techniques such as writing out an interview protocol and developing a positive rapport with the participants provided rich information on the research topic (Majid et al., 2017). During the interviews, I followed the advice of Sheperis et al. (2017) and spent time with each participant before the interview started to create a conducive interview setting and establish rapport before I turned on the audio recording and started asking the interview questions.

Brinkmann and Kvale (2018) defined this time spent with a participant as a *briefing*. Brinkmann and Kvale opined that the first few minutes of an interview determine how the remainder of the interview will proceed. It is important to practice sensitive listening during the interviews (Sheperis et al., 2017) and allow pauses in the interview without speaking (Brinkmann & Kvale, 2018). I practiced sensitive listening by focusing my attention on what the participant was saying and using paraphrasing techniques so that the participant could correct any misinterpretation of the interview responses. I tried to elicit the participants' experiences and narratives until I fully understood that person's observations of the phenomenon.

Ethical Research

At all times, I abided by all ethical principles in the *Belmont Report* (National Commission for the Protection of Human Subjects in Biomedical and Behavioral Research, 1979), given that my research involved human subjects. Additionally, I did not commence any data collection before I had obtained approval from the Walden IRB. (The IRB approval number for this study is 11-10-21-0608563.)

The initial contact with potential participants was by email (see Appendix E) and included an informed consent form. The consent form informed potential participants of the study's purpose, the data collection method, and any risks and benefits of participating in the study (Cook & Hoas, 2014). The consent form had my contact information should a participant have questions or concerns before or after the interview. The consent form also explained to the participants that there would be no monetary or any other type of incentive for volunteering. Potential participants could provide their

consent to participate in the study by responding to my email with the words “I consent.” I informed participants in the initial email, in the consent form, and before the commencement of the interview that their consent was voluntary and that they had the option to withdraw from the research study at any point without any consequences. I explained that during the interview, the participant could stop the interview or withdraw their participation until publication.

Once potential participants were selected, I explained the criteria for participation to ensure that those who responded positively to participate met this study’s eligibility criteria. Once the sample was selected, but before the interviews commenced, I explained that there were no incentives or payment for their participation in the research. I also informed the participants that the risk should be no more than that experienced in a normal workday. If a participant had experienced any discomfort and informed me of such, I would have stopped the interview at any time. I did not coerce participation in any way.

Protection of the research participant occurs by maintaining any information given and ensuring that they perceive no threat to their confidentiality, security, or position (Corbin & Strauss, 2014; Cugini, 2015). Before starting the interview, I ensured that the participants understood the study’s intent, were aware of their rights, and were aware of confidentiality assurances. Participants have the right to withdraw from the study at any time with written notification, without providing a reason and without negative recourse (Cugini, 2015). I reminded participants that they may submit their written withdrawal notices to my Walden University email account. If a participant had

wished to withdraw from the study, I would have removed that participant's information, including the information obtained from the interview, by erasing all audio records and shredding any notes or printed information related to the participant. However, no participants withdrew from the study.

During data collection, I followed the same interview protocol (see Appendix A) for each participant and used member checking to ensure accurate interpretation of the participants' responses. I assured participants that I would not ask for personal information that would identify them. To uphold confidentiality, I assigned a coding system with a letter code for each hospital (HU-1 and HU-2) and for the corporate office (HO). The complete coding included both the hospital and participant (e.g., Hospital 1, Participant 1 = HU-101) or the corporate office and participant (e.g., Corporate Office, Participant 1 = HO-01). To help establish the validity of the interview, I emailed each participant a copy of the data collected during my interview with them for member checking. Merriam and Tisdell (2016) explained that the process of member checking allows participants to review the interpretation of the information they provided at the interview and validate that there is no misinterpretation.

Preventing the accidental release of confidential information by maintaining the proper safeguards is critical for the research study, the participants, and the organization (Pletcher et al., 2014). I have made all attempts to disguise the hospital group and any participant in this study by not disclosing the name of the organization or the hospitals' specific locations. I took measures to protect the research data by not collecting any identifying information and using password-protected files for electronic storage. I have I

secured all paper products, placed audio recordings and study information on an external disk drive, and kept all information provided during the interviews locked in a private safe in my home, for which I have the only key. I will keep the records for 5 years. At the end of 5 years, I will use a shredding machine to destroy physical paper documents. I will permanently erase the data on the external disk drive by installing a file shredder software tool called Eraser on my computer and applying the necessary steps to ensure permanent deletion.

Data Collection Instruments

The researcher is the main data collection instrument in qualitative research studies (Yin, 2018). An interview protocol guides researchers to keep them from forgetting key details of the interview (Patton, 2015). A case study database will help to maintain a chain of evidence (Yin, 2018). I used an interview protocol, semistructured interview questions, and a case study database. I depended upon these data collection instruments to guide me through the interview phase of data collection.

Interviews are a trusted data collection method for qualitative studies as the researcher explores the interviewees' experiences regarding the phenomenon (Majid et al., 2017). Patton (2015) described three different types of interviews: (a) the informal conversational interview or unstructured, (b) the universal interview guide approach or semistructured interviews, and (c) the standardized open-ended interview method or structured interviews. Considering these three approaches, I determined the use of the semistructured interview to be the most appropriate for this study. I used semistructured Zoom audio conferencing interviews to gather the narrative of the participants.

Using semistructured interviews allows participants to freely express their experiences, knowledge, and perspectives so the researcher can obtain in-depth information (Drew, 2014; Marshall & Rossman, 2016). Using an interview protocol minimizes potential variations between each participant interview (Marshall & Rossman, 2016). Throughout the interview, the researcher needs to remain open to identifying new themes and phenomena (O'Sullivan, 2015). I used an interview protocol (see Appendix A) to minimize potential variations when framing the predetermined interview questions. The interview protocol helped me focus on interview questions related to the research problem, so the participants' responses yielded specific information that addressed the study topic. Although I controlled the interviews as much as possible to ensure the focus stayed on the interview questions, I allowed conversational discourse and remained open to identifying new themes and phenomena. The interview period was approximately 45 minutes. After explaining that I would like to audio record the interview, and received permission to do so, I used the Zoom recording function. I also had a Sony ICD-UX533BLK digital voice recorder backup recorder in the event of Zoom recording failure. Additionally, I transferred information from the audio files manually.

Before commencing an interview, I requested that participants turn off all electronic devices. As part of the interview protocol, I informed the participant when I turned on the recorder. As I was the primary data collection instrument, to enhance the reliability and validity of the data collection process, I implemented a consistent interview method using the same interview protocol and audio recording each interview. Additionally, I requested the participants to respond as comprehensively as possible to

each interview question. If a participant identified him or herself or named any other person or any identifying information about the organization during the interview, I anonymized that portion of the interview during transcription.

Brinkmann and Kvale (2018) recommended that interviewers spend time debriefing with participants after the interview concludes. During an interview, the researcher should watch for any sign of anxiety, tension, or discomfort (Brinkmann & Kvale, 2018). Following Brinkmann and Kvale's advice, once I had concluded each interview, I turned off the recorder and debriefed with each participant by summarizing the study's purpose to provide the participant with the opportunity to correct any misperceptions and ask questions.

In-person, face-to-face interviews were not a possible alternative to the Zoom audio conferencing interview method due to travel restrictions to Myanmar at the time. Following my preliminary review of the data, I did not need to request a second interview to address any ambiguity in the initial responses. If a second interview had been required, it would have occurred by audio conferencing using Zoom or by telephone.

Member checking increases the research's credibility and validity (Corbin & Strauss, 2014; Iivari, 2018). During member checking, interview participants review and validate the interpretation of the information collected by the researcher (Thomas, 2016). I conducted member checking by asking each participant to review the interview information collected and validate that there had been no misinterpretation of their interview responses.

Data Collection Technique

The primary data collection technique of qualitative research is semistructured interviews with participants (Yin, 2018). This technique includes using the same questions in the same order for each interview (Moustakas, 1994) and capturing the participants' opinions and experiences (van den Hooff & Goossensen, 2015). I used an interview protocol (see Appendix A) with Zoom audio conferencing semistructured interviews and used the same questions in the same order with all participants. I conducted a manual notation and an audio recording of the interviews to capture the participants' opinions and experiences.

