**The Role of Effective Inventory Management on the Operational Performance in the Health Sector of Sunyani in the Bono Region of Ghana**

**Abstract**

The study assessed the role of effective inventory management on the operational performance in the health sector of Sunyani in the Bono Region of Ghana. The study used a survey design and a quantitative methodology. The study employed simple random sampling to select 124 managers and officers of procurement and operations for health facilities in the Bono Region of Ghana. Structured questionnaire was used as the main data collection tool to gather information from respondents. Both descriptive techniques and inferential analysis was used to analysed the data. The study revealed that the inventory management technique mostly practice by the Sunyani in the Bono Region of Ghana health sector is Strategic Supplier Partnership (SSP) (mean = 4.22; SD = 1.07). With all factors remaining constant, the study shows that a unit increased in VMI practice will bring about operational performance unit increase of 0.264. Moreover, a unit increase in JIT (p-value = 0.014), SSP (p-value = 0.002), ABC (p-value = 0.026), EOQ (p-value = 0.020), and MRP (p-value = 0.001) practices increased operational performance by 0.258, 0.463, 0.234, 0.241, and 0.473, respectively. The study revealed that the biggest challenge facing the health sector was delays in drugs delivery resulting in inadequate inventories (mean = 4.39; SD = 1.31). This challenge was followed by bureaucratic process in procurement (mean = 4.33; SD = 1.34), inadequate funds for procurement (mean = 4.31: SD = 1.76), understocking/overstocking (mean = 4.24; SD = 1.60), and conflict of interest (mean = 4.23; SD = 1.65). The study recommends that the government together with the ministry of health should support the health sector with enough funds to prevent understocking of health products.

**Keywords:** Inventory Management, Operational Performance, Health sector, Role, Effective

**1.0 INTRODUCTION**

**1.1 Background to the Study**

In this 21st Century of intense competitiveness and globalisation, the obligation for health sector either public or private sector is the necessity to be efficient and effective in organising resources and avoiding wastage (Oballah et al., 2015). Health sectors, particularly in developing nations are managed with scarce resources (Oppong, 2019). A considerable amount of the scarce resources are utilised in the purchase of medicine and drugs so as to provide goods and services needed by their customers. Because of the health care system making use of a considerable amount of scarce resources, there is the necessity for it to be effectively managed, and this can be achieved through effective inventory management (Sporta, 2018). Musau et al. (2017) defined inventory as the procedures and policies, which regulate and determine an organisation’s inventory. It is also linked to identification, preparation, procurement, storage, packaging, and transportation of inventories to meet customers’ levels of satisfaction (Sitienei & Memba, 2015; Abd Karim et al., 2018). Inventory management mainly minimizes production costs, thefts, shortages, inventory wastages, while guaranteeing competitiveness, customer satisfaction, sales growth, and in the long run survival of organisations (Irmayanti, 2019).

Preferably, an organisation wishes to have sufficient inventories to satisfy their customers demands and not to lose sales as a result of stock-outs of inventory. Most organisations, small or large have some kind of inventories, which are in place to ensure efficient daily activities and smoother flow of goods and services (Orobia et al., 2020). While too much inventory decreases capital that can be used in other sections of the firm’s activities, insufficient inventory can lead to problems including customer dissatisfaction or loss of sales. The difficulty then becomes ways to effectually manage the overall inventory so that the satisfactory or optimal proportion is maintained (Modgil and Sharma, 2017).

Effective inventory management allows organisations to alleviate risk by hedging against fluctuations as a result of major risk-related issues like weather, market, financial and economic demand. Effective inventory management also aids as a buffer to manage process out variations and uncertainties (Sitienei and Memba, 2015; Omoush, 2020). In addition, effective inventory management avoids understocking and overstocking by determining future and current inventory requirements (Ayivi et al., 2022; Johnson and Ruankaew, 2018). On the other hand, ineffective inventory management could lock up approximate 75% of a company’s total current assets, which could subsequently have effect on their operational performance (Onikoyi et al., 2017; Abd Karim et al., 2018). It could also build a massive gaps in internal controls resulting in fiscal risks: fraud and theft schemes (Zakaria et al., 2016), while exposing organisations to lack of competitive advantages, employee dissatisfaction, lack of flexibility, low quality products, high customer dissatisfaction, product shortages, frequent material wastages, and improper storage practices (Irmayanti, 2019).

1.2 Problem Statement

In order to meet people expectations, it mostly depends on how health facilities can ensure medical supplies availability at their right quantity and at the right time to prevent misuse of the supplies and expiry of drugs. Ghanaian public health facilities resources are inadequate and thus the necessity to find the best and effectual means of minimizing purchasing cost and holding inventory cost. The health sector must offer 24-hour services to its populace, hence the necessity to keep stocks of essential medical supplies and medicines in order to effectively perform their duties. It is widely perceive that poor inventory management in health sector results in poor healthcare delivery and organisational performance (Onikoyi et al., 2017; Atnafu and Balda, 2018; Tang and Anane, 2023).

For example, in Nigeria, Onikoyi et al. (2017) revealed significant and positive relation between control policy, inventory management, and profitability. Atnafu and Balda (2018) revealed that higher level of inventory management practices can result in an improved organizational performance and improved competitive advantage. In addition, Bawa et al. (2018) examined the effect of inventory management on the performance of listed manufacturing firms in Ghana. The authors revealed that inventory management has no influence on performance of companies and is insignificantly associated with manufacturing companies performance. Despite the differences in findings among the above mentioned studies, none of the studies revealed so far was carried out in the Ghanaian health sector. Therefore, this study investigates the role of effective inventory management on operational performance of health sector in Bono Region of Ghana.

