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Risk Management Techniques as a Sustainable Tool for Healthcare Supply Chain Resilience in Lagos State

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Abstract

This study examined the nexus between risk management techniques and healthcare supply chain resilience among public health workers in Lagos. A cross-sectional survey design was adopted via-a-vis double sampling technique which comprised of judgmental and convenience. The study employed a designed questionnaire to gathered data from a sample of 183 participants. Descriptive and inferential statistics were adopted in the study. Findings from the study revealed a positive association between risk management techniques and healthcare supply chain resilience. The study recommended that risk management frameworks should be further strengthened by leveraging on technology for better healthcare supply chain resilience and information systems. This study emphasises the urgent need for inclusive policy intercession targeting public healthcare workers whose understanding of risk management techniques are not adequate in a bid to improve logistics flexibility, adaptation and collaboration in the healthcare supply chain resilience.

Keywords: *Risk management, healthcare system, resilience, supply chain.*

1. Introduction

Subsequent to the outburst of the COVID-19 crisis, healthcare systems around the universe have been struggling to resist with the unequalled shocks arising from its occurrence [9]. However, resilience in the healthcare systems in Africa was a mirage until some economic powerhouse like China, America and the likes brought in their logistics capacities in the area of managing the health risks in Africa in terms of medical supply and drugs [12, 16]. In Nigeria, the third goal of the United Nations Sustainable Development (UNSD) of ensuring safe access to quality, effectual, and inexpensive healthcare facilities would be thwarted, if health-related shocks are not properly addressed [1, 13]. In a bid to achieve the UNSD goals and sustaining the healthcare system, in the face of the varied risks, risk management techniques are essential to enable the supply chain resilience among public healthcare facilities in Lagos State. This study is important as it helps sustain risk management techniques and resilience in healthcare supply chain among public health workers in Lagos. It thus helps enhance public healthcare workers' perceptions of risk management techniques as coping strategy for resilience in healthcaresupply chain in Nigeria.

Therefore, this study underscores the need to examine the nexus between risk management techniques and resilience in healthcare supply chain in Lagos, Nigeria.

2. Theorectical Background and Review of Literature

Theoretical Review Theory of Resilience

The study is based on Dr. Norman Garmezy's resilience theory from 1991, which emphasizes the use of reaction mechanisms and maintaining composure when faced with disruptions. Resilience theory centers around the ability of a supply chain to anticipate, strategies, respond to, and recover from disruptive occurrences [2]. There has been a trend towards combining internal and external stakeholders in order to enhance resilience and efficiently handle risks, particularly in the healthcare industry [6]. Moreover, the absence of adaptability in health systems indicates a limited capacity to respond to circumstances that deviate from the norm, resulting in heightened vulnerability and a deterioration in performance [4]. Consequently, the act of recognising and managing these potential dangers and enhancing the ability to withstand them in healthcare operations has been increasingly recognised as a highly successful response to this circumstance [20].

The concepts of risk management and healthcare supply chain resilience have been developed throughout time to place more importance on collaboration, sharing of information, and proactive tactics; and therefore, serves as the basis for this study.

Conceptual Review

Risk Management Techniques and Healthcare Supply Chain

Managing risks in supply chain operations has evolved over time to become a formidable tool employed to detect and address causes of disruption in supply chain within the public health environs [19]. This involves a number of activities, including risk identification, risk assessment, risk control. Each of these activities plays a central character in identifying and managing supply chain risks within the healthcare systems.

According to [4] risk management technique as an approach is used to manage supply chain operations challenges faced by the healthcare especially in the face of unforeseen challenges and disaster, as a risk management technique ensures the protection of the quality and availability of health commodities for patients. It involves anticipating potential dangers and effectively managing risks through a continuous process of risk consciousness, risk reduction, or risk tolerance.

