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Supply Chain Management Practices and Quality Performance of Butaro Level II Teaching Hospital

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Abstract

This study aimed to evaluate Butaro Hospital's supply chain management practices and quality performance. Study's goals were to evaluate the impact of procurement of health commodities processes on quality performance, to assess the effects of storage and distribution of health commodities processes on quality performance and to determine the role of electronic logistics management information system (e-LMIS) on quality performance of Butaro Hospital. A descriptive research design carried out, utilizing both qualitative and quantitative data, study's design directed the data collection, analysis, and interpretation processes. Sample size of the study made up with 62 respondents were selected by using a census sampling method from the five different departments which are concerned with hospital supply chain management practices and quality performance of Butaro Hospital. Collected data were analyzed by SPSS version 22.0 for descriptive analysis and inferential statistics analysis, thematic analysis was applied to data captured from interviews. Findings shows that procurement of health commodities and quality performance are positively correlated, as shown by a positive coefficient; this relationship is statistically significant ($p=0.0220.05$). One-unit increase in the procurement of health commodities will result in a quality performance score of (0.119). Probability is ($p=0.440.05$), which indicated that there is a positive correlation between distribution and storage of health commodities on quality performance. (e-LMIS) has a statistically significant positive correlation on quality performance, with a probability of ($p=0.0000.05$) and a contribution to quality performance of (0.807). Quality performance of Butaro Hospital changes by 0.109 due to an increase of one unit. Study concluded that supply chain management practices have a positive impact on quality performance of Butaro hospital, by ensuring the availability of medicines at the dispensing points, ensuring the effective services delivery and promotes Hospital's performance in general. It recommended that Butaro Hospital should improve internet connectivity availability in order to provide better services delivery and to be able to navigate and efficiently use (e-LMIS) system in health supply chain cycle. And that the Hospital should invest in the storage facilities and have a

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required enough storage space together with required materials and equipment to promote a good storage practice (GSP).

Keywords: *Supply chain management, Quality performance, Butaro Level II Teaching Hospital, Healthcare logistics, Inventory management.*

1.0 Introduction

Global supply chain management aims to increase productivity, eliminate inefficiencies, and deliver products in a timely and seamless manner at every stage of lifecycle. In developing countries, supply chain management is becoming increasingly important to provide the flow of materials at the right place, at the right time, and at the lowest possible cost. Industries are focusing on streamlining their supply chain management practices and skills to build a better network of suppliers for their end users. In healthcare, supply chain management is critical to service quality and patient satisfaction, this is especially important in the healthcare industry, which requires an effective supply chain not only for pharmaceuticals but also for hospital supplies (Tugce, *et al.*, 2019)

In Türkiye, four supply chain management practices to evaluate supply chains and manage innovation in Turkish manufacturing industries were presented, namely logistics, supplier relations, customer relations and production (Ulusoy, 2003). A study by Chin *et al.*, (2004) examined how manufacturers develop and implement supply chain management strategies in Hong Kong, the five identified supply chain management practices included creating relationships between customers and suppliers, utilizing Information technology, re-engineering material flows, altering corporate culture, and identifying and use performance measures.

While studying on development of supply chain management practices in Cleveland, US. In 2015, Chen and Paulraj (2004), has identified a set of four valid and reliable practices required for supply chain management, namely lean supplier base, long-term relationships, cross-functional teams, and supplier involvement. In developing countries like Bangladesh, establishing a proper supply chain management system in a hospital or healthcare facility is essential to reduce customer dissatisfaction and provide better service to society (Pervez *et al.*, 2016).

The supply chain surplus determines the quality of health services (Kwon, *et al.*, 2016). To ensure affordable delivery of medical supplies from the point of manufacture to the final consumers, Rwanda Ministry of Health has implemented the integration of health supply chain management (Habiyaemye, 2019). Through an integrated system that includes Rwanda Medical Supply Limited, the Bureau des Formations Médicales Agréées du Rwanda, and private pharmaceutical wholesalers, the ministry of health in Rwanda coordinates the supply of healthcare commodities, medical equipment, and health technologies. These organizations are a part of Rwanda's integrated health supply chain system, and purchases and distributes goods to both public and private pharmacies as well as hospitals and other health facilities (MoH, 2021).

The Rwandan government and Partners in Health (PIH) opened the 140-bed Butaro Hospital in Rwanda's Burera District in January 2011. And in July 2012 the Butaro Cancer Center of Excellence (BCCOE) was inaugurated at the Butaro Hospital. BCCOE is the district and country's referral center for cancer care, but patients from neighboring countries and the region also seek treatment from there (Neal, C *et al.*, 2017). In order to boost the number of healthcare workers by expanding the locations where medical students can receive trainings from, the Ministry of Health

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upgraded Butaro Hospital to the level of a university teaching hospital in August 2022 (MoH, 2022). In May 2023, following the survey which was conducted by Rwanda agency for accreditation and quality healthcare with the support of USAID, the Rwanda integrated health systems activity in collaboration with Rwanda Ministry of Health, Butaro hospital have been assessed and recognized for complying with Rwanda hospital accreditation standards and achieved Level 2 during FY 2022/2023 progress accreditation survey.

1.1 Problem Statement

According to Wagenaar, *et al.*, (2014) availability, accessibility, and affordability of safe medicines must be considered to facilitate healthcare quality. Despite increasing access to drugs and health commodities in different countries, majority of the countries in sub-Saharan Africa are still struggling to manage pharmaceutical supply chains (Sekabembe, 2009). Africa do not consistently have access to the essential health products (Elamin, *et al.*, 2010). In Ethiopia, Malawi, and Rwanda different community case management programs struggle with product availability, in order to develop cost-effective, straightforward, and long-lasting supply chain solutions, program structure, country context, and evidence must be taken into consideration (Chandani, *et al.*, 2012).

In developing countries in Africa and Asia, as many as one-third of the population has limited access to essential medicines due to access issues. Because of these issues, medicine stock-outs have increased, and patients are not receiving a whole package of their prescription medications. Control of clinical situations is hampered when critical drugs are not given, resulting in incidents in which healthcare service consumers face medical difficulties and potential loss of life (WHO, 2014). Drug shortages in public health facilities in Rwanda often force patients to purchase drugs from the private pharmacies at higher costs and not covered by public health insurance (Steele, *et al.*, 2022).

The scarcity of medicines in Rwanda's public health facilities affect the quality performance of health facilities, and may lead to poor clinical outcomes, such as drug resistance mutations and a rise in population mortality. There are no known studies which have focused on supply chain management practices and quality performance in Rwanda at the Hospital level. Therefore, this study is designed to evaluate supply chain management practices and quality performance of Butaro Hospital, in order to improve healthcare service delivery in Rwanda through health supply chain management.