Using Zoom audio conferencing to conduct semistructured interviews has advantages and disadvantages. One advantage of Zoom audio conferencing interviews is a high participation rate in responding to the interview questions (Archibald et al., 2019). Additional benefits of using Zoom audio conferencing for semistructured interviews include that the platform is a cost-effective and time-efficient method, has specific in-built data management features such as recording, and allows for security options (Archibald et al., 2019). The disadvantages of using Zoom audio conferencing for semistructured interviews include that there may be difficulty connecting or maintaining a stable connection or inconsistent call quality, which could be disruptive to the interview process (Archibald et al., 2019).

I conducted member checking by asking each participant to review my interpretation of the information collected and advise me of any misinterpretations. The member checking process is useful to mitigate possible researcher bias and increase data

accuracy as it allows the participant to validate the researcher's interpretation of the interview (Thomas, 2016). I emailed the information I collected during the interview to participants to have them confirm my interpretation of the information collected. Merriam and Tisdell (2016) described that validation from respondents through member checks reduces the risk of misinterpretation of their message.

Data Organization Technique

The researcher is responsible for ensuring that the organization of data from the semistructured interviews and documents enables case study analysis through an appropriate technique such as pattern matching (Yin, 2018). The researcher determines the method of information retrieval, storage security, storage security, creating a raw data database, coding, and identifying themes (Linneberg & Korsgaard, 2019; Yin, 2018). Data security measures ensure the participants' and organization's confidentiality and support ethical research practices (Beskow et al., 2014). During the transcription process, the researcher removes all personal identifiers from the interview transcripts (Adu, 2019).

To organize all the collected data, I used a Microsoft Excel spreadsheet and an electronic filing system. To protect the organization and the individual, I assigned an alphanumeric label to each interview event. I used the same sequence of steps with each file to maintain reliability (Yin, 2018). The electronic filing system headings were Interview Questions, Interview Protocol, Interview Transcript, Consent Form, Email Communications, Emergent Themes, Interpretation Notations, and Member-Checking Notations. I password protected all electronic files, saved the files to an external hard

disk, and placed them in a locked filing cabinet with hard copy documents. I will retain them for 5 years after study completion, after which all data will be destroyed.

Data Analysis

As part of the data analysis, I used methodological triangulation for this research study. To achieve methodological triangulation, I conducted semistructured interviews as the primary data source; accessed publicly available documents, including reports; and gathered data from reflective notes during information-gathering sessions. Methodological triangulation incorporates the gathering and cross-checking of relevant primary, secondary, and other information sources (de Massis & Kotlar, 2014; Marshall & Rossman, 2016; Yin, 2018). The researcher cross-references the different data sources to ascertain the consistency and validity of the primary findings and conclusions (Denzin, 1978; Marshall & Rossman, 2016).

Yin (2018) outlined a five-step method for data analysis to conduct a systematic exploration of the gathered materials: (a) compiling, (b) disassembling, (c) reassembling, (d) interpreting, and (e) concluding. For the first phase in structured data analysis, I compiled the data. The compiling process includes data analysis integrity and the participants' confidentiality (Pletcher et al., 2014). In qualitative research, Yin defined compiling as organizing raw data for analysis.

Organizing raw data begins with creating a data repository for interview notes, reflective journal entries, and transcriptions from the sessions (O'Sullivan, 2015; Pletcher et al., 2014). Miles et al. (2018) recommended that the researcher create a set of propositions derived from the research question or interpretation of data from other

sources, such as the literature, to link the data to the propositions and assist in the final data analysis phase. I created propositions as part of my compiling process. I used an external hard drive and created a digital data repository using Microsoft Excel and developed a schema to show the relationship and links between each type of data. Codd (1990) defined 12 rules to define the meaning of the term relational database. Codd's rules' minimum requirements were data tabulation in columns and rows for operators to view. Using the relational database theory principles enables a researcher to manipulate coded data and allows the researcher maximum view of the data (Codd, 1990).

The second data analysis step, disassembling, refers to separating the information collected and placing it into meaningful groups such as themes and codes (Yin, 2018). I sorted the data sources and organized the data into smaller groupings through labeling and referencing to make the information more manageable. The third step, reassembling, refers to conducting a contextual analysis of the data, comparing the different data, and placing the information into patterns (Yin, 2018). To facilitate the disassembling and reassembling of compiled data, I used NVivo, a computer-assisted data analysis software, to disassemble the data into a logical nodal structure reassemble it into themes.

The final stages of data analysis are interpreting and concluding (Yin, 2018). Identifying themes from the collected data (Harvey, 2015) and linking propositions derived from the research question (Miles et al., 2018) help a researcher interpret the study findings and ensure completeness, accuracy, and credibility (Yin, 2018). To interpret and conclude the data analysis, I correlated the key themes with my literature review, sought and included new studies published since the writing of the proposal, and

referred to the research questions throughout the entire process to ensure I remain aligned with the purpose of the study. In concluding my data analysis, I sought to confirm if my conclusions were substantiated. Generating different reports from the codes and respective case study data helps to determine if the propositions are supported (Miles et al., 2018). In conclusion, I also identified future research needs and opportunities and identified the potential for the study to be used in a broader set of situations.

Reliability and Validity

Qualitative researchers should demonstrate the trustworthiness of the data collection and analysis processes (Henriksen et al., 2015). Qualitative researchers do not rely on statistics to substantiate results (Marshall & Rossman, 2016). Reliability equates to dependability in qualitative research (Barry et al., 2014). Establishing qualitative validity occurs through credibility, transferability, and confirmability (Houghton et al., 2013).

Reliability

A research study's reliability enables repeat studies to obtain the same or similar findings through consistent research practices (Cypress, 2017). Methods of dependability include creating uniformity of all steps in the interview process and maintaining a research log (Fluk, 2015; Lincoln & Guba, 1985). I enhanced dependability by establishing an audit trail. Lincoln and Guba (1985) described the audit trail as a study authentication method by following the researcher's journey on the study topic. To establish the audit trail, I comprehensively logged, in a journal, each aspect of my

research journey, including the data I collected, the categories I developed, the challenges and issues I faced, and my decisions.

Ary et al. (2010) described that improving dependability also occurs through a method called stepwise replication. I incorporated stepwise replication by requesting another researcher's support to analyze my data independently and then compared our results for similarity. Differences in the analysis of the data provided me with the opportunity for further review.

Validity

Confirmability refers to the ability of others to corroborate that findings accurately reflect the participant responses, minimizing the risk of researcher bias (Houghton et al., 2013). Confirmability increases the study's credibility and refers to the establishment of transparency through a clear audit trail of each step of the research path (Houghton et al., 2013). To establish confirmability, I provided an audit trail, highlighting every step of the research and data analysis to provide a rationale for the decisions.

To enhance validity, I asked each participant to member check the information I had gathered from the interview to confirm that my interpretations were accurate. I continued to collect data until no new themes or information emerged. I used methodological triangulation and converged the multiple sources of information to validate the interpretation of information. I conducted a systematic, step-by-step content analysis approach by reviewing the interview transcripts, observation notes, and

documents. The application of a systematic approach during in-depth interviews, content analysis, and member checking enhances research validity (Bengtsson, 2016; Yin, 2018).

Transition and Summary

Section 2 outlined the key elements required to achieve the study purpose of identifying cost-containment strategies that healthcare business leaders use for pharmaceutical inventory by first describing the researcher's role and participants' selection. I then included the rationale for choosing the research method and design and the population and sampling method. I also examined the requirements to ensure robust ethical research, data collection techniques, data organization techniques, and data analysis. To address the rigor, I outlined the methods I used for maintaining reliability and validity throughout the research process.

In Section 3, I present the study findings, including the identified themes, and how they tie to the literature's conceptual framework. I include a detailed discussion on the application of the findings to professional practice. I also express the implications for social change improvement. I list recommendations for actions and further research, and finally, I reflect on my experience and discuss possible personal biases, ideas, and values before closing with a concluding statement.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative single case study was to explore the cost-containment strategies that some hospital business leaders use to reduce the expense of pharmaceutical inventory. The data came from six virtual, semistructured interviews of healthcare business leaders. Other sources of data included a review of internal company documents, publicly available annual reports, and my reflective notes. Through analyzing the data, four themes associated with cost-containment strategies emerged: (a) management controls, (b) specialist engagement and compliance, (c) supplier management, and (d) centralized systems. In this section, I discuss these themes as well as offer my perspectives regarding applications to professional practice, implications for social change, and recommendations for action and further research. I conclude my doctoral study with a reflection on the doctoral study process.