Risk Identification Techniques in Healthcare Supply Chain

The first phase of supply chain process in healthcare system is risk identification, which entails identifying various types of risks and their contributing elements. This step is crucial for the overall supply chain process [18]. Risk identification involves a thorough and organised evaluation of potential risks in the healthcare supply chain that are related with the specific situation [14]. Prior to doing risk analysis and devising management methods, it is crucial to identify and categorise risks based on their inherent characteristics [6]. Prior to the exacerbation or potential escalation of these concerns, it is imperative to proactively identify and reduce risks in advance. Moreover, it is essential for the identification stage to take place prior to the occurrence of disruption, enabling healthcare administrators to proactively mitigate its effects [3].

Risk Assessment Technique in Healthcare Supply Chain

The intensifying disruptions in supply chains, compounded by innovations, have led to greater complexity and difficulty in identifying and quantifying risks which has led to spillover effects of risks within organisations and around supply chains in the healthcare systems [7. 20]. The risk assessment technique entails the collaboration between different organisations, where both quantitative and qualitative risk management methodologies are employed to recognise, assess, handling, and monitor unanticipated large-scale and small-scale events that could potentially affect any facet of an organisation's supply chain method [4].

According to [14], this method can facilitate the conversion of risk mitigation strategies at the organisational level into an inclusive risk management solution through collaborative involvement of stakeholders. This can culminate in the fragmentation of risk severity into manageable sizes, by enhancing clarity, promoting a shared risk management culture, and mitigating crisis in the healthcare sector [8].

Risk Control Technique in Healthcare Supply Chain

Risk control techniques comprise encompasses the numerous activities, instruments, and methodologies that an organisation can employ to manage its business efficaciously and handle any preventable risks that could impede the attainment of the organisation's mission [3]. In the health sector, risk control is a range of activities undertaken by health facility to recognise potential risk circumstances and subsequently take measures to avert these risks [5].Moreso, [15] sees risk control, in healthcare systems, as an approach to enhancing healthcare quality by specifically focusing on recognising circumstances that endanger patients and taking preventive measures to handling or averting those risk. Thus, the main goal is to enhance patient safety and care quality while plummeting the pecuniary burden related with such risks for health providers. In a healthcare setting, risk control involves decisions such as not undertaking certain medical procedures or treatments that pose a high risk to patients, choosing to use established and proven medical equipment and technology instead of new, untested ones, or avoiding activities that could lead to patient harm or legal liability [5].

Resilience in Healthcare Supply Chain

Resilience in healthcare supply chain is the ability of health actors, organisations, and communities to sufficiently plan for, and successfully handle unanticipated events and crisis in the health system. This includes the ability to absorb, adapt, access, and change resources and processes [18]. This resilience is closely tied to health system governance. In other words, the aptitude to endure and recuperate from crisis in the supply chain is consequent upon on the decisions and actions of various groups and individuals who establish, modify, oversee, and implement the guidelines that direct the health system [21]. [18] argue that the healthcare supply chain necessitates continuous human training, the deployment of technology, and the shift from paper-based to electronic data gathering systems. This transition is especially important in the realm of mobile health applications, which involve the integration of electronic gadgets and other wireless apparatus into healthcare systems. Furthermore, [9] proposed that enhancing healthcare infrastructure is crucial for bolstering the seven dimensions of quality patient experience, including effectiveness, equity, efficiency, safety, sustainability, and timeliness. However, by actively involving private individuals in the health supply chain, one can confirm long-term benefits and effectively tackle the problem of limited infrastructure by financing supply chain infrastructure and administration.

Empirical Review

[21] evaluated the enablers of resilience in healthcare supply chain, with empirical evidence among United State healthcare industry in the period of COVID-19 crisis. The study was aimed at assessing the features of resilient supply chain, with its significant focus at healthcare supply chain. The study adopted a rank reversal index in decision making. The findings revealed that aside redundancy, robustness, and collaboration that were key determinants of supply chain; less important focus was placed on supply chain design, supply chain risk management, and communication capability during COVID-19 crisis. The study's implication was disruption in healthcare supply chain can combat in large-scale crisis through prompt information sharing, reduce over-dependence on supply chain design and regularly tracking medical supplies.