1.2 Research Objective

- i. To evaluate the impact of procurement of health commodities processes on quality performance of Butaro Hospital.
- ii. To assess the effect of storage and distribution of health commodities processes on quality performance of Butaro Hospital.
- iii. To determine the role of electronic logistics management information system (**e-LMIS**) on quality performance of Butaro Hospital.

1.3 Research Questions

- i. What is the impact of procurement of health commodities processes on quality performance of Hospital?
- ii. What is the effect of storage and distribution of health commodities processes on quality performance of Butaro Hospital?

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- iii. What is the role of electronic logistics management information system (e-LMIS) on quality performance of Butaro Hospital?

2.1 Theoretical framework

2.1.1 Resource Based View Theory

According to this theory, a firm's capabilities and resources determine its success in the supply chain. Firms with unique resources and capabilities that competitors find difficult to imitate will have a competitive advantage in the supply chain (Barney, 1991). According to the firm's resource-based perspective, firm activity can be seen as a hunt for competitive advantage. In a competitive market, supply chain stakeholders seek influence over manufacturing factors that will provide them a competitive advantage over their closest competitors (Ahuja, 2000). The primary objective of the resource-based theoretical perspective is acquiring access to the key competences of another organization in order to acquire a competitive advantage. According to the resource-based viewpoint, a company's most valuable assets are its resources and capabilities.

2.1.2 Transaction Cost Theory

According to this theory, firms choose whether to integrate or outsource specific supply chain activities based on the transaction costs involved. In general, firms will integrate activities with high frequency, uncertainty, and asset specificity and outsource activities with low frequency, uncertainty, and asset specificity (Williamson, 1985). The supply chain management literature has been captivated by transaction cost theory (Williamson, 1991). In a word, transaction cost theory is concerned with how a company's boundary-spanning activities should be organized in order to lower the sum of its production and transaction costs.

Manufacturing prices vary owing to the size of their operations, their learning/revel in results, geographical advantages, and private impacts such as patents, trade secrets, and methodologies. Transaction costs vary as well, and include fees for planning, administering, and monitoring cross-market transactions (Halldorsson, *et al.*, 2015). Transaction cost theory tries to lower the costs involved with carrying out a transaction while selecting whether to make or buy in the context of supply chain management. In general, transaction cost theory suggests that various control and governance systems should be utilized to decrease the danger of supply chain enterprises engaging in opportunistic conduct while outsourcing.

2.1.3 Institutional Theory

According to this theory, firms are influenced by the institutional norms and values in which they operate. Institutional pressures, such as environmental sustainability and social responsibility, can have an impact on supply chain practices (DiMaggio & Powell, 1983). According to institutional theory, firms are under pressure to conform to society standards and look legitimate in institutional environments. In a corporate context, institutional pressures may drive organizations to pursue goals that increase their legitimacy and make them appear to be in compliance with the laws, regulations, and norms that govern their specific industries (Oliver, 1990; Touboulis & Walker, 2015). The formation and growth of a corporate body's formal structure can be significantly influenced by institutional pressure and legitimacy. A structured organization can assure technological efficiency, allowing it to compete. This theory has ramifications for the thinking of supply chain management and other related concerns.

2.1.4 Stakeholder Theory

According to the theory, firms should consider the needs and expectations of a diverse set of stakeholders, which includes customers, communities, employees, suppliers, and the natural environment. The supply chain formation rationale for stakeholder management envisions firms at the center of a stakeholder association (Donaldson & Preston, 1995). Stakeholder theory is concerned with both stakeholders and shareholders. It focuses on creating value for stakeholders. This theory is applicable to a range of business decisions, such as supplier strategy, outsourcing strategy, make-or-buy decision, and so on. Supply chain management decision making, and stakeholder theory are deeply interconnected.

2.1.5 Network Theory

According to McNichols and Brennan (2006), the main focus of networks viewpoint, also known as networks theory in the literature was value creation through inter-organizational relationships. Key concepts in network theory include strong and weak ties. As the labels imply, strong ties involve closely related businesses, and loose ties involve those with numerous flimsy connections (cf. Granovetter, 1973). Each type offers supply chains various benefits. According to Thorelli (1986), it describes, explains, and forecasts relationships between related elements. Supply chains are, in essence, a type of network, thus, network theory has the potential to reveal interesting truths regarding chains. However, as the supply chain networks are expanded to a lot of diverse professional and geographic domains, the organizational supply chains are exposed to numerous kinds of risks. The networks perspective has been utilised for both global supply chain studies as well as supply chain in specific industries or countries (Peck 2005; Zhao, Anand and Mitchell, 2005).

The network theory offers a more comprehensive account of the interactions between organizations in a network environment. In addition to recognizing the impact of partner-partner connections on an organization's operations, it emphasizes the dynamics of network environments (Halldórsson et al., 2007). The Network Theory asserts that a network resource view helps managers to build a lot of accurate assessments of individual node resources and their implications for company by emphasizing the concept of strong and weak linkages. The theory is also useful for examining the persistence and trust in bilateral relationships (Gadde & Hkansson, 2001). By using a network strategy, businesses may build their supply chains to take advantage of benefits like strong ties' ability to produce stability and weak ties' capacity to create flexibility and control responsiveness. By displaying network-wide knowledge-sharing procedures and management, the NT also has the potential to support supply chain innovation (Miles & Snow, 2007).

2.1.6 Strategic Choice Theory

This theory is focused on how organizations make decisions in order to accomplish their stated objectives. Institutional theory and other externally focused strategies are in opposition to strategic choice theory. According to the strategic choice theory, managers' choices greatly influence whether an organization succeeds or fails (Child, 1972). Strategic renewal and repositioning are a key topic in the theory of strategic choice. The underlying presumption is that firms will actively shape and enact their environment. This theory aims to offer solutions to some supply chain management studies, such as those in (Ketchen and Hult, 2007). Decisions in the supply chain have both direct and indirect effects on revenue and stock prices. - Organizational supply chain methods that are tailored to the lifecycle of the company (Meyer and Coleman, 1978) - supply chain tactics that can take into account a variety of organizational tactics. The circumstances that made each of

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those tactics more successful. One of the limitations of the strategic choice theory in defining supply chain activities is that it pays less attention to the effective execution of organizational processes and is more concerned with the governance structure and political forces involved in decision-making. Child (1997) underlines that the authoritative management group's ability to "influence the structures of their organizations through a primarily political process" is a key component of the strategic choice theory. According to Ketchen and Hult (2007), the strategic choice theory is a good theory to use when presenting studies on "strategic supply chain management."

