Effect of Pandemic Preparedness on the Supply Chain Performance of Federal Medical Centre Abuja Headquarters, Nigeria

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ABSTRACT

Supply chain performance is foundational to healthcare delivery during pandemics, with metrics like availability of essential supplies, procurement lead time, and stockout frequency determining patient outcomes and system resilience. This study examined the effect of pandemic preparedness specifically Strategic Stockpile Readiness (SSPR), Cold Chain Storage Capacity (CCSS), Procurement Agility (PRAG), and Response Training (RETR) on Supply Chain Performance (SUCP) at Federal Medical Centre Abuja Headquarters, Nigeria. Supply chain performance, in this study, is measured through availability and continuity of essential medical supplies, procurement lead time as an indicator of response speed, and frequency of stockouts or service disruptions during health emergencies. Using a cross-sectional survey design, data were collected from 129 key stakeholders across four critical departments via structured questionnaires. Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed to analyze the data, revealing that Cold Chain Storage Capacity ($\beta = 0.393$, $p < 0.001$), Strategic Stockpile Readiness ($\beta = 0.328$, $p = 0.015$), and Procurement Agility ($\beta = 0.214$, $p = 0.003$) all significantly affect supply chain performance, while Response Training ($\beta = 0.022$, $p = 0.477$) had no significant effect. Collectively, these preparedness variables explain 74.5% of the variance in supply chain performance ($R^2 = 0.745$). While Response Training was perceived positively, it did not translate into measurable performance gains. This study concluded that infrastructure- and process-driven preparedness is vital to ensuring supply continuity, reducing delays, and minimizing disruptions during crises. Recommendations for FMC Abuja Headquarters include prioritizing cold chain upgrades, expanding strategic reserves, institutionalizing agile procurement frameworks, and revamping training with outcome-focused drills to strengthen overall supply chain resilience.

Keywords: Supply Chain Performance, Pandemic Preparedness, Strategic Stockpile Readiness, Cold Chain Storage Capacity, Procurement Agility, Response Training.

INTRODUCTION

The Supply Chain Performance of healthcare facilities, particularly in the face of global health crises, is a foundational determinant of effective service delivery and patient outcomes. The devastating impact of the COVID-19 pandemic globally exposed critical vulnerabilities in the procurement, storage, and distribution of essential medical supplies, revealing that healthcare supply chain performance defined by the ability to ensure availability, timeliness, and continuity of critical supplies under stress (Choi et al., 2020) is inextricably linked to proactive Pandemic Preparedness measures. Globally, the response to the pandemic highlighted a clear dichotomy between prepared and unprepared systems. Countries with robust preparedness frameworks, such as Singapore and South Korea, demonstrated superior supply continuity through proactive measures like pre-positioned national stockpiles and highly digitized, flexible procurement systems (Lee et al., 2021). These systems demonstrated that an investment in Strategic Stockpile Readiness the maintenance of pre-positioned reserves of critical items (PPE, drugs, oxygen) to buffer demand surges (Ivanov, 2021) directly mitigates the risk of catastrophic stockouts, thereby bolstering Supply Chain Performance. Similarly, cold chain storage capacity, which is the availability and reliability of temperature-controlled storage for vital items like vaccines and blood products (Kartoglu & Milstien, 2014), proved non-negotiable for effective response, ensuring the integrity and availability of temperature-sensitive supplies, a key metric of high Supply Chain Performance.

In Africa, the challenges were significantly amplified, with many nations, including Nigeria, experiencing severe shortages (Adepoju, 2020; WHO, 2021). The failures were often linked to slow, bureaucratic purchasing processes, underscoring the vital role of Procurement Agility, the ability to rapidly activate alternative suppliers and bypass routine bureaucracy during emergencies (Dolgui et al., 2020). Procurement agility ensures rapid delivery, which is essential for minimizing lead times and improving Supply Chain Performance. Furthermore, a lack of staff Response Training regular drills, simulations, and staff education on emergency supply protocols (Timmins et al., 2021) in many facilities contributed to logistical breakdowns and delayed patient care. Response training equips personnel to manage surge demand efficiently, directly contributing to the timeliness and continuity aspect of Supply Chain Performance.

In Nigeria, Federal Medical Centers (FMCs) are central to the nation's emergency health response. However, frequent stockouts, delayed procurement, and inadequate cold chain systems continue to undermine service delivery during crises (Oleribe et al., 2021). Supply Chain Performance in these critical facilities is often crippled by the absence of proactive Pandemic Preparedness. This study posits that specific dimensions of preparedness are the primary determinants of robust Supply Chain Performance (measured by supply availability, lead time, and stockout frequency) at the Federal Medical Centre Abuja Headquarters. Strategic Stockpile Readiness ensures a buffer against national supply disruptions (Ivanov, 2021); Cold Chain Storage Capacity ensures the availability of viable medical products (Kartoglu & Milstien, 2014); Procurement Agility significantly reduces procurement lead times; and Response Training ensures the supply chain operates efficiently under pressure (Dolgui et al., 2020). This global, African, and local evidence consistently points to a causal link: systematic investment in these four preparedness measures directly enhances a facility's capacity to maintain the availability, timeliness, and continuity of supplies, thereby optimizing Supply Chain Performance during a crisis.

The central problem this study addresses is the sub-optimal Supply Chain Performance (SUCP) experienced by the Federal Medical Centre Abuja Headquarters (FMC Abuja) during health emergencies, characterized by unacceptable levels of stockout frequency, prolonged procurement lead time, and compromised availability and continuity of essential supplies (Oyenuga et al., 2024). The COVID-19 pandemic starkly revealed that reactive responses failed to secure timely supplies, leading to treatment disruptions. This recurring failure suggests a significant deficiency in the implementation and effectiveness of its Pandemic Preparedness framework. While global research confirms that preparedness dimensions like Strategic Stockpile Readiness, Cold Chain Storage Capacity, Procurement Agility, and Response Training should bolster SUCP (Gupta & Gupta, 2025; Dolgui et al., 2020), there is a lack of localized, empirical evidence demonstrating which of these specific preparedness factors significantly drives SUCP within the Nigerian tertiary public hospital setting like FMC Abuja. For example, while Response Training is conceptually important (Timmins et al., 2021), its actual impact on measurable performance outcomes (like reduced lead time or stockouts) in the FMC Abuja supply chain remains unverified, as suggested by findings in other contexts (Stamati et al., 2024). Similarly, infrastructure deficiencies, such as poor Cold Chain Storage Capacity, are known to cause significant stock wastage and availability issues (Gedi, 2022), yet the quantitative effect relative to administrative preparedness like Procurement Agility is unknown at this specific location. This research is necessary because without empirically validated data distinguishing the impact of each preparedness dimension, FMC Abuja risks continuing to misallocate limited resources on measures that do not significantly translate into improved supply chain performance under duress, thereby failing to enhance its resilience against future pandemics. The main objectives of this study are to determine the effect of Pandemic Preparedness on the Supply Chain Performance of Federal Medical Centre Abuja Headquarters, Nigeria with specific objectives to:

i. To assess the effect of Strategic Stockpile Readiness on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

ii. To evaluate the effect of Cold Chain Storage Capacity on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

iii. To examine the effect of Procurement Agility on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

iv. To determine the effect of Response Training on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

The following null hypotheses were tested in the course of this study:

H_{01}: Strategic Stockpile Readiness has no significant effect on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

H_{02}: Cold Chain Storage Capacity has no significant effect on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

H_{03}: Procurement Agility has no significant effect on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

H_{04}: Response Training has no significant effect on Supply Chain Performance in Federal Medical Centre Abuja Headquarters.

