Volume 13 Issue 1
Originally issued as A3

Global Journal of Management and Business Research
Administration and Management
Volume 13 Issue 3 Version 1.0 Year 2013
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4588 & Print ISSN: 0975-5853

The Impact of Procurement Operations on Healthcare Delivery: A Case Study of Malawi's Public Healthcare Delivery System

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Design/Methodology/Approach: Data was collected using three sets of questionnaires administered to 40 patient caregivers (nurses, clinicians and doctors), 12 senior hospital managers, and 6 procurement managers. Data was analyzed using the Statistical Packages for Social Sciences

Findings: The study found that procurement functions derailed healthcare delivery through failure to ensure availability of drugs. Frequent stock outs of drugs were confirmed, the effects of which on healthcare delivery ranged from death of patients, deterioration of medical conditions of patients, hospital overcrowding, to transfer of patients to other hospitals. These stock outs were attributed to: failure by a 'government-instituted supplier' to fulfill drug orders; delays by procurement staff; and withholding of funds by donors.

Research limitations: The study was conducted at a time when drug stock outs were at crisis levels in public hospitals. The results may therefore strongly represent the situation at that material point in time.

Practical Implications: The study provides insights into the significance of procurement operations in healthcare delivery. It recommends a strategy shift from single sourcing to dual sourcing in order to avert the persistent drug stock outs in public hospitals.

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GJMBR-A Classification : *JEL Code: H57*



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The Impact of Procurement Operations on Healthcare Delivery: A Case Study of Malawi's Public Healthcare Delivery System

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I. Introduction

The procurement and supply management function plays an important role in healthcare delivery. Failure by the function to safeguard the availability of supplies can sabotage the very interests of the organization which the function is supposed to support (Kumar, Ozdamar and Zhang, 2008). Over the past 12-18 months, local media in Malawi was awash with reports on the worsening situation of drug shortage in Malawi's public hospitals (Mmana, 2011) despite the same being adequately available in private and Christian Health Association of Malawi (CHAM) hospitals. This raised questions regarding both internal and external forces (Day and Lichtenstein, 2006) affecting the ability of procurement functions at public hospitals to ensure availability of medicines in public hospitals. Such shortages / stock outs of medical supplies can have fatal consequences on patients because they can result in total failure of healthcare delivery systems (White and Mohdzain, 2009). With a single supplier, the supply risk at hospitals could be greater since all procuring entities would be prone to forces affecting the supplier (Khan and Burnes, 2007). This is in direct contrast with the CHAM hospitals which have multiple suppliers and continue to enjoy high levels of availability of medical supplies.

According to Mmana (2011), procurement audit reports for 2010 at the Malawi ministry of health headquarters which controls for the single government instituted supplier namely Central Medical Stores (CMS), uncovered irregularities in the procurement of medicines that consequently resulted in Health Sector-Wide Approach (HSWAp) pool partners withholding funds meant for the procurement of medicines until the situation was rectified. This meant the CMS could not have sufficient inventory of medicines and could therefore hardly meet the drug requirements of public hospitals. This and other challenges external to hospital procurement functions 'can directly affect the downstream customer' (the patient) in public hospitals (Miocevic, 2011).

While literature suggests procurement's significance in safeguarding availability of medicines and consequently, healthcare delivery; (Kumar, Ozdamar and Zhang, 2008; Mustaffa and Potter, 2009; and Miocevic, 2011); practices, decisions and interventions derailing the function's performance in Malawi's public hospitals do not seem to be treated with due urgency and significance. In addition, despite acknowledging challenges in public procurement of medicines, both the Malawi Health Sector Strategic Plan (HSSP, 2011) and the Draft Annual Report (2010-2011) for the Ministry of health fell short of linking the procurement performance to the downstream customer.

This researcher could only assume that such a link was well known and implied, although the conduct

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of authorities in handling issues affecting the function might suggest otherwise.