2.2 Empirical Literature

2.2.1 Procurement of Health Commodities

The Chinese government launched the first phase of the national centralized drug procurement (NCDP) pilot (dubbed the "4 + 7" program) in mainland China in 2019, with 25 medications included. Chen, L. *et al.*, (2020) conducted a study to investigate the effects of NCDP policy on drug consumption and expenditures, as well as to identify the primary elements influencing drug expenditure changes. This study made use of drug purchasing order data from the Shenzhen 2019 Centralized Drug Procurement Survey. As study samples, 23 "4 + 7" policy-related types and 15 fundamental alternative medications were selected. The A.M. index system analysis.

(Addis & Magrini N.' approach) was used to examine the factors influencing changes in drug expenditures. After the NCDP policy was implemented, the volume of "4 + 7" policy-related variety climbed by 73.8%, with winning items increasing by 1638.2% and non-winning products decreasing by 70.8%; expenditures on "4 + 7" policy-related varieties reduced by 36.9%. Structure effects (0.47) and price effects (0.78) both contributed negatively to the increase in "4 + 7" policy-related drug expenditures, while volume effects (1.73) had a favorable contribution. NCDP policy reduced drug expenditures by "4 + 7" policy-related variations, with structure effects playing a key role. However, due to the increased use of alternative medications, total drug costs were not adequately managed.

In Tanzania, Medical Stores Department (MSD), the national supplier to public health facilities, provides health commodities to Tanzanian hospitals. Therefore, missing health commodities at Medical Stores Department (MSD) may be obtained from prequalified private vendors. Mbepera (2022), used a cross-sectional descriptive study at tertiary health care facilities to assess hospital procurement processes from private vendors. A semi-structured questionnaire was utilized to collect data on procurement methods for missing health commodities at the Medical Stores Department (MSD), as well as current and retrospective documentation. In five regions, fifteen hospitals were chosen at random sampling.

Purchases were also made from non-prequalified sources, according to reviewed documents. The study showed that there was no consistency in the procurement of health commodities from private vendors among the examined institutions. Compliance with public procurement procedures varies and is frequently lacking. Adherence to public procurement standards was required to simplify procurement procedures of health commodities from private vendors when stocked-out at Medical Stores Department (MSD) in order to ensure uninterrupted supply of health commodities to hospitals and attainment of value for money.

Direct association between strategic planning and procurement was 18%. However, when the total causal effect was computed, it was discovered that strategic planning and the linked variable of

finance contributed 77% to medical procurement under the existing hierarchical model in which MOH is entrusted with developing strategic plans for the whole health sector. Because there were complaints with this contribution, this study has offered a new model called CALF, which, according to a simulation, if used by MOH, in which would contribute 87% to the effectiveness in medical procurement.

Byomuhangi (2019), conducted a study to describe various aspects of PPPs in Health Supply Chain Management (HSCM). Purposive sampling, a non-probability sampling approach, were used, semi structured questionnaire was a data gathering approach for this study. After entering data into the template in MS Excel, the data was exported into SPSS for statistical testing. Univariate and bivariate analysis were employed. The data discovered was also graded in accordance with the pertinent questions.

Findings revealed that Public-Private Partnerships (PPPs) areas employed in HSCM in Rwanda included commodity supply (99%), delivered health supplies IT supplies and other medical equipment (operate) (53%), finance (52%), maintenance area (40%), and project design (35%). build area, health facility/building construction (31%). Company's contribution to PPPs included the availability of health commodities (99%), the cost effectiveness of patient treatment (84%), transportation (71%), financing (61%), and infrastructure (36%). In Rwanda, the chances for implementing PPPs in HSCM were 95% political will, 92% active private pharmaceutical industry, 83% well-structured health supply chain, 80% universal health coverage, and 76% e-health systems (e-procurement, online importation).

The respondents agreed that there were difficulties in implementing PPPs projects in HSCM, and these difficulties included limited communication or dialogue and the lack of formal platforms or systems for public and private engagement (83.7%), difficult requirements for public institutions to procure medical products and equipment (73.3%), ineffective coordination/management and a lack of clarity of roles and responsibilities between public institutions and key stakeholders (67.6%), effective management/coordination of PPPs (93.3%), enhanced dialogue and formal platforms (90.6%), promotion of transparency for all partners (89.3%), development of trust between parties in PPP (84%), appropriate risk allocation (financial) (81.3%).

Legal regulations and reminders regarding PPPs in HSCM (65.33%), and properly drafted contractual documents (64%) are actions/strategies to improve PPPs in HSCM. Study concluded that the private sector plays an important role in managing Rwanda's healthcare supply chain through PPPs. Private sector involvement can increase the financial support associated with funding HSCM activities, such as the supply and delivery of healthcare supplies and other medical equipment. PPPs in HSCM enables the effective and affordable medications for patients through the availability and accessibility of subsidized medicines. This requires that public decision makers at various levels always take into account private sector involvement in HSCM.

2.2.2 Storage and Distribution of Health Commodities

Suiyati, *et al.*, (2022), conducted analysis of drugs distribution system in Karanganyar district hospital, Indonesia. The study's purpose was to determine the percentage of drug compatibility with stock cards, to determine the turnover ratio as well as the proportion of expired and damaged drug value. To determine the average time, it takes to deliver drugs into the hands of patients, and to determine the percentage of drugs served at Karanganyar district hospital. Drugs distribution system in Karanganyar Regency's Inpatient Hospital was studied using a descriptive research approach. The data gathered in the form of primary and secondary data. The findings show that

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the percentage of matches between pharmaceuticals and stock cards is 86.6%, while the indicator set is 100%, indicating that the indicator set was ineffective.

The turnover ratio value was 9 times turnover, whereas the usual indicator is 8-12x capital turnover in one year. This indicates that the turnover ratio is effective. The percentage of expired/damaged medicine value is 4.5%, while the standard indicator is 0% indicates that it was ineffective. The average time it takes to get medicines into patient's hands, the long waiting time for compound pharmaceuticals is 36.28 minutes, while the long waiting time for non-concoction drugs is 29.42 minutes, with service hours from 14.00 to 20.00. When compared to the standard value of compound pharmaceuticals (30 minutes) and non-concoction drugs (15 minutes), this is inefficient. The percentage of pharmaceuticals not served is 0.0085%, indicating that it has not been effective based on its indicator of 0%.