**1.3 Importance/Significance of Study**

The study presents a number of benefits to health institutions, policy makers, the general populace and future researchers. The findings from this study can aid health institutions to come up with effective and efficient inventory policies. Hence, the study will highlight how healthcare institutions will manage its inventory policies in order to be efficient and responsive in its downstream operations thus improving the value chain of the supply chain. The general populace will also benefit from the study as the study will presents applicable recommendations on how timely and in the right amounts that inventory would be managed in the delivery of healthcare in order to be capable to satisfy their requirement. In addition, Stakeholders and policy makers in the health sector can use this study as a guide to ascertain how best to run its activities, as the study will disclose the status of health institutions inventory management practices and also reveal the level of service delivery to patients. Lastly, future researchers interested in studying inventory management and operational performance of firms can make use of the study findings in its empirical literature review.

1.4 Research Objectives

The research objectives include

1. To assess the inventory management practices of health sector in Bono Region of Ghana.
2. To examine the effect of different inventory management practices on organisational performance of health sector in Bono Region of Ghana.
3. To identify the challenges facing the health sector inventory management in Bono Region of Ghana.

**2.0 LITERATURE REVIEW**

## 2.1 Inventory

The term "inventory" refers to warehouse or a stock of items (Stock and Lambert, 2001). Musau et al. (2017) defined inventory as the procedures and policies, which regulate and determine an organisation’s inventory. These products are kept on hand at or close to an industry's site so that it can satisfy demand and achieve its goals. If the company is a retail store, a consumer might turn elsewhere to get their needs met if they arrive and the company does not have what they need in stock. If the company is a manufacturer, it needs to hold a stock of raw materials and work-in-progress to keep the plant operational. If the institution is a hospital, it needs to hold inventory of medicines and medical supplies. In order to meet demand, it must also maintain a certain quantity of finished items. Inventory is described as "raw materials, work-in-progress, finished goods, and supplies required for creation of a company's goods and services" (Abd Karim *et al.,* 2018). Inventory is also described by Sitienei and Memba (2015) as "the stock of every item or resource used in an organization." In a larger sense, inventory can refer to both finished goods and work-in-progress as well as inputs like raw materials, equipment, labour, time and money. It can also refer to intermediate stages of the production process like partially finished goods. The physical resources that a company keeps on hand in the hopes of selling them or upgrading their value are known as inventories (Irmayanti, 2019).

## 2.2 Inventory management techniques

Monitoring goods movement out of and into stockroom locations in addition to balancing the inventory are all part of the tracking and management of goods known as inventory management. Managing inventory techniques comprise:

Based on the relative values or impact of the things that make up the group, this technique divides the items into three groups. For instance, the items considered to have the highest value or impact made up the "A" group, while the items considered to have a lesser value or impact are divided into the "B" and "C" groups, respectively (Musau *et al.,* 2017). In many ABC analyses, it is a common error for management to concentrate mostly or exclusively on the "A" items because they are perceived as being of more important than the "B" and "C" items. For the "A" items, it may be decided to assume very high in-stock levels, whereas the "B" and "C" items may have minimal to no availability. The assumption that each item in categories A, B, and C is significant to some degree and that a plan should be in place to ensure availability at a reasonable price constitutes a fallacy. In health facilities, some medicines such as malaria drugs, paracetamol, plaster and oral rehydration salts are categorised under ‘’A’’ items due to their frequent demand and use by patients. By concentrating on the items with the highest prospect for savings, this ordering aims to make sure that procuring employees spend resources as efficiently as possible. Selective control will be more efficient than a method that handles every item the same (Sitienei and Memba, 2015). This concept is pertinent to this study since it contends that, despite the importance of each category of inventory, each category needs to be classed or classified differently based on its relative influence or worth.

Economic Order Quantity (EOQ) describe an accounting formula that identifies the point at which the sum of order costs and inventory expenses is the lowest. Economic Order Quantity is also described by Lysons and Gillingham (2003) as the ideal ordering quantity for a stock item that reduces cost. Lysons and Gillingham (2003) explains that a mathematical representation of reality must be created to ascertain the EOQ. Every mathematical model contains simplifying assumptions about reality. Only when the assumptions are true or almost accurate can the model hold up. An entirely new model needs to be built whenever an assumption is added, changed, or removed. When lead time and demand are rather consistent in addition to when there is a lot of unpredictability and uncertainty, EOQ techniques have been shown to be successful inventory management techniques. The optimal or ideal level of inventory or stock that a company should store or maintain must aid to lower the cost of conducting business, according to this notion, which is pertinent to this study. By the practice of EOQ, health facilities will be able to lower inventory cost.

Material requirement planning (MRP) is a mechanical approach of supply scheduling where the timing of purchases or production output is synchronized to meet operational needs on a period-by-period basis (Modgil and Sharma, 2017). Modgil and Sharma (2017) went on to say that, approaches for material requirements planning aim to carry no more inventory than is necessary at any given time. As a result, carrying only the stock that is necessary at any given moment is prioritized, and this is accomplished via precisely timed material flows to meet requirements.

MRP was described by Orobia *et al.* (2020) as a product-focused computerized method intended to reduce inventory and uphold delivery schedules. MRP makes use of forecasts from sales and marketing in addition to other input data to tie the dependent requirements for the materials and parts that form an end product to time intervals known as "buckets" across a defined horizon (usually one year). Orobia *et al.* (2020) described MRP as a set of logically related rules, decisions, records and procedures aimed to translate a master production schedule into time-phased net inventory requirements for each constituent item required to execute this schedule.

Following are the objectives of MRP, according to Lysons and Gillingham (2003):

• To order and deliver materials and components in accordance with the demands of production.

• To accomplish planned and managed inventories and guarantee that requisite items are available at the moment of use or no earlier.

• To encourage planning between the supplier and the buyer that benefits both parties.

• To make it possible to respond quickly to resolve a material or component shortage brought on by emergencies, delayed deliveries, etc.