II. Problem Statement and Research Objectives

In the absence of any empirical studies testing the procurement and healthcare delivery link in local public hospitals in Malawi, it is difficult for policy makers to manage the function with due consideration to its impact and significance in healthcare delivery. The research therefore sought to empirically investigate the extent to which procurement functions affected healthcare delivery, as judged by the impact on public healthcare delivery supply chain's downstream customers. It also attempted to establish the aspects of the function that had the most impact on healthcare delivery in Malawi's public hospitals. The research further explored the impact of single sourcing in either mitigating or exacerbating supply risk, given that non-availability or delays in the delivery of drugs can have fatal consequences on patients as observed by Mustaffa and Potter, (2009).

The remainder of this paper begins with a review of the literature, followed by the methods section. The survey data are then analyzed to profile the respondents and identify how they manage supply chain risks. The article then concludes with an evaluation of the factors underlying the decision to develop a system for managing supply chain.

III. Literature Review

a) Supply Chain Management (SCM) Systems

The concept of supply chain is defined by Meijboom, Schimidt-Bakx and Westert (2011) as a way to envision all steps needed from beginning to end in order to deliver products or services to the customer. Supply chain management (SCM) on the other hand, involves the management of flows between and among stages in a supply chain to maximize total profitability (Sila et al, 2006) and customer satisfaction (Danese and Romano, 2011). The procurement function occupies centre stage in managing supply chains. According to Juha and Pentti (2008), the function determines availability, cost, quality of materials as well as responsiveness and flexibility of organizations in meeting customer needs and expectations. In recent years, various articles have noted the strategic importance and competitive potential of procurement or the purchasing and supply management (PSM) function (Gonzalez-Benito, 2007; Ogden et al., 2007). Previous research quoted by Gonzalez-Benito (2007), reveals the importance of aligning the function with the overall business strategy.

The significance of the purchasing and supply management function in organizations can neither be downplayed nor limited to a particular industry (Saranga and Moser, 2009; Van Weele; 2008). Schiele (2007) cites the rising purchasing volume expressed as a percentage of a firm's total turnover, as evidence of the function's strategic potential across industries. In the healthcare industry, procurement can play a key role in the value chain for healthcare delivery in hospitals. As noted by Aronsson, Abrahamsson and Spens (2011), hospitals and healthcare systems could gain competitive advantages and improved performance through good procurement practices such as lean and agile supply chain processes.

b) Procurement and Healthcare Delivery

Since services cannot be produced for storage like physical products, Meijboom, Schmidt-Bakx and Westert, (2011) note that providers adopt customer waiting as a remedy. However, as a result of the differences between healthcare and other services, long waiting times are not affordable in healthcare systems because patient condition may worsen substantially during the waiting (Mustaffa and Potter, 2009). This therefore calls to duty all functions including procurement which must ensure that medical supplies are always available. Meijboom, et al. (2011) underscore the role of the procurement function in healthcare systems. They contend that 'simultaneity of production and consumption of services results in highly unpredictable and unique demand which is difficult to match with service capacity; hence the need for sufficient inventory. Additionally, extant literature suggests that some aspects of procurement performance such as inefficient processes and delayed delivery or stock outs of medical supplies may affect both efficiency (Kumar, DeGroot, and Choe, 2008) and effectiveness (Mustaffa and Potter, 2009) of healthcare systems.

Whatever basis of performance measurement is used, the driving feature of such performance should primarily be the extent to which healthcare systems are customer focused (Parnaby and Towill, 2007). According to Butt and Run (2009, p.659) 'customers are concerned about healthcare providers' ability to cure their diseases, while upholding their best interest at a lowest possible cost'. More specifically, they note that due to the significance of healthcare service, patients are willing to abandon free healthcare services in public hospitals for expensive but better healthcare in private hospitals. As Aronsson et al. (2011) suggest, it really does not matter which dimension of performance measurements takes prominence (cost or customer satisfaction / healthcare quality), because both dimensions can be achieved through the PSM function. Such is the significance of the procurement function.