LITERATURE REVIEW

Conceptual Framework

Supply Chain Performance

Supply Chain Performance (SCP) measures how effectively and efficiently a volatile healthcare system, like the Federal Medical Centre Abuja, meets patient needs by ensuring the right product is delivered at the right time under variable demand (Choi et al., 2020; Oyenuga et al., 2024). High SCP is indicative of a resilient supply chain capable of absorbing unexpected shocks and rapidly restoring functionality (Jabbour et al., 2020). Failures in this performance within Nigerian Federal Medical Centres lead to severe consequences, including treatment delays, higher mortality, and eroded public confidence (Amzat et al., 2021). The collective view is that high performance hinges on capabilities like flexibility, integration, and customer responsiveness, which contribute directly to operational efficiency and reduced costs (Al-Barghouthi, 2024; Orji & Ajueyitse, 2025).

For this study, SCP is quantified using three specific, inter-related variables:

1. **Availability and Continuity of Essential Supplies:** This refers to the **consistent presence** of critical medical items. Its importance is underscored by findings that availability (sometimes as low as 50-75%) is directly linked to stockout frequency, especially under the stress of disruptions (Abdulkadir et al., 2023; Dwivedi et al., 2025).

2. **Procurement Lead Time:** This is the total time from the ordering decision to the supplies' receipt and availability. It is a measure of procurement agility, with extended lead times (e.g., 15.92 days vs. A ≤ 7-day target) significantly inflating stockout frequency and prolonging replenishment cycles (Dixit & Shivhare, 2025; Abdulkadir et al., 2023).

3. **Stockout Frequency:** Defined as how often essential supplies reach a zero-inventory level, this variable directly impacts service delivery. Observed stockout rates (up to 59.98% against a ≤ 5% benchmark) signal weak readiness and are often driven by long lead times and insufficient inventory buffers (Dixit & Shivhare, 2025; Gupta & Gupta, 2025).

Ultimately, this study defines SCP as the ability of the Federal Medical Centre Abuja to maintain a consistent flow of medical resources, measured by continuous availability, minimal procurement lead time, and low stockout frequency, thereby ensuring effective and cost-optimized patient care during emergencies.

Pandemic Preparedness

Pandemic Preparedness (PP) is the set of proactive strategies health systems undertake to ensure supply chain resilience and the continuity of essential medical services when facing a large-scale public health crisis. It acts as a crucial buffer against sudden, massive demand surges and widespread global supply network disruptions (Goetz, 2022; Gupta & Gupta, 2025). Core components repeatedly cited in the literature include strategic stockpiling, development of infrastructure capacity, adoption of agile procurement methods, and specialized personnel training (Nartey et al., 2022; Dwivedi et al., 2025). Agile procurement, for instance, moves away from rigid purchasing cycles to rapidly adapt sourcing strategies under strained market conditions (Alali et al., 2022). Long-term actions, such as supplier diversification, are also key to buffering against over-reliance on single sources (Goetz, 2022). The overarching goal of high PP is to *prevent* catastrophic outcomes, like widespread drug shortages, by building robust systems that can withstand stress across raw material sourcing, manufacturing, and transportation, ensuring the sustained availability of critical supplies like PPE and vaccines.

Strategic Stockpile Readiness

Strategic Stockpile Readiness (SSR) is a critical, proactive supply strategy focused on maintaining pre-positioned reserves of essential medical supplies, medical countermeasures (MCMs) to bridge production gaps during sudden demand surges. It directly aims to ensure availability and continuity when commercial supply chains are overwhelmed (Abbas & Gasmi, 2024; U.S. Department of Health and Human Services, 2021). This concept goes beyond simple storage; it demands active management to prevent wastage from expiration through systematic practices like stock rotation into commercial markets (Yang & Zelbst, 2024). Inadequate SSR, as seen during early COVID-19 surges, leads directly to high stockout frequency and price gouging (Harland et al., 2021). Effective readiness is defined by maintaining inventory levels that deliberately exceed routine demand, often requiring a 6-to-12-week supply of critical items (Chen & Wanbon, 2022). Furthermore, readiness is a tiered system, requiring not only centralized national reserves but also hospital-level caches coupled with clear logistical mobilization policies to ensure supplies can be rapidly and equitably distributed when a crisis mandates their deployment.

Cold Chain Storage Capacity

Cold Chain Storage Capacity (CCSC) is the essential infrastructural backbone required to maintain the required temperature conditions typically 2°C to + 8°C for sensitive pharmaceuticals and vaccines from manufacture to administration. Its primary function is to preserve the potency and effectiveness of these temperature-sensitive supplies, as failure to maintain the correct range renders stock unusable, directly leading to wastage and increased stockout frequency (Chukwu & Adibe, 2021; Ogboghodo et al., 2017). CCSC is a holistic system comprising not just the refrigeration equipment itself, but also reliable energy sources (like backup generators), functional monitoring devices (thermometers), and well-defined management procedures. Deficits in operational practice, such as mixing non-vaccine items in cold storage or failing to monitor incoming product temperatures, significantly compromise functional capacity even where equipment exists (Tumwine et al., 2023). For supply chain performance, robust CCSC is non-negotiable; it ensures that the investments made in strategic stockpiling are protected, preventing the degradation of reserves and thus guaranteeing the supply continuity of life-saving medicines during a health crisis.

Procurement Agility

Procurement Agility (PA) is the organizational capability of the purchasing function to swiftly sense, respond to, and adapt its sourcing strategies in the face of sudden market shifts or urgent demand spikes, which is vital during emergencies. It is fundamentally about minimizing the procurement lead time that plagues traditional buying cycles (Akhil et al., 2025). PA involves accelerating contract awards, bypassing routine bureaucracy through pre-established emergency frameworks, and rapidly activating alternative suppliers across diverse geographic locations (Harland et al., 2021; Anozie et al., 2024). This capability is heavily enabled by technology, where e-procurement systems allow for better sensing of market shifts and quicker decision-making compared to manual processes (Mungai & Peter, 2023). Close supplier relationships are also key, as agility requires collaborating with vendors to ensure they can meet surge capacity needs (Perera et al., 2019). Ultimately, procurement agility directly mitigates stockout frequency by ensuring essential supplies are acquired and made available for use faster than the rate of consumption, regardless of unforeseen turbulence in the global supply market.