The following is how Orobia *et al.* (2020) defined the objectives of MRP:

• Make sure the availability of products, parts, and materials for planned production and delivery to customers.

• Keep your inventory at the lowest possible level.

• Schedule deliveries for production activities and purchase activities.

The material requirement planning system takes planning time into account while also taking into account the actual and planned amounts of inventory items and parts.

In order to lower inventory levels, Otundo and Bichanga (2015) described Just-In-Time (JIT) scheme as an inventory control scheme that coordinates supply and demand such that the requested item arrives just in time for usage. Products should ideally be delivered just when a company needs them, with no tolerance for early or late deliveries. According to Saraste (2013) the JIT scheme is a philosophy of inventory control whose major aim is to keep enough raw materials in the correct location at the right time to deliver the right quantity of finished goods. According to the JIT scheme, inventories should be accessible only when a company requires them, never later nor earlier. According to Onikoyi *et al.* (2017), a JIT system is a strategy that aims to cut out non-value-added tasks from any activity in order to make high-quality goods, achieve high productivity levels, keep inventory levels low, and forge long-lasting bonds with channel partners. The authors went on to say that, everything over the minimum quantity requisite for a task is viewed as wasteful in the JIT system. Thus, JIT aims to decrease inventories by getting rid of safety stock. Because it emphasizes the discovery and removal of production systems, this practice is pertinent to the study at hand. As a result, the entire supply chain system's costs are reduced and needless inventory is eliminated. This will ensure that delivery of medical supplies is done right on time.

## 2.3 Inventory management in the Ghana Health Service

Inventory management schemes quickly and efficiently shift equipment and supplies to the locations where they are required. Typically, supplies and equipment cannot be sent straight from the manufacturer to the final user. At various points along the journey, they frequently need to be kept at the warehouse. Due to this, the Ghana Health Service (GHS) maintains a supply warehouse and maintains an inventory of equipment and supplies at all levels. The inventory management system is aware of the wide range of duties that employees at all levels are responsible for. Consumers of healthcare frequently rank access to necessary medications and supplies as the most crucial component of quality, and the absence of these items is a key contributing factor in the underutilization of public health services.

Three sources, namely international organizations, private supplies on the local market, and producers of medical and pharmaceuticals products on the international market, are used to source health commodities at the national level. As a result, Tema Central Medical Stores (CMS) serves as the storage location for all national purchases of goods. The Central Medical Stores then supply Regional Medical Stores, the Tertiary Hospitals, and even the private sector providers. At the regional level, health supplies are bought from two places: private suppliers on the local market and Central Medical Stores (CMS). All items purchased at the regional level are then kept at the country's sixteen (16) regional capitals' various Regional Medical Stores (RMS). Hospitals in the various regions also make purchases from the same two sources as the regional level procurements, but they do so after first visiting the Regional Medical Stores (RMS). If they are unable to find what they need there, they are then given a non-availability certificate that enables them to make their purchase elsewhere. In GHS, the goods are therefore transported and kept in a number of intermediate facilities at various levels before reaching the health institutions where they are dispersed to patients.

## 2.4 Inventory management role in healthcare delivery

Inventory is crucial to the supply chain for the reason that it increases the quantity of demand that can be met by having the product on hand when the consumer wants it. Without adequate quality of the essential material, quality care cannot be delivered on time. Regarding the availability, safety, and affordability of the medical goods used in medical facilities, inventory management is essential to providing effective healthcare.

## 2.4.1 Timing

The importance of timing is arguably not as great in other industries as it is in the delivery of healthcare, where a delay of a few seconds might result in a fatality. Thus, inventory managers bear enormous duty for ensuring timely availability of thousands of various health items. The difficulty is made much greater by the unpredictability of the anticipated patient population, the unreliability of the providers, and the escalating costs.

## 2.4.2 Safety of patient

In healthcare, patient safety is the first priority, and inventory managers are essential to upholding this goal. The main duty of an inventory management is to guarantee the high calibre of the supplies bought for clinical usage. Cost is a key factor in evaluating commodities, but safety and clinical efficacy issues are given priority. Managers of inventory must also make sure that products are well within their expiration dates before stocking them.

## 2.4.3 Cost (Affordability)

Inventory managers are under intense pressure to start significant cost-cutting initiatives. While the price of medical supplies has been skyrocketing, more patients are demanding high-quality, cost-effective healthcare. Inventory managers should constantly look for better bargains because the cost of supplies makes up a sizable amount of healthcare expenditures. Affordable healthcare is made possible for the vast majority through reasonable prices. The healthcare facility benefits from increased revenue realization as a result of an increase in patient volume. Inventory managers need to constantly look for competitive alternatives—products or methods—that can produce superior results. While price is a significant factor, the product quality should be the top priority to guarantee that patient care is not jeopardized.

## 2.5 Operational performance

According to Saraste (2013), operational performance refers to the swiftness and strength of the logistic chain. Speed and consistency of the supply chain are two attributes of operational performance. Drugs can save many lives if they are utilized properly, at the appropriate time, in the correct quantities, with the right quality, and for an affordable price. This makes handling inventory, especially drugs, in medical stores extremely important. According to research conducted by Kagashe and Massawe (2012) in Tanzania's public hospitals, Dar Es Salaam Region hospitals struggle to keep their drug inventories up to par. Lack of funding, evolving treatment protocols, uncommon medications, an unanticipated rise in patients, a tiny warehouse, bureaucracy, failing to pay suppliers on time, and a protracted procurement process are some of the factors that contribute to low drug stocks (Kagashe and Massawe, 2012).