Dairo, *et al.*, (2016) conducted a study on factors affecting vaccine handling and storage practices among immunization service providers in Ibadan, Oyo State, Nigeria. A cross-sectional study design was used to evaluate the factors related with vaccination handling and storage methods. Three stage sampling was utilized to recruit 380 vaccine handlers from 273 health institutions in 11 Local Government Areas in Ibadan. SPSS 16 was used to analyze the data. 73% were aware of vaccination handling and storage recommendations, with 68.4% having ever read such instructions. Only 15.3% had read the guideline within the previous month of this study. About 65.0% had undergone vaccination management training.

Incorrect handling procedures noted included storing vaccines with injections (13.7%) and preserving vaccine temperature by using ice blocks (7.6%). Approximately 43.0% had strong knowledge of vaccination management, while 66.1% had a good vaccine management practice. Respondents with strong understanding of storage and vaccine handling [OR=10.0, 95%CI (5.28 - 18.94), p 0.001] and formal vaccine management training [OR=5.3, 95%CI (2.50 - 11.14), p 0.001] were likely to have a good vaccine handling and storage practices. The study recommended a regular training to improve vaccination handling and storage methods.

Akingeneye (2019), conducted a study to assess the storage conditions of pharmaceutical products in Rwanda. A descriptive analytical study was conducted in which the actual state of pharmaceutical product storage in Rwanda was reported and tested to see whether it complies with Good Storage Practices (GSPs) and manufacturer recommendation on storage settings. The survey included ten district pharmacies out of thirty and the RBC/MPPD warehouses. As data sources, a questionnaire, a check list on warehouse premises layout, and temperature and humidity records for three years which was (2016-2018) were employed.

According to the findings, Rwanda has warehouse premises, but they are constructed as residential buildings for occupancy, thus space is limited, and they are not adequately equipped as required by the pharmaceutical warehouse requirements. They are inadequately aired, medicines are exposed to direct sunlight, no calibrated devices in the cold-rooms. Temperature was not monitored at district pharmacies during holy days and weekends, warehouse staffs were using different academic backgrounds some of them have been trained for a long time ago, cartons of products were stacked not following Good Storage Practices guidelines.

There was no regular monitoring at district pharmacies on relative humidity, there was a lack of cool storage conditions (i.e., 8°C to 15°C), distribution area was not separated from receiving area in all evaluated district pharmacies. The study revealed that pharmaceutical product warehouses are available, but there are many problems that must be addressed, as well as the introduction of

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various features that are now lacking. In addition, prompt corrective and suitable steps are required to protect products that are at risk of degradation due to poor monitoring and required storage conditions as well as conditions which have been advised by manufacturers.

Nyirimanzi, *et al.*, (2023) assessed medicines cold chain storage conformity with the requirements of the World Health Organization in health facilities of the Eastern Province of Rwanda. The study examined medicine cold chain storage compliance in public health facilities in Rwanda's Eastern Province. A prospective and cross-sectional study with qualitative and quantitative approaches were used, by using stratified, convenience, as well as purposive sampling strategies 44 health facilities. Data loggers for refrigerators temperature were attached to test the Mean Kinetic Temperature. (MKT). Overall performance of cold chain storage compliance of refrigerators evaluated was 54 (73.0%).

The conformance observed in public health facility pharmacy stock refrigerators was 22 (56.0%), in immunization program was 25 (100.0%), and in private pharmacies was 7 (70.0%). At this rate, the MKT measurements met the required cold chain storage. Most of the refrigerators used in pharmacy stock (27.0%) were 8 to 10 years old, whereas those ones used in immunization programs were less than 4 years old. Regular refrigerator and temperature monitoring device (TMD) calibration rates were 39.0% and 24.0%. And some of the respondents, 44 (80.0%), were aware of proper cold chain storage; however, only 16 (29.1%) were aware of the impact of keeping cold chain products with vaccinations.

Transportation of cold chain products from central medical stores evaluated revealed inefficiencies since only one of them used temperature data recorders during the delivery of the products listed above. This study concluded that the cold chain storage conformance of pharmaceuticals studied in seven areas of Rwanda's Eastern Province was better than previously reported in other LMICs. However, the cold chain storage for pharmacy supplies did not always fulfill the standards. Observed drawbacks posed a major threat to public health, to optimize cold chain storage, calibrate cold chain equipment, perform routine maintenance, and commission new cold chain equipment were recommended.

2.2.3 Electronic Logistics Management Information System (e-LMIS)

Tewfik (2018) assessed e-LMIS implementation and user satisfaction for pharmaceutical products management in public health facilities of the Addis Ababa Regional Health Bureau. The goal of the study was to determine the efficacy of e-LMIS adoption in optimizing pharmaceutical products management procedures and increasing efficiency at Addis Ababa Regional Health Bureau hospitals and health centers. A descriptive study approach was used to explain the functionality and characteristics of e-LMIS, HCMIS FE as well as to evaluate e-LMIS data utilization and data quality. The research was entirely cross-sectional and was conducted in a single snapshot. Specifically, observation and survey approaches were used. Qualitative and numerical data generated via field survey and observation were then used to generate a descriptive information and frequencies. Data were obtained from 39 users from 49 mature e-LMIS HCMIS adopting public health facilities in Addis Ababa.

In general, the ability of the system to provide timely access to relevant, complete, and customized, logistics information was good, though the use of system generated data for decision making could be improved. This study also discovered that three of the characteristics were statistically significant: information quality ($=0.554$), perceived usefulness ($=0.377$), and system support ($=0.398$), with information quality being the highest predictor of user happiness. The e-LMIS-

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HCMIS system requires major upgrading to meet its purpose in the supply chain context, although good e-LMIS data visibility for all stakeholders was noted, with PFSA coming out on top.

This study concluded that, creating a data-use culture is just as vital as constructing logistics information management solutions. Creating and strengthening a data-driven culture by enabling and training employees to assess and apply data for decision making is critical to increasing supply chain performance. It is also critical to identify the hook or elements that push data use and quality to improve use. Given that the model only explains 58.1% of the elements that contributed to user satisfaction, author recommended that future research should concentrate on including additional components that explain more (60% and above) of the factors that contributed to user satisfaction.

Mkumbwa, *et al.*, (2023) assessed the factors affecting the use of electronic logistics management information system (e-LMIS). The goal of this study was to investigate the factors that influence the usage of e-LMIS data in bottom-up quantification of health commodities in Tanzania's coast region. Explorative cross-sectional study design was used, with a mixed-method approach quantitative and qualitative for data collection and analysis. The study focused on healthcare professionals whose function it is to generate health commodities reports using e-LMIS and then aggregate them in bottom-up quantification methods (N=30). For qualitative and quantitative data gathering, structured interviews and a checklist were used. NVivo 12 and SPSS version 23 were used for data analysis.