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Response Training

Response Training (RT) is the systematic, structured set of practical learning activities designed to ensure that all personnel can competently execute emergency supply chain and operational protocols under the high pressure of a health crisis. It serves as the critical mechanism that operationalizes preparedness plans, bridging the gap between having a written policy and its flawless application (WHO, 2024). Effective RT is not limited to clinical staff; it must cover technical skills like cold chain management and administrative skills like implementing agile sourcing procedures (Feyisa, 2021). The literature shows that regular drills and simulations are highly effective, allowing staff to practice vetting new suppliers or executing deployment protocols in a risk-free environment, significantly reducing actual response times (Harland et al., 2021). Inadequate training is directly linked to poor SCP metrics, as untrained staff revert to slow, routine processes, leading to prolonged lead times and increased stockout frequency due to inventory management errors (Abdulkadir et al., 2023). Therefore, providing dedicated, frequent, and targeted training is an essential investment for building true system resilience.

EMPIRICAL REVIEW

Strategic Stockpile Readiness and Supply Chain Performance

Gupta and Gupta (2025) analyzed comprehensive risks and strategic resilience in the u.s. pharmaceutical supply chain. The study examined vulnerabilities in API manufacturing (80% foreign-sourced), strategic stockpiling, supply chain transparency, and regulatory oversight, using pandemic preparedness proxies like stockpile readiness, surge capacity, and response coordination to enhance supply chain performance measured by medication availability, shortage duration, and continuity of essential supplies. Historical disruption analysis (2010–2024), case studies (Operation Warp Speed, Hurricane Maria), and risk matrices were employed across U.S. pharmaceutical networks, with no specified sample size but drawing from FDA data, industry reports, and global production statistics. Data were collected via literature synthesis and regulatory documents; qualitative and quantitative risk assessment was used. Findings revealed geographic concentration and just-in-time inventory caused frequent stockouts and prolonged lead times during COVID-19; recommended 90-day strategic reserves and early warning systems. The strength lies in its multi-stakeholder framework and actionable timelines. However, it lacks primary hospital-level data and African context applicability.

Abdulkadir et al. (2023) assessed performance using maturity model: a multiple case study of public health supply chains in Nigeria. The study determined constraints leading to medicine stockout, examined whether mental models improve understanding of medicine availability, and developed a dynamic theory for improving medicine availability performance, with proxies including infrastructure and assets, fund and financial management, procurement, inventory management, and stockout rate. Researchers employed a mixed-method approach combining quantitative Global Health Supply Chain Maturity Model (GHSCMM) surveys and qualitative semi-structured interviews. The population comprised five public health-care supply chains operating Drug Revolving Fund programs in Kaduna State, Nigeria, with a sample of 78 respondents for surveys and 5 key informants for interviews; data collection involved 4-hour workshops and 40–60-minute recorded interviews, while analysis used Qualtrics software for quantitative data and quotation analysis with Vensim for causal loop diagrams. Findings revealed 80% of sites had fund and financial management as the primary constraint, medicine availability ranged 50%–75% in four cases with 25%–50% stockout, and Case A showed higher performance due to network-oriented mental models emphasizing collaboration and visibility; dynamic hypothesis identified 11 feedback loops driving availability, with reinforcing stockout from delays and balancing loops from procurement. Researchers recommended cross-case collaboration, pooled procurement, and technology adoption to reduce stockouts, while strengths included mixed-method triangulation and grounded dynamic theory development. However, the study lacked manufacturer perspectives and simulation validation, limiting generalizability beyond revolving funds.

Azai and Laryea (2025) conducted a comparative analysis of national medical stockpile strategies lessons learned from covid-19 pandemic response. The study explored governance structures, stockpile composition (PPE, vaccines, antivirals, ventilators), deployment mechanisms, and operational challenges in Australia, the United States, and European countries (France, Latvia, Lithuania, the Netherlands, Norway), using qualitative synthesis of government reports, peer-reviewed literature, and policy analyses published 2018-2025, with no specified population or sample size as a review, employing thematic comparative framework for data analysis. Findings revealed Australia's federal-state model enhanced distribution agility (91 million masks deployed), U.S. SNS faced supply fragility and coordination issues, while European hybrid models with private wholesalers reduced waste via stock rotation. Recommendations included clear legal mandates, stable funding, hybrid physical-surge contracts, diversified supply chains, domestic manufacturing, real-time inventory systems, and international collaboration. The strength lay in synthesizing diverse global models for actionable insights. However, reliance on secondary data limited primary empirical validation in low-resource contexts like Nigeria.

Cold Chain and Supply Chain Performance

Girma et al. (2024) assessed effect of cold chain management practices on health centers operational performance: a facility based cross-sectional study. The objective was to assess the cold chain management practice and operational performance in government health centers in the Administration of Addis Ababa, Ethiopia. The methodology was a cross-sectional facility-based study. The population involved 20 health centers and the sample size included sixty (n = 60) key informants (warehouse manager, pharmacy head, and expanded program immunization focal person). Data collection used logistic indicator assessment tools and analysis included the chi-square test and multivariate regression. The finding revealed a strong correlation between employee factors (educational background, work experience) and practices, and operational performance showed inefficiencies, including an 85% rate of inaccurate inventory records and 80% product wastage. Recommendations emphasized implementing better training, standard operating procedures, logistics and inventory management techniques, and infrastructure. A strength of this study is the quantitative establishment of a link between cold chain practices (Cold Chain Storage Capacity) and operational performance (proxied by wastage and inventory records), offering concrete measures for supply chain output. A critique is that the study focused solely on routine cold chain management at the health center level and did not explicitly address the unique demands of Pandemic Preparedness or Procurement Agility required for large-scale emergencies.

Chukwu and Adibe (2021) examined quality assessment of cold chain storage facilities for regulatory and quality management compliance in a developing country context. The study's objective was to explore the quality of practice of supply chain management of cold chain products in line with the World Health Organisation's Expert Committee report on Specifications for Pharmaceutical Preparations, given that Nigeria's drug distribution guidelines did not adequately address cold chain management. The methodology used was a descriptive survey, set in Abuja, Nigeria. The study employed a checklist developed from WHO regulatory requirements covering documentations, storage, and distribution guidelines to assess supply chain management of cold chain medicines across various facilities. The authors did not specify the exact sample size but assessed various facilities (including retail and hospital pharmacies). Data analysis was conducted using the IBM Statistical Package for the Social Sciences (SPSS) version 25. The finding showed that most of the storage facilities assessed (66.7%) did not meet up to the required standards of quality management, and 50.4% of retail and hospital pharmacy facilities performed poorly in cold chain management practices. The conclusion highlighted that the levels of the supply chain assessed for quality management performed poorly due to limited availability and use of validated quality monitoring systems. A strength of this work is its direct relevance to the study's location (Abuja, Nigeria) and its focus on Cold Chain Storage Capacity and quality management. A critique is that the study focused on compliance with existing guidelines and did not explicitly link cold chain quality to broad Supply Chain Performance metrics like stockout frequency during a large-scale emergency.

Gulma (2025) assessed health products storage: cold chain and dry storage assessment in northwestern nigeria. The study evaluated the storage capacity of health facilities in Katsina State, focusing on both cold chain (6 indicators) and dry storage (17 indicators) using an adapted USAID|DELIVER Project’s Logistics Indicators Assessment Tool (LIAT). A cross-sectional survey was conducted across 314 randomly selected public and private health facilities in all 34 Local Government Areas (LGAs) of Katsina State, with data collected through on-site verification and observation by 11 trained data collectors. Microsoft Excel was used for data aggregation, and qualitative analysis was performed on observed trends. Findings revealed that only 23% of facilities had operational electricity, 36% had functioning refrigerators, and 13% maintained liquefied petroleum gas supplies for backup, while dry storage indicators were met by 72-91% of facilities except for fire safety equipment (39%).