[10] investigated risk management techniques adoptable for sustaining supply chain resilience capabilities. The study explored resilient capability in supply chain and four basic risk control techniques in line with sustainability. The study employed a survey technique cum structural equation model. The findings proposed a structural approach for improved supply chain resilience under various sustainable plans. The study's implication suggested that supply chain management practices for top management team should focus at detecting risk aggressively and react promptly to ensure an enhanced supply chain resilience.

[11] conducted a wide-ranging analysis of prevailing literature to explore the management of risks in healthcare supply chains, as well as their resilience and potential areas for further research. A thematic analytical technique was adopted for literature survey.

The findings showcased three areas of empirical research gaps. The study created a basis for future research and thus noted ways to enhance supply chain resilience and means to adapting to unanticipated disruptions in healthcare organisations.

3. Research Methods

This study utilised a cross-sectional survey approach to gather the opinions of public healthcare workers regarding the correlation between risk management techniques and the resilience of the healthcare supply chain. The study gathered empirical evidence from Lagos State, Nigeria. This study utilised a survey design, complemented by quantitative analysis, to get insight into public healthcare workers' perceptions of necessary decisions concerning risk management techniques. Lagos State is divided into five divisional areas and so is its healthcare facilities. On this basis 50 copies of questionnaire were delivered to each divisional areas making a total of 250 questionnaire based on its equality. Out of the whole distribution, 183 copies of the questionnaire were deemed apposite for scrutiny. The data gathering tool adopted was a structured questionnaire combined with a two-fold sampling strategy, which included judgmental and convenience sampling. The survey technique was preferred because it was fit for the research plan, cost-effective, and easy to distribute [17]. The dimension of validity in the study included construct and content validity. The concept validity was designed consequent on the convergent and discriminant perspectives of previous research. Content validity, on the other hand, was assessed by specialists in risk management and healthcare supply chain.

4. Analysis and Interpretation of Findings

Analytical Description of Research Variables

Table 1: Risk Identification Techniques

Variables	SD (1)	D (2)	U (3)	A (4)	SA (5)	Mean	Std. Dev.
Group technique is a regularly employed strategy for identifying possible risks in healthcare supply chain	5.5	0.0	10.9	57.4	26.2	3.99	0.932
Expert judgment is required for healthcare workers' drives towards healthcare supply chain	0.0	2.7	21.3	57.4	18.6	3.92	0.710
Health risk survey is required for healthcare workers' knowledge design of healthcare supply chain	0.0	0.0	12.6	63.9	23.5	4.11	0.592
Identifying causes and possible effects of health risk can aid healthcare supply chain	2.7	4.9	0.0	81.4	11.0	3.93	0.742
Public health documentation review is necessary for healthcare supply chain process	0.0	0.0	11.5	78.1	10.4	3.99	0.469
Historical health risk information will aid public health workers' knowledge of healthcare supply chain process	0.0	2.7	11.5	74.3	11.5	3.95	0.581

Source: *Researchers' Computations, 2025*

In Table 1, survey items projecting the risk identification techniques include group techniques, expert decision, health risk survey, cause and effect, public health documentation, & historical health risk information. The responses from the participants that participated in the study showcased that majority, in references to group techniques (83.6%), expert judgment (75%), health risk survey (87.4%), cause and effects (92%), public health documentation (88.5%), and historical health risk information (85.8%) all agreed. For contrasting view, the followings were noticed for the survey items group techniques (5.5%), expert judgment (2.7%), health risk survey (0%), cause and effects (7.6%), public health documentation (0%), and historical health risk information (2.7%) For participants views depicting their indecision, the followings were recorded – group techniques (10.9%), expert judgment (21.3%), health risk survey (12.6%), cause and effects (0%), public health documentation (11.5%), and historical health risk information (11.5%). The mean scores and that of standard deviation agreed with the results. The outcomes imply that risk identification techniques plainly indicate the identical decisions regarding all subject areas in the distribution.