Presentation of the Findings

The overarching research question for this study was the following: What cost-containment strategies do some hospital business leaders use to reduce the expense of pharmaceutical inventory? I conducted six virtual semistructured interviews with each interview lasting between 35 and 45 minutes. I used an interview protocol in each interview and asked the questions in the same order. Throughout each interview, I asked additional clarification questions if necessary. In the data analysis process, I reviewed my reflective notes, publicly available annual reports, and company documents received by

email. Documents included the organizational chart, policies, job descriptions of stakeholders, and the minutes from relevant committee meetings.

I transcribed the interviews and interpreted the audio interview recordings. I used NVivo software to help me to narrow down themes. To authenticate my interpretations of the data from the research participants, I invited the participants to conduct member checking by email or video conference. All six research participants requested that I email my interpretations to them, and no one expressed there was any misinterpretation. Figure 2 shows a word cloud depicting the word frequency of cost-containment strategies to reduce the expense of pharmaceutical inventory used by the six interviewed hospital business leaders.

Figure 2

Word Cloud of Word Frequency From Hospital Business Leaders

Table 2 displays the four key themes I identified from the interviews with the hospital business leaders. In the subsections that follow, I discuss each theme, and I have identified subthemes and relationships from the analysis. I compared the themes to the corresponding literature reviewed in this study. The findings demonstrated that cost-containment requires a system approach and therefore aligned with the conceptual framework on CAS, which Adobor and McMullen (2018) described as a nonlinear dynamic theory as it refers to the continuous evolution and change of systems. The existing literature on CAS supported the study findings.

Table 2

Themes Representing Hospital Business Leaders' Perspectives

Theme	Frequency (%) in interviews	Present in reflective journal?
Management controls	100%	Yes
Specialist engagement and compliance	100%	Yes
Supplier management	100%	Yes
Centralized systems	80%	Yes

Theme 1: Management Controls

The first theme emerging from the research participants' responses was management controls. Management controls in this study refer to policies, processes, contracts, and monitoring systems the leadership of the organization has implemented to support decision-making and oversight of the pharmaceutical inventory system. Each of the participants described specific controls that were essential to cost containment.

HO-08 provided an example of the formulary as a control mechanism. After getting the formulary set up, the organization tried "to get all the specialists and all the users to use that formulary. . . . That helps us to get the bulk purchasing, and then that is how we can negotiate the price" (HO-08). HO-05 confirmed the formulary as a control mechanism and described how it leads to additional benefits, stating,

> We have to first set up and standardize the formulary across our hospitals and clinics. And only after we implement that strategy, can we do the central purchasing, and then we can negotiate with the suppliers better to give us a better price. And then maybe some of the items they can give us on a consignment model so that we don't have the cost of the inventory in our hospital. And then that is a better management system.

The formulary, as a control mechanism, allowed the organization to align users of the system, negotiate with stakeholders, and have oversight of activities to help determine the formulary's efficiency and effectiveness.

Table 3 displays the subthemes that emerged from the data analysis regarding specific management controls that supported the organization in reducing its pharmaceutical expense. The identified subthemes were found to be managed at the operational level but controlled through central oversight. For example, the formulary, although groupwide, was managed at the operational level in each hospital with monitoring and oversight conducted centrally. The medication management committee had groupwide oversight and decided what medications were placed on the formulary for

all hospitals. Participants identified these two subthemes of the formulary and the medication management committee as interdependent systems.

Table 3

Subthemes on Specific Management Controls Hospital Business Leaders Identified

Theme	Frequency (%)
Implementation of the hospital formulary	100
Active medication management committee	100
Inventory monitoring and measuring processes	100
Supplier contracts and evaluations	100

As subthemes, the formulary and medication management committee featured convincingly from all participants. As researchers have identified, the committee oversees the pharmaceutical formulary system, sets standards for best practice, promotes evidence-based prescribing, and reduces the variation in the level of treatment provided to patients (Vázquez-Mourelle et al., 2019). An effective formulary will help inventory controls and, therefore, medication costs (Austin & Halvorson, 2019; Keren et al., 2018).

HO-08 confirmed through their description what was found in the literature:

> And another part of our strategy is we set up the medication management process. For example, in our formulary, we set up three categories. So, for one medication, we allow the multinational, and the "me too" [the same drug of a different brand], and the generic. And so, we set up the three categories so that we have a proper process to use to review the formulary.

HO-08 clarified that if a specialist or end-user wanted to add or delete a medication, they had to pass through a medication management committee.

HO-05 concurred by describing that the organization was recording all pharmaceutical supplies, setting the formulary management for supplies already in the hospital, and closely monitoring consumption. HO-05 explained, “And then the other thing is the formulary restriction. This is purposeful because doctors and physicians are used to using their desired drugs based on their training. So, the restriction process in our hospital stops things getting out of control.” The organization used the formulary to make decisions given the multiple demands from the specialists.

The other subthemes of inventory monitoring and measuring, and supplier contracts and evaluations, were all mentioned. However, the discussion of those themes was not as in depth. HO-05 stated, “Every month we have, as I mentioned earlier, other indicators such as stock turnover and the stock holding percentage.” HO-08 added, “We contract with the suppliers. So, we will use that drug for this year, and we will guarantee to purchase that amount so that we can negotiate the price and the payment and credit terms.” Hospital business leaders saw the need to implement contracts to suppliers that were specifically designed to provide the expected service levels to support their cost-containment strategies.

I also explored relationships between each of the major themes to identify if management controls positively impacted cost-containment strategies for specialist engagement and compliance, supplier management, and centralized systems. In the analysis of the relationship between management controls and specialist engagement and compliance, the findings were that the research participants mentioned, on a total of 22

occasions, eight different types of management controls that positively impacted cost-containment strategies.

One dominant challenge of specialist compliance that all participants voiced was whether the specialist was full-time or visiting. HO-02 explained,

> Visiting specialists come and want to use what they use in other hospitals when they come to our hospital. They want a brand name they usually use. So sometimes they have so many requests. They have to discuss with the operation manager and follow our system. We must educate the visiting specialists.

HO-02 clarified that it would typically take 2 to 3 months for the visiting specialist to understand the system, after which they would follow it.

HU-202 agreed there was an ongoing need for the management to identify and address specialist noncompliance directly: “We have to meet with the specialists that usually prescribe a lot of different brand names and different formularies. So, we have to meet with them one by one, but . . . we are still doing that.” Hospital business leaders stated that they required additional efforts of direct approach, education, communication, and involving specialists, and in particular visiting specialists, as decision-makers to gain compliance with the management controls that were in place.

On analyzing the relationship between management controls and supplier management, the findings were that the research participants mentioned, on a total of 29 occasions, 11 different types of management controls that positively impacted cost-containment strategies. A few of the positive impacts included having robust contracts with suppliers, consolidating the total number of suppliers to achieve lower pricing for

higher purchase volumes, and being able to place expensive items such as chemotherapy medications on consignment so they only paid for them if used.

HO-08 stated about the benefits of supplier contracts: “For example, once we contract them, it’s not only the price we consider. We also contract them to deliver drugs that only have an expiry date that must be at least 1 year.” HO-04 explained, when referring to management controls and suppliers,

> We have a policy that does not allow suppliers to come and meet directly with the specialists. In other hospitals in the country, they allow that, and the supplier representatives come directly to the specialists to promote their product, and then the specialist will ask to have that product.

By not allowing suppliers and representatives to meet directly with specialists, this hospital was able to maintain better control.

HO-02 confirmed the same issue with suppliers trying to approach specialists:

> All the pharmaceutical companies try to promote the drugs to our specialists. So, if they promote directly, that drives our specialists to want to use new drugs. So, we have a system where they cannot promote directly to the specialists, and they have to go through the operations manager and supply chain manager, and this helps our control.

From the viewpoint of HO-02, suppliers were seeking ways to access specialists to influence their medication-prescribing decisions. This practice was viewed by the organization’s leaders as contradictory to their efforts to control the formulary, which is why they implemented a control mechanism to stop this practice.

For the relationship between management controls and centralized systems, the findings were that the research participants mentioned, on a total of 44 occasions, seven different types of management controls that positively impacted cost-containment strategies. The two primary management control factors were the formulary and having an electronic medical record (EMR) system that could provide transparent oversight of inventory stock levels and how and where the stock was moving. Data showed that the hospital business leaders used various management controls and that these had a positive impact in reducing the expense of pharmaceutical inventory. Additionally, management controls were integral and formed a part of each of the other three identified themes that emerged from the data analysis.

