

CrossRef DOI of original article:

# 1 Inventory Management and Control Systems in Covid-19 2 Pandemic Era: An Exploratory Study of Selected Health 3 Institutions in Anambra State, Nigeria

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6 *Received: 1 January 1970 Accepted: 1 January 1970 Published: 1 January 1970*

## 7 **Abstract**

8 The content and scope of this study explored inventory management and inventory control in  
9 selected health institutions in Anambra state. The study adopted survey research design.  
10 Inventory management, was measured by re-order level system, periodic review system and  
11 economic order quantity model while inventory control, was measured by optimal stock level.  
12 Out of a population of 74 drawn from 7 health institutions, Taro Yamane (1967) formula and  
13 stratified sampling technique were used to determine the sample size of 66 respondents.  
14

15 *Index terms*— inventory management, inventory control, COVID-19, health institutions, and challenges

## 16 **1 Introduction**

17 a) Background to the study inventory management and control which revolve around coordination of materials  
18 availability, control, utilization and procurement of materials helps firms to maintain the optimum level of  
19 inventory at any given time. Issues concerning inventory management generally involve the overall success of an  
20 enterprise (Iliemena, Ijeoma & John-Akamelu, 2019). This is because, the revenue and profit capacities of any  
21 business depend on its inventory level which also indirectly makes it an issue of concern when the sustainability of  
22 a business institution is in discussion. Inventory management is however, not a new concept in itself as there have  
23 been past studies in this regard (Bawa, Asamoah & Kissi, 2018; Prempeh, 2016; ??ensah, 2016; ??wanzi 2016).  
24 Due to the nature of inventory in health institutions, health implication of poor inventory management system  
25 and the need to ensure the sustainability of health institutions being one of the basic needs of an economy, we  
26 considered it a very necessity to evaluate how effective the old systems of inventory management and control work  
27 given the present COVID-19 pandemic emergencies. Owing to this, a lot of developed countries have adopted the  
28 use of advanced technologies in inventory management but the case is reverse for developing countries like Nigeria  
29 whose poor technological infrastructure and general economic condition may not support the advanced systems  
30 (Dedunu & Weerasinghae, 2018). As effective inventory management system is basic to corporate success, the  
31 inventory management objective of health institutions in the corona virus era is expected to constantly strike a  
32 balance between demand, inventory level (considering availability, perishability and high/low patient turn-up as  
33 the case maybe), supply and adequate return on investment. Onikoyi, Babafemi, Ojo and Aje, (2017) did not  
34 find it necessary for continuous study on inventory management especially as excess inventory were indications  
35 of wealth accumulation but recent events in terms price level changes, current health trend, general economic  
36 and health implications  
37

## 38 **2 c) Objective of the Study**

39 The broad objective of this study is to explore the inventory management and control systems being used by  
40 selected health institutions, and its suitability and challenges in the Covid-19 era using the case of Anambra  
41 state, Nigeria. To achieve this, this study specifically sought to:

## 5 B) STATEMENT OF PROBLEM

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42 1. Ascertain the inventory management systems currently being used in health institutions and its level of  
43 effectiveness. 2. Determine the extent to which the inventory management systems pose challenges to health  
44 institutions in the COVID-19 era. 3. Examine the degree to which inventory management influence optimal  
45 stock levels in the COVID-19 era.

### 46 3 d) Research Questions

47 The following research questions were addressed in this study:

48 1. What inventory management systems are currently being used in health institutions and how effective are  
49 they? 2. To what extent do the inventory management systems pose challenges to health institution in the  
50 COVID-19 pandemic period? 3. To what degree do the inventory management systems influence optimal stock  
51 levels in selected health institutions in the COVID-19 era?

52 e) Hypotheses Development H O1 : The inventory management systems currently being used in the COVID-19  
53 pandemic era are not significantly effective.

54 H O2 : The inventory management systems pose no significant challenges to health institutions in the COVID-  
55 19 pandemic era.

56 H O3 : Inventory management systems (proxies by reorder level system, periodic review system and economic  
57 order quantity model) do not significantly influence optimal stock levels in selected health institutions in the  
58 COVID-19 era.

### 59 4 II.

60 Literature Review a) Conceptual Review i. Inventory Management and control systems Inventory management  
61 (IM) simply refers to a process that consists of planning, organizing and controlling the flow of stock of materials  
62 from their initial purchase unit through internal operations to the service point through distribution to clients or  
63 customers. Agu, Obi-Anike and Eke (2016) defined inventory management as the sum total act of coordinating  
64 the purchase, manufacturing and distribution functions with a view to meeting the marketing demands and  
65 organizational needs of availing the product to its clients or customers. It equally refers to the collection  
66 of activities that are put in place in order to ensure that customers have the demanded product or service.  
67 Inventory management encompasses the development and management of inventory levels such as raw materials,  
68 semi-finished materials and finished goods. The only way of making adequate supplies of goods is of COVID-19.  
69 There are varied options which an institution can utilize in managing its inventory as a way of achieving improved  
70 product and service delivery and efficiency (Wanyoike & Tundura, 2016). Prempeh (2016) opine that the current  
71 assets constitute one of the fundamental assets in health institutions, it makes it very vital that the right quantity  
72 of inventory is maintained at any given time to avoid stock out, expirations and excess holdings. This could be  
73 the challenge with some health institutions that have been found with stock-out situation that they had to refer  
74 patients to external sources when prescriptions are made.