## 2.6 Conceptual framework

The independent and dependent variables of the study are represented diagrammatically in the conceptual framework. The dependent variable's level of variation is predicted by the independent factors. As a result, any change in the independent variable affects the value of the dependent variable. The independent variable of the study is inventory management practices. These include JIT, MRP, EOQ, VMI, ABC, and SSP. On the other hand, the dependent variable of the study is operational performance. The operational performance examined in this study include quality, on time delivery, safety and cost (Figure 1).

***Independent variable Dependent variable***

**Inventory management practices**

* Just-In-Time
* Material Resource Planning
* Vendor Managed Inventory
* Strategic Supplier Partnership
* Economic Order Quantity
* Activity Based Costing

**Operational performance**

* Quality
* On time delivery
* Safety
* Cost

Figure 1: Conceptual framework of the study

## 2.7 Theory of Constraints (ToC)

Eliyahu Goldratt created the theory of constraints (ToC) as a management philosophy with the goal of recognizing constraints that prevent a system from performing to expectations (Goldratt, 1990). According to the theory, every business has at least one restriction (limiting factor) that prevents its whole system from accomplishing predetermined objectives (Puche *et al.,* 2016). Anything that prevents a company from attaining its objectives is a limitation (Cooper, 2006). It is the primary obstacle to achieving the firm's goals, making it the weakest link in the chain (Stevenson, 2005). The idea also makes the assumption that businesses can only overcome limits by offering a distinct, methodical, strategic, and all-encompassing focus. ToC is a management concept that, according to Gupta and Boyd (2008), centres on constant system enhancement by addressing any constraints through total quality management and efficient processing processes.

The theory contends that institutions can only resolve their inventory problems by implementing the best inventory management strategies that address bottleneck concerns while assuring inventory controls and production planning. The theory works well since it removes all constraints, increases value addition, and does not interfere with the institution’s activities. In this current study, constraints or limitations that may hinder inventory of health facilities include inadequate funds for inventory, uncommon medications, an unanticipated rise in patients’ population, and bureaucracy. The study is thus supported by ToC, which enables health facilities to understand the idea of inventory constraint and how it may be addressed using appropriate techniques like VMI, EOQ, SSP, JIT and ABC analysis, among others.

**3.0 METHODOLOGY**

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## 3.1 Research design

The study used a survey design and a quantitative methodology. Survey design entails the use of both structured and unstructured questionnaire for data collection, with the intent of generalising from a sample to a population (Flynn *et al.,* 2018). Survey design leads to the identification of attributes of a large population from a small sample. Using survey results in the collection of an extensive range of information and data. Nonetheless, one weakness of survey research design is that, respondents may not always be comfortable to provide responses that depict them in an unfavourable way. The survey design and a quantitative method is appropriate for analysing cause and effect connections between the variables being studied (Ghauri *et al.,* 2020). The layout also benefits from getting a lot of responses from a variety of people. This structure permits the use of surveys or standardized questionnaires for data collecting (Creswell and Creswell, 2017). Additionally, it permits the description of important issues using inferential and descriptive statistical procedures that need a substantial amount of narrative and numerical data (Ghauri *et al.,* 2020).

## 3.2 Population

The study employed administrators, managers and officers of procurement and operations for health facilities in Sunyani in Bono Region of Ghana.

## 3.3 Sampling and sampling technique

In all, eight (8) health facilities were selected from the study area. These eight (8) hospitals had 180 procurement officers/personnel and staff related to procurement and inventory. Using Yamane (1967) formula, 124 respondents were selected for the study.

Yamane formula

where *N* is the total number of procurement officers in the study area, *n* is the sample size, and *e* is the margin of error (0.05).

= 124 respondents

The 124 respondents were selected using simple random sampling method, where all members had equal chance of being selected. This sampling technique was used to get fair representative. Moreover, this technique was suitable for undertaking quantitative research as it was straightforward, less expensive, simple and quick (Opoku *et al.,* 2020).

## 3.4 Data collection instrument

Structured questionnaire was used as the main data collection tool to gather information from respondents. Cheung (2021) research showed that a structured questionnaire requires each respondent to answer the same set of questions in a specific order. A well-structured survey is ideal for eliciting objective responses that enable quantitative analysis (Saunders *et al.,* 2012; Cheung, 2021). Additionally, it works well for gathering numerical data for both inferential and descriptive statistics in order to produce more accurate results for population-wide generalization. The question items in the questionnaire all geared toward fulfilling the study's research goals. All of the questions proposed for the study were adapted from earlier research. For example, questions on VMI were taken from (Inman and Green, 2018; Belekoukias *et al.,* 2014), JIT (Yadav *et al*., 2019), EOQ (Korir *et al.,* 2021), MRP (Katuu, 2020), ABC (Vetchagool et al., 2020); and SSP (Qrunfleh and Tarafdar, 2013).

## 3.5 Validity and Reliability of Data Collection Instrument

According to earlier research by Bolarinwa (2015), determining the correctness of all the question items entails weeding out any conflicts and vague or ambiguous statements. Professional and peer reviews helped achieve this. The amount to which a data gathering tool truly measures what it is designed to measure is the emphasis of reliability (Bolarinwa, 2015; Saunders *et al.,* 2012). Additionally, it makes sure that other researchers can use the same research tool in similar study. An internal consistency reliability test called a Cronbach Alpha test is used to make the determination. A Cronbach Alpha is considered acceptable if it has a value of 0.7 or higher (Malhotra, 2015). As a result, the study conducted pre-test of the questionnaire, which was based on 20 key managers and officers of operations and procurement from health facilities in Bono Region of Ghana. Cronbach’s Alpha coefficient for JIT was 0.79, MRP was 0.80, VMI was 0.80, SSP was 0.81, EOQ was 0.82 and ABC was 0.82, which was obtained using Statistical Package for Social Science (SPSS).