According to the findings, one of the major variables influencing healthcare worker's utilization of e-LMIS data is a lack of bottom-up quantification training. Inadequate infrastructure, such as computers, poor ICT skills for using computers and e-LMIS software, a lack of regular supportive supervision on the use of e-LMIS data, and a lack of funds and qualified staff emerged as other major factors affecting the use of e-LMIS data in bottom-up quantification of health commodities in public health facilities. Training was found to be a major source of information for improving e-LMIS system use and increasing favorable attitude toward e-LMIS data utilization ($p=0.003$). The study stated that the elements shown in the current study may affect forecasting, which is based on data from e-LMIS, which records the demand for commodity consumption over time. This is particularly concerning for the consistent availability and affordability of health commodities in public health facilities, as incorrect forecasting may result in inaccurate commodity quantification.

Sindambiwe (2019), evaluated the impact of electronic logistics management information system in Rwanda health supply chain. The goal of this study was to assess the effectiveness of e-LMIS implementation in Rwanda health supply chain at district pharmacies in Rwanda. From July 8 to July 26, 2019, a descriptive cross-sectional study with a qualitative method was carried out. The census convenience sampling method was used to recruit participants for the study. The questionnaire served as a data collection tool. The tool was tested for validity and reliability during its pilot phase. During data analysis, the demographic characteristics of respondents, the level of e-LMIS utilization, and the impact of e-LMIS use in health supply chain management were described and analyzed using the descriptive SPSS version 21, as well as limitations and suggestions.

This study included 59 out of 60 users from 30 district pharmacies. According to the findings of this study, two-thirds of respondents always use e-LMIS as part of their job, and at least half of respondents (57%) use all e-LMIS functions, with 72.9% using e-LMIS information to report. According to the findings of this study, e-LMIS improves data accessibility by 94.9% and reduces

quantification challenges by 57.6%. Furthermore, the use of e-LMIS has improved data quality by 77.9% and inventory management of health products to an optimal level, with losses due to expiries reduced. System complexities, a lack of sufficient staff, and accountability for both users and authorities were highlighted as limitations. The findings revealed that most users only use e-LMIS functions in part and agreed that e-LMIS use will improve health supply chain management. For better use of e-LMIS, it is necessary to resolve system complexities, gain user commitment, and involve local and national authorities.

2.3 Conceptual Framework

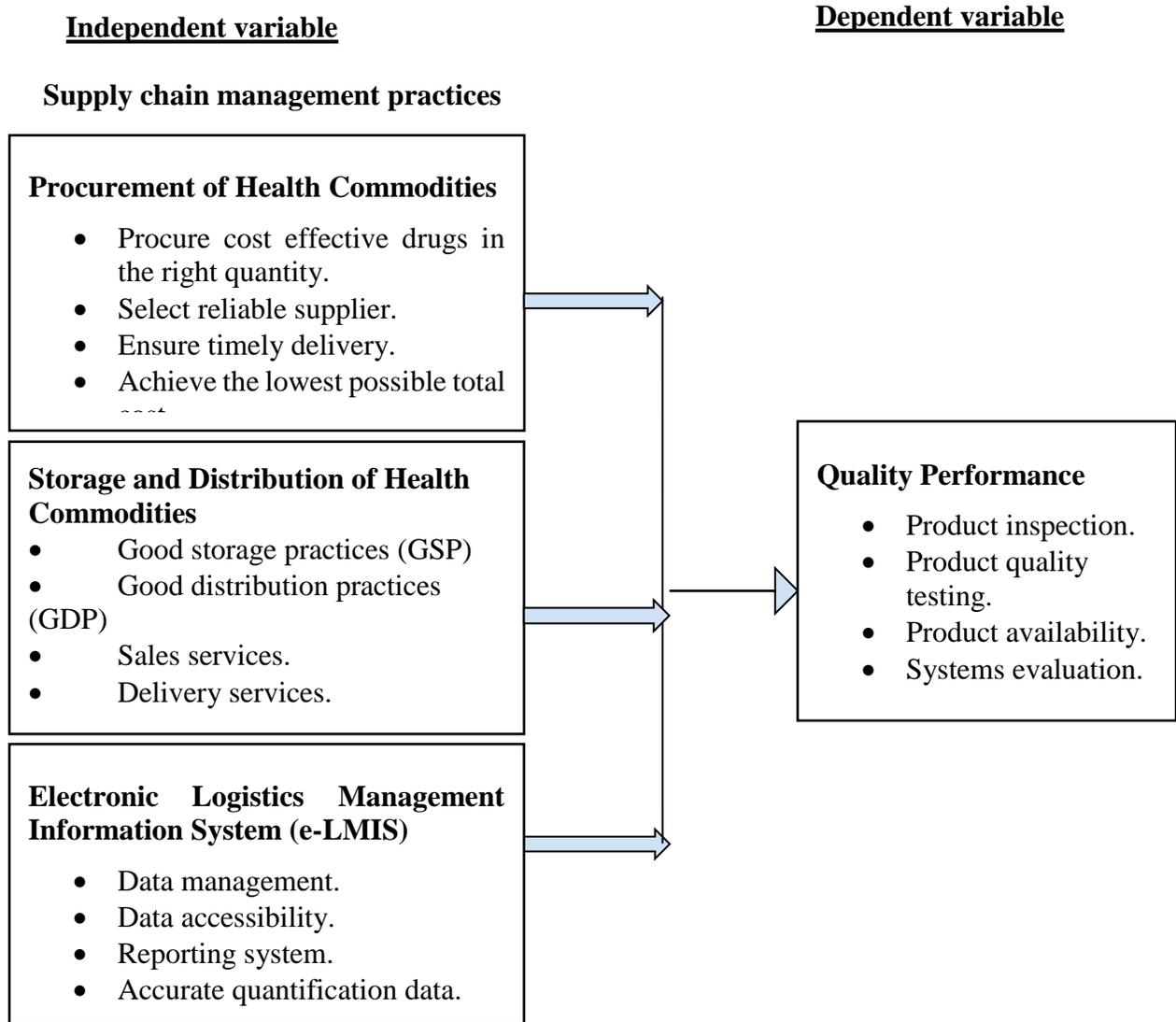


Figure 1: Conceptual Framework

3.0 Research Methodology

A descriptive research design study was carried out, utilizing both qualitative and quantitative data. The study's design directed the data collection, analysis, and interpretation processes. According to Zohrabi (2003), descriptive research studies are designed to accurately represent respondents' views. According to Mugenda and Mugenda (2012), the descriptive survey approach is excellent when the final goal is to assess whether there is a meaningful link between variables at some point in time. The researcher can collect and analyze both qualitative and quantitative data using the descriptive method (Mugenda & Mugenda, 2012). In that regard, the researcher conducted this study descriptively with a mixed approach to be able to meet research objectives. The correlational regression research design was adopted to establish the relationship between variables for specific research objectives.