The study recommended investments in reliable power sources, solar-powered refrigeration, fire safety equipment, and staff training on cold chain management and FEFO principles to improve storage conditions and safeguard public health. The strength of this study lies in its comprehensive coverage of all LGAs and use of a standardized assessment tool for objective on-site evaluation. However, its reliance on a single-day snapshot limits insights into longitudinal reliability of storage conditions, and the absence of statistical inference reduces generalizability beyond descriptive trends.

Procurement Agility and Supply Chain Performance

Mwaiseje and Mwagike (2019) examined effects of agile supply chain practices on performance of healthcare sector in tanzania: a case of selected public hospitals in dodoma city. The study assessed impacts of treatment conducted at reasonable time, waiting for registration, time to contact medical personnel, ICT uses, reduction of path flows, effective communication, quick medical assistance, and quick response with changing number of patients on patient satisfaction. Cross-sectional design was employed in Dodoma Municipality at Benjamin Mkapa and Dodoma General hospitals; purposive sampling selected 236 respondents including doctors, nurses, laboratory technicians, procurement staff, and outpatients. Primary data came from questionnaires and interviews, secondary from documents; binary logistic regression analyzed relationships. Results showed treatment at reasonable time ($\beta=.724$, $p=.012$), waiting for registration ($\beta=.725$, $p=.013$), ICT uses ($\beta=.835$, $p=.019$), path flow reduction ($\beta=.790$, $p=.022$), and quick medical assistance ($\beta=.814$, $p=.018$) significantly enhanced satisfaction, while others were insignificant. The study recommended adequate staffing of doctors, nurses, pharmacists, and technicians to smooth operations. Strength lies in robust logistic regression validating agile practices. However, reliance on self-reported satisfaction risks bias and limits generalizability beyond Dodoma.

Oyenuga et al. (2024) examined influence of supply chain practices on healthcare supply chain performance: a decision-making trial and evaluation laboratory approach. The study assessed relationships among lean (vendor managed inventory, 5S), agile (rapid response to special demands, information technology integration), resilient (flexible sourcing, total supply chain visibility), and green (environmental emission control, prequalification of suppliers) paradigms and their impact on supply chain performance. The study employed quantitative design with DEMATEL methodology, targeting supply chain experts in Lagos University Teaching Hospital and Lagos State University Teaching Hospital, using multistage sampling to select 75 experts, with 40 valid responses collected via structured DEMATEL questionnaires on a 5-point Likert scale, analyzed using Microsoft Excel Solver. Findings revealed resilient paradigm with highest centrality (28.201) and cause degree (0.610), with total supply chain visibility most influential practice, followed by flexible sourcing. The study recommended prioritizing resilient practices for performance improvement. Strength lies in DEMATEL's causal mapping for interrelations. However, limited generalizability due to focus on two teaching hospitals; broader inclusion of private facilities suggested.

Kuria and Ndeto (2024) examined supply chain agility and performance of selected private hospitals in Nairobi City County, Kenya. The study examined the relationship between supply chain alertness and performance of private hospitals, and assessed the relationship between supply chain flexibility and performance of private hospitals, with independent variables including supply chain alertness (measured by technologies, supply networks, demand changes) and supply chain flexibility (measured by product flexibility, distribution flexibility, responsiveness flexibility), while the dependent variable was performance of private hospitals (measured by operational cost, lead time, quality of services). The study adopted a cross-sectional survey research design, targeted 340 respondents from 17 private hospitals in Nairobi City County, used Yamane's (1973) formula to select a sample size of 184 respondents, collected primary data through structured questionnaires using drop-and-pick method, and analyzed data using SPSS and Microsoft Excel with Pearson correlation and multiple regression analysis. The study found a very strong positive relationship between supply chain alertness and performance ($r = 0.821$, $p = 0.002$), and between supply chain flexibility and performance ($r = 0.831$, $p = 0.001$), with regression analysis showing supply chain alertness ($\beta = 0.390$, $p = 0.000$) and flexibility ($\beta = 0.382$, $p = 0.001$) significantly influenced performance, explaining 86.1% of variance ($R^2 = 0.861$). The study recommended that hospital management invest in advanced supply chain technologies like real-time tracking systems, predictive analytics, and automated inventory management to enhance operational efficiency and responsiveness, and prioritize supply chain flexibility across product, distribution, and responsiveness dimensions. The strength of this study lies in its robust statistical validation and context-specific insights into healthcare supply chains in a developing economy. However, its limitation to private hospitals in Nairobi restricts generalizability to public or rural facilities.

Response Training and Supply Chain Performance

Zhang et al. (2024) assessed competence and training needs in infectious disease emergency response among chinese nurses: cross-sectional study. The study evaluated nurses' emergency response competence (dependent variable) against highest degree, drill frequency, training frequency, and willingness for further training (independent variables) as key predictors. Using multistage stratified sampling, researchers surveyed 2055 nurses across 80 hospitals (10 tertiary, 20 secondary, 50 primary) via anonymous questionnaires; data underwent multiple linear regression. Nurses scored 141.75 (SD 20.09) in competence, with higher drill and training frequency yielding significant positive coefficients (B=7.344–14.432, $P<.001$). Nearly 91% desired more training, preferring 3–7-day simulation drills. The large multisite sample strengthened generalizability, though self-reported competence limited objectivity. Response training emerged as the strongest modifiable factor enhancing performance.

Unegbu et al. (2024) examined staff training as predictor of service delivery by health information management practitioners in federal teaching hospitals in south-west, nigeria. The study investigated the influence of staff training (on-the-job training, off-the-job training) on service delivery by health information management practitioners. The study adopted the survey research design with a population of 325 licensed health information management practitioners in federal tertiary hospitals and medical centres in south-west, Nigeria; total enumeration was employed, yielding a 76.3% response rate (n=248) via structured validated questionnaire (Cronbach's α 0.73–0.79). Data were analysed using descriptive and inferential (simple and multiple regression) statistics at 5% significance. Findings revealed staff training significantly predicted service delivery (Adj. $R^2 = .160$, $F(2,156) = 16.055$, $p < .05$), with on-the-job training exerting significant positive influence ($\beta = 1.495$, $t = 3.723$, $p < .05$) while off-the-job training did not ($\beta = .189$, $t = .612$, $p > .05$); frequency of training was moderately regular (grand mean = 2.7). Management was recommended to prioritize training programs for health information management practitioners to enhance visionary and transformational leadership skills. Strength lies in total enumeration and robust reliability. However, self-report bias and regional focus limit generalizability.