Correlation to the Literature

The importance of management controls as a principal theme was not identified in the literature concerning cost-containment strategies; however, all participants indicated that various management controls were necessary. Therefore, I consider the finding of management controls as an extension of the existing knowledge. As Settani et al. (2017) stated, identifying pharmaceutical inventory efficiency strategies using a systemwide lens has received less research attention than the individual operational issues that impact costs.

The research literature did identify those specific types of hospital processes, such as the formulary and the medication management committee, that were essential to ensure a robust medication system. Austin and Halvorson (2019) described that the multiplicity of available medication types, brands, and doses makes it mandatory that a

sound program of medication usage be developed within the hospital to ensure that patients receive the best care and protection possible. The pharmacy and therapeutics committee membership plays an important role in integrating and effectively managing medication selection and procurement while improving patient safety and decreasing costs (Leonard et al., 2018). Therefore, although the literature does not specifically identify these processes as management controls, it is evident from the literature and the data analysis from this study that controls are necessary for both patient safety and cost-containment. Management controls as a key finding of cost-containment strategy for reducing the expense of pharmaceutical inventory would require additional research to verify its significance.

Correlation to the Conceptual Framework

Given that management controls in this study were related to policies, indicators, and standardized processes, the data analysis correlates with the findings of Braithwaite et al. (2017) related to system complexity. Braithwaite et al. (2017) claimed that hospital leaders' historical attempts to control complexity occurred through the development of policies, regulations, performance indicators, and standardized processes. Braithwaite et al. (2017) stated that many control mechanisms fail because leaders assume a linear line between a directive from the leadership and compliance at the grassroots.

Theme 1, management controls, using many of the key tenets of CAS identified by researchers, included systems thinking (Golding, 2018), multiple agent interactions (Cohen & Axelrod, 1984), emergence, feedback loops, and change and adaptation (Rutter et al., 2017). The data analysis revealed that hospital business leaders incorporated

systems thinking to implement their management controls. Golding (2018) defined systems thinking as the analysis of any type of system to determine how to develop a system to run more efficiently by understanding the consequences of the existing and evolving systems. The data from this study demonstrated that leaders of the organization were continuously reviewing and evolving their systems, such as their formulary, by using multiple interactions and communication channels to effect change.

The subthemes specifically identified some of the systems that the organization was relying on and included the formulary, supplier contracts, and evaluation, and their EMR for monitoring purposes. Kuziemsky (2016) outlined that using CAS as the lens helps healthcare leaders to develop system models that incorporate the processes, concepts, and relationships to achieve the desired outcomes. The organization was particularly interested in using management controls to influence their relationships with and behaviors of key stakeholders, such as the specialists and suppliers. Cohen and Axelrod (1984) described how agents make decisions to generate a change to effect improvements and continue to adapt the system changes when they see positive results. Cohen and Axelrod also identified how positive results impact behaviors and become a motivational force for accepting additional system change.

The data supported the importance business leaders placed on using management controls coupled with communication methods to change the behavior of and increase compliance to the policies and systems that the organizational leaders had put in place. Turing and von Neumann (as cited in Jankowski, 2017) identified that systems requiring multiple interactions and components could emit expected behavior. On multiple

occasions, participants stated that over time, specialists did change their practices and become more willing to adapt and converge to use their systems as expected.

Theme 2: Specialist Engagement and Compliance

The second theme that arose from the interview data was specialist engagement and compliance. Specialist engagement in this study refers to the willingness of specialists to be involved in committees, decision-making processes, and positively influence their colleagues to implement the organization's policies. Compliance refers to how effectively the specialists implement the policies of the organization. All the hospital business leaders talked about the challenges they faced and the methods they used to engage and achieve compliance of the specialists and in particular, the visiting specialists, to use the hospital formulary. Management controls, identified as Theme 1, included the formulary system and the data revealed a strong relationship between specialist engagement and formulary compliance.

HU-202 shared leadership challenges, including that "some specialists are forcing the hospital. For example, [they say,] 'If you don't give me what I prescribe, I will not see the patient at your hospital.'" These types of challenges the leadership has faced demonstrate the need for a sound pharmaceutical governance system which many of the leaders described as the hospital formulary.

HO-04 identified the link between the formulary and the specialists, stating, "So firstly, we set the formulary control for pharmacy and also, we have the medication management committee, so it will link with all the specialist requests." HU-202 also stated a link between doctors and the formulary by sharing, "In our hospital, we have few

full-time specialists and most of the specialists are visiting. They are not our full-time doctors, so we are having so much formulary prescribed by them." These comments demonstrate how the formulary control, and the decision-making powers of the medication management committee were viewed as critical factors in managing the specialists' demands.

Most of the research participants also mentioned how much easier it was to communicate with their full-time specialists in comparison to their visiting specialists. The participants mentioned that ongoing communication was necessary when engaging specialists. Participants believed that the full-time specialist model strategically assisted the organization's efforts to contain the formulary structure which ultimately supported pharmaceutical inventory cost-containment.

HO-04 explained,

> In our hospitals, we have a full-time specialist model. In our country, most of the hospitals are run by the visiting specialists. So, this means their specialists are very difficult to control because they don't have a proper institutional spirit because they just go to this clinic and that clinic and then hospitals and it's very difficult to discuss with them. But we have the full-time specialist model in some of our hospitals where we have 90 percent of specialists full-time salary based.

HO-04 went on to describe how the organization proactively sought opportunities to encourage full-time specialists to discuss the hospital policies with the visiting specialists.

On the topic of visiting specialists, HU-102 commented,

> And another thing is that one of the reasons we can implement the system in our flagship hospital is that we have many full-time specialists. . . . We have the department system where we have two full-time clinical consultant specialists under that department, and when the visiting specialists come, they have to conform to the drug policy procedures and protocols that we have.

HU-102 shared that having full-time specialists and their influence over visiting specialists was a positive containment strategy.

Specialist engagement was viewed as a key cost-containment strategy, as demonstrated in Table 4, which shows the total number of times each research participant mentioned specialists in their responses. Table 4 also displays the number of times participant responses referred to a positive or negative contribution to cost-containment strategies of the full-time or visiting (part-time) specialists. The data shows that 39 of the total 99 comments that included specialists (39%) were related to positive or negative aspects, with 20 of them 39 (50%) relating specifically to negative responses about visiting specialists.

Table 4

Hospital Business Leaders on Specialists' Contributions to Cost-Containment Strategies

	Total frequency	Full-time		Visiting	
Participant	Specialist(s) mentioned	Positive	Negative	Positive	Negative
HO-02	13	2	0	1	2
HO-04	29	3	1	0	3
HO-05	11	3	1	0	2
HO-08	20	4	0	0	4
HU-102	12	3	0	0	3
HU-202	14	1	0	0	6
Total	99	16	2	1	20

HO-08 described the visiting specialist issues as follows:

> So, some of the barriers I can categorize as internal barriers. Like our stakeholders such as the specialist compliance with the formulary drugs. So especially from a visiting specialist, they would like to use what they want to use. So that's the compliance of the visiting specialists that we have to manage. To get them to use within the formulary we have to communicate, we have to always engage with them, and also, we have to explain the medication management process and the process for adding the additional drugs. So that is the difficulty sometimes we have in managing the specialists, especially visiting specialists.

The additional efforts employed by the hospital team to engage visiting specialists was apparent through each participant interview. However, these communications were viewed as essential to the success of the pharmaceutical cost-containment strategy.

Correlation to the Literature

Theme 2, which consists of specialist engagement and compliance aligns with the findings of Chandler (2018) whereby stakeholders' engagement and behaviors determine the success of change and system evolution. The data on engagement and compliance confirms the findings of peer-reviewed studies from the literature review. The available literature identified possible causes of increasing pharmaceutical costs, as physician demands (Saha & Ray, 2019), and lack of formulary controls (Karel et al., 2017).

As Austin and Halvorson (2019) described, organizational leaders need to ensure that the pharmacy's and therapeutics committee's expertise do not rely purely on personal agendas or experiences. Formulary restrictions are strategies healthcare business leaders use to optimize pharmaceutical inventory (Verghese et al., 2019). Participants of this study felt that it was worth their efforts to spend the necessary time and use different methods to engage the specialists and achieve compliance. They stated that their efforts did result in successful outcomes however continuing to increase their number of full-time specialists remained a key strategy to improving the success of their cost-containment strategies.