Regarding the impact of procurement on healthcare delivery costs to the customer, Kumar, DeGroot, and Choe, (2008) suggest that inefficient purchasing as well as any advances in efficiency will

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eventually be passed along to the patient as additional costs or lower costs respectively. In addition, Aaronson et al. (2011) notes that inadequate and tedious procurement procedures and practices are responsible for rising costs and inefficiencies in healthcare systems.

c) Aspects of Procurement Affecting Healthcare Delivery

Several authors have underlined the uniqueness of supply chain management (SCM) in a healthcare setting which makes it difficult to transfer knowledge from the industrial sector to the healthcare sector in a direct way (White and Mohdzain, 2009; Vries and Huijsman, 2011). Chandra, Kumar and Ghildayal (2009), argue that the importance of healthcare services has reduced the extent to which the industry adopts cost reduction and responsiveness strategies and practices such as Just-in-time (JIT) purchasing and Kanban systems.

The significance of SCM is further emphasized by Mustaffa and Potter (2009), when they note that within the healthcare industry, procurement operations associated with pharmaceutical products can affect the standard of care for patients. They contend that effective management of the function can ensure that both service level and cost objectives are met. Similarly, Kumar et al., (2008) suggest that procurement practices affect inventory levels and ultimately the service provided to the consumer or patient in the case of hospital. There is high risk therefore, that erroneous decisions in SCM can culminate into stock-outs (White and Mohdzain, 2009) and total failure of healthcare delivery systems (Mustaffa and Potter, 2009). Consequently, Kumar et al., (2008) rule out the feasibility of inventory elimination because medical supplies must be available for immediate use by medical professionals.

d) Healthcare Inventory Management

Extant literature suggests that inventory management is one key aspect of procurement having substantial impact on healthcare delivery (Chandra et al., 2009). Lee, Lee and Schniederjans (2011) contend that managing costs while meeting customer demands is one of the biggest challenges for SCM in the healthcare industry. Further literature show that hospital inventory management can have far reaching consequences on healthcare delivery systems. For example, Varies (2010, p.61) contends that 'under-stocking of medicines can result in increased dissatisfaction of physicians and/or surgeons'; can delay treatment such as surgery and 'in a worst case scenario, can even cause death of patients'. On the contrary, he suggests that overstocking can at worst only result in an increase of carrying costs.

Much as the latter impact (over stocking) sounds a lesser evil, reality surrounding accelerating healthcare costs (Chandra, Kumar and Ghildayal, 2009) and the fact that inventory of medical supplies comprise a substantial percentage of hospital costs (Tordoff, Norris, and Reith, 2008), make inventory management a real challenge for hospitals. Failure to control the escalating costs will in the long-term make healthcare services unaffordable and therefore unavailable to most people.

Consequently, the long-term effects of overstocking may become as expensive as the effects of under stocking where both scenarios lead to service unavailability and death of patients (Mustaffa and Potter, 2009). The implication of rising expenses in the long run will either be reflected in fewer beneficiaries accessing free healthcare services at public hospitals, or more tax payer funds being spent on healthcare delivery (Chandra et al., 2009). Further challenges come as a result of forces external to procurement. On this, Vries (2010) argues that inventory management decisions for hospitals are often made by many stakeholders who have conflicting interests. He notes that such decisions often seem to be more politically and experience-based rather than data-driven and potentially affect availability. Regardless of the interests of policy makers, Pan and Pokharel (2007) advise that it is prudent that some minimum stock of medical supplies be kept. Similarly, Vries (2010) encourages managers to clearly understand how inventory systems are affected by specific hospital characteristics, in order to improve healthcare inventory management.

e) Logistics for Medicines

Many other aspects of procurement adversely and positively affect healthcare delivery. Specifically, Tetteh and Pharm (2009) contend that the state of drug supply chains affect availability, affordability and acceptability dimensions of medicines access. They suggest that failures of in-country supply chains to operate effectively and efficiently can erode all the success achieved in earlier stages of the supply chain.