Ansari et al. (2023) assessed pandemic preparedness of shiraz teaching hospitals for covid-19 from the perspective of health care workers: a cross-sectional study. The study determined emergency-response readiness of 11 teaching hospitals affiliated with Shiraz University of Medical Sciences in 2021-2022, using an 89-item WHO/CDC hospital readiness checklist that measured leadership and coordination, operational support/procurement and resources management, human resources management (including response training), continuity of basic services and capacity expansion, rapid identification, diagnosis, patient isolation, and infection prevention and control; dependent outcomes centred on overall preparedness score (0-100). Researchers applied census sampling to 230 senior/middle managers, emergency physicians, and nurses; data were collected via self-administered questionnaires and analysed in SPSS-22 with descriptive statistics, percentage conversion, and independent t-tests. Findings revealed 87% good-level readiness, with dedicated COVID-19 centres scoring 90.5%; hospitals excelled (>90%) in human resources management and resource procurement but scored poorly (<75%) in rapid identification and infection control; COVID centres significantly outperformed others in continuity of services, surge capacity, and training-driven infection control ($p<0.05$). Recommendations urged immediate investment in response training drills and rapid-testing pathways to sustain essential-supply availability and reduce stockouts. Strength lay in multi-level stakeholder input and pandemic-timing relevance. Critique: cross-sectional design limited causal inference on training's direct effect on procurement lead time or stockout frequency, and self-report bias possibly inflated scores.

Theoretical Framework

The underpinning theory for this study is the Supply Chain Resilience Theory, originally propounded by Ponomarov and Holcomb (2009), which defines resilience as the supply chain's ability to absorb disruptions, adapt to changing conditions, and restore functionality swiftly. The theory delineates three core capacities:

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absorptive (pre-emptive buffering via Strategic Stockpile Readiness), adaptive (dynamic reconfiguration through Procurement Agility), and restorative (recovery enabled by Cold Chain Storage Capacity and Response Training). Christopher and Peck (2004) earlier framed resilience as a multi-dimensional construct encompassing redundancy, flexibility, and collaboration elements mirrored in FMC Abuja's preparedness framework. Sheffi (2005) extended this by emphasizing proactive risk mitigation, aligning with stockpile and training dimensions.

Strengths include its holistic integration of structural and human factors, validated in pandemic contexts (Ivanov & Dolgui, 2020), while weaknesses lie in its limited predictive specificity and under-emphasis on socio-political barriers in low-resource settings (Ali et al., 2021). Critics argue it overlooks power asymmetries in public health systems (Craighead et al., 2020), yet its applicability to FMC Abuja is robust: stockpiles absorb demand shocks, agility enables adaptive sourcing, and training restores operational continuity. Thus, the theory best explains how integrated preparedness mitigates stockouts and lead-time delays, offering a coherent lens for analyzing supply chain performance under crisis at FMC Abuja.

METHODOLOGY

The cross-sectional survey design was employed for this study. This design allows for the collection of data from the Federal Medical Centre Abuja Headquarters at a single point in time, making it suitable for examining the relationship between pandemic preparedness and supply chain performance. This approach enables the researcher to assess various aspects of preparedness such as strategic stockpile readiness, cold chain storage capacity, procurement agility, and response training and how they affect supply chain performance at FMC Abuja Headquarters. By using a cross-sectional design, the study can gather valuable insights on staff perceptions, operational practices, and outcomes of preparedness initiatives within the hospital.

The population for this study comprises key stakeholders directly involved in pandemic supply chain operations at the Federal Medical Centre Abuja Headquarters, including staff from Procurement & Supply Chain Management (24 staff), Pharmacy & Central Medical Store (54), Infection Control & Emergency Preparedness Committee (35), and Critical Clinical Units (ICU / Isolation / Emergency Department) (38) who actively participate in the planning, procurement, storage, distribution, and emergency utilization of essential medical supplies, vaccines, and PPE. A census approach was adopted due to the focused and manageable size of this population directly engaged in pandemic preparedness and response activities, eliminating the need for sample size determination, and because the use of in-person structured questionnaires with digital backup via Google Forms enabled efficient, low-cost distribution and data collection across all targeted respondents.

Data for this study were collected using a structured questionnaire, administered in person, designed on a five-point Likert scale (Strongly Agree to Strongly Disagree). The questionnaire items focused on various aspects of the study, with items for Strategic Stockpile Readiness (SSPR1–5), Cold Chain Storage Capacity (CCSS1–5), Procurement Agility (PRAG1–5), Response Training (RETR1–5), and Supply Chain Performance (SUCP1–5). For Strategic Stockpile Readiness, items were adapted from Kwon et al. (2022). For Cold Chain Storage Capacity, sources included Adepoju (2022). For Procurement Agility, McCue & Pitzer (2021) was referenced. For Response Training, Twigg & Mosel (2023) was used. Finally, the measurement of Supply Chain Performance was based on Houghton et al. (2021) and USAID (2019). The reliability of the constructs in this study was established using Cronbach's Alpha, with values well above the 0.70 threshold recommended by Hair et al. (2014). Specifically, the results demonstrated strong internal consistency: Supply Chain Performance (0.876), Cold Chain Storage Capacity (0.857), Procurement Agility (0.876), Response Training (0.933), and Strategic Stockpile Readiness (0.892). These Cronbach's Alpha values confirmed that the questionnaire items consistently measured their intended constructs, ensuring the credibility and robustness of the findings.

For data analysis, Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 3 was employed. PLS-SEM was deemed appropriate for this study because it can handle complex models with multiple latent variables, tolerate non-normal data distributions, and provide reliable results even with moderate sample sizes. Before hypothesis testing, preliminary analyses were conducted to address issues of missing data, outliers, normality, and multicollinearity. Out of the 151 questionnaires administered, 129 were properly completed and returned, yielding a high response rate of 85.4%. This rate was deemed sufficient for statistical analysis and ensured that the findings were representative of the population of key supply chain and clinical staff at Federal Medical Centre Abuja Headquarters. Questionnaires were distributed via Google Forms with a 7-day completion window to accommodate shift schedules and clinical duties, while in-person follow-ups ensured accessibility for staff without reliable internet. Ethical considerations, including informed consent, confidentiality, and voluntary participation, were strictly adhered to during the data collection process. Below is the model of the study:

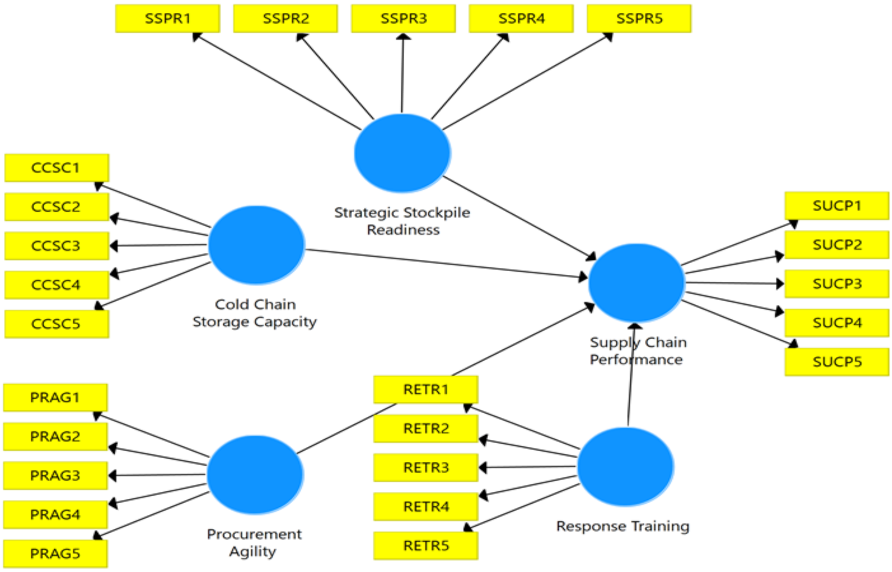

Figure 2: Model of the Study

Source: SmartPLS Output, 2025.