## 3.6 Data processing and analysis

Software from IBM SPSS Statistics, version 21, was used to process the data (Pallant, 2020). Following processing, the data were analysed using both descriptive techniques, such as standard deviations and means, and inferential analysis (ordinary least squares regression). The regression analysis was used to examined the causal relationship between inventory management techniques and operational performance. The remaining objectives used mean and standard deviations to analyzed the responses. Six independent variables were used in the investigation, from which the following regression equation was derived:

Y = β0 + β1X1 + β2X2 + β3X3 + β4X4 + β5X5 + β6X6 + ɛ

Where: Y = Operational Performance; β0 = Constant; β1, β2, β3, β4, β5 and β6 = regression coefficients; X1 =Just in Time (JIT); X2 = Material Resource Planning (MRP); X3 = Economic Order Quantity (EOQ); X4 = Vendor Managed Inventory (VMI); X5 = Activity Based Costing (ABC); X6 = Strategic Supplier Partnership (SSP); ɛ = Error Term

**4.0 RESULTS**

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## 4.1 Demographic profile of the respondents

The study revealed that 92 of the respondents representing 74.2% were males and the remaining 32 respondents representing 25.8% were females (Table 1). The study further revealed that less than half (38.7%) of the respondents were between the ages of 41-50 years. Least number (11.3%) of the respondents were between the ages of 21-30 years, while 38 (30.6%) were between 31-40 years and 24 (19.4%) were between 51-60 years.

In terms of educational qualification of the respondents, more than half (77.4%) of the respondents were having first degree, 8 (6.5%) respondents were having diploma, and 20 (16.1%) respondents were postgraduate. Moreover, the study showed that while 32 (25.8%) had worked for more than 15 years, 8 (6.5%) had worked for less than six (6) years. In addition, 48 respondents representing 38.7% had worked for 11-15 years and 32 respondents representing 29.0% had worked for 6-10 years. Regarding marital status, majority (82.3%) of the respondents were married, 12 (9.7%) respondents were single, 6 (4.8%) were divorced and 4 (3.2%) respondents were widowed (Table 1).

Table 1: Demographic profile of the respondents

|  |  |  |
| --- | --- | --- |
| Profile | Frequency | Percentage (%) |
| Age  21-30 years  31-40 years  41-50 years  51-60 years | 14  38  48  24 | 11.3  30.6  38.7  19.4 |
| Gender  Male  Female  Educational Level  Diploma  First Degree  Postgraduate | 92  32  8  96  20 | 74.2  25.8  6.5  77.4  16.1 |
| Working experience  Less than 6 years  6-10 years  11-15 years  More than 15 years  Marital status  Married  Single  Divorced  Widowed | 8  36  48  32  102  12  6  4 | 6.5  29.0  38.7  25.8  82.3  9.7  4.8  3.2 |

## 4.2 Inventory management practices of health sector in Bono Region of Ghana

The first objective assessed the inventory management practices of health sector in Bono Region of Ghana. The inventory management practices from the study included Just-In-Time (JIT), Material Resource Planning (MRP), Vendor Managed Inventory (VMI), Strategic Supplier Partnership (SSP), Economic Order Quantity (EOQ), and Activity Based Costing (ABC).

**4.2.1 Just-In-Time**

The first inventory management practice observed in the study was Just-In-Time (JIT). The JIT in the study ranges from 3.29 – 3.64 with composite mean of 3.45, which implies that the respondents moderately agreed to the JIT practices in the study (Table 2). The study revealed that there is no or little expediting (Mean = 3.63; SD = 1.28), agreement with suppliers for short cycle delivery (Mean = 3.43; SD = 1.36) and accurate prediction of delivery dates by supplier (Mean = 3.29; SD = 1.39).

Table 2: Just-In-Time practices carried out by the health sector

|  |  |  |
| --- | --- | --- |
| Just-In-Time | Mean | SD |
| Agreements with supplier for short cycle deliveries (items which does not take long to deliver) | 3.43 | 1.22 |
| Accurate prediction of supplier delivery dates | 3.29 | 1.24 |
| No or little expediting | 3.63 | 1.18 |
| **Composite mean** | **3.45** | **1.34** |

Likert scale: 1 = strongly disagree, 2 = Disagree, 3 = Moderately agree, 4 = Agree, and 5 = Strongly Agree, SD = Standard Deviation

**4.2.2 Material resource planning**

The next inventory management practice assessed in the study was MRP. The MRP ranges from 3.03 – 4.06, with composite mean of 3.68, implying that the respondents moderately agreed that they practice MRP (Table 3). The MRP mostly practice by the respondents include replenishment of stock (Mean = 4.06; SD = 1.08), followed by determining the amount of items/materials required (Mean = 4.03; SD = 1.12) and determining the amount of items/material held in stock (Mean = 4.02; SD = 1.15).

Table 3: MRP practiced by the health sector

|  |  |  |
| --- | --- | --- |
| Material Resource Planning | Mean | SD |
| The health facility determine the amount of items/material required | 4.03 | 1.12 |
| The health facility determine the amount of items/material held in stock | 4.02 | 1.15 |
| The health facility do replenishment of stocks | 4.06 | 1.08 |
| The health facility create inventory levels for each kind of material/item and communicate requirements and information to procurement operations | 4.01 | 1.16 |
| The health facility assess material/item quality to ensure it meets demands | 3.49 | 1.20 |
| The health facility procure equipment and items required at the health sector | 3.03 | 1.26 |
| The health facility perform inventory tracking | 3.13 | 1.21 |
| Composite mean | **3.68** | **1.28** |

Likert scale: 1 = strongly disagree, 2 = Disagree, 3 = Moderately agree, 4 = Agree, and 5 = Strongly Agree, SD = Standard Deviation

**4.2.3 Vendor Managed Inventory**

The third inventory management practice observed in the study was Vendor Managed Inventory (VMI). The VMI in the study ranges from 3.70 – 4.24 with composite mean of 4.01 (Table 4). This implies that the respondents agreed to the VMI practices in the study. The VMI that recorded the highest mean was electronic payment (Mean = 4.24; SD = 1.01), followed by generation of purchase order (Mean = 4.21; SD = 1.06) and high supply chain integration level (Mean = 4.09; SD = 1.08). Other VMI practices were advanced delivery notices (Mean = 3.94; SD = 1.13), automatic forecasting of materials/items (Mean = 3.87; SD = 1.16) and using suppliers to manage inventory in the best interests of the hospital (Mean = 3.70; SD = 1.22).