Table 2: Risk Assessment Techniques

Variables	SD (1)	D (2)	U (3)	A (4)	SA (5)	Mean	Std. Dev.
Public health workers' enlightenment of the likelihood of health risk events is a good approach for measuring healthcare supply chain process	0	0	5.4	86.9	7.7	4.02	0.362
Public health workers' knowledge of the severity of health risk can be a good measure for healthcare supply chain process	0	1.6	5.5	76	16.9	4.08	0.533

Source: *Researchers' Computations, 2024*

In Table 2, survey items projecting the risk assessment techniques include likelihood of health risk & severity of health risk. The responses from the participants that participated in their study showcased that majority, in references to likelihood of health risk (94.6%), and severity of health risk (92.9%) all agreed. For opposing view, the followings were noticed for the survey items likelihood of health risk (0%), and severity of health risk (1.6%). For participants views depicting their indecision, the followings were recorded – likelihood of health risk (5.4%), and severity of health risk (5.5%). The mean scores and that of standard deviation agreed with the results. The outcomes imply that risk assessment techniques clearly signify the identical judgments regarding all subject areas in the distribution.

Table 3: Risk Control Techniques

Variables	SD (1)	D (2)	U (3)	A (4)	SA (5)	Mean	Std. Dev.
Risk avoidance is one priority for healthcare supply chain unit when engaged in healthcare deliveries	2.7	0	12.6	66.1	18.6	3.98	0.748
Healthcare supply unit endeavours to reduce all risk related to healthcare deliveries	0	2.2	12.6	65	20.2	4.03	0.645
Healthcare supply unit employs risk retention techniques (such as setting aside of funds, borrowing, donations, etc.) in healthcare deliveries	2.7	5.5	8.2	67.2	16.4	3.98	0.838
Possible risk attached to healthcare supply unit is usually transferred to an insurance company in order to manage healthcare deliveries	2.7	2.7	17.5	51.4	25.7	3.95	0.888

Source: *Researchers' Computations, 2025*

In Table 3, survey items projecting the risk control techniques include risk avoidance, risk minimization, risk retention, & risk transfer. The responses from the participants that participated in their study showcased that majority, in references to risk avoidance (84.7%), risk reduction (85.2%), risk retention (83.6%), and risk transfer (77.1%) all agreed. For conflicting view, the followings were noticed for the survey items risk avoidance (2.7%), risk reduction (2.2%), risk retention (8.2%), andrisk transfer (5.4%). For participants views depicting their indecision, the followings were recorded – risk avoidance (12.6%), risk reduction (12.6%), risk retention (8.2%), and risk transfer (17.5%). The mean scores and that of standard deviation agreed with the results. The outcomes imply that risk control techniques clearly signify the identical judgments regarding all subject areas in the distribution.

Table 4: Healthcare Supply Chain Resilience

Variables	SD (1)	D (2)	U (3)	A (4)	SA (5)	Mean	Std. Dev.
Healthcare supply chain unit tracks medical supplies visibly from manufacturers to major healthcare distributors	0	8.2	2.7	74.3	14.8	3.96	0.71
Healthcare supply chain unit easily adapts to changes when disruption occurs in the distribution of healthcare products	0	17.5	2.2	72.1	8.2	3.71	0.851
Healthcare supply chain unit easily adjusts its procedures in order to meet current trends	0	2.7	5.5	79.2	12.6	4.02	0.539
Healthcare supply chain unit collaborates with suppliers, manufacturers, and other stakeholders in the healthcare industry	2.7	0	4.4	68.3	24.6	4.12	0.724
Healthcare supply chain unit maintains proper inventory for the flow of healthcare products	2.7	0	4.4	69.4	23.5	4.11	0.718

Source: *Researchers' Computations, 2025*

In Table 4, survey items projecting the visibility, adaptability, flexibility, collaboration, and Storage. The responses from the participants that participated in their study showcased that majority, in references to visibility (89.1%), adaptability (80.3%), flexibility (91.8%), collaboration (92.9%), and storage (92.9%) all agreed. For contradictory views, the followings were noticed for the survey items visibility (8.2%), adaptability (17.5%), flexibility (2.7%), collaboration (2.7%), and storage (2.7%). For participants' views depicting their indecision, the followings were recorded – visibility (2.7%), adaptability (2.2%), flexibility (5.5%), collaboration (4.4%), and storage (4.4%). The mean scores and that of standard deviation agreed with the results. The outcomes imply that healthcare supply chain resilience clearly signify the identical judgments regarding all subject areas in the distribution.