Lengthy public distribution systems have also been identified by Tetteh and Pharm (2009) as one factor affecting availability of medicines and therefore healthcare delivery. They note that such situations are common where distribution systems involve delivering of drugs to central warehouses, wherein they are then transferred to regional and district warehouses before being delivered to health facilities. Such chains of non-value adding and time consuming activities comprise what Taiichi Ohno, in Bailey et al, (2005) refers to as 'the waste of unnecessary movements'. Tetteh and Pharm precisely indicate that these lengthy distribution systems, coupled with lack of extensive information systems are responsible for frequent drug stock-outs and shortages in African nations.

These assertions are strongly supported by Ramani and Mavalankar (2006) who in their research on health systems in India, found that poor logistics

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management of supply of medicines and drugs negatively affected the availability of healthcare services in India. Further research demonstrates that shortening the supply chain in Mexico did not only reduce the procurement cycle times but also reduced costs through lower numbers of warehousing staff and storage space. The resultant cost savings can positively affect healthcare delivery if reinvested into the procurement of more drugs which can improve both availability and variety (Tetteh and Pharm, 2009).

IV. Research Design and Methodology

The research collected data from three different categories of staff namely patient caregivers, hospital managers and procurement managers at five public healthcare delivery centres in Southern Malawi. A combination of quantitative and qualitative data collection instruments was used. This comprised questionnaires and interviews respectively. Data was collected through three sets of self completed questionnaires, which allowed respondents to complete at their convenience thereby minimizing interruptions to healthcare delivery at participating hospitals. Follow up interviews with randomly selected managers were also conducted in order to obtain clarification on any ambiguous or contradicting results from the study. These interviews were semi-structured in order provide both in depth and specific insight into the understanding, interpretation and discussion of findings (Black, 2005).

The first of the three questionnaires was completed by staff that used or at least handled procured medical supplies in delivering healthcare to the end customer, the patient. The purpose of this questionnaire was to establish the link between procurement functions and healthcare delivery. It investigated the occurrence of stock outs of medical supplies, the effects of such stock outs and also enquired into the reasons given for the stock outs.

The second questionnaire was completed by procurement staff. It investigated the causes of stock outs at respective hospitals from the 'horse's mouth', and assessed the performance of the single supplier and how the same affected availability of medical supplies. Finally, the third questionnaire was completed by hospital managers and administrators. It probed into the effects of procurement in healthcare delivery; and the role of sourcing strategy in improving responsiveness and averting supply risks respectively. Although the latter two questionnaires mostly addressed similar issues, the responses from the different respondent categories helped illuminate different aspects of the research problem (Gill and Johnson, 2006).

The questionnaire was designed in such a way that the structure, focus and phrasing of questions was intelligible with respondents, reduced bias and provided data that could be statistically analyzed (Gill and Johnson, 2006). Although the research was generally qualitative, questionnaires were quantitatively designed to increase objectivity. A five point Likert Scale was used with response options ranging from 'strongly disagree', disagree, neutral (or do not know as the case may be), agree, to 'strongly agree'. Open ended questions were also included to allow for the collection of in depth data.

A total 78 questionnaires were sent out from which 58 questionnaires were collected representing an overall response rate of 74.4%. Among patient caregivers, 50 questionnaires were sent and 41 collected representing a response rate of 82%. To hospital managers, 12 questionnaires were collected out of the 20 distributed giving a response rate of 60%. The response rate for procurement managers was 75% with 6 out of 8 questionnaires collected.

Stratified random sampling which involves taking a random sample from identifiable groups (strata) that are homogenous for the desired characteristics' (Black, 2005), such as people working in one hospital ward or belonging to the same profession, was used to distribute questionnaires to patient care givers and hospital managers. For procurement staff, non-probabilistic purposive sampling which involves handpicking respondents based on desired traits (Black, 2005) was used to ensure that only functional heads participated.

Quantitative data was analyzed using Statistical Packages for Social Sciences (SPSS) whereas thematic analysis (Braun, 2006) was adopted for qualitative data. Themes were identified in textual data based on three criteria namely recurrence, repetition and forcefulness (Keyton, 2006).