The target population for this study were 62 employees of Butaro Hospital from the Administration and Finance Unit, Directorate General, Pharmacy Department, Quality Assurance Management Unit and the Corporate Services Division. Sample design refers to a blueprint for acquiring a representative group of respondents, it provides procedures and techniques that the author uses to select items from a representative group (Blaxter & Tight, 2010).

The sample of respondents within this study was employed to capture the primary information of the study. The 62 employees of Butaro Hospital in Burera District/Northern Province from five different departments which were concerned with supply chain management practices and quality performance of Butaro Hospital, were used to determine the sample size. Thus, 27 employees from the Administration and Finance Unit, 6 employees from the Directorate General, 11 employees from Pharmacy Department, 6 employees from Quality Assurance Management Unit and 12 employees from the Corporate Services Division were selected using a census sampling method.

Techniques of sampling were used to select the number of respondents that were used in this study (Alvi, 20216). Thus, this study used census sampling method to select 62 respondents who have equal chance to participate in the study by providing quantitative and qualitative data. Among of the selected respondent, 7 respondent who seemed to have all information related to hospital supply chain management practices and the quality performance of the Butaro hospital have been chosen to be interviewed.

Both questionnaire and interview guide were used to collect primary data, the semi-structured and closed-ended questions which was conceptualized, based on research objectives to answers each of research questions were asked in a questionnaire. The interview guide was used to collect information from managers on the impact of procurement of health commodities processes on quality performance of Butaro Hospital, the effect of storage and distribution of health commodities on quality performance of Butaro Hospital, the impact of electronic logistics management information system (e-LMIS) on the quality performance of Butaro Hospital, assessing the operating procedures regarding to the supply chain of health commodities, Butaro hospital quality performance, and the challenges faced by Butaro Hospital in supply chain management.

Collected quantitative data from 55 respondents who were given questionnaires were coded and entered SPSS 22.0 version for descriptive analysis and inferential statistics analysis. Through the data analysis process, the researcher got qualitative and quantitative results, analyzed through estimated descriptive and inferential statistics. And thematic analysis was applied to data captured from interviews for 7 respondents as qualitative data. The researcher also used a correlation

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coefficient, which was used to establish a relationship between independent variables, and the linear regression analysis model for modeling the relationship between dependent and independent variables, with 95% confidence intervals.

Therefore, $Y = \alpha + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \varepsilon$ whereby, α is constant and $\beta_1, \beta_2, \text{ and } \beta_3$ are the coefficients and ε is error term.

X= Independent variable which is supply chain management practices (SCMP)

Y= Dependent variable which is quality performance (QP)

X1= Procurement of health commodities (PHC)

X2= Storage and distribution of health commodities (SDHC)

X3= Electronic logistics management information system (e-LMIS)

4.0 Findings and Discussion

The study involved 62 respondents who participated fully 100% in providing perceptions and views as response rate. The research results are presented in frequency tables, regression table and ANOVA table.

Demographic information revealed that most of sampled respondents within Butaro Hospital have 2years to 4years of experience as confirmed by 35.82% followed by 34.33% of respondents who have above 5 years. The results however present that 17.79% of respondents have 1year to 2years of experience while the small number of respondents have less than one year presented by 11.94%.

The results revealed a mean of 1.5254 and standard deviation of .72768 implying that a big number of respondents asserted that University is dominated at high level, a mean of 1.3254 and standard deviation of .71399 implying that secondary school respondents have more information about supply chain management practices and quality performance at high level. Thus, the overall mean of 1.2621 implies that respondents declared that supply chain management was achieved in Butaro Hospital. This result shows that all respondents are educated, and the answers are significance to use.

4.1 Descriptive Statistics

Procurement of Health Commodities

According to Cousin and Spekman (2023) an efficient procurement of health commodities procedure will thus ensure that medical products reach all parts of the country via the public health network. Procurement is essentially the acquisition of commodities at a sustainable cost while ensuring that quality is maintained throughout the process. Respondent's appraisal on possible information on the supply chain management practices in Butaro Hospital and quality performance of Butaro Hospital.

Table 1: Procurement of health commodities

Statements concerning procurement of health commodities	Mean	Std. Deviation
Procure cost effective drugs in the right quantity enhances quality performance	1.8383	.48795
Select reliable supplier promotes quality performance.	1.9331	.88372
Ensuring timely delivery enhances quality performance.	1.4667	.74322
Achieve the lowest possible total cost promotes quality performance	1.6667	.81650
Overall mean	1.427	

Key: (5) strongly agree, (4) agree, (3) not sure, (2) disagree and (1) strongly disagree.

Source: Field Data (2022)

The results in table 1 demonstrate the mean of 1.3333 and SD of .48795 shows that the respondents asserted that procure cost effective drugs in the right quantity enhances quality performance to a strongly agree. The mean of 1.9331 and .88372 of SD shows that the respondents declared that select reliable supplier promotes quality performance to a strongly agree. The mean of 1.4667 and .74322 of SD shows that the respondents asserted that ensuring timely delivery enhances quality performance to a strongly agree. The mean of 1.6667 and .81650 of SD shows that the respondents stipulated that Achieve the lowest possible total cost promotes quality performance to a agree extent. Thus, the overall mean of 1.427 implies that respondents asserted that procurement of health commodities processes impact quality performance of Butaro Hospital.

Qualitative data from the employees of Butaro hospital about procurement of health commodities process focussed on positive and negative impact: Thus, one of the interviewees have stated in his own words that: *The procurement of health commodities positively impacts the quality performance of Butaro hospital on the availability of medicines at the dispensing points, ensuring the effective services delivery and promotes hospital performance in general. However, the procurement of health commodities negatively impacted the quality performance of Butaro hospital on stock out and drugs shortages, poor clinical quality services, poor financial performance.*

The descriptive results of this research concerning the first objective have revealed that procurement of health commodities process play a significant role in quality performance of Butaro Hospital which is supported by the results of the study of WHO (1999) revealed that procurement of health commodities has four main objectives which are to procure the most cost-effective drugs in the right quantities, selecting reliable suppliers, ensuring timely delivery as well as achieving the lowest possible total cost

Storage and distribution of health commodities

This section provides information of respondent’s views on storage and distribution of health commodities and said that public health products must be stored in storage rooms, or pharmacies in a way that ensures product safety, quality, and efficacy. Strategic public health inventory storage conditions must be ensured by keeping storage areas clean, environmental conditions control, and implementing product inventory control procedures.

