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Healthcare Supply Chain Efficacy as a Mechanism to Contain Pandemic Flare-Ups: A South Africa Case Study

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ABSTRACT

The resilience and reliability of healthcare supply chain models were put to the test by the Corona Virus Disease 2019 (COVID-19). This study investigated the application of supply chain systems in South African healthcare institutions during the COVID-19 pandemic. A systematic literature review (SLR) was employed to explore the performance of existing supply chain systems, followed by a case study that tested and compared the acquisition and distribution of COVID-19 resources. The SLR revealed that most of the flare-ups were exacerbated by the acquisition of insufficient resources and speculative shortages as the supply chain systems got overwhelmed by the unprecedented demand. The simulation of the real-world data of South Africa revealed gaps in the distribution of resources, allocation of medical staff to administer COVID-19 vaccines, and shortages of vaccines. The study recommends development of effective contextual (SA) healthcare supply chain systems to support the containment of pandemic flare-ups. The study was conducted in South Africa and only reported data was used.

KEYWORDS

Healthcare Supply Chain, Supply Chain Concepts, Supply Chain in Healthcare Institutions, Supply Chain Models, Supply Chain Systems

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INTRODUCTION

A supply chain system enables an organization to manage its resources efficiently and view various aspects of its operations, including its dependents, from a single system (Supply Chain Council, 2022). A supply chain is a network of entities collaborating to produce a service or product and deliver it to end users (Hasibuan et al., 2018). These entities include suppliers, manufacturers, distributors, and retailers (Akkucuk, 2020; Hasibuan et al., 2018). The purpose of a supply chain system is to enable organizations to manage and utilize their resources efficiently (Hasibuan et al., 2018).

The healthcare sector is a critical section of the economy and impacts human lives (Aldrighetti et al., 2019; Francis, 2020; Sanjoy et al., 2020; Sarkis, 2020). Studies conducted and compiled during the COVID-19 pandemic revealed shortcomings in existing supply chain systems (Alexander & Hendrik, 2021; Bhaskar et al., 2020; Guiyang et al., 2020). The shortage of COVID-19 vaccines, protective clothing, and equipment made it evident that existing supply chain systems could not accommodate the demand (Bhaskar et al., 2020; Guiyang et al., 2020; Park et al., 2020). Hence, the following research question guided this study: *How can the South African healthcare supply chain become more efficient and effective in combating pandemic flare-ups?* The study aimed to understand the application of supply chain systems used in healthcare institutions to equip them to mitigate and contain pandemics such as COVID-19. In addition, improving and optimizing supply chain systems and networks saves lives; for example, Harris (2021) states that masks saved an average of 20,000 lives in South Africa in 2020. Effective healthcare supply chain systems must enable federal governments to achieve the vaccination of 70% of the total population toward obtaining herd immunity (Tetteh & Hernandez-Vargas, 2021). The current study undertook a systematic literature review to provide a scientific dimension to the study. In addition, a case study was simulated using real-world data on COVID-19 in South Africa to establish gaps and alignment, and the simulated results were compared to actual values. The following section provides the background of the study.

BACKGROUND

Many healthcare institutions, particularly in developing countries, found it exceedingly difficult to manage the pandemic, mainly due to a shortage of human and health resources, such as ventilators and nebulizers (Bhaskar et al., 2020; Park et al., 2020). In addition, funding and sourcing the vaccines proved problematic, leading to delayed vaccination in most developing countries (Department of Co-Operative Governance and Traditional Affairs, 2020; Edholm et al., 2022; Statista, 2023). The existing healthcare supply chain systems proved inefficient due to an imbalance between supply and demand (Bhaskar et al., 2020; Singh et al., 2021). The following sections elaborate on three essential concepts—the supply chain overview, supply chain operation reference (SCOR) model, and healthcare supply chain—to facilitate an understanding of the application and effectiveness of the healthcare supply chain systems implemented by the South African government.

Supply Chain Overview

A healthcare supply chain consists of several stakeholders, such as pharmaceutical drug, medical device, and vaccine manufacturers, suppliers, and distributors; care providers, such as hospitals; and patients (Queiroz et al., 2022; Rehman & Ali, 2022; Skowron-Grabowska et al., 2022). All supply chain components must be in harmony to be efficient (Queiroz et al., 2022; Supply Chain Council, 2022). The components of a supply chain vary depending on the nature of the business it services. Porter's value chain describes the basic components of the supply chain as its primary activities: inbound logistics, operations, outbound logistics, marketing and sales, and services (Barnes, 2001). In a supply chain, these activities, along with their associated businesses and individuals, are integrated to transfer products from one place to another to the customers' satisfaction (Bvuchete et al., 2020). Those who play a role in a supply chain include suppliers, manufacturers, distributors,