The research empirically establishes the significance of procurement operations in healthcare delivery in Malawi's PHDSC and beyond. It will provide useful guidance to policy makers in raising the function's profile, so that matters affecting the function's performance can now be treated with due urgency and diligence in order to avoid disruptions to healthcare delivery.

V. Empirical Results and Discussion of Findings

The results are placed into four main sections. The first section concerns the link between procurement and healthcare delivery. It also discusses the causes of stock outs, which, as the study reveals, represent the greatest source of interruption to healthcare delivery. Section two is about the role of single sourcing in exacerbating or mitigating the risk of supply failure. The third section ranks the factors considered to negatively affect healthcare delivery in public hospitals.

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a) Frequency of stock out of drugs

43.1% of all respondents indicated that stock outs occurred at least once every month, and 25.9% put the frequency at 'once every 2-3 weeks' while the remaining 31% rated the same at 'once every week'. Despite these differences, there was overwhelming agreement at all the hospitals that stock outs did occur. The differences in stock out frequencies were real considering that different medical departments at the same hospital had varying drug requirements. Thus, some respondents worked in departments where stock outs did occur more regularly compared to others. This implies that while hospitals did not experience institution wide stock outs of drugs, ensuring continuous availability of all drug types in all hospital departments remained a big challenge in public hospitals.

Additionally, other response options regarding the frequency of stock outs namely 'once every 3 months' and 'they never occur at all' had been completely ignored by respondents indicating full agreement to both the existence and frequency of drug stock outs at respective hospitals. Further analysis of results by respondent category revealed that 91.7% of managers put the frequency at 'once every month' as opposed to 8.3% who put the same at 'once every week'. Such a result is strongly reflective of the fact that managers had an aggregated view of the situation.

b) Effects of stock outs

i. *Effect 1: Stock outs cause death of patients*

The results below show strong agreement among patient care givers where 87.5% of respondents (strongly) agreed that stock outs of drugs caused death of patients; 10% of respondents were neutral while the remaining 2.5% disagreed. Among hospital managers, 75% agreed that stock outs caused death of patients while 25% remained neutral. Overall, the results indicated the enormity of the extent to which the procurement operations, which must ensure availability of drugs, affected healthcare delivery. However, as has been shown hereunder, the stock outs could not entirely be blamed on the function due to the contribution of other factors external to the function.

Table 1 : Effects of Stock outs

The stock outs of drugs and other medical supplies affect patients in the following ways:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Result in deaths of patients	0%	1.9%	11.5%	30.8%	55.8%
Bring overcrowding in hospitals	1.9%	5.7%	0%	26.9%	65.5%
Deterioration of conditions of patients	0%	5.9%	0%	41.2%	52.9%
Delay Medical surgery/ operations	0%	0%	10.6%	61.7%	27.7%

Although the 1.9% level of disagreement could be considered insignificant, it nevertheless represented reality because: i) some diseases have lower fatality rates; ii) more serious medical cases were often transferred to those hospitals that had inventory of the required drugs; and iii) some cases were usually treated as out-patients and were usually sent back in case of stock outs. Thus, owing to these factors, deaths did not usually occur in some hospital departments or wards in cases of stock outs.

ii. *Effect 2 : Stock outs bring overcrowding in hospitals*

Death of patients is perhaps the worst possible impact of stock outs of drugs (White and Mohdzain, 2009) but is surely not the only impact. The results revealed other effects such as deterioration of medical conditions of patients, overcrowding of patients in hospitals, delays in medical surgery, and the transfer of patients to other hospitals.