Table 4: Vendor Managed Inventory practiced by the health sector

|  |  |  |
| --- | --- | --- |
| Vendor Managed Inventory | Mean | SD |
| Using suppliers to manage inventory in the best interests of the hospital | 3.70 | 1.22 |
| Automatic forecasting of materials/items | 3.87 | 1.16 |
| There is advanced delivery notices | 3.94 | 1.13 |
| Generation of purchase order | 4.21 | 1.06 |
| Electronic payments | 4.24 | 1.01 |
| High level of supply chain integration | 4.09 | 1.08 |
| Composite mean | **4.01** | **1.11** |

Likert scale: 1 = strongly disagree, 2 = Disagree, 3 = Moderately agree, 4 = Agree, and 5 = Strongly Agree, SD = Standard Deviation

**4.2.4 Economic Order Quantity**

The next inventory management practice observed in the study was Economic Order Quantity (EOQ). The EOQ in the study ranges from 3.90 – 4.20 with composite mean of 4.04 (Table 5). This implies that the respondents agreed to the EOQ practices in the health facilities. The EOQ that recorded the highest mean score was ordering costs are evaluated from time to time (Mean = 4.20; SD = 1.08), the hospital maintained minimum stock levels at all the time (Mean = 4.06; SD = 1.15), and the hospital is always aware of the time taken to replenish stocks (Mean = 4.05; SD = 1.09). The remaining EOQ practices were EOQ ensures smooth flow of goods in hospital (Mean = 4.01; SD = 1.22) and holding costs is evaluated to determine the right amount of stock to be procured by the hospital (Mean = 3.90; SD = 1.26).

Table 5: Economic Order Quantity practiced by the health sector

|  |  |  |
| --- | --- | --- |
| Economic Order Quantity | Mean | SD |
| Ordering costs are evaluated periodically | 4.20 | 1.08 |
| Holding costs is evaluated to determine the right amount of stock to be procured | 3.90 | 1.26 |
| The health facility is always aware of the time taken to replenish stocks | 4.05 | 1.09 |
| EOQ ensures smooth flow of goods in hospital | 4.01 | 1.22 |
| The health facility maintained minimum stock levels at all the time | 4.06 | 1.15 |
| Composite mean | **4.04** | **1.16** |

Likert scale: 1 = strongly disagree, 2 = Disagree, 3 = Moderately agree, 4 = Agree, and 5 = Strongly Agree, SD = Standard Deviation

**4.2.5 Strategic Supplier Partnership**

The SSP in the study ranges from 3.91 – 4.46 with composite mean of 4.22, which implies that the respondents agreed that SSP is practiced in the health facilities (Table 6).

Table 6: SSP practices carried out by the health sector

|  |  |  |
| --- | --- | --- |
| Strategic Supplier Partnership | Mean | SD |
| The health facility has continuous improvement programmes that involve our key suppliers | 4.36 | 1.02 |
| The health facility involves key suppliers in our goal-setting and planning activities | 4.16 | 1.11 |
| The health facility actively includes our key suppliers in new product development processes | 4.19 | 1.12 |
| The health facility considers quality as the main criterion in choosing suppliers | 4.46 | 0.98 |
| The health facility regularly solves problems together with our suppliers | 4.25 | 1.10 |
| The health facility has supported our suppliers to enhance their product quality | 3.96 | 1.11 |
| The health facility uses smaller number suppliers as opposed to several suppliers | 4.32 | 1.05 |
| Regular meetings between the suppliers and the hospital inventory team | 3.91 | 1.12 |
| Complete information sharing between the suppliers and the hospital | 4.15 | 1.09 |
| Proper communication between the suppliers and the hospital | 4.36 | 1.03 |
| Long – term agreements between the suppliers and the hospital | 4.29 | 1.09 |
| Composite mean | **4.22** | **1.07** |

Likert scale: 1 = strongly disagree, 2 = Disagree, 3 = Moderately agree, 4 = Agree, and 5 = Strongly Agree, SD = Standard Deviation

From the study (Table 6), it was revealed that the health sector considers quality as their main criterion in choosing suppliers, which recorded mean score of 4.46 and standard deviation of 0.98. Other SSP practices recorded in the study were the health facility have continuous improvement programmes that involve their key suppliers (Mean = 4.36; SD = 1.03), there is proper communication between the suppliers and the hospital (Mean = 4.36; SD = 1.02), and the health facility use smaller number of suppliers as opposed to several suppliers (Mean = 4.32; SD = 1.05). Moreover, there is long-term agreements between the suppliers and the hospital (Mean = 4.29; SD 1.09), the health facility regularly solve problems together with suppliers (Mean = 4.25; SD = 1.10) and the health facility actively include their key suppliers in new product development processes (Mean = 4.19; SD = 1.12).

## 4.2.6 Activity Based Costing

Activity Based Costing (ABC) was the last inventory management practice determined in the study. The ABC practices ranges from 3.79 – 4.28 with composite mean of 4.10, which implies that the respondents agreed to the ABC practices carried out at the health facilities (Table 7). From the study, it was shown that ABC has been closely tied to the competitive strategies of the hospital (Mean = 4.29; SD = 1.03), ABC initiative has the strong active support of top management (Mean = 4.26; SD = 1.08), and ABC data have been used for performance evaluation (Mean = 4.21; SD = 1.11).