Correlation to the Conceptual Framework

Theme 2, comprising specialist engagement and compliance, ties in with the findings of CAS. Complex systems evolve due to the aggregated behavior of different agents who work on adapting the system by anticipating the rules required to maintain the system (Chandler, 2018). The medication formulary in a hospital is an intricate system to navigate because of the multiple stakeholders' demands from organizational leaders who

need to monitor the inventory budget, doctors and specialists who expect all types and doses of medications to be available for patient needs, and pharmacists who are responsible for the purchasing, storage, and dispensing of medications (Karel et al., 2017). The research participants understood the interconnectedness between gaining specialist engagement and achieving their compliance to the formulary and other policies to meet the pharmaceutical targets set by the leadership. They also understood the positive influence that their full-time specialists could have on their visiting specialists. This is why they continued to spend time and effort on different methods of engagement.

Theme 3: Supplier Management

The third theme that the data revealed was supplier management. Supplier management in this study refers to how the organizational leaders handle supplier relationships, negotiation, pricing, evaluation, and contracts. The research participants described how supplier management was an important cost control mechanism that also helped them to ensure the quality of the products and services they were expecting from the suppliers. The participants expressed that there were multiple facets to supplier management. As HO-08 described,

> We have been in the healthcare industry for more than 15 years. So, we have a strong long-term relationship with the big suppliers. . . . This will affect not only the cost-containment but also the supply chain quality and also the product, the pharmaceutical quality that we can rely on from that supplier relationship. And so [a good supplier relationship is] very important.

HO-08 believed that having strong supplier relationships reaped significant benefits.

HO-05 added,

> For the supplier evaluation procurement side, we do it every year, and it includes the company history, quality of their product for that period, have they provided their product consistently, is the service good, and regarding their price, have they provided better pricing. Another thing is that we want the supplier to deliver as expected and in a timely manner.

HO-05 expected that if a supplier agreed to include all necessary components in their agreement, then the organization would be assured of a positive relationship and achieve the expected outcomes.

I explored the relationship between Theme 1, management controls, and Theme 3, supplier management. Table 5 displays the management controls that research participants discussed specific to supplier management. The data show that the hospital leadership used multiple management controls as part of their overall supplier management system.

Table 5

Relationship Between Management Controls and Supplier Management: Type of Control and Number of Participants Discussing the Control

Type of control	Frequency (*n*)
Supplier contracts and monitoring	6
Stock return/expiry policy	6
Annual supplier evaluation	6
Policy on restricted access to specialists	5
EMR system for stock transparency	4
Central purchasing system	4

Table 6 outlines the subthemes of supplier management. One key finding was that all research participants identified that there were external forces that they viewed as barriers impacting their implementation of cost-containment of pharmaceutical inventory. The external forces were identified mainly as the government regulations and systems on manufacturing and importation. Additionally, four of the six participants mentioned how the current political upheaval and COVID-19 pandemic increased some of the challenges faced by the organization.

Table 6

Subtheme Frequency on Supplier Management

Themes	Frequency (%)
Government and external forces	100
Supplier volume and price negotiation	80
Supplier consolidation	67

Although participants stated the external government regulations and systems were largely out of their control, they also voiced the need to understand them to help them manage the suppliers and their operational stock levels. Therefore, understanding the external environment and implementing solutions to counter negative impacts was a primary strategy for the organization. HO-08 spoke of how supplier consolidation to identify and work closely with the top 10 suppliers helped them to negotiate prices and reduce their total number of formulary drugs. HU-202 mentioned how through their management controls which included supplier contracts and consolidation efforts they had been able to reduce their formulary by approximately 20% over 6 months.

HO-04 summarized several barriers that the leadership needed to be aware of for the organizational leaders to understand the impact of the external environment. They included less product variety in the market, lack of manufacturing availability in the country, restrictive rules and regulatory issues that sometimes lead to a single supplier for a given type of inventory, and logistical issues in getting approval from the Food and Drug Administration. HO-04 mentioned that, in some cases, there was a market monopoly that reduced the variety of available products which resulted in additional flow-on impacts to their access to the necessary supplies.

HU-102 spoke of actions the organization used to mitigate the risks:

> And then the most recent barrier that we have is the supply chain risk of supply chain cut-offs due to the recent political situation and border closure and all that. So, some of the items are COVID-related items. We purchase in bulk to get what we assume we need, as we have a high capacity for COVID patients. So, we try to project our needs and try to purchase as much as we can of the stock we need.

As HU-102 mentioned, making purchase decisions based on the country's situation was often difficult.

HO-02 described how the external forces have flow-on impacts:

> Issues include the turnaround time of the FDA [Food and Drug Administration] because of the current politics and poor stability and also the COVID situation. . . . Suppliers cannot control their stock because of these issues. . . . But we have been lucky as it does not affect us too much.

HO-02 commented on how, given the external environment, it was difficult for suppliers to fully honour their contracts, which caused flow-on problems to the organization.

The external challenges faced by suppliers resulted in downstream impacts to the organization. The business leaders were aware of and sympathetic to the issues faced by the suppliers. Rather than blame the suppliers for the impacts felt by the organization, the leaders opted to understand the problems and work collaboratively with the suppliers to find the best solutions.

Correlation to the Literature

The research participants provided data that mirrored the findings of Kritchanchai et al. (2018), who researched 18 hospitals across Asia, including Myanmar, to identify areas of improved efficiency and cost reduction of the healthcare supply chain. The study results showed that 27% of those interviewed stated that inventory availability, visibility, and accuracy were vital to creating an efficient supply chain system by reducing logistics and storage costs (Kritchanchai et al., 2018, p. 60). Additionally, Kritchanchai et al.'s study revealed that 27% of those interviewed agreed that information technology's capability to order and accurately track supplies substantially improved supply chain performance.

The organization found that specific management controls and other processes were necessary to achieve effective supplier management. Specific tools, which could be considered as management controls, were outlined in the literature. The research found that freeing up inventory costs increased an organization's ability to use the funds for other uses and that hospitals that increased their inventory turn by one freed up 4% of

their total inventory costs (Clubb et al., 2018, p. 410). The organization's leaders mentioned inventory turnover as one of their management controls.

As HU-102 described, "On pharmaceutical in terms of inventory at a high level, we looked at the inventory turnover. So, our CEO gave us the target of the stock turnover to be 15 days. Ideally, 10 days, three times per month." Other modeling tools and techniques to manage stochastic demands include probability simulations, storage capacity, consideration of historical data, perishability of the specific supply, patient demographics, and supply lead times (Maestre et al., 2018; Saha & Ray, 2019). In this study, the monitoring measures mentioned by the organizational leaders to manage their pharmaceutical inventory included reorder levels, slow-moving items, near-expired items, and supply lead times.

Another example of where the study data correlated with the literature was how information systems support inventory efficiency. Many healthcare leaders have turned to software to increase inventory efficiency levels by automating the reordering system and minimizing stock levels (Clubb et al., 2018). Software programs help leaders analyze high-cost medications and determine what stock levels are required to increase their turns and contain costs by decreasing the inventory cost on hand (Clubb et al., 2018). The participants identified their EMR as one of their supplier management controls that supports them to improve efficiency.

A highlighted subtheme of the supplier management was the external environmental pressures that participants described as a significant barrier to achieving pharmaceutical inventory cost containment, which is in alignment with the literature.

Specific to Myanmar, the World Bank (2019) has identified healthcare infrastructure and governance challenges, including the lack of pharmaceutical waste management from expired and unfinished drug solutions representing a chemical risk to the community and the environment. According to Latt et al. (2016), the Myanmar government's attempts at regulating pharmaceuticals require further work as there is a lack of pricing regulation, resulting in significant price variation along the supply chain. Expiry of medications is an identified issue in Myanmar, with poor distribution, long delays, and incorrect storage conditions contributing to the problem (Verghese et al., 2019). The participants corroborated the impact of the pharmaceutical supply challenges and had built-in controls such as expiry limits into their contracts to minimize the risk to the organization.

All participants mentioned the challenges they faced in achieving const-containment given the government regulations. The literature identified that risks to supply chain costs and performance include stakeholders' behaviors, government regulation, political changes, and environmental uncertainty (Brusset & Teller, 2017). Medication expiry, the perishability rate of medications, and the potential scarcity of access negatively affect inventory costs and present some pharmaceutical inventory management challenges (Bray et al., 2019; Weraikat et al., 2019). The participants went on to describe some of the management controls and processes they had put in place to reduce the environmental uncertainty, and this also correlates with the literature. Mitigation of risks through clarity of processes and agreements form part of the supply chain integration strategy (Jajja et al., 2018). Reduction in uncertainty occurs by

understanding the primary drivers of supply, demand, controls, and processes (Bohme et al., 2016).