92.5% of patient care givers either agreed or strongly agreed that stock outs brought overcrowding in hospitals while the remaining 7.5% disagreed. This is in slight contrast to responses from managers where 83.3% (strongly) agreed while the remaining 16.7% expressed disagreement. The overwhelming level of agreement is not surprising because stock outs of drugs prolonged the stay of patients in hospitals resulting in overcrowding in hospital wards. Such prolonged stay was also feared to have psychological effects on both patients and guardians regarding the disease outcomes.

iii. *Effect 3: Stock outs deteriorate medical condition of patients*

94.8% of all respondents, (patient care givers and managers combined), (strongly) agreed that stock outs of drugs worsened the medical conditions of patients while the 5.2% disagreed. This result is not surprising because for most diseases, conditions of patients would deteriorate if their illnesses are left unattended to. Stock outs of drugs will in most cases entail total failure of healthcare delivery systems hence the deterioration. This result is also in line with (Mustaffa and Porter, 2009) regarding the impact of stock outs. This implies that, however caused, stock outs potentially increased human suffering both directly to the patient and indirectly to guardians and relations.

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iv. *Effect 4: Stock outs delay medical surgery*

83.3% of hospital managers and 92.5% of patient care givers (strongly) agreed that stock outs resulted in unplanned delays to medical surgery at their respective hospitals. The remaining 16.7% and 7.5% of managers and patient care givers respectively, which represent 8.6% of all respondents, expressed neutrality. Although such delays have not been empirically linked with other results in the study, it would be reasonable to suggest the link. The study found that prolonged delays eventually worsened medical conditions of patients and in worst case scenarios, patient deaths occurred. It is for such reasons that Kumar et al., (2008) ruled out the feasibility of inventory elimination in the healthcare sector arguing that medical supplies ought to be always available for immediate use by medical personnel.

The foregoing adequately proves the existence of a relationship between the procurement function and healthcare delivery. The results show how failure by the function (whether internally or externally initiated) to ensure availability of drugs and other medical supplies, affects not only the healthcare delivery system but most importantly, the patient.

c) Causes of stock outs

Analysis of the results revealed wide disparities in the reasons given by various respondent categories with regard to the causes of the stock outs. While there was such great disparity, the results showed that nurses and clinicians, who together make up 95% of patient care givers, represented 100% of respondents who were either neutral or did not know the causes of drug stock outs at their respective hospitals. This lack of knowledge might suggest the distance between the procurement function and the patient care givers.

i. *Cause 1: Delays by procurement staff*

As would naturally be expected, a majority 83.3% of procurement staff denied that stock outs were caused by delays on their part with the remaining 16.7% being neutral. This is in contrast to 63.6% of managers who cited delays by procuring units as one of the causes of stock outs, while 36.4% denied the existence of such a link between procurement delays and stock outs. Amongst patient care givers, 68.4% believed that stock outs arose from delays by procurement units as opposed to 21.1% that disagreed and the remaining 10.5% had no knowledge on the matter.

Table 2 : Causes of Stock outs

The following are the causes of stock outs of drugs at our hospital.

	Strongly Disagree	Disagree	Don't know	Agree	Strongly Agree
Delays by procurement staff in buying	10.7%	21.4%	7.2%	26.8%	33.9%
Withholding of funds by donor partners	5.5%	10.9%	34.5%	27.3%	21.8%
Lack of funds at the hospital	26.2%	13.1%	23.2%	25.3%	12.2%
Wrong demand forecasting	8.8%	15.8%	3.5%	40.3%	31.6%
Insufficient Inventory at Central Medical Stores (CMS)	5.5%	3.6%	30.9%	21.8%	38.2%
Unexpected disease outbreaks	22.4%	31.1%	17.3%	18.9%	10.3%
Poor communication between purchasing and pharmacy staff	23.2%	25%	21.4%	16.1%	14.3%
Poor inventory management by pharmacy staff	19.3%	43.9%	17.5%	3.5%	15.8%
Unavailability of drugs at the market	28.2%	20.4%	25.9%	14.4%	11.1%

However, within the patient caregivers, 57.1% of medical doctors expressed disagreement while the other 42.9% agreed. Such disparity in opinions might indicate the split in knowledge regarding the actual causes of stock outs given that some doctors, like some managers and all participating procurement staff were part of hospital internal procurement committees (IPCs). Alternatively, these IPC members could be deliberately concealing the truth. This is supported by evidence of a three- week long procurement cycle across the hospitals (as indicated by all participating procurement managers). Thus, it can be reasonably concluded that procurement delays were partially responsible for stock outs.