Table 7: Activity Based Costing practiced by the health sector

|  |  |  |
| --- | --- | --- |
| Activity Based Costing | Mean | SD |
| ABC has been closely tied to the competitive strategies of the hospital | 4.29 | 1.03 |
| ABC initiative has the strong active support of top management | 4.26 | 1.08 |
| ABC data have been used for performance evaluation | 4.21 | 1.11 |
| Upper management has provided adequate resources, such as commitment and time, to the ABC implementation effort | 4.15 | 1.15 |
| Compensation systems in the institution are designed to motivate employees to implement ABC | 3.88 | 1.16 |
| When the ABC initiative began, the objectives of ABC implementation were clearly understood both by designers and users | 3.79 | 1.19 |
| Composite mean | **4.10** | **1.12** |

Likert scale: 1 = strongly disagree, 2 = Disagree, 3 = Moderately agree, 4 = Agree, and 5 = Strongly Agree, SD = Standard Deviation

## 4.3 Effect of different inventory management practices on organisational performance

This objective of the study assessed the effect of inventory management practices on health sector in Bono Region of Ghana. This analysis was carried out using ordinary least square regression. The different inventory management practices assessed in the study were JIT, MRP, EOQ, VMI, ABC, and SSP. Three subsections were used to discuss the effects of inventory management practices on health sector in Bono Region of Ghana. These subsections included Coefficients, ANOVA, and Model Summary. The study revealed from the model summary that the inventory practices including VMI, JIT, SSP, ABC, EOQ and MRP caused approximate 34.1% of change in operational performance in health sector in Bono of Ghana (Table 8).

Table 8: Model summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Standard Error |
| 1 | 0.639a | 0.418 | 0.341 | 2.84110 |

Predictors: VMI, JIT, SSP, ABC, EOQ, MRP

With the use of F-statistics, the ANOVA result presents the significance test for R and R Square. The regression mean square was divided by the residual mean square to give the F-statistics. In the study, the calculated F-statistics was higher than the F- critical and the significant p-value was lesser than 0.05 (Table 9). This implies that there is significance difference among the different inventory management practices and operational performance in health sector in Bono Region of Ghana.

Table 9: ANOVA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Sum of squares | Df | Mean Square | F | Sig. |
| 1 Regression  Residual  Total | 642.68  954.36  1597.04 | 6  106  112 | 104.06  8.935 | 11.968 | 0.000 |

Independent variables (predictors): VMI, JIT, SSP, ABC, EOQ, MRP

Dependent variable: Operational performance

Using the standardized coefficient, the regression model was:

Y = 12.018 + .264X1 + .258X2 + .463X3 + .234X4 + .241X5 + .473X6

With all factors remaining constant, the coefficient results shows that the health sectors in Sunyani operational performance will be 12.018. With all factors remaining constant, the study results as shown in the standardized coefficient, a unit increased in VMI practice will bring about operational performance unit increase of 0.264 (P-value = 0.008). Moreover, a unit increase in JIT (p-value = 0.014), SSP (p-value = 0.002), ABC (p-value = 0.026), EOQ (p-value = 0.020), and MRP (p-value = 0.001) practices increased operational performance by 0.258, 0.463, 0.234, 0.241, and 0.473, respectively (Table 10). The aforesaid results clearly show that, individually, the inventory management practices have significant contribution in improving the operational performance levels in Bono Region of Ghana Health Sector.

Table 10: Co-efficient

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Unstandardized | coefficients | Standardized | coefficient |  |
| Model | **B** | **Std. Error** | **Beta** | **T** | **Sig.** |
| 1 (Constant) | 12.018 | 1.324 |  | 9.864 | 0.000 |
| VMI | 0.814 | 0.382 | 0.264 | 3.841 | 0.008 |
| JIT | 0.743 | 0.345 | 0.258 | 3.952 | 0.014 |
| SSP | 0.837 | 0.353 | 0.463 | 6.832 | 0.002 |
| ABC | 0.729 | 0.379 | 0.234 | 3.568 | 0.026 |
| EOQ | 0.792 | 0.393 | 0.241 | 3.346 | 0.020 |
| MRP | 0.845 | 0.398 | 0.473 | 5.735 | 0.001 |

Independent variables (predictors): VMI, JIT, SSP, ABC, EOQ, MRP

Dependent variable: Operational performance

## 4.4 Challenges facing inventory management at health sector in Ghana

The challenges facing the Sunyani health sector in their inventory management ranges from 3.29 – 4.39, with composite mean of 4.02, which indicates that the respondents agreed to the stated challenges (Table 11). The study revealed that the biggest challenge facing the Sunyani health sector was delays in drugs delivery resulting in inadequate inventories (mean = 4.39; SD = 1.31). This implies that drugs do not get to the health facilities on time, and this causes inadequate inventories. This challenge was followed by bureaucratic process in procurement (mean = 4.33; SD = 1.34), inadequate funds for procurement (mean = 4.31: SD = 1.76), loss of drugs through inventory management (mean = 4.27; SD = 1.69), understocking/overstocking (mean = 4.24; SD = 1.60), and conflict of interest (mean = 4.23; SD = 1.65). The remaining challenges were weak management system (mean = 4.13; SD = 1.89), holding too little/too much inventory (mean = 4.04; SD = 1.72), usage of outdated storage facilities (mean = 3.93; SD = 1.87), inadequate technology (mean = 3.60; SD = 1.83), inadequate training (mean = 3.46; SD = 1.85) and drugs purchase near expiration date (mean = 3.29; SD = 1.80).

Table 11: Challenges facing inventory management of Ghana health sector

|  |  |  |
| --- | --- | --- |
| Challenges | Mean | SD |
| Conflict of interest | 4.23 | 1.65 |
| Loss of drugs through inventory shrinkages | 4.27 | 1.69 |
| Bureaucratic process in procurement | 4.33 | 1.34 |
| Understocking/ Overstocking | 4.24 | 1.60 |
| Drugs purchase with a near expiration date | 3.29 | 1.80 |
| Delays in drugs delivery resulting in inadequate inventories | 4.39 | 1.31 |
| Inadequate funds for procurement | 4.31 | 1.76 |
| Inadequate of technology /Use of manual inventory management system | 3.60 | 1.83 |
| Usage of outmoded storage facilities | 3.93 | 1.87 |
| Holding too little/too much inventory | 4.04 | 1.72 |
| Weak management system | 4.13 | 1.89 |
| Inadequate training | 3.46 | 1.85 |
| **Composite men** | **4.02** | **1.69** |

Likert scale: 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

## Discussion of results

The study revealed that the inventory management technique mostly practice by the Sunyani health sector is SSP. This shows that the health facilities in their inventory management have long-term relations with suppliers, have good communication with suppliers, have adequate sharing of information and high level of trust with suppliers. This will enable the health sector to get important resources in terms of exposure, fiscal support, and expertise. In a related study, Mukopi and Iravo (2015) and Opoku *et al.* (2020) studied companies practice of inventory management practice and reported that SSP is the most widely inventory management practice.

Among the inventory management practices, ABC practice came second, thus, the health sector in Sunyani prioritizes their inventory. This is done by managing inventory in order of value and importance. Hence, highly valued or very important (core) inventories are given special fiscal support, security and control than the less important inventories (Monczka, 2015; Child, 2016; Mulandi and Ismail, 2019). Moreover, a study conducted by Eckert (2017) revealed that ABC practice brings about identification and classification of cost, and this aids companies to better comprehend their costs structures to improve competitiveness.

The remaining inventory management practices were EOQ, VMI, MRP and JIT. The JIT recorded the least mean score, implying that the health sector do not always practice JIT. This can be attributed to the fact that JIT is mostly effective when institutions have highly responsive supply chains (SC) that is able to meet demands as and when needed. Possibly, there is lack of such robust SC within the health sector particularly in developing countries like Ghana, making it difficult for the health sector to carry out such a practice. Notwithstanding, JIT is based on some key fundamentals: keep inventory that is only required, ensuring quality with no defects, and reduce lead times through reductions in queue lengths, lot sizes and set-up times (Chen *et al.,* 2020; Opoku *et al.,* 2020). Nonetheless, most health facilities in Ghana find in difficult to adopt this practice mainly because of their over-dependence on obsolete technology, meanwhile JIT calls for sophisticated technology.

From the study, SSP was the practice that recorded the greatest significant impact on operational performance. This implies that having strategic partnership with one’s supplier allow them to get appropriate/relevant resources to meet the health sector’s needs to promote client satisfaction and invariably operational performances in areas of dependability, speed, operational flexibility, and product quality while decreasing cost. Earlier studies in the research area conducted by Masudin *et al.* (2018) and Opoku *et al.* (2020) recorded a positive significant relations between inventory management practices and operational performance of firms.

Other inventory management practices that had significant effect on operational performance of the health sector of Sunyani were MRP, VMI, JIT, EOQ and ABC. In a related study, similar findings were found by Mbah *et al.* (2016) and Atnafu and Balda (2018), who discovered positive significant difference between inventory management practices and operational performance of companies. In addition, a study conducted by Kimani (2018) and Akinlabi (2021) reported that inventory management practices contribute to operational performance of companies.

The findings from this study on challenges facing inventory management relates to findings reported by other researchers such as Ogbo et al. (2014), Oballah et al. (2015), and Osei (2015). In the research conducted by Osei (2015), the author reported on challenges facing inventory management the health sector to include overstocking, delays in drugs delivery, conflict of interest and bureaucracy. Oballah et al. (2015), the authors mentioned challenges facing inventory management the health sector to include inadequate funds, drugs loss due to inventory shrinkage, weak management system and inadequate funds.

## Conclusions

The study concludes that the health sector in Sunyani practice inventory management. The inventory management mostly practice were Economic Order Quantity, Activity Based Costing and Strategic Supplier Partnership, while Just In Time was the least practiced inventory management. Hence, Economic Order Quantity, Activity Based Costing and Strategic Supplier Partnership were greatly probable to improve the health sectors’ flexibility, dependability, speed, and product quality, while reducing cost. All the inventory management practices had significant positive relation with the health sectors’ operational performance. However, the health sector faces challenges in their inventory management practices. The biggest challenge facing the health sector was delays in drugs delivery resulting in inadequate inventories. This challenge was followed by bureaucratic process in procurement, inadequate funds for procurement, understocking or overstocking, conflict of interest and loss of drugs through inventory management. The remaining challenges were weak management system, holding too little/too much inventory, usage of outdated storage facilities, inadequate technology, inadequate training and drugs purchase near expiration date.

## Recommendations

The following recommendations have been suggested:

1. The Ghanaian Health Sector should invest greatly in Strategic Supplier Partnership to appropriately manage their inventories. This can be accomplished by strategically collaborating and incorporating key suppliers into their inventory management activities and functions.
2. The study recommends that the government together with the ministry of health should support the health sector with enough funds to prevent understocking of health products.
3. Further study is recommended on effect on inventory management on operational performance of other sectors of the economy such as manufacturing, education and construction.

**Abreviations**

SSP Strategic Supplier Partnership

VMI Vendor-managed inventory

JIT Just-In-Time System

EOQ Economic Order Quantity

## MRP Material Resource Planning

## ToC Theory of Constraints

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