Supplier management as an identified theme extends the knowledge of the available literature as currently, the literature does not extensively cover the multiple components that form a complete supplier management cost-containment strategy. The supplier management finding purports that multiple specific processes were necessary to achieve cost-containment and reduce the expense of pharmaceutical inventory.

Correlation to the Conceptual Framework

Supplier management links with the conceptual framework in that according to Brainard and Hunter (2016), in complex systems such as healthcare, there should be consideration given to the many human elements involved, including the healthcare staff, the insurers, the patients, and even suppliers. According to de Toni and Comello (2013), inventory systems are CAS characterized by numerous elements and nonlinear connections, influencing agents to continuously seek optimization strategies; it stands to reason that this premise would apply to hospital inventory. From the data in this study, it was evident that the suppliers played a major role in the organization's cost-containment strategies. As noted in Chapter 2, Tan et al. (2005) outlined that complex systems, including humans and organizations such as healthcare systems, share certain characteristics: (a) they can exchange properties with the environment, (b) they have many interrelated parts that work together, (c) they can organize themselves, (d) they show collaborative complexity, and (e) they are unpredictable. The multiple supplier management initiatives described by the participants align with these characteristics.

Theme 4: Centralized Systems

The fourth theme emerging from the research participants' responses was centralized systems. Centralized systems in this study refer to systems and processes that supported a groupwide approach to cost-containment strategies. The organization consisted of three hospitals and three clinics. The research participants mentioned that their centralized systems included the oversight of the head office team through regular reporting mechanisms and expectations of targets. HO-08 responded,

> And also, there is a report to the leadership. Leadership oversight which is important. . . . For example, we expect inventory hold is a maximum of 21 days. So, we expect compliance to that. And also, we set up that minimum level and they have to follow all of these processes properly.

The participants accepted the importance of leadership through centralized oversight and monitoring of targets and benchmarks as a supporting system.

Other centrally driven systems included the formulary, the medication management committee, centralized categorization of the medications, and the groupwide electronic medical system which provided a transparent view of the inventory levels in each hospital. Many of the participant responses linked to, and therefore demonstrated, a strong relationship with, management controls. Table 7 displays the relationships with management controls and the number of participants mentioning controls in relation to centralization.

Table 7

Relationship Between Management Controls and Centralized Systems: Type of Control and Number of Participants Discussing the Centralized Systems

Type of control	Frequency (*n*)
Groupwide formulary system	5
EMR system for stock transparency	5
Centrally managed medication management committee	5
Head Office oversight of targets and benchmarks	5
Centrally managed supplier consolidation and contracts	4

Once again, the formulary featured as the main topic with five of the six participants linking the formulary as a central process that supported their strategies. Additionally, the EMR system enabled not only oversight of actual inventory but the management of that inventory. Table 8 shows the participants that mentioned the EMR concerning a specific strategy. As HO-08 explained, "Another thing is we use the EMR system. So, inventory management can be seen in real-time and keep control in our system so that we can manage. So that is a great opportunity to manage our pharmaceutical inventory." Leaders viewed the EMR as beneficial to the operational management of their pharmaceutical inventory.

Table 8

Specific Cost-Containment Strategies Supported by EMR Transparency

Type of strategy	Frequency (*n*)
Management of near-expired drugs	6
Movement of stock for slow-moving items	6
Monitoring the total number of formulary medications	5
Monitoring the total number of nonformulary medications	4
Oversight of stock levels	3

HO-04 explained the control mechanisms of the central EMR system:

> At a high level, we have an EMR electronic medical record system, and it starts from the patient journey. So, it is including inventory. Start from the inventory, indents, transfer between their departments, everything we control in the system. . . . And we can see all units, so if there is slow-moving items in one hospital, we see if it is possible to use them in the other hospitals.

HO-04 added that being able to see stock levels in the EMR enabled them to decide whether stock transfer between departments was necessary and helped them to monitor the inventory and manage their costs.

HO-02 confirmed how the organization used the central system:

> We have three hospitals and also three clinics. So, we are now ordering supplies using a centralized system and distributing them to the hospitals and clinics. If any of the hospitals or clinics need certain supplies, they can be moved between hospitals and clinics. We can see what items are in our system.

HO-02 viewed the transparency of stock distribution between hospitals as an effective system to determine the movement of stock between hospitals and clinics. positive system. Table 9 shows the benefits of centralized systems in relation to cost containment that research participants mentioned.

Table 9

Type of Benefits From a Central System and Number of Participants Referring to Each Benefit

Type of benefit	Frequency (*n*)
Price negotiation	5
Availability of required stock	4
Moving stock between hospitals and clinics	4
Inventory on consignment	4
Supplier compliance to contracts	3

All participants provided comments on more than one central initiative that the organization implemented as part of their central strategy. HO-02 explained, “We also have central distribution and can see all stock through the EMR so if a certain hospital has too much stock . . . we can send the medication to another hospital or clinic.” HO-05 mentioned other initiatives: “And then we have the material costs and calculate the stock holdings. . . . And another thing is we check the slow-moving—and if it is a consignment product, we can easily return it to the supplier.” HU-202 also weighed in on this topic: “The central purchasing process is to reduce the stockholding amount. . . . If we purchase locally, sometimes we have difficulty getting the stock and the price is much higher . . . so we compare with the head office pricing.” The participants agreed that there were

multiple benefits of the defined centralized management processes to drive the overall pharmaceutical cost-containment strategy.

Correlation to the Literature

The literature review did not identify whether centralized systems benefit hospitals or hospital groups as it was not an area that the researcher explored during the literature review process. As this study was conducted within a hospital group and given that the data revealed that centralized systems supported cost-containment strategies, additional review is required to verify the findings. Researchers have found that healthcare systems are often known for their operational silo approach, with limited integration and communication between departments that reduce the multidisciplinary treatment approach to the detriment of patient care (Cordina, 2019). Therefore, having centralized processes within a single hospital, let alone a hospital group, would bring benefits. As Holm et al. (2015) described, the basic starting point of hospital inventory data management is to install system improvement measures through standardization of clinical systems and data sharing among healthcare organizations.

The research participants provided data that indicated which specific centralized processes were beneficial and how they were beneficial. The literature review did include and align with some of these specific central processes such as the formulary, the EMR, the committees, and leadership oversight reporting. For example, the literature review revealed how EMR systems, which the research participants described, benefit an organization. Clubb et al. (2018) found that many healthcare leaders have turned to software to increase inventory efficiency levels by automating the reordering system and

minimizing stock levels. Software programs help leaders analyze high-cost medications and determine what stock levels are required to increase their turns and contain costs by decreasing the inventory cost on hand (Clubb et al., 2018). Information systems enable healthcare leaders to benchmark with counterparts, develop different specifications at different levels of the supply chain, and instill trust in the information the system provides (Dash et al., 2019). The literature correlates with the data from the business leaders in confirming the importance of their EMR system in supporting their efforts to reduce the expense of pharmaceutical inventory.

Correlation to the Conceptual Framework

Centralized systems correlate with CAS in that each central process identified by the research participants was integral to the entire pharmaceutical inventory management system. For example, the EMR system was necessary to provide transparency to the inventory stock hold which was dependent on the approved formulary, and which was overseen by the medication management committee. Bucknall and Hitch (2018) described how complex healthcare systems are interconnected and influence more than one department. If leaders of change do not recognize interrelationships, the result may be chaos and adverse outcomes (Bucknall & Hitch, 2018). The research participants mentioned on multiple occasions how they were constantly reviewing and monitoring the different processes.

S. Khan et al. (2018) used CAS to describe that system interconnections result in interdependencies throughout the system with a disruption in one area, potentially causing implications in other areas of the system. S. Khan et al. agreed that because of

the interdependencies in the system, the system's level of adaptability was important if the hospital business leaders expected a hospital to transform and achieve the expected levels of efficiency and effectiveness. The study by S. Khan et al. focused on how actors in the healthcare systems needed to understand complexity thinking to guide system change through proactive management in the dynamic healthcare environment. The data provided by the participants shows that each of the centralized processes was essential for cost-containment to reduce the expense of pharmaceutical inventory, and the CAS literature verified the tenet of the interconnectedness of the centralized processes.

Applications to Professional Practice

There are multiple strategies that healthcare business leaders use to optimize pharmaceutical inventory (Verghese et al., 2019). This study may be beneficial to other private hospital business leaders who seek to develop cost-containment strategies to reduce the expense of pharmaceutical inventory. Nguyen and Phan (2020) noted that business leaders may form plans based on their learnings from the successful strategies and discoveries of other leaders.