ii. *Cause 2 : Withholding of funds by donor partners*

In line with fears expressed in the Malawi Health Sector strategic Plan (Malawi Government, 2011), the results indicated that the donor partners who provide funds for the purchase of drugs were also partially responsible for the stock outs of drugs in public hospitals. This also supports newspaper reports that following irregularities in the procurement of drugs, donor partners had withheld funds meant for the purchase of drugs which resulted in acute drug shortages in the country's public hospitals (Mmana, 2011). This is an indication of how procurement practices have indirectly affected healthcare delivery.

From the analysis, 83.3% of procurement managers agreed that withholding of funds by donors caused stock outs while the other 16.7% disagreed. This is in contrast to responses from hospital managers where 66.7% agreed, and the remaining 33.33% disagreed. Among patient care givers, while 83.3% of doctors agreed and 16.7% disagreed that withholding of funds by donors caused stock outs, 33.3% and 53.3% of nurses and clinicians respectively agreed to the same.

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56.7% of nurses and 38.5% of clinicians expressed lack of knowledge; the remaining 10% of nurses and 11.5% of clinicians disagreed. Overall, the results indicate that withholding of funds was one of the important causes of stock outs in Malawi's public hospitals.

iii. *Cause 3 : Lack of funds at hospital level*

The foregoing findings contradict other results which deny that lack of funds was one of the causes of stock outs. 88.2% of both managers and medical doctors (both part of IPC), disagreed and the other 11.8% agreed that lack of funds at hospitals caused stock outs. 46.1% of clinicians, 20.8% of nurses, and 66.7% of procurement staff disagreed that stock outs arose from lack of funds at hospital level. This is in contrast to 41.7% of nurses, 38.5% of clinicians and 33.3% of procurement staff who agreed. 37.5% and 15.4% of nurses and clinicians respectively lacked knowledge on the matter. The overall picture is that lack of funds at respective hospitals was not a major cause of stock outs since 39.3% of all respondents disagreed, 37.5% agreed and 23.2% did not know the relationship between lack of funds and stock outs at respective hospitals.

The explanation given for these contradictory responses in the above two scenarios (cause 2 and cause 3) was that while individual hospitals could have sufficient funds for the purchase of drugs, they still experienced shortages due to non-availability of drugs at the CMS, the single supplier. The withholding of funds by donors directly affected the availability of drugs at CMS. This is further confirmed by the fact that 78.4% of all respondents agreed that insufficient inventory at CMS caused stock outs. On this aspect, only 5.9% disagreed whereas the remaining 15.7% lacked knowledge on the matter. Since public hospitals received funding directly from Malawi Government, they were only indirectly affected from resultant stock outs at their single source of drugs, the CMS.

iv. *Cause 4 : Wrong demand forecasting*

Challenges in forecasting demand for drugs at respective hospitals was also highly ranked as one important cause of stock outs. 72.7% of managers, 100% of procurement staff and 64.9% of 'patient care-givers' agreed that wrong demand forecasting caused stock outs of drugs. 27.3% of managers, 29.7% of patient care givers disagreed whereas the remaining 5.4% of the latter expressed ignorance. The results were further evidenced by recommendations that 'hospitals should procure huge quantities of drugs', suggesting that insufficient quantities were often procured.