Table 2: Storage and Distribution of Health Commodities

Statements related with storage and distribution of health commodities	Mean	Std. Deviation
Good storage practices (GSP) promote quality performance	1.6105	.81650
Good distribution practices (GDP) promote quality performance	1.7656	.81147
Effective sales services activities enhance quality performance	1.0313	.87230
Effective delivery services activities enhance quality performance	1.2639	.90851
Overall mean	1.4621	

Key: (5) strongly agree, (4) agree, (3) not sure, (2) disagree and (1) strongly disagree.

Source: Field Data (2023)

The results in table 3 show a mean of 1.6105 and standard deviation of .81650 implying that respondents agreed that good storage practices (GSP) promotes quality performance, a mean of 1.7656 and standard deviation of .81147 implying that a big number of respondents strongly agreed that Good distribution practices (GDP) promotes quality performance in Butaro Hospital, a mean of 1.0313 and standard deviation of .87230 respondents strongly agreed that effective sales services activities enhances quality performance while a mean of 1.2639 and standard deviation of .90851 implying that respondents declared that effective delivery services activities enhances quality performance of Butaro Hospital. Thus, the overall mean of 1.4621 implies that respondents asserted that storage and distribution of health commodities processes affect quality performance of Butaro Hospital.

Storage and distribution of health commodities has negative and positive effect on quality performance. Thus, one of the interviewees have said in his own words that: *Negatively: Butaro hospital has storage facility for medical commodities, but it constructed as a meeting room, the space is limited, and it is not adequately equipped as required by the pharmaceutical storage requirements. Products in cartons are stacked not respecting Good Storage Practices, there are no security precautions and safety equipment and there is a stock out for some of the essential medicines.*

Positively: Maintaining proper storage conditions is vital to ensuring the quality of life saving health commodities and product expiration dates monitoring based on adequate storage conditions, and ensuring the storage conditions helps to protect product quality and save resources.

This result supported by Akingeneye (2019), conducted a study to assess the storage conditions of pharmaceutical products in Rwanda. A descriptive analytical study was conducted in which the actual state of pharmaceutical product storage in Rwanda was reported and tested to see whether it complies with Good Storage Practices (GSPs) and manufacturer recommendation on storage settings.

Electronic logistics management information system (e-LMIS)

Electronic Logistics Management Information System (e-LMIS) aimed to resolve issues related to data quality, visibility, and accessibility to required data issues.

Table 3: Electronic Logistics Management Information System (e-LMIS)

Statements on electronic logistics management information system	Mean	Std. Deviation
(e-LMIS) Data management enhances quality performance	1.8644	.73008
(e-LMIS) Data accessibility promotes quality performance	1.8136	.73048
(e-LMIS) Reporting system promotes quality performance	1.7797	.67128
Accurate quantification data enhances quality performance	1.6441	.63688
Overall mean	1.3924	

Key: (5) strongly agree, (4) agree, (3) not sure, (2) disagree and (1) strongly disagree.

Source: Field Data (2023)

The results in table 4 show a mean of 1.8644 and standard deviation of .73008 implying that respondents agreed that (e-LMIS) data management enhances quality performance, a mean of 1.8136 and standard deviation of .73048 implying that a big number of respondents strongly agreed that (e-LMIS) data accessibility promotes quality performance in Butaro Hospital, a mean of 1.7797 and standard deviation of .67128 respondents agreed that (e-LMIS) reporting system promotes quality performance while a mean of 1.6441 and standard deviation of .63688 implying that respondents declared that accurate quantification data enhances quality performance of Butaro Hospital. Thus, the overall mean of 1.3924 implies that respondents asserted that (e-LMIS) plays a role on quality performance of Butaro Hospital.

Electronic logistics management information system (e-LMIS) has an impact on the quality performance of Butaro Hospital. It has positive and negative impact accordingly, *one of the interviewees said about this statement for the negative side in Butaro Hospital, that there are internet connectivity issues, most of times e-LMIS can't be accessible due to internet issues, and therefore the e-LMIS cannot contribute to data accessibility. The e-LMIS cannot contribute to reduction of quantification challenges, quantification is being done manually based on handwritten stock cards data. In other hand it has positive impact: If the internet was working effectively, e-LMIS could: Improve data accessibility and reduces quantification challenges. Improve the quality of data and inventory management of health products with reduction of losses due to expiries.*

Sindambiwe (2019), evaluated the impact of e-logistics management information system in the Rwandan health supply chain. He's findings revealed that most users only use e-LMIS functions in part and agree that e-LMIS use will improve health supply chain management. For better use of e-LMIS, he concluded that it is necessary to resolve system complexities, gain user commitment, and involve local and national authorities.

Quality performance

The results of the researcher presented in this section show that product inspection, product quality testing, product availability and systems evaluation are the party of quality performance in Butaro Hospital.

Table 4: Quality Performance

Statements concerning with quality performance	Mean	Std. Deviation
Products inspection is achieved	1.8475	.69017
Products quality testing is achieved	1.7458	.68464
Products availability is achieved	1.6271	.64054
Systems evaluation is achieved	1.6271	.58423
Overall mean	1.2621	

Key: (5) strongly agree, (4) agree, (3) not sure, (2) disagree and (1) strongly disagree.

Source: Field Data (2023)

The results in table 5 show a mean of 1.8475 and standard deviation of .69017 implying that respondents agreed that products inspection is achieved in Butaro Hospital, a mean of 1.7458 and standard deviation of .68464 implying that respondents strongly agreed that Products quality testing is achieved in Butaro Hospital, a mean of 1.6271 and standard deviation of .64054 respondents strong agreed that Products availability is achieved while a mean of 1.6271 and standard deviation of .58423 implying that respondents confirmed that Systems evaluation is achieved of Butaro Hospital. Thus, the overall mean of 1.2621 implies that respondents asserted that supply chain management practices enhance quality performance of Butaro Hospital. Butaro hospital maintains quality performance for keeping update and revising policies and quality standards based on the performance outcomes. Continuous staff trainings to ensure that all staff are well trained in what they are doing in their daily working activities for enhancing the efficiency of quality performance.