### 75 5 b) Statement of Problem

76 The system of inventory management being used in some hospitals could have their number of challenges presently  
77 due to corona virus (COVID-19) pandemic and its implication on health institutions. Some hospitals, thus, find  
78 it hard to balance the supply of inventory with current demand though every hospital would want to have  
79 enough inventories in medical supplies to satisfy the demands of its patients. Ideally, no hospital would want  
80 to hold too much inventory to due to the associated inventory holding cost ?? Anichebe and Agu (2013), and  
81 others have all examined the extent to which inventory management affect corporate performance of enterprises.  
82 There are abundant local researches in Nigeria that determined the relationship between inventory management  
83 techniques and firm profitability before the onset of corona virus disruptions in Nigeria. However, the studies  
84 always assumed that the presence of adequate inventory management techniques already presupposes that there  
85 is also an appreciable inventory control measure but the COVID-19 pandemic has faulted this assumption. To  
86 fill this gap, this study was conducted to explore the inventory management system (proxies by re-order level  
87 system, periodic review system and economic order quantity model) and inventory control (proxy by optimal  
88 stock level) using selected registered health institutions in Anambra state as cases of reference.

89 when the inventory is properly managed. With this, they are made available to meet up with customers'  
90 demand and the costs of over or under stocks are lowered in the process. IM refers to all the policies and  
91 firm managerial processes of planning, organizing and controlling that relate to how the firm's stock level will  
92 be kept or maintained at a level whereby the least cost will be incurred by the firm (Kwadwo, 2016). It is  
93 primarily about how best to guarantee the availability of all input materials of production to the firm so that  
94 the quantity of the stock in question is at a level where production is not interrupted with the barest operational  
95 cost of holding the inventory without prejudice to operation efficiency (Eneje, Nweze, and Udeh, 2012). Onikoyi,  
96 Babafemi, Ojo and Aje (2017) averred that IM, which they preferably called stock management, refers to the  
97 business activity aspect that comprises the planning for purchase, receiving, handling, storing, and releasing of  
98 inventory for use in production or distribution to customers. It is the science-based art of making sure that  
99 just sufficient inventory stock is held by a firm for meeting with demand for them. Through IM, hospitals are  
100 able to identify items of stock. In the management of inventory, the primary involvements range from being

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101 able to specify the size and placement of stocked goods. The goal of IM therefore is to reach a balance in the  
102 above requirements which will then result in an effective inventory control process that brings about optimal  
103 inventory level. This is often a continuous process that is subject to constant change and therefore requires the  
104 organization to respond to market changes on time. IM is used to create inventory purchase plan, and track  
105 the existing inventories and their utilization (Muhayimana, 2015). It is impossible to talk of the effectiveness  
106 of management in organizations without making reference to how effective the IM of the organization is since  
107 inventory control is remains a central part of core management functions in organizations. The critical place of  
108 inventory in a firm is so because inventory are resources which in addition to having an economic value have some  
109 idle resources tied to it. This is why corporate managers in hospitals try to implement policies and plans that  
110 will help them strike a balance between the benefits accruing from holding stock against the cost incurred from  
111 holding same (Musau, Namusonge, Makokha and Ngeno, 2017). Attafu and Assefa (2018) simply defined IM as  
112 the act and process that are undergone to record and observe stock level, estimate future request, and settle on  
113 when and how to arrange for new order. It is this sort of process and procedures that enables firms to effectively  
114 know how to go about the storage and replacement of stock and also how to keep a sufficient amount of stock  
115 even as they minimize the cost. Inventory can be managed via re-order level system, periodic review system,  
116 economic order quantity model, perpetual inventory system, etc. However, this study focuses on the systems  
117 discussed below:

## 118 **6 Re-Order Level System**

119 According to Onuorah (2019), re-order level system is a way of managing inventory in such a way that a level at  
120 which another order is made for inventory is set ahead of time and systematically complied with for every item of  
121 inventory. Re-order level system often involves the operational use of two bins for inventory management whereby  
122 re-order is made when inventory is exhausted from the first bin. The merits of the re-order level system is that  
123 it allows the firm to respond to changes in demand and also enables the organization to generate replenishment  
124 order automatically at the designated time simply by a comparison of inventory levels against re-order level.  
125 However, the re-order system may be over-loaded if different types of inventories that are jointly used to produce  
126 different items reach their re-order at the same time.

## 127 **7 Periodic Review System**

128 Periodic review system is a method of inventory management whereby stock levels are subjected to some fixed  
129 interval reviews usually once every week, month or year, as the case may be. It can be seen as physical counting  
130 method of IM where-in inventories are cross-checked and also updated at a fixed interval of time (Onuorah, 2019).  
131 This system ensures that all inventory items are reviewed periodically which often provides more possibility of  
132 eliminating outdated items or obsolete inventories. Orders for replenishment in periodic review system are follow  
133 the same sequence. This singularly facilitates order of different items (of medical use for instance) and attracts  
134 large quantity of discounts to the purchasing firm. However, the periodic review system does not fully enable  
135 firms to respond to changes in consumption and so stock-out is more likely to occur especially when the usage  
136 rate changes shortly after the review. Demand for the inventory item has to be constant before the appropriate  
137 periodic review can be determined and this is often taxing.

## 138 **8 The system of Economic Order Quantity**

139 The economic order quantity theory suggests that the quantity of inventory that ought to be maintained by  
140 corporate organizations is the stock level that provides the lowest total holding cost and acquiring cost (Mwangi,  
141 2016). Economic Order Quantity Model is undeniably the most fundamental and also the bestknown inventory  
142 decision model f which its origin is often dated back to the early 1900s. It is the ordering quantity that minimizes  
143 the balance of inventory cost that exists between inventories re-orders costs and inventory holding costs (Ogbo &  
144 Ukpere, 2014). The calculation of the EOQ Model is calculated using some assumptions as enlisted below, that;  
145 Holding stock is certain and known, Ordering costs is constant, known and certain, rate of demand is known, unit  
146 price is constant, and that there is no stock-outs . However, the assumptions seem not to be realistic in practice  
147 and this system may not be suitable in health sector due to the unpredictable pattern of demand. However,  
148 demand for medical supplies seem to be on the increase as more and more persons get sick due to covid-19 and  
149 other related diseases. One notable weakness of this system is its failure to consider buffer stocks that should be  
150 maintained to accommodate for variations in lead-time and demand for inventory.