Ho1: Risk management techniques have no effect on healthcare supply chain resilience among selected public healthcare workers in Lagos State

Table 5: Multiple Regression Results for Risk Management Techniques vs Healthcare Supply Chain Resilience among Public Healthcare Workers in Lagos State

Section	Variable/Statistic	Value 1	Value 2	Value 3	Value 4	Value 5
Model Summary	R	0.463[a]				
	R Square	0.214				
	Adjusted R Square	0.205				
	Std. Error of the Estimate	2.6783				
	F Change	19.106				
	df1	3				
	df2	179				
	Sig. F Change	0.031				
ANOVA	Regression	Sum of Squares = 3016.082	df = 3	Mean Square = 1121.021	F = 19.106	Sig. = 0.031
	Residual	Sum of Squares = 1206.815	df = 179	Mean Square = 3.163		
	Total	Sum of Squares = 4222.897	df = 182			
Coefficients	Constant	B = 2.573	SE = 0.517	t = 1.320	Sig. = 0.000	95% CI = 1.501–1.521
	Risk Identification Techniques	B = 0.371	SE = 0.018	Beta = 0.131	t = 6.015	Sig. = 0.000
	Risk Assessment Techniques	B = 0.247	SE = 0.025	Beta = 0.240	t = 4.785	Sig. = 0.001
	Risk Control Techniques	B = 0.174	SE = 0.012	Beta = 0.525	t = 2.715	Sig. = 0.004

Source: *Researchers' computations, 2025*

The multiple regression analysis conducted aimed to evaluate the effect of risk management techniques (comprising risk identification, risk assessment, and risk control) on healthcare supply chain resilience among selected public healthcare workers in Lagos State. The model summary indicates a substantial relationship between the predictors (risk identification, risk assessment, and risk control) and the response variable, healthcare supply chain resilience ($R = .463$, $R^2 = .214$, Adjusted $R^2 = .205$). This result proposes that 21.4 percent of the variation in healthcare supply chain resilience can be explained by the combined influence of the risk management techniques. The ANOVA outcomes additionally support the significance of the regression, with a highly significant F-statistic ($F = 19.106$, $p < .05$). The regression analysis indicates that the combined effect of risk identification, risk assessment, and risk control significantly predicts healthcare supply chain resilience among public healthcare workers in Lagos State. Upon assessing the coefficients in Table 5, it is obvious that risk identification (β=.371, t=6.015, p < .000), followed by risk control techniques (β= .247, t = 4.785, p < .001), and risk assessment techniques (β = .174, t = 2.715, p < .004).

Discussion of the Findings

This study affirmed the connection established between risk management techniques and healthcare supply chain resilience among selected public healthcare workers in Lagos State The outcomes from the hypothesis showcased that risk management techniques have a positive but low relationship with healthcare supply chain resilience among selected public healthcare workers in Lagos State; thereby invalidated the null hypothesis. The study's outcomes supported earlier studies [4, 19] that risk management technique as an approach is used to manage supply chain operations challenges faced by the healthcare especially in the face of unforeseen challenges and disaster. Also supported is [21], who noted that the aptitude to endure and recuperate from crisis in the supply chain is consequent upon on the decisions and actions of various groups and individuals who establish, modify, oversee, and implement the guidelines that direct the health system.

5. Conclusion and Implications

The study confirmed the connection between risk management techniques and healthcare supply chain resilience in Lagos State, Nigeria. The study recommended that risk management frameworks should be further strengthen by leveraging on technology for better healthcare supply chain resilience and information systems. However, government should encourage local production of essential medical supplies and foster strong partnerships between healthcare providers, government agencies, and the private sector. This study emphasises the urgent need for inclusive policy intercession targeting public healthcare workers whose understanding, in application of risk management techniques, are not adequate in a bid to improve logistics flexibility, adaptation and collaboration in the healthcare supply chain resilience.

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