Healthcare is a multifaceted, complex system constantly challenging leaders to seek system and process efficiencies (Braithwaite et al., 2017). The themes that emerged in this study came from semistructured interviews and secondary data. The themes may assist private hospital business leaders with obtaining a better knowledge of what it would take to enhance their existing strategies and complex systems. Theme 1, management controls, was significant to all the business leaders. All six participants

recognized the importance of utilizing multiple control factors to build and maintain an effective and efficient system.

Theme 2, specialist engagement and compliance, indicated the importance of understanding what strategies will successfully engage the specialists, and how essential it is to cultivate specialist relationships. For Theme 3, supplier management, the participants were emphatic that effective supplier management was pivotal in achieving the required supplies and being able to negotiate the cost and other processes and benefits to offset rising expenses. It was evident that in an uncertain environment, understanding the challenges faced by the suppliers themselves was an important part of developing the right strategies. Theme 4, centralized systems, demonstrated that having a groupwide leadership oversight strategy, supported each of the operational units to achieve their targets.

During the research of implementing successful cost-containment strategies, I found that management controls were the primary strategy that the leaders relied on to ensure stability, oversight, review, evaluation, and achievement of their targets. The management controls were also integrated within the processes of each of the other three themes and confirmed the significance of control factors in reducing the expense of pharmaceutical inventory. Using my study as a guide, private hospital business leaders could complete an assessment of their organization and glean deep insight into determining which major management control elements may have the most positive impact on their cost-containment strategies.

The findings in this study have the capacity to positively impact business practice in two ways. The first way that the study could impact business practice is for hospital leaders to use the themes to develop a framework. When combining the themes into a framework, business leaders could link the framework with their current practices, determine current levels of effectiveness, and identify gaps that need further development or change. The second way that the study could positively impact business practice is to provide business leaders with an understanding of the significance of the relationships between each theme and how each theme forms part of an integral, complex, adaptive system. Understanding the interrelationships between the themes may result in the transformation or enhancement of existing strategies, improve cost-containment efforts, and achieve a greater reduction in the expense of pharmaceutical inventory.

The findings of this study expand on and contribute to the existing literature on successful cost-containment strategies in a healthcare system because theme 1, management controls, has not been identified previously. Additionally, as there is no available study specific to reducing the expense of pharmaceutical inventory in a healthcare environment, this study provides new information. This research may be significant to the private hospital business leaders who have not defined best-fit strategies and need contemporary research findings to implement cost-containment strategies to reduce the expense of pharmaceutical inventory.

Implications for Social Change

Financial toxicity refers to the stress impact that patients may suffer when they have protracted medical conditions and cannot easily manage the out-of-pocket expenses

of treatment (de Souza et al., 2017). The expense of costly medical and pharmaceutical technologies as well as our aging population are strong contributors to financial toxicity (Liang & Huh, 2018). Healthcare leaders are under pressure to develop strategies to reduce the cost of patient healthcare while ensuring high-quality treatment (Moons et al., 2019). McGrail (2017) identified possible healthcare expenditure drivers as increasing patient complexity, healthcare reforms, innovations in technology, and the rising cost of pharmaceuticals. Healthcare business leaders who implement cost-containment strategies for their pharmaceutical inventory may provide medications at an affordable cost and achieve increased positive health outcomes.

The findings positively influence social change by providing strategies that hospital business leaders could use to successfully reduce the expense of pharmaceutical inventory and pass these savings onto the patients. The implications for positive social change include residents who trust that their local healthcare service provides affordable medications may be more likely to purchase the medications that they require to remain healthy. Residents who consume the needed medications may have better health outcomes and could remain productive in their society as students, parents, and workers. With the increased aging population, a healthier elderly population may contribute to positive social change as experienced and knowledgeable members who are in the workforce longer may have more opportunities to pass their skills onto the younger generation within their community.

Recommendations for Action

The purpose of this qualitative case study was to identify successful cost-containment strategies to reduce the expense of pharmaceutical inventory. The key themes from this study were fourfold: (a) management controls, (b) specialist engagement and compliance, (c) supplier management, and (d) centralized systems. The themes afford hospital business leaders with a foundation on which to create a framework focused on strategies to reduce the expense of pharmaceutical inventory. The framework may help hospital business leaders to categorize their existing system combinations and corresponding interrelationships within the framework. The framework may also assist hospital business leaders in detecting potential strategies not yet defined and which may be valuable to include. These actions would present the organizational leaders with a comprehensive structured method to determine the changes required to significantly improve their systems and monitor the results.

Individual private and public hospitals, and healthcare groups, should pay attention to the results of this study because of the prospective advantages. The study results may intensify the discussion amongst healthcare leaders and raise the awareness of the need to comprehend the system complexities that are limiting or enhancing their efforts to implement cost-containment strategies specific to pharmaceutical inventory. The increased understanding and application of the strategies proceeding from the results of this study will fuel the need to focus on this topic to support business efficiency. I will distribute the study findings electronically to healthcare groups, present at international

conferences, and have discussions with business leaders through my work efforts in my organization.

Recommendations for Further Research

The subject matter of exploring cost-containment strategies to reduce the expense of pharmaceutical inventory merits further research given the lack of studies that focus on this topic. Recommendations for further research include limitations to this study that may provide transparency for future research. The limitations identified in Section 1 of this study can be improved upon by (a) replicating the study in nonhealthcare industries that supply pharmaceuticals, (b) ensuring that all aspects of the pharmaceutical inventory system are studied, and (c) application of this study to other healthcare organizations in geographical areas outside of Myanmar.

Other research possibilities illuminated while conducting the study include applying a mixed-methods approach to quantify the results of the strategies described in the study. Data from mixed-method studies might consist of measurements of the significance of the relationships between the themes and the impact of the subthemes to quantify their value within each theme. Additional research could also identify additional subthemes not captured in this study.

One of the themes uncovered in this study may be used to further scholarly conversation and recommendations for future research. The theme of centralized systems indicated that healthcare groups experienced advantages that may not be afforded to individual hospitals. The discovery of this theme revealed the need to conduct a further literature review and corresponding research on the centralized strategies hospital groups

use and whether there is a way to apply these strategies to hospitals that are not part of a group.

Reflections

My objective for conducting this study was to explore a business problem in which to create positive change within healthcare organizations. Although I have many years of healthcare experience, I did not have any background in pharmaceutical inventory management, which made this study topic both exciting and challenging. I also wanted to build my competency as a researcher. At the beginning of this journey, I planned to study the more extensive topic of medical supply inventory and realized after multiple reiterations of my prospectus that to gain a deeper understanding, I would need to reduce the scope of my research. Narrowing down my research topic helped me to identify the focal points when conducting the literature review. I am now able to converse with business leaders in my organization on the challenges they face related to supply chain management as a whole, even though my study topic was more specific.

Engaging research participants through a semistructured interview process and using an interview protocol enabled me to objectively, and in an unbiased manner, explore the cost-containment strategies private hospital business leaders used to reduce the expense of pharmaceutical inventory. All participants of this study recognized that the pharmaceutical inventory system was complex and evolving. The CAS framework was therefore well suited for this study. The data I gathered and analyzed was in alignment with the literature review.

The doctoral program has transformed the way that I write formal communication. I now review all formal correspondence and reporting in a much more academic manner to ensure clarity and professionalism. I also have a much higher appreciation for ensuring the validity of research as, in healthcare, we base many decisions on evidence-based best practice. Therefore, my learnings through this program have helped me to be much more thorough in my review of any research with which I am presented. I continue to pass these learnings onto my work team.

This study has changed the way I view systems in the healthcare environment. I now use the tenets of CAS in my everyday conversation and operational decision-making. I believe that I am now a true system-thinker. My experience throughout this journey has helped me to reflect on how, through persistence and patience, I can succeed.

Conclusion

The successful implementation of cost-containment strategies to reduce the expense of pharmaceutical inventory requires strategic healthcare business leaders who recognize the complexity of pharmaceutical inventory and that it is an expenditure driver. Given that inventory allocation requires up to 50% of a hospital's capital investment (Basri et al., 2018, p. 262), healthcare business leaders are under pressure to seek ways to improve the safety and efficiency of their complex inventory system (Haq & Muselemu, 2018). The lack of available research on reducing the expense of pharmaceutical inventory in hospitals demonstrated the need for this research.

