Towards a Basis for Policy Framework for Stockouts and Shortages of Drugs

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Abstract

Stockouts and shortages of essential medicines in hospitals and health facilities are severe and well-known public health