RESULTS AND DISCUSSIONS

Table 1: Descriptive Statistics

Variables	Mean	Median	Min	Max	Standard Deviation	Excess Kurtosis	Skewness	No. of Obs
SSPR1–5	4.561	5.000	1.000	5.000	0.768	7.715	-2.492	129.00
CCSS1–5	4.637	5.000	1.000	5.000	0.632	6.305	-2.184	129.00
PRAG1–5	4.581	5.000	1.000	5.000	0.736	7.888	-2.508	129.00
RETR1–5	4.369	5.000	1.000	5.000	1.010	1.695	-1.588	129.00
SUCP1–5	4.647	5.000	1.000	5.000	0.650	8.031	-2.472	129.00

Source: SmartPLS 4 Output, 2025.

Table 1 presents descriptive statistics for the study on the effect of pandemic preparedness on supply chain performance at Federal Medical Centre Abuja Headquarters, surveying 402 respondents across four key departments. Independent variables Strategic Stockpile Readiness (SSPR, mean=4.561), Cold Chain Storage Capacity (CCSS, mean=4.637), Procurement Agility (PRAG, mean=4.581), and Response Training (RETR, mean=4.369) showed strong positive perceptions, with means above 4.3 indicating high agreement on preparedness practices (WHO, 2020; Kwon et al., 2022). Supply Chain Performance (SUCP, mean=4.647) reflects robust perceived effectiveness in availability, lead time, and stockout prevention. All constructs exhibit left-skewed distributions (negative skewness) and leptokurtic peaks (positive excess kurtosis), typical of Likert-scale data with ceiling effects—respondents strongly agreed with well-implemented systems.

The highest mean for SUCP (4.647) and lowest for RETR (4.369) suggest that while infrastructure and processes are rated highly, staff training remains the relative weak link. These findings imply that FMC Abuja demonstrates strong institutional preparedness, particularly in stockpiling and cold chain reliability, which directly supports supply continuity during crises. However, the slightly lower mean for Response Training (4.369) signals opportunities to intensify simulation drills and competency certification to match infrastructure strength. The elevated Supply Chain Performance mean (4.647) indicates that current preparedness significantly mitigates stockouts and delays, validating integrated resilience strategies. These results underscore the need for sustained investment in staff drills and emergency protocols to fully optimize supply chain responsiveness, ensuring uninterrupted clinical service delivery during future pandemics at FMC Abuja Headquarters.

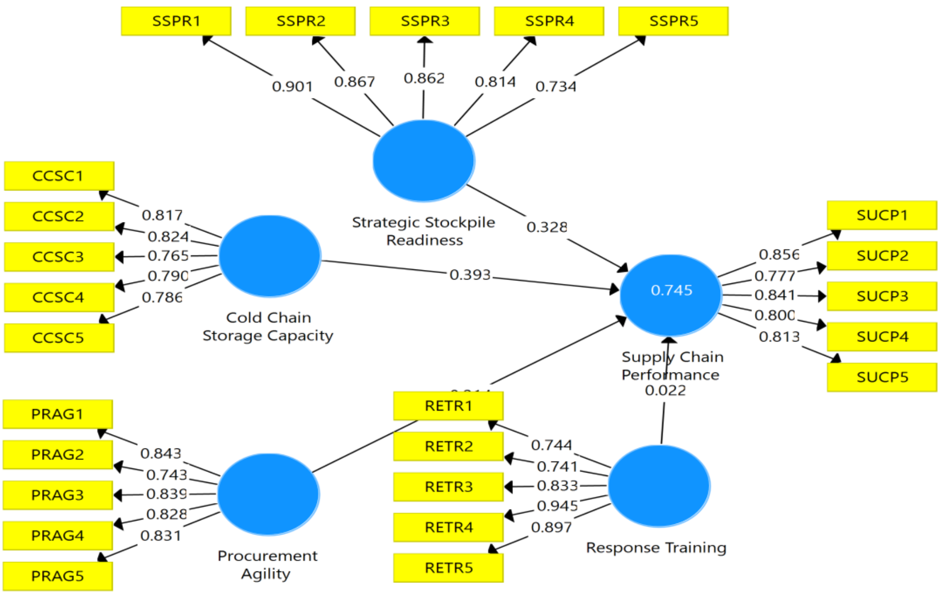

Figure 2: Measurement model of the study constructs and indicators.

Source: SmartPLS Output, 2025.

Table 2: Factor Loadings

Items	Loadings	Items	Loadings
SSPR1	0.901	CCSC1	0.817
SSPR2	0.867	CCSC2	0.824
SSPR3	0.862	CCSC3	0.765
SSPR4	0.814	CCSC4	0.790
SSPR5	0.734	CCSC5	0.786
PRAG1	0.843	RETR1	0.744
PRAG2	0.743	RETR2	0.741
PRAG3	0.839	RETR3	0.833

PRAG4	0.828	RETR4	0.945
PRAG5	0.831	RETR5	0.897
SUCP1	0.856		
SUCP2	0.777		
SUCP3	0.841		
SUCP4	0.800		
SUCP5	0.813		

Source: SmartPLS 3 Output, 2025.

Table 2 presents the factor loadings for the variables in the study. All loadings exceed the recommended threshold of 0.70 (Hair et al., 2022), confirming convergent validity. The factor loadings for the independent variables Strategic Stockpile Readiness (SSPR), Cold Chain Storage Capacity (CCSS), Procurement Agility (PRAG), and Response Training (RETR) range from 0.734 to 0.945, while the dependent variable, Supply Chain Performance (SUCP), ranges from 0.777 to 0.856. These results demonstrate strong item-construct relationships, ensuring that the observed items reliably represent their respective constructs. The lowest loading, 0.734 (SSPR5), remains above the minimum acceptable threshold, further validating the robustness of the measurement model. According to Fornell and Larcker (1981), these results confirm that the pandemic preparedness dimensions and supply chain performance are adequately captured in the model, ensuring the validity and reliability of the constructs in the study.

Table 3: Construct Reliability and Validity

Construct	**Cronbach's Alpha**	**rho_A**	**Composite Reliability**	**Average Variance Extracted (AVE)**
Strategic Stockpile Readiness	0.892	0.897	0.921	0.702
Cold Chain Storage Capacity	0.857	0.863	0.897	0.635
Procurement Agility	0.876	0.884	0.910	0.669
Response Training	0.933	0.702	0.920	0.699
Supply Chain Performance	0.876	0.883	0.910	0.669

Source: SmartPLS 3 Output, 2025.