Contrary to these suggestions, 83.3% of participating procurement staff collaborated that while larger orders were usually placed with the supplier, hospitals experienced random yield whereby random portions of order quantities are delivered by a supplier (Tomlin, 2009). The results indicate a supplier delivery failure rate of 35% which is quite high for any system and more disastrous for essential services such as healthcare delivery. The supplier ignored purchase orders and rationed available drugs to hospitals based on supplier's own inventory levels. This therefore suggests that wrong demand forecasting at hospital level was not among the significant causes of stock outs.

v. *Cause 5 : Insufficient Inventory at the Central Medical Stores (CMS)*

The role of the central medical stores in exacerbating the stock outs was also specifically considered. In addition to observations made under 'causes 3 and 4' above, there was an overwhelming level of agreement among all respondents that the unavailability of sufficient inventory at the CMS greatly contributed to the stock outs. 38.2% and 21.8% of respondents 'strongly agreed' and 'agreed' respectively, representing a 60% agreement level among all respondents. This is in contrast to 30.9% who that 'did not know' and a combined 9.1% that either (strongly) disagreed. These results imply that the single supplier is part of the problem of persistent stock outs in public hospitals.

vi. *Cause 6 : Expiry of drugs*

While stock outs have been shown to occur frequently at the respective hospitals under study, there are also cases of drug expiry prevalent at the hospitals. Although it is possible that the expiry of drugs could partly be responsible for the stock outs, the same does not reflect the case in Malawi's public hospitals. Results on the causes of expiry of drugs indicated that donations of drugs that were in excess of hospital requirements were the major cause of such expiry.

In responding to a question on the extent to which drug donations contributed to expiry, 100% of procurement staff, 90.9% of managers and 82.8% of patient care givers agreed that donations of drugs were the main cause of expiry. Most such donations were usually received (mostly from international cooperating partners) in huge quantities without regard to local demand. It was also revealed that some such donations involved drugs that were nearing expiry dates hence they sometimes expired before usage.

vii. *Other Causes*

A range of other factors namely disease out breaks, poor inventory management, poor communication and unavailability of drugs on the market, were also evaluated regarding their role in the persistent stock outs. Results show that these variables are not among the important causes of stock outs. For example, a combined 53.5% (strongly) disagreed, 29.2% (strongly) agreed that disease outbreaks caused stock outs. The remaining 17.3% did not know. Regarding the role of poor communication between purchasing and pharmacy staff in causing stock outs, a

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combined 48.2% and 30.4% (strongly) disagreed and (strongly) agreed respectively, and 21.4% indicated lack of knowledge. Poor inventory management is another factor considered insignificant in causing stock outs. A combined 63.2% of respondents disagreed compared to 19.3% that disagreed that stock outs emanated from poor inventory management. 25.9% did not know about the existence of such a relationship. Finally, 28.2% and 20.4% of all respondents strongly disagreed and disagreed while a combined 25.5% (strongly) agreed that stock outs originated from unavailability of drugs on the market. The remaining 25.9% did not know. This result is not surprising considering that CHAM hospitals had adequate supply of drugs from the same market

VI. Conclusion, Practical Implications and Limitations

The foregoing results have shown that factors both internal and external to procurement functions have contributed to the frequency of stock outs and consequently derailed healthcare delivery. The implication of such revelations is that management and policy makers should look both internally and externally in their attempt to arrest the occurrence of stock outs in public hospitals.

The study adds to existing literature on sourcing strategy by revealing that: i) single sourcing is not the right strategy for healthcare delivery systems because it exposes entire systems to the risk of supply failure (see also Khan and Barnes, 2007) that paralyses the whole healthcare delivery supply chain resulting in multiple undesirable effects the worst of which being death of patients. A dual sourcing strategy is therefore recommended because it ensures that non-delivery by one supplier is covered by another. Such a strategy would hedge public hospitals against the risk of stock outs arising from factors affecting one supplier (Tomlin, 2009). ii) Lengthy procurement cycles are not desirable for healthcare procurement because although such cycles encourage institutions to hold sufficient inventory (Hou et al., 2010; Tetteh and Pharm, 2009) the nature and significance of healthcare delivery call for flexibility and responsiveness to save lives (Mustaffa and Potter, 2009).

The major limitation of the study is that it was conducted at a time when stock outs of drugs were at crisis levels in Malawi's public hospitals. The results may therefore strongly represent the situation at that material point in time, other than the status under normal conditions of supply.

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