The measurement data showed that supply chain management practices play significant role on quality performance of Butaro Hospital. Thus, one of the interviewees have stated in own words that: *Butaro Hospital achieve quality performance by continuous monitoring and evaluation to assess the hospital processes and performance by using measurements of tangible products and statistical sampling of the process output. Butaro hospital maintains quality performance by ongoing staff trainings to ensure that all staff are well trained in what they are doing in their daily working activities. Keep updating and revising policies and quality standards based on the performance outcomes.* This result supported by Almomani *et al.* (2020) said that quality is measured through performance by physical products, the statistical output of processes, and surveys of users or buyers of goods and services.

4.2 Inferential Statistics

Correlation Analysis

Table 5 shows correlation matrix.

Table 5: Correlations analysis

		PHC	SDHC	ELMIS
PHC	Pearson Correlation	1	.011**	.041**
	Sig. (2-tailed)		.000	.000
	N	62	62	62
SDHC	Pearson Correlation	.011**	1	.025**
	Sig. (2-tailed)	.000		.000
	N	62	62	62
ELMIS	Pearson Correlation	.041**	.025**	1
	Sig. (2-tailed)	.000	.000	
	N	62	62	62

** . Correlation is significant at the 0.05 level (2-tailed).

Each cell in the table shows the correlation between two specific variables. For example, the higher correlation cell above shows that the correlation between “ELMIS (electronic logistic management system)” and “PHC (Procurement of health commodities)” is (0.04), which indicates that they are weak positively correlated between variables.

And the lower correlation cell above shows that the correlation between “SDHC (Storage and distribution of health commodities)” and “(Procurement of health commodities) is 0.11, which indicates that they are weakly positively correlated between variables.

Also notice that the correlation coefficients along the diagonal of the table are all equal to 1 because each variable is perfectly correlated itself.

Regression Analysis

Table 6 shows model summary results.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.846 ^a	.716	.702	.30516

a. Predictors: (Constant), Procurement of health commodities, storage, and distribution of health commodities, electronic logistics management information system.

Table 6 show the model summary table which is used to test the degree of suitability between independent variable (Procurement of health commodities, storage, and distribution of health commodities, electronic logistics management information system) and dependent variable (quality performance). Basing on R-square which 0.716 means 71.6% there is strong relationship between supply chain management practices and quality performance in Butaro Hospital.

The correlation results have revealed that measures of supply chain management practices such as Procurement of health commodities, storage, and distribution of health commodities, electronic logistics management information system, play a significant and positive role on quality performance ($r=0.846$ at 0.01 level of significance. Hence, this implies that supply chain management practices play a significant and positive role on quality performance of Butaro Hospital.

Table 7: ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.790	3	4.930	52.941	.000 ^b
	Residual	5.867	63	.093		
	Total	20.657	66			

a. Dependent Variable: Quality Performance

b. Predictors: (Constant), Procurement of health commodities, storage, and distribution of health commodities, electronic logistics management information system.

The overall regression results as shown in the ANOVA table 4.8 indicates that there is long run relationship between supply chain management practices and quality performance because the F value of 52.941 and significance level of 0.000 which is under 0.05. Hence, since the calculated level of significance it is $0.000 < 0.05$, it implies that supply chain management practices play a positive and significant role on quality performance in Butaro Hospital.

Table 8: Regression Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.064	.119		.541	.591
Procurement of Health Commodities	.119	.096	.080	2.233	.022
1 Electronic logistics management information system	.807	.056	.833	14.457	.000
Storage and Distribution of Health Commodities	.109	.093	.086	2.176	.044

a. Dependent Variable: Quality Performance

The regression analysis equation as $Y = \alpha + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \varepsilon$

$$Y = 0.064 + 0.119 * PHC + 0.807 * ELMIS + 0.109 * SDHC$$

Where

* : is multiplication in this model.

The regression coefficients above establish that taking all factors into Procurement of Health Commodities, Electronic logistics management information system, storage and distribution of health commodities constant at zero, quality performance will be 0.064. Procurement of Health Commodities is positively related with quality performance as indicated with a positive coefficient, it is statistically significant as (p=0.022<0.05). The findings presented that a one unit increase in procurement of health commodities will lead to (0.119) on quality performance. Electronic logistics management information commodities system is positively related with quality performance its probability is (p=0.000<0.05) therefore, there is statistically significant relationship it contributes (0.807) on quality performance. The result indicated that there is positive relationship between storage and distribution of health and quality performance because the probability is (p=0.44<0.05). The increase of one unit leads the change of (0.109) on quality performance of Butaro Hospital. Hence, there is statistically significant relationship between independent variables and dependent variables.

5.0 Conclusion

The descriptive results of this research concerning the first objective have revealed that the procurement of health commodities processes play a significant role on quality performance at the Butaro Hospital. Procurement of health commodities is positively related with quality performance as indicated with a positive coefficient; it is statistically significant as (p=0.022<0.05). The findings presented that a one unit increase in procurement of health commodities will lead to

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(0.119) on quality performance. Procurement of health commodities has positive impacts to the quality performance of Butaro hospital on the availability of medicines at the dispensing points, ensuring the effective services delivery and promotes hospital performance in general.

The descriptive results of the second objective revealed that storage and distribution of health commodities processes has an effect on quality performance at the Butaro Hospital. Storage and distribution processes are positively related with quality performance, the probability is ($p=0.000<0.05$) therefore, there is statistically significant relationship, it contributes (0.807) on quality performance.

The descriptive results of the third objective revealed that electronic logistics management information system (e-LMIS) play a significant role on quality performance in Butaro Hospital. The result indicated that there is positive relationship between electronic logistics management information system (e-LMIS) and quality performance because the probability is ($p=0.44<0.05$). The increase of one unit leads the change of (0.109) on quality performance of Butaro Hospital. Hence, there is statistically significant relationship between independent variables and dependent variables.

6.0 Recommendations

Based on the findings of the study, the researcher would like to recommend to the management department of Butaro Hospital to improve internet connectivity availability in order to provide better services delivery and to be able to navigate and efficiently use (e-LMIS) system data elements in health supply chain cycle. The researcher would also like to recommend that the Hospital should invest in the storage facilities and have a required enough storage space for pharmacy department together with required storage materials and equipment in order to promote a good storage practice (GSP). In additional to that, there is a need for additional staff in the pharmacy department and continuous trainings in order to ensure a safe and effective team to meet the required standards for hospital pharmacy.

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