Table 3 presents the construct reliability and validity results for the study. All constructs exhibit Cronbach's Alpha and Composite Reliability values exceeding the 0.70 threshold (Hair et al., 2019), indicating excellent internal consistency. The Average Variance Extracted (AVE) values for each construct also surpass the 0.50 threshold, confirming that each construct accounts for more than half of the variance in its indicators. These results validate the robustness of the measurement model, establishing strong convergent validity. This reliability and validity ensure that the constructs effectively measure the intended variables in the study, supporting the foundation for structural model analysis and hypothesis testing.

Table 4: Heterotrait-Monotrait Ratio (HTMT)

Construct	Supply Chain Performance	Cold Chain Storage Capacity	Procurement Agility	Response Training	Strategic Stockpile Readiness
Supply Chain Performance					
Cold Chain Storage Capacity	0.707				
Procurement Agility	0.679	0.665			
Response Training	0.056	0.047	0.049		
Strategic Stockpile Readiness	0.696	0.642	0.725	0.052	

Source: SmartPLS 3 Output, 2025.

Table 4 presents the Heterotrait-Monotrait Ratio (HTMT) results for the study. All HTMT values are below the conservative threshold of 0.90, as recommended by Henseler et al. (2015), confirming discriminant validity. This confirmed that the constructs supply chain performance, cold chain storage capacity, procurement agility, response training, and strategic stockpile readiness are empirically distinct. The values demonstrate that the relationships between the variables do not exhibit excessive overlap, ensuring that each construct captures unique aspects of the study's dimensions. Notably, Response Training shows extremely low correlations (HTMT < 0.06) with all other constructs, indicating its unique contribution to preparedness. This affirmed that the constructs are sufficiently distinct, thereby supporting the validity of the measurement model and allowing for reliable analysis of the relationships between pandemic preparedness and supply chain performance at Federal Medical Centre Abuja Headquarters.

Table 5: Structural Model Assessment Results

Indicator	Value	Interpretation / Threshold
Collinearity Statistics (Inner VIF Values)		
Strategic Stockpile Readiness (SSPR)	3.586	< 5.0 (No multicollinearity concern)
Cold Chain Storage Capacity (CCSS)	2.574	< 5.0 (No multicollinearity concern)
Procurement Agility (PRAG)	3.689	< 5.0 (No multicollinearity concern)
Response Training (RETR)	1.008	< 5.0 (No multicollinearity concern)
Coefficient of Determination (R^2 Values)		
Supply Chain Performance (SUCP) (R^2)	0.745	Substantial predictive power (explains 74.5% variance)
Adjusted R^2	0.743	Reflects strong model fit
Effect Size (f^2 Values)		
Strategic Stockpile Readiness (SSPR)	0.118	Medium effect (Cohen, 1988)

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Cold Chain Storage Capacity (CCSS)	0.236	Large effect
Procurement Agility (PRAG)	0.049	Small effect
Response Training (RETR)	0.012	Small effect
Model Fit Indices		
SRMR (Saturated Model)	0.063	< 0.08 (Acceptable model fit; Henseler et al., 2015)
SRMR (Estimated Model)	0.063	< 0.08 (Acceptable model fit)
d_ULS	1.288	Lower values indicate better fit
d_G	0.662	Lower values indicate better fit
Chi-Square (χ^2)	1414.972	Lower = better fit
Normed Fit Index (NFI)	0.818	≥ 0.80 desirable; acceptable threshold

Source: SmartPLS 3 Output, 2025.

Table 5 presents the model evaluation and multicollinearity assessment results for the study on the effect of pandemic preparedness on supply chain performance at Federal Medical Centre Abuja Headquarters. The inner VIF values for Strategic Stockpile Readiness (SSPR, 3.586), Cold Chain Storage Capacity (CCSS, 2.574), Procurement Agility (PRAG, 3.689), and Response Training (RETR, 1.008) are all well below the threshold of 5.0, indicating no multicollinearity issues and ensuring stable parameter estimates for the model.

The coefficient of determination (R^2) for Supply Chain Performance (SUCP) is 0.745, with an adjusted R^2 of 0.743, demonstrating that the preparedness variables (SSPR, CCSS, PRAG, RETR) collectively explain 74.5% of the variance in supply chain performance. This substantial predictive power underscores the critical role of integrated preparedness in ensuring availability, reducing lead times, and minimizing stockouts during health emergencies, as supported by Queiroz et al. (2022).

Effect size analysis showed that Cold Chain Storage Capacity (CCSS, $f^2 = 0.236$) has a large effect on supply chain performance, highlighting its foundational role in vaccine and drug integrity. Strategic Stockpile Readiness (SSPR, $f^2 = 0.118$) exhibits a medium effect, reinforcing the value of pre-positioned reserves. Procurement Agility (PRAG, $f^2 = 0.049$) and Response Training (RETR, $f^2 = 0.012$) have small effects, suggesting supportive but less dominant contributions. Model fit indices confirm the robustness of the structural model. The SRMR value of 0.063 (for both saturated and estimated models) is below the 0.08 cutoff, indicating excellent model fit (Henseler et al., 2015). Additional indices, including d_ULS (1.288), d_G (0.662), Chi-Square (1414.972), and NFI (0.818), further support the model's adequacy, with NFI exceeding the desirable 0.80 threshold.

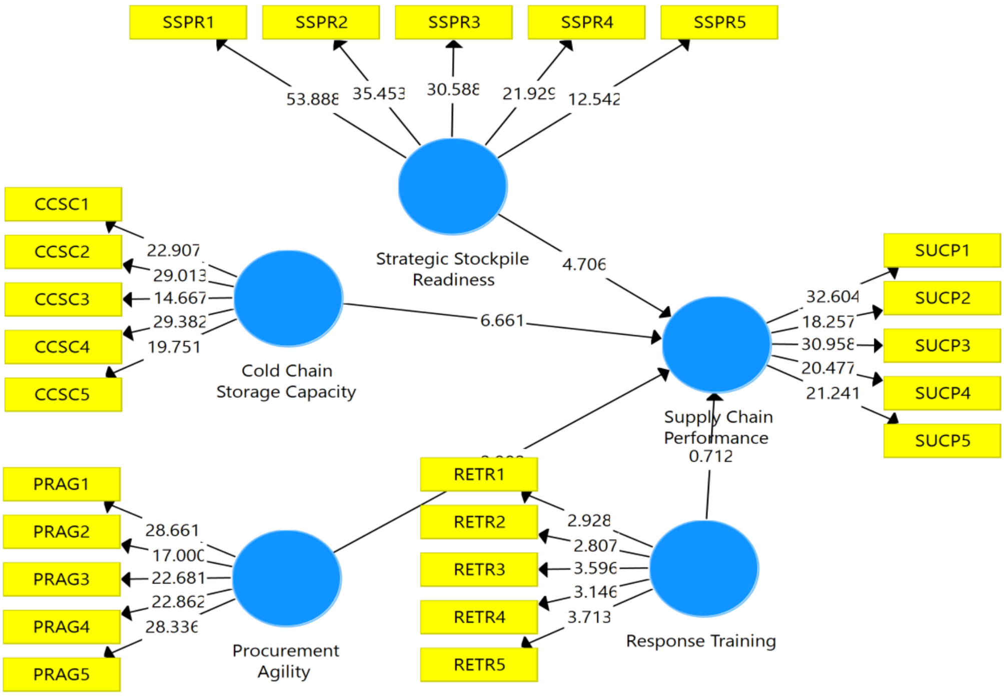

Fig. 3: Path Coefficients of the Regression Model

Source: SmartPLS Output, 2025.