CAS was well suited for the study as the tenets were illustrated in the themes and interrelationships of the themes. The pharmaceutical inventory system involves multiple

departments and has varying influencing factors which Saha and Ray (2019) purported increased a system's complexity. When there are interrelationships between systems, as found in the themes of this study, there could be contradictory strategies occurring between different departments which Trojanowska et al. (2017) found impacted system efficiency.

The findings from this study show that hospital business leaders are using multiple strategies to reduce the expense of pharmaceutical inventory; however, none had thought of forming these strategies into a structured program for review, evaluation, and oversight. Therefore, the study findings are important given that the themes could help hospital business leaders to develop a framework that mitigates the risk of conflicting strategies, increases system efficiency, and improves business profitability.

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Appendix A: Interview Protocol

Research: A study on cost-containment strategies used by hospital business leaders to reduce the expense of pharmaceutical inventory

Date:

Time:

Location:

Interviewer: Julie McCaughan

Interviewee:

Consent Form Returned?

Notes to the Interviewee

Thank the interviewee for participation and state the value of their input into the research.

Reassure the interviewee that confidentiality of responses is guaranteed.

The approximate length of the interview is 45 minutes.

The total number of major questions is seven.

Before starting the interview, recap the purpose of the research.

Does the interviewee have any questions before commencing the interview?

Inform the interviewee when the recording of the interview will commence.

Ask interview questions. Take notes.

At the End of the Interview

Thank the interviewee for the time and information.

Reassure of confidentiality.

Confirm the process of interviewee review of the researcher's data interpretation from the interview as part of member checking.

Interview Questions

1. What cost-containment strategies did you use to reduce the expense of pharmaceutical inventory?
2. How did you measure the effectiveness of your cost-containment strategies to reduce the expense of pharmaceutical inventory?
3. What were the key barriers to implementing your cost-containment strategies to reduce the expense of pharmaceutical inventory?
4. What were the key factors that positively influenced your cost-containment strategies to reduce the expense of pharmaceutical inventory?
5. How did you address the key challenges to implementing your strategies for each of the cost-containment strategies?
6. How do you monitor your pharmaceutical inventory to determine if the cost-containment strategies to reduce inventory expense are successful?
7. What other information can you share relating to the successful cost-containment strategies of your healthcare organization's pharmaceutical inventory system?

Appendix B: CEO Introductory Letter

[Date]

[Name]

[Address]

Dear [Name],

My name is Julie McCaughan. I am currently enrolled in a Doctor of Business Administration at Walden University, Minnesota, USA, and am in the process of writing my doctorate study. The study is titled "Cost-Containment Strategies Used by Hospital Business Leaders for Pharmaceutical Inventory."

To meet the aims of this research, I request permission for access to relevant hospital documents, such as the organizational structure and policies, and to interview leaders from within the management teams of two of your hospitals and your corporate office. The eligibility criteria for participants are hospital business leaders with decision-making authority and responsible for pharmaceutical inventory management. I would identify the appropriate leaders by conducting process mapping of your inventory management decision-making processes followed by purposive sampling of potential candidates. With your permission, the participants identified would be invited to participate in the study by email and provided with a consent form. Participants agreeing to be involved in the study would be invited for an audio Zoom interview. Each interview would take no longer than 45 minutes.

Your approval to conduct this study would be greatly appreciated. I have also attached a sample letter of cooperation, which I would request you to complete and return

to me if you agree to support my study. I would be happy to answer any questions or concerns that you may have. My contact email address is [email address].

Sincerely,

Julie McCaughan (DBA, candidate)

Appendix C: Letter of Cooperation

[Date]

[Name]

[Address]

Dear Julie McCaughan,

Based on my review of your research proposal, I give permission for you to conduct the study entitled Cost-Containment Strategies used by Hospital Business Leaders for Pharmaceutical Inventory within [Name] Hospitals.
As part of this study, I authorize you to:

a. Request information from me or my delegated team members that enables you to determine eligible interview participants for your study.
b. Recruit interview participants from a list of eligible candidates following final approval by myself.
c. Seek consent via email from the list of eligible candidates. We understand that the individuals' participation will be voluntary and at their own discretion.
d. Arrange dates and times with each consenting candidate for interview during their work hours.
e. Conduct the interview either face-to-face in an appropriate area of each participant's workplace, or via Zoom audio conference call. If conducted in the workplace, the area to be used for the interview will be determined by each participant.
f. Request access to and review of information about the organization that is available publicly.
g. Request review of organization policies that are relevant to the study. Access to any specific policy will only be granted following approval by myself.
h. Once the interviews and additional data collection of information are completed, you may retain contact via email with myself, my delegated team members, and the participants via email for clarification and member checking of the interview.
i. Contact me further if you require additional participants for your study once you determine if you have achieved data saturation.
j. Disseminate to myself a summary report of activities conducted if you are on or off-site.
k. Disseminate to myself a copy of your final study once approved by your university.

We understand that our organization's responsibilities include:

a. Providing documentation as outlined above and providing time for our employees to attend the interview directly or via Zoom. If required by the researcher, we will provide a suitable area to review documents and/or conduct interviews and have

support from our team members for the researcher to conduct field visits to areas within the organization. We reserve the right to withdraw from the study at any time if our circumstances change.

I understand that the student will not be naming our organization in the doctoral project report that is published in ProQuest.

I confirm that I am authorized to approve research in this setting and that this plan complies with the organization's policies.

I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

Sincerely,
[Authorization Official]
[Contact Information]

Appendix D: Signed Letter of Cooperation

[redacted]

23 September 2021

Dr. [redacted]
Chief Executive Officer
[redacted]
[redacted]
Yangon
Myanmar

Dear Ms Julie McCaughan,

Based on my review of your research proposal, I give permission for you to conduct the study entitled Cost-containment strategies used by Hospital Business Leaders for Pharmaceutical Inventory within [redacted] Hospitals.

As part of this study, I authorize you to:

a. Request information from me or my delegated team members that enables you to determine eligible interview participants for your study.
b. Recruit interview participants from a list of eligible candidates following final approval by myself.
c. Seek consent via email from the list of eligible candidates. We understand that the individuals' participation will be voluntary and at their own discretion.
d. Arrange dates and times with each consenting candidate for interview during their work hours.
e. Conduct the interview either face-to-face in an appropriate area of each participant's workplace, or via Zoom video-conference call. If conducted in the workplace, the area to be used for the interview will be determined by each participant.
f. Request access to and review of information about the organization that is available publicly.
g. Request review of organization policies that are relevant to the study. Access to any specific policy will only be granted following approval by myself.
h. Once the interviews and additional data collection of information is completed, you may retain contact via email with myself, my delegated team members, and the participants via email for clarification and member checking of the interview.
i. Contact me further if you require additional participants for your study once you determine if you have achieved data saturation.
j. Disseminate to myself a summary report of activities conducted if you are on or off site.
k. Disseminate to myself a copy of your final study once approved by your University.

We understand that our organization's responsibilities include:

a. Providing documentation as outlined above and providing time for our employees to attend the interview directly or via Zoom. If required by the researcher, we will provide a suitable area to review documents and/or conduct interviews and have support from our team members for the researcher to conduct field visits to areas within the organization. We reserve the right to withdraw from the study at any time if our circumstances change.

CARE WITH COMPASSION FOR THE NATION

[redacted]

[redacted]

I understand that the student will not be naming our organization in the doctoral project report that is published in Proquest.

I confirm that I am authorized to approve research in this setting and that this plan complies with the organization's policies.

I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

Sincerely,

[redacted]

[redacted]

cc: [redacted]

Appendix E: Invitation Email to Potential Study Participants

Subject of Email: Invitation to take part in a research study

You are invited to take part in a research study about the successful cost-containment strategies implemented in your organization related to pharmaceutical inventory. The participants that fit the inclusion criteria for this study are hospital business leaders with decision-making authority for the supply chain and pharmaceutical inventory system in your organization. Your organization's CEO has provided permission for the researcher to contact business leaders that fit the participant criteria and invite them to volunteer for this study. No one, not even the CEO, is aware of who the researcher contacts. You are free to decide if you wish to accept or decline this invitation. Your decision to volunteer or decline to volunteer will remain confidential. No one in your organization will be informed of your decision.

If you are interested to participate in this study, please read the attached consent form and respond according to the instructions in the consent form. If you do not wish to participate in this study, you do not need to do anything. If you have not responded within ten working days of receiving this email, the researcher will assume that you do not wish to volunteer for the study.

Thank you for taking the time to read and consider this invitation.

Julie McCaughan

Researcher

Walden University