151 ii. Inventory Control system (ICS) using optimal stock level According to the views of Wanyoike and Tundura  
152 (2016), inventory control (IC) refers to a set of procedures and techniques that are used to oversee and control  
153 ordering, storage and use of inventory resources. Onikoyi, Babafemi, Ojo and Aje (2017) defined inventory control  
154 as the process of supervising the storage, the supply and the accessibility of items to ensure an adequate supply  
155 of inventory without over or under supply. Inventory control is carried out to make sure that only the adequate  
156 amount of inventory are available whenever and wherever required by customers. The distinction between IC  
157 and IM is that whilst IM refers to all the activities that are done in the process of procuring, storing, selling,  
158 disposing or using inventory while IC is a subset i.e a part of inventory management. However, managers assume  
159 that once they are good with inventory management then the firm is safe in terms of the possibility of having

### 9 III. LEVERAGING INVENTORY MANAGEMENT AND CONTROL IN

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160 under or excess stock level. This is where IC comes in to control the flow of inventory so that only the optimal  
161 stock level would be maintained in the firm. The necessity for inventory control is that sufficient and appropriate  
162 quantity of inventory is required each time in order to minimize the rate of stock-outs in the firm, and thereby  
163 unnecessarily increasing the stock-out cost of the firm which is the cost incurred when the firm is not able to meet  
164 current external and internal demand for inventory. IC often reveals the continuity chances of a hospital because  
165 a hospital requires some level of stock that will keep the firm running which extant literature have enlisted as  
166 cycle inventory, safety inventory, speculative demand inventory and dead inventory (Okerulu, 2019).

167 Onikoyi, Babafemi, Ojo and Aje (2017) was of the opinion that corporate managers require both reliable  
168 and effective control of inventory resources so that the operating cost of the firm will be maximized for the  
169 sake of remaining viably competitive. Inventory control practically enhances firm profitability since it can bring  
170 about reduction in corporate operating costs that are associated with handling and storage of inventory. This  
171 sis further justified by Iliemena and Amedu (2019) which opine that cost reduction strategies should be the  
172 focal point of management if sustainable profit is aimed. Thus, it is against the undesirable reality of having  
173 excessive inventory or having insufficient inventory that IC has become a very highly placed strategic management  
174 technique. Excessive inventory ties down the funds of the organization, increases the possibility of inventory  
175 deterioration, obsolescence and theft and also increases holding cost. Still, inappropriateness of insufficient stock  
176 is such that it can interrupt the process of production and distribution of goods and services, especially for  
177 hospitals and pharmaceuticals firms, proper inventory management and control cannot be over-looked. Thus,  
178 hospitals are at all times expected to have an optimal stock level that both caters for customers' demand and  
179 minimizes the cost of holding the inventory. Operational efficiency is therefore guaranteed by optimal stock level  
180 which eliminates the possibility of stock-out, especially in emergency cases.

#### 181 9 iii. Leveraging inventory Management and Control in

182 Health Institutions in the COVID-19 pandemic period Health institutions often make managerial efforts to reach  
183 corporate decisions while providing strategies that are required for the effective management of the firm's resources  
184 and this has not changed in the period of covid-19 pandemic. Certainly, the stock of medical supplies is one of  
185 the institution's resources that critically need to be effectively managed and monitored especially considering the  
186 economic times of corona virus and its health implications. Opinion exists that the COVID-19 era is associated  
187 with global increase in demand for medical supplies which could possibly lead to stock-out while opinion also  
188 exist that even though the pandemic has come with a lot health challenges but due to the poverty induced by the  
189 virus and the fear of being compelled to isolation centers, sick persons would want to explore other means like  
190 off-the-shelf drugs, herbal treatment and home therapies in managing their health issues, thus culminates into low  
191 demand for medical supplies. Low demand for medical supplies put a lot of health institutions at risk of incurring  
192 losses if not properly managed. This is due to the expiry nature of their products and services. On the other hand,  
193 increase in demand for medical supplies in the COVID -19 pandemic periods if not properly managed could lead to  
194 stock-out which has damaging effect on the sustainability and overall corporate performance. However, Dedunu  
195 and Weerasinghae (2018), and, Iliemena, Goodluck, and Amedu (2020) are of the opinion that large inventory  
196 bunch generates extra costs and this lends credence to the ever growing importance of inventory management  
197 through which proper managerial attention could be paid to procedures, techniques or processes. This makes  
198 inventory management a very crucial decision area for corporate success of health institutions in the pandemic  
199 period. According to Bawa, Asamoah and Kissi (2018), IM is necessary mainly because it is one of the ways  
200 for health institutions to minimize operating costs and funds Year 2022 ( ) invested. This is by reducing the  
201 cost of holding stock of inventory so as increase both profit and operating cash flow that simultaneously leads  
202 to an improved corporate performance (Iliemena & Amedu, 2019). But the contributions of IM would equal to  
203 nothing if proper ICS is not installed to help minimize the very inventory cost for the purpose of maximizing  
204 profit margins. Additionally, IM is stronger and more effective when the inventory control procedures have been  
205 properly implemented to facilitate an optimal stock level that allows for the best utilization of inventory resource.

206 No firm will ever be as efficient as it would want when the firm has not implemented sound IM and ICS that  
207 would guarantee optimal level of medical supplies (Mwangi, 2016). It is through proper inventory management  
208 of stock of drugs that hospitals or pharmaceutical firms can ensure that patient service level is considerably  
209 adequate since insufficiency of stock is detrimental and excessive stock is wasteful. There could be reasons for  
210 a hospital to hold excessive stock of materials more because of uncertainty in demand by patients for drugs  
211 and related products and medical services. The sorts of things that are put into consideration during inventory  
212 management and control processes are the modalities for the purchase of stocks that are commensurate with  
213 both internal and external demands, changing usage patterns, seasonal variation, and monitoring for expiration  
214 and pilferage. This therefore make it necessary that health institutions review their inventory management and  
215 control systems periodically especially when there is massive global change like the changes currently induced by  
216 the covid-19 pandemic, to ascertain the continuous suitability of the old system in the new structure of events.

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217 **10 b) Theoretical Framework i. Theory of Economic Order**  
218 **Quantity Model**

219 According to Mwangi (2016), the major and first proponent of the economic order quantity (EOQ) model was  
220 Haris in 1913 that used the model to determine the optimal level of inventory. In line with the propositions of the  
221 first proponent, economic order quantity entails the level of inventory that can both minimize inventory ordering  
222 cost and also inventory holding cost. Ziukov (2015) put this in another way when the researcher submitted that  
223 economic order quantity as a model is primarily meant to be used when determining an optimal ordering size  
224 that will not only minimize ordering but will also minimize the sum of both carrying costs and ordering costs  
225 of inventory. There are some assumptions that guide the application of this model to business realities. One of  
226 the assumptions is that demand is certain, i.e. demand must equal annual total quantity that is ordered by the  
227 firm at any point in time (Ziukov, 2015). Of essence, economic order quantity model puts into consideration a  
228 tradeoff between ordering cost and storage cost while making policies and decisions on the quantity to order and  
229 use as regards replenishing inventory items. Ordering a larger quantity of inventory practically reduces ordering  
230 frequency and by implication reduces total ordering costs but would require a more spacious storage capacity and  
231 increases holding or storage cost. There are holding costs that reduce ordering costs increase and vice versa until  
232 there is a minimum point on the cost curve where the sum of ordering costs and holding costs will be barest with  
233 the best optimal stock level. The costs that are incurred when an additional unit of inventory is procured is called  
234 ordering costs carrying costs are the inventory costs that are incurred for storing or holding stock. According  
235 to Mwangi (2016), economic order quantity is therefore determined by the intersection of carrying cost line and  
236 ordering cost curve, where the total ordering cost equals the total carrying cost (Kumar, 2016).

237 The relevance of the theory to the study is that economic order quantity model is expected to be useful to  
238 health institution in the Covid-19 pandemic era by providing an optimal order quantity of medical supplies that  
239 minimizes total inventory cost in stock-out or expiration. This model is applied in inventory management and  
240 control that is applicable to the management of not only raw materials but also work-in-progress and finished  
241 goods. As a model for inventory control, EOQ model proposes that the purchase and storage of inventory, using  
242 either periodic review system and re-order level system, should be carried out in such a way as to make sure that  
243 there is no excess or under stocking at a given point in time. To this end, this theory makes a good argument  
244 that supports the relationship between inventory control and management and this informed the need to anchor  
245 the study upon the theory.

246 **11 ii. Lean Theory**

247 Lean theory proposes that inventory systems should be designed in a way that optimizes costs of inventory.  
248 According to Atnafu and Assefa (2018), the lean theory augments the thoughts of Just-in-Time model and puts  
249 buffer stock into consideration while it advocates for the minimization of wastages in production procedure. On  
250 the note that inventory leanness significantly influences the productivity of health institutions (Iliemena, Goodluck  
251 & Amedu, 2020), lean theory is of the view that optimal inventory level should be maintained. Through this  
252 theory, the shortcomings of the economic order quantity model are considerably addressed because the lean theory  
253 also borrows foundation from the EOQ model that solely seeks to optimize the quantity of any batch of inventory  
254 ordered (Musau, Namusonge, Makokha & Ngeno, 2017). Lean theory just like JIT emphasizes that a pullbased  
255 system should be put in place to help the organisation align the production and business processes throughout  
256 the supply chain and inventory planning. Musau, Namusonge, Makokha and Ngeno (2017) submitted that, based  
257 on the lean theory, firms can more successfully find ways of optimizing inventory by way of lean supply chain  
258 systems and practices in order to achieve a better level of both asset utilization and customer satisfaction that  
259 ultimately result in enhancement of organizational profitability, growth, and operational performance.

260 The relevance of lean theory to this study is because it presented inventory management practices as a vital part  
261 of any supply chain regardless of whether the firm operates a product or service supply chain. In the present study,  
262 hospitals majorly although not entirely operate a service supply chain but need to match demand and supply  
263 in the supply chain while considering uncertainties in the market environment. Analyzing lean theory vis-à-vis  
264 the inventory management of hospitals will reveal that most hospitals are beleaguered by ineffective inventory  
265 control and the majority of the hospital do not utilize nor implement the basic inventory control concepts and  
266 principles for various reasons (Atnafu & Assefa, 2018). Most hospitals rely on imported medical substances or  
267 drugs coupled with unnecessary delays and communication problems which all jointly make the calculations of  
268 lead time inaccurate. This is the reason lean theory is mostly advocated for as an inventory management tool  
269 that best controls the flow of stock for optimal stock levels especially in the corona virus pandemic era.

270 **12 c) Extant Literature and gaps in studies**

271 A study carried out by Onuorah (2019) ascertained the effect of inventory management system on corporate  
272 performance of a pharmaceutical company (Juhel Nigeria Limited) using descriptive research design. The study  
273 sample was 41 full time staff of the company while data were gathered using a structured questionnaire. Data  
274 gathered for the purpose of their study were tested using Pearson Product Moment Correlation Coefficient and  
275 findings showed IMS significantly affects a firm's performance. The study only examined one firm, which makes  
276 the finding less generalizable. (Iliemena and Amedu, 2019), studied the effect of inventory turnover period on

277 equity of 22 manufacturing companies quoted on the Nigerian stock exchange from the period 2012 to 2018 using  
278 ex-post facto research design. Data from the financial statements of the companies were tested using multiple  
279 regression analyses and evidence indicated that inventory turnover period has significant positive effect on equity  
280 component. The implication of this to our present study is that health institutions are expected to turn over their  
281 inventory of medical suppliers soon enough so it would not culminate to loss of equity capital investment. Sequel  
282 to the evidence emanating from the manufacturing sector, this outcome may be said to be debatable. Anichebe  
283 and Agu (2013) investigated the effect of inventory management on organizational effectiveness using three  
284 companies (Yemenite, Hardis and Dromedas, and Nigerian bottling company) in Enugu State using descriptive  
285 research method on a sample of 248. The data gathered using questionnaires and interviews were tested using  
286 Pearson product moment correlation co-efficient and regression method. Evidence emanating from the study  
287 showed good inventory management is significantly related to organizational effectiveness. By way of limitation,  
288 the study failed to gather evidence relating to challenges in their inventory management system. Ogbo and Ukpere  
289 (2014) also using a descriptive research design, evaluated the relationship between effective IM and organizational  
290 performance as a case study of 7-up bottling company Nigeria. The study sample was made up of 83 respondents  
291 while data gathered were tested using Chi-square method. Findings from this study revealed a relationship  
292 between operational feasibility and IM and that flexibility in inventory management is key to good corporate  
293 performance. Critically, only one organisation was studied by the researchers which made the findings less  
294 generalizable. Furthermore, Koin, Cheruiyot and Mwangangi (2014) investigated the effect of IM on performance  
295 of manufacturing sector using 56 out of 459 business process owners. The descriptive study gathered its data  
296 using questionnaires. The outcome of the study revealed that IM and supplier relation both has significant effect  
297 performance even though order management was found to have just a mild effect. The study however, failed  
298 to consider the effect of inventory management system on optimal stock levels of the selected firms. Edwin and  
299 Florence (2015) in their study assessed the effect of IM on profitability of the 6 cement manufacturing firms listed  
300 on Nairobi stock exchange in Kenya from 1999-2014 using secondary data from annual reports. The ordinary  
301 least square regression results in multiple analyses revealed a negative relationship existing between inventory  
302 turnovers, storage cost and conversion period with profitability as measured using return on asset. Thus, since  
303 the system of inventory control in manufacturing firms differs from that of hospitals, there is need to carryout a  
304 similar study using evidence from hospitals. Also in Kenya, Mwangi (2016) further investigated IM, profitability  
305 and operating cash flow 6 beer distribution companies in Nairobi for a ten years period ranging from 2006 to  
306 2015. The secondary data gathered for the study was analyzed using ordinary least squares regression analyses  
307 and findings revealed a significant relationship between IM, profitability and operating cash flows. By way of  
308 criticism, the study focused on inventory management practices such as just in time and material requirement  
309 planning and did not consider re-order level system, periodic review system and economic order quantity model.  
310 In a related study carried out in Nigeria, Etale and Bingilar (2016) focused

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312 Volume XXII Issue VIII Version I Year 2022 ( ) on examination of IM and profitability of three listed breweries  
313 on Nigerian stock exchange from 2005 to 2014. The data for the study were obtained from the annual reports of  
314 the companies while analyses were carried out using multiple regression methodology. Evidence revealed in line  
315 with most other studies that IM has significant positive effect on profitability. However, the study derived its  
316 evidence further emanated from brewery companies and outcome may differ from the health sector. The findings  
317 do not fit the realities and peculiarities in the health sector. Agu, Obi-Anike and Eke (2016) in their own study  
318 evaluated the effect of ICS on the productivity of Nigerian manufacturing firms using a sample of 285 respondents.  
319 The descriptive study generated data using the questionnaire method and statistical analysis were carried out  
320 on the data using linear regression coefficients. Findings showed ICS have significant positive relationship with  
321 productivity. Also, demand management was found to have a positive relationship with customer satisfaction.  
322 Aligning this with our present study, the finding implies that when changes in demands for medical supplies in  
323 the COVID-19 pandemic era, are properly managed, patients issues will be well addresses and thus image of the  
324 hospital boosted while ensuring continuous patronage. As a limitation however, the evidence emanating from  
325 manufacturing firms may need to be reexamined before it can be said to also apply to the health sector. Onikoyi,  
326 Babafemi, Ojo and Aje (2017) evaluated the IM practices of a Nigerian cement producing company, Lafarge  
327 Africa (WAPCO) plc using the survey design on annual reports from 2005 to 2015. Regression analyses on the  
328 gathered data indicated that significant relationship exists between costs of goods sold and value of inventory in  
329 stock. This study was however, conducted before the inception of the COVID-19 pandemic in 2019 and it may  
330 have affected the current position. Also, the researchers adopted a case study design where only one firm was  
331 studied. This reduced the generalizability of the findings.

332 Still emphasizing on how relevant IM is to corporate success, Bawa, Asamoah and Kissi (2018) conducted  
333 an evaluation of IM and performance of 14 companies listed on the stock exchange of Ghana from 2007 to  
334 2016. Regression and correlation co-efficient were used on relevant financial statement information and findings  
335 showed no significant effect of IM on selected profitability measures over the period. This evidence even though  
336 contradicted earlier views, failed to cover the aspect of IC using optimal stock levels. As a remedy, Sporta (2018)  
337 in his study evaluated the IC techniques of medical supply agencies in Ghana using descriptive research design on  
338 a population of 100 employees. The result of the correlations and the multiple regression analysis carried out on

339 the qualitative and quantitative data revealed IC techniques significantly affect performance. Thus, the findings  
340 are not fittingly applicable to health institutions in Nigeria given the peculiarities.

## 341 **14 III.**

## 342 **15 Methodological Steps**

343 This study adopted a descriptive research design to enable the researchers have a comprehensive picture of  
344 the phenomenon of interest by surveying the opinions of a sample that is derived from our target population.  
345 The full time staff of procurement, stores, emergency, accounting and finance departments (PSEAFD) of seven  
346 health institutions formed the study population as shown in table ??1 below: = Sampling error (5%), 1 =  
347 Constant. From the calculation after approximation,  $n = 66$ . For the determination of the stratum size, the  
348 formula expressed underneath was applied and calculated in Table ?? We obtained primary data for the study  
349 using structured and unstructured questionnaires administered to 66 staff as comprised above in table ??2. The  
350 structured questionnaire was designed in using five-point-likert scale as strongly agree, agree, neutral, disagree  
351 and strongly disagree. To rightly make sense of the research constructs, the responses were ordered and numbered  
352 accordingly as 5,4,3,2 and 1. The internal consistency of the questionnaire was determined by Cronbach alpha  
353 that produced a Cronbach co-efficient of 0.81 which made the constructs reliable since the coefficient of reliability  
354 exceeded the threshold of 0.7. The test of first and second hypotheses was conducted with the use of Chisquare  
355 while the third hypothesis was tested using Spearman Ranked Order Correlation Coefficient which is calculated  
356 with the aid of Statistical Package for Social Sciences (SPSS). The choice for this particular statistic for test of  
357 hypothesis three was because the collected data were ranked and required a non-parametric tool to produce a  
358 more reliable result. The questionnaire was administered to sixty-six (66) respondents during the field survey  
359 by the researcher. However 63(95.45%) were well filled and returned while 3 (4.55%) were not returned. 4.4  
360 presented responses to the question of the extent inventory management systems pose a challenge to health  
361 institution in the covid-19 pandemic period. The summary table above shows that 15 (23.8%) of the respondents  
362 were of the opinion that their inventory management system poses very little challenge to their hospital in the  
363 pandemic era. 11 representing 17.5% were of the view that the extent of challenge is little. 7 respondents (11.1%)  
364 were undecided on the extent of challenge currently being posed by their inventory management . 12 (19%)  
365 opined that the extent of such challenge is great while the rest of the 18 respondents (28.6%) claim that the  
366 extent of challenge is very great. The result above shows that the Pearson's Chi-Squared Statistical Test result  
367 is significant ( $X^2 = 0.6377$ , p-value =0.001). To further support the statistical position of the above result, the  
368 Likelihood Ratio of the test is 0.6132 with a p-value of 0.003. Since the p-value of the test (0.001) is less than 0.05,  
369 the null hypothesis was rejected. Consequently, the researchers concluded that IMS pose significant challenges  
370 to health institutions in the COVID-19 pandemic era at 5% level of significance. The findings of the study are in  
371 tandem with the outcome of the studies earlier carried out by iii. Hypothesis III H O3 : Inventory management  
372 systems (proxies by reorder level system, periodic review system and economic order quantity model) do not  
373 significantly influence optimal stock levels in selected health institutions in the COVID-19 era. The output of the  
374 test is given below: Order Quantity Model increases optimal stock level by 0.267, 0.368 and 0.342, respectively.  
375 Since the p-value of the test (0.001) is less than 0.05, the null hypothesis was therefore rejected. This led to  
376 the conclusion that inventory management systems (proxies by re-order level system, periodic review system and  
377 economic order quantity model) significantly influence optimal stock levels in selected health institutions. This  
378 result is in agreement with the findings of Iliemena, Ijeoma and John-Akamelu (2019). Also in line with the  
379 findings of this study is the works of Edwin and Florence (2015), Ogbo and Ukpere (2014), and Anichebe and  
380 Agu (2013).

## 381 **16 b) Analysis of Respondents' level of management**

## 382 **17 e) Theoretical contribution of Findings and application to 383 wider research**

384 Generally, the outcome of this study reemphasized the Lean Theory and lean practice for health institutions as in  
385 proposed by earlier researches. The theoretical application of the lean theory in medical supplies management was  
386 earlier highlighted by Iliemena, Goodluck and Amedu (2020) which viewed inventory management practices as a  
387 vital part of any supply chain regardless of whether the firm operates a product or service supply chain. In the  
388 present study, hospitals majorly although not entirely operate a service supply chain but need to match demand  
389 and supply in the supply chain while considering uncertainties in the market environment like the COVID-19  
390 pandemic.

391 V.

## 392 **18 Conclusion, Implications and Recommendations**

393 The overall objective of inventory management is to maintain stock level in a way that reduces cost of inventory.  
394 The optimum level of stock depends on some factors which arise from the interest of the management to establish  
395 an overall policy for stock taking. An effective inventory management strategy enhances optimal stock level and

396 ensures that the right quantity and quality of the relevant stock is available at the right time and at the right  
397 place. Thus, the results of the study provided empirical evidence for managers of health institutions and thus the  
398 conclusion that inventory management, proxy by Re-order Level system, Periodic review system and Economic  
399 Order Quantity Model, positively influence optimal stock level of medical supplies in health institutions using  
400 the case of selected hospitals in Anambra state but currently pose significant challenges in cost minimization  
401 due to COVID-19 pandemic. This implies that inventory management systems of health institution urgently  
402 need to be modified to properly fit the unpredictable changes in demand and supply of medical supplies in the  
403 pandemic era. In other words, there is need for hospitals to adopt flexible systems of inventory management as  
404 it suits the economic and medical situation of the time. Consequent to the above, this study recommends that;  
405 1. Management of health institutions should strive to ensure that the right stock is kept in their warehouses  
406 to hedge against excessive holding cost of medical supply inventories and stock-outs which could lead to loss of  
407 life/ patronage. 2. Given that the utilization of Re-order Level System, Periodic Review System and Economic  
408 Order Quantity Model positively influences optimal stock level, management of hospitals should diversify their  
409 inventory management system to suit specific needs of considering movements in demand and supply.

### 410 19 Management of hospitals and other health

411 institutions should closely monitor and regulate their inventory system as a way of ensuring corporate  
412 sustainability due to its influence on performance.

### 413 20 a) Suggestions for Further Studies

414 Given the limitation of our study based on the scope and area, future research may attempt same topic in such  
415 a way that other methods of inventory management and control are subjected to similar tests. Flowing from our  
research outcome, the following topics of research are suggested for further studies:<sup>1</sup>



Figure 1:



Figure 2:



Figure 3:

---

**31**

SN/	Name of Health Institution	No of Staff in PSEAFD
1.	Izunna Hospital, Amansea Junction, Awka	12
2.	Amen Specialist & Diagnostic Clinic, Amaenyi, Awka	12
3.	Crest Specialist Hospital, Enweana, Awka	9
4.	First Hospital and Maternity, Umuokpu Awka	10
5.	Graceland Specialist Hospital & Maternity, Old INEC Road, Awka	12
6.	Okoye Specialist Hospital, Emma Nnaemeka Street, Awka	9
7.	Eldorado hospital, Awka	11
	Total	74

Source: Field Survey, 2022.

Figure 4: Table 3 . 1 :

**32**

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Figure 5: Table 3 . 2 :

**41**

Response	Frequency	Percentage (%)
Well Filled in Questionnaires	63	95.45
Unreturned in Questionnaires	3	4.55
Total	66	100

Source: Field Survey 202

Figure 6: Table 4 . 1 :

**4**

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Global Journal of Management and Business Research	Level	Low	2: Respondents' Level of Management Frequency	Percentage (%)
	Middle	26		41.3
	Top	23		36.5
	Total	63		100.0

Source: Field Survey 2022

Figure 7: Table 4 .

**4**

2 above shows that among the

respondents, 14 (representing 22.2%) are low level managers. 26 respondents (representing 41.3%) are  
c) Analyses of Research Questions

middle level managers while 23 (representing 36.5%) are top level managers.

Figure 8: Table 4 .

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**43**

Response	Frequency	Percentage (%)
Re-order level system	11	17.5
Periodic review system	25	39.7
Economic order quantity model	21	33.3
Others	6	9.5
Total	63	100.0

Source: Field survey, 2022

Table 4.3 above summarized the responses to the research question of what inventory management

systems are currently being used in health institutions

and its efficiency rates. The above table shows that 11

respondents (17.5%) pointed that they use Re-order-

level system most frequently in the COVID-19 pandemic

period. 25 of the respondents representing (39.7%) opted for Periodic Review System; 21 (33.3%) use

Economic Order Quantity; while 6 (9.5%) use other

inventory management systems which are currently not

of concern to the researchers.

Figure 9: Table 4 . 3 :

**44**

Response	Frequency	Percentage (%)
Very Little Extent	15	23.8
Little Extent	11	17.5
Neutral	7	11.1
Great Extent	12	19.0
Very Great Extent	18	28.6
Total	63	100.0

Source: Field survey, 2022

Table

Figure 10: Table 4 . 4 :

45

Response	Frequency	Percentage (%)
Very Little Degree	10	15.9
Little Degree	3	4.8
Neutral	12	19.0
Great Degree	11	17.5
Very Great Degree	27	42.9
Total	63	100.0

Source: Field survey 2022

Table 4.5 provided a summary of the responses to the research question of the degree to which inventory management systems influence optimal stock

levels in the COVID-19 era. The table above shows that 10 (15.9%) of the respondents believe that the degree to

which inventory management system enhances optimal

stock level is very little. 3 respondents (4.8%) opted for

little degree; 12 (19%) were undecided; 11 respondents

(17.5%) opined that there is a great degree of influence

of inventory management on optimal stock level. Finally, 27 respondents (42.9%) indicated that the degree of such influence is very great.

d) Test of hypotheses

i. Hypothesis I

H O1 : The inventory management systems currently be

used in the COVID-19 pandemic era are not significantl

Figure 11: Table 4 . 5 :

46

	Value	Df	Asymp. (2-sided)	Sig.
Pearson Chi-Square	15.336 a	16	.060	
Likelihood Ratio	9.443	16	.071	
Linear-by-Linear Association	1.911	1	.167	
N of Valid Cases	63			

Source: Field survey 2022

Figure 12: Table 4 . 6 :

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4

the inventory management systems being used in selected health institutions in Anambra state are not effective in the COVID-19 pandemic period at 5% level of significance.

ii. Hypothesis II

H O2 : the inventory management systems pose no significant challenge to health institutions in the COVID-19 pandemic era. Below is the output of the test:

Figure 13: Table 4 .

47

	Value	df	Asymp.	Sig.	(2-sided)
Pearson Chi-Square	0.6377 a	8		.001	
Likelihood Ratio	0.6132	8		.003	
Linear-by-Linear Association	0.8332	1		.074	
N of Valid Cases	63				

[Note: a. 10 cells (66.7%) have expected count less than 5. The minimum expected count is .44. Source: Field Survey 2022]

Figure 14: Table 4 . 7 :

48

				Re-Order	Periodic	Economic	Optimal
				Level	Review	Order	Stock
				System	System	Quan-	Level
Re-Order	Level	Correlation Coefficient		1.000			
System		Sig. (2-tailed)		.			
		N		63			
Periodic	Review	Correlation Coefficient		-.011	1.000		
System		Sig. (2-tailed)		.931	.		
		N		63	63		
Economic	Order	Correlation Coefficient		.895 **	.029	1.000	
Quantity	Model	Sig. (2-tailed)		.000	.822	.	
		N		63	63	63	

Figure 15: Table 4 . 8 :



417 [Ziukov ()] 'A literature review on models of inventory management under uncertainty'. S Ziukov . *Verslo Sistemos irEkonomika* 2015. 5 (1) p. .

418 [Iliemena et al. ()] 'An Assessment of the Practicability of Lean Accounting in Healthcare Sector: Evidence from Anambra State'. R Iliemena , Goodluck , Amedu . *Nigeria. Test Engineering and Management* 2020. 81 (1) p. .

419 [Kumar ()] 'Economic Order Quantity (EOQ) Model'. R Kumar . *Global Journal of Finance and Economic Management* 2016. 5 (1) p. .

420 [Iliemena et al. ()] 'Effect of cash conversion cycle on capital structure: empirical evidence from quoted manufacturing firms in Nigeria'. R O Iliemena , N B Ijeoma , C R John-Akamelu . *Journal of Global Accounting* 2019. 6 (1) p. .

421 [Eneje et al. ()] 'Effect of efficient inventory management on profitability: Evidence from selected brewery firms in Nigeria'. C Eneje , A Nweze , A Udeh . *International Journal of current Research* 2012. 4 (1) p. .

422 [Sporta ()] 'Effect of Inventory Control Techniques on Organization's Performance at Kenya Medical Supplies Agencies'. F O Sporta . *International Journal of Business & Management* 2018. 6 (3) p. .

423 [Mwangi ()] *Effect of Inventory Management on Firm Profitability and Operating Cash Flows of Kenya Breweries Limited, Beer Distribution Firms in Nairobi County. Unpublished MSc. Project Submitted to School of Business*, L Mwangi . 2016. University of Nairobi

424 [Anichebe and Agu ()] 'Effect of Inventory Management on Organizational Effectiveness'. N A Anichebe , O A Agu . *Information and Knowledge Management* 2013. 3 (8) p. .

425 [Agu et al. ()] 'Effect of Inventory Management on the Organizational Performance of the Selected Manufacturing Firms'. O Agu , H Obi-Anike , C Eke . *Singaporean Journal of Business Economics, And Management Studies* 2016. 5 (4) p. .

426 [Onuorah ()] *Effect of Inventory Management on the Performance of Manufacturing Firms: A Study of Juhel Pharmaceuticals Nigeria Ltd. Unpublished Research Project Submitted to Department of Accounting*, N Onuorah . 2019. Awka. Nnamdi Azikiwe University

427 [Koin et al. ()] 'Effect of Inventory Management on the Supply Chain Effectiveness in the Manufacturing Industry in Kenya: A Case Study of Tata Chemicals Magadi'. V R Koin , G Cheruiyot , P Mwangangi . *International Journal of Social Sciences Management and Entrepreneurship* 2014. 1 (2) p. .

428 [Onikoyi et al. ()] 'Effect of Inventory Management Practices on Financial Performance of Larfage Wapco Plc'. I Onikoyi , E Babafemi , S Ojo , C Aje . *Nigeria. European Journal of Business and Management* 2017. 9 (8) p. .

429 [Iliemena and Amedu ()] 'Effect of standard costing on profitability of manufacturing companies: study of Edo state Nigeria'. R O Iliemena , J M A Amedu . 10.7176/JRDM/5303. *Journal of Resources Development and Management* 2019. 53 (3) p. .

430 [Bawa et al. ()] 'Impact of Inventory Management on Firm Performance: A Case Study of Listed Manufacturing Firms in Ghana'. S Bawa , G Asamoah , E Kissi . *International Journal of Finance and Accounting* 2018. 7 (4) p. .

431 [Okerulu ()] *Inventory control system on the logistics cycle of selected retail outlet in Anambra State. An Unpublished Research Project Submitted to Department of Accountancy*, S O Okerulu . 2019. Awka. Nnamdi Azikiwe University

432 [Muhayimana ()] 'Inventory Management Techniques and Its Contribution on Better Management of Manufacturing Companies in Rwanda: Case Study: Sulfo Rwanda Ltd'. V Muhayimana . *European Journal of Academic Essays* 2015. 2 (6) p. .

433 [Etale and Bingilar ()] 'The Effect of Inventory Cost Management on Profitability: A Study of Listed Brewery Companies in Nigeria'. L M Etale , P F Bingilar . *International Journal of Economics, Commerce and Management* 2016. 4 (6) p. .

434 [Dedunu and Weerasinghae ()] 'The Effect of Inventory Management on Company Performance Reference to Listed Manufacturing Companies in Sri Lanka'. H H Dedunu , I M Weerasinghae . *International Journal of Management Sciences and Business Research* 2018. 7 (7) p. .

435 [Kumar and Bahl ()] 'The Effect of Inventory Management on Organizational Performance'. P Kumar , R N Bahl . *International Journal of Innovative Science, Engineering &Technology* 2014. 1 (4) p. .

436 [Musau et al. ()] 'The Effect of Inventory Management on Organizational Performance among Textile Manufacturing Firms in Kenya'. E G Musau , G Namusonge , E N Makokha , J Ngeno . *International Journal of Academic Research in Business and Social Sciences* 2017. 7 (11) p. .

437 [Edwin and Florence ()] 'The Effect of Inventory Management on Profitability of Cement Manufacturing Companies in Kenya: A Case Study of Listed Cement Manufacturing Companies in Kenya'. S Edwin , M Florence . *International Journal of Management and Commerce Innovations* 2015. 3 (2) p. .

## 20 A) SUGGESTIONS FOR FURTHER STUDIES

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474 [Ogbo and Ukpere ()] 'The Impact of Effective Inventory Control Management on Organisational Performance:  
475 A Study of 7up Bottling Company Nile Mile Enugu'. A Ogbo , W Ukpere . *Nigeria. Mediterranean Journal*  
476 *of Social Sciences* 2014. 5 (10) p. .

477 [Kwadwo ()] 'The Impact of Efficient Inventory Management on Profitability: Evidence from Selected Manu-  
478 facturing Firms in Ghana'. B P Kwadwo . *International Journal of Finance and Accounting* 2016. 5 (1) p.  
479 .

480 [Prempeh ()] 'The impact of efficient inventory management on profitability: evidence from selected manufac-  
481 turing firms in Ghana'. K B Prempeh . *International Journal of Finance and Accounting* 2016. 5 (1) p.  
482 .

483 [Atnafu and Assefa ()] 'The impact of inventory management practice on firms' competitiveness and organiza-  
484 tional performance: Empirical evidence from micro and small enterprises in Ethiopia'. D Atnafu , B I Assefa  
485 . *Cogent Business & Management* 2018. 5 (1) p. .

486 [Wanyoike and Tundura ()] D Wanyoike , L Tundura . *Effect of Inventory Control Strategies on Inventory Record*  
487 *Accuracy in Kenya Power Company*, 2016. 5 p. .

488 [Mensah ()] 'Working Capital Management and Profitability of Firms: A Study of Listed Manufacturing Firms  
489 in Ghana'. J M K Mensah . *International Journal of Economics* 2015. 1 (2) p. . (Business and Finance)