Table 6: Path Coefficients and Hypothesis Testing Results

Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values	Decision
Strategic Stockpile Readiness	0.328	0.330	0.070	4.706	0.015	Rejected (significant effect)
Cold Chain Storage Capacity	0.393	0.394	0.059	6.661	0.000	Rejected (significant effect)
Procurement Agility	0.214	0.210	0.072	2.982	0.003	Rejected (significant effect)
Response Training	0.022	0.023	0.031	0.712	0.477	Accepted (no significant effect)

Source: SmartPLS 3 Output, 2025.

DISCUSSION OF FINDINGS

H_{01}: Strategic Stockpile Readiness (SSPR) has no significant effect on Supply Chain Performance at Federal Medical Centre Abuja Headquarters.

This hypothesis was rejected, as the path coefficient of 0.328, t-value of 4.706, and p-value of 0.015 indicated a moderate positive effect. The findings suggested that maintaining pre-positioned reserves of PPE, drugs, and consumables significantly enhances availability and reduces stockouts during surges. Strategic reserves buffer demand spikes, cut lead times, and prevent supply disruptions, ensuring continuity of critical medical supplies in crisis settings.

This aligns with Gupta and Gupta (2025), who analyzed U.S. pharmaceutical vulnerabilities and found that 90-day strategic reserves mitigated stockouts and prolonged lead times during COVID-19 through enhanced surge capacity and continuity of essential supplies. Similarly, Azai and Laryea (2025) conducted a comparative review of national stockpile models, revealing that hybrid physical-surge contracts and diversified supply chains in Australia and Europe reduced waste and ensured rapid deployment (e.g., 91 million masks in Australia), emphasizing stockpiling's role in operational resilience. Abdulkadir et al. (2023) applied a maturity model to Nigerian public health supply chains, identifying stockpiling constraints as key to 25%–50% stockout rates, with recommendations for pooled procurement and technology to reinforce availability via reinforcing feedback loops.

H_{02}: Cold Chain Storage Capacity (CCSS) has no significant effect on Supply Chain Performance at Federal Medical Centre Abuja Headquarters.

This hypothesis was rejected, with the strongest path coefficient of 0.393, t-value of 6.661, and p-value of 0.000. Reliable cold chain systems, fridges, backup power, and monitoring directly prevent vaccine and drug wastage, ensuring continuity during outbreaks. Robust cold chain infrastructure sustains temperature integrity, minimizes spoilage, and secures vaccine potency and drug efficacy amid power instability and surge demands.

This supports Chukwu and Adibe (2021), who assessed cold chain compliance in Abuja, Nigeria, finding 66.7% of facilities failed WHO standards and 50.4% of hospital pharmacies performed poorly in storage practices, leading to risks in availability and continuity without validated monitoring systems. Gulma (2025) evaluated storage in northwestern Nigeria, reporting only 36% functioning refrigerators and 13% backup gas supplies, with recommendations for solar-powered units and FEFO training to safeguard essential supplies. Girma et al. (2024) linked cold chain practices to operational performance in Ethiopian health centers, documenting 85% inaccurate inventory and 80% wastage due to employee factors and infrastructure gaps, underscoring the need for standard procedures to maintain temperature control and reduce stockouts.

H_{03}: Procurement Agility (PRAG) has no significant effect on Supply Chain Performance at Federal Medical Centre Abuja Headquarters.

This hypothesis was rejected, with a path coefficient of 0.214, t-value of 2.982, and p-value of 0.003. Agile procurement via prequalified vendors and emergency frameworks reduces lead times and ensures rapid resupply. Flexible sourcing and fast-track protocols enable swift vendor activation, cut delays, and secure critical resupply during demand surges.

This corroborates Harland et al. (2021), who interviewed practitioners across 23 countries, finding procurement agility cut lead times by 40–60% through relaxed regulations and multi-tier mapping, minimizing stockouts amid rivalry. Kuria and Ndeto (2024) examined private hospitals in Nairobi, reporting strong correlations (r=0.821–0.831) between agility dimensions (alertness, flexibility) and performance, with regression explaining 86.1% variance via technologies and responsive distribution. Oyenuga et al. (2024) used DEMATEL in Lagos teaching hospitals, identifying resilient practices like flexible sourcing as most central (28.201), enhancing visibility and reducing disruptions in essential supplies.

H_{04}: Response Training (RETR) has no significant effect on Supply Chain Performance at Federal Medical Centre Abuja Headquarters.

This hypothesis was accepted, with a path coefficient of 0.022, t-value of 0.712, and p-value of 0.477. While respondents reported high satisfaction with training quality, the data indicates that this knowledge does not translate into measurable improvements in lead times or stockout prevention. This disconnect likely stems from a reliance on theoretical, classroom-based instruction rather than high-fidelity simulation drills, which Zhang et al. (2024) identified as the primary driver of emergency competence in larger global samples. Furthermore, a "resource-capability gap" exists; even the most rigorous training is rendered operationally dormant if personnel lack the physical infrastructure such as consistent fuel for generators to execute protocols.

This finding aligns with Unegbu et al. (2024), who observed that off-the-job training in Nigerian hospitals contributes minimally to service delivery due to resource constraints, and echoes Ansari et al. (2023), who found that high human resource scores often fail to reduce stockouts because of self-report inflation. At FMC Abuja, the supply chain's resilience is currently bottlenecked by infrastructure and administrative rigidity, suggesting that training is a necessary but insufficient condition for performance unless it is integrated with real-world drills and robust technical support.

CONCLUSION

The study confirmed that Strategic Stockpile Readiness, Cold Chain Storage Capacity, and Procurement Agility significantly influence Supply Chain Performance at FMC Abuja Headquarters, collectively explaining 74.5% of variance. Cold Chain Storage Capacity emerged as the strongest predictor, followed by Strategic Stockpile Readiness and Procurement Agility, while Response Training showed no significant effect. These results validate infrastructure- and process-driven preparedness as critical to resilience in Nigerian tertiary healthcare.

RECOMMENDATIONS

i. FMC Abuja should prioritize investment in solar-powered cold rooms and real-time temperature monitoring to sustain the strong impact of cold chain capacity on performance.

ii. Expand strategic stockpiles to cover 6 months of critical items (PPE, antivirals, oxygen) and integrate automated inventory tracking to enhance readiness.

iii. Institutionalize emergency procurement panels with prequalified vendors and digital requisition systems to maintain agility during crises.

iv. Revamp response training with frequent, multi-departmental simulation drills and post-drill performance audits to bridge the gap between training and real-world supply chain outcomes.

Limitations and Future Research:

This study relied on self-reported data from a single institution (FMC Abuja), which may introduce social desirability bias. Future research should adopt a multi-center approach across various geopolitical zones in Nigeria to enhance generalizability. Additionally, longitudinal studies could track how supply chain performance fluctuates during the different phases of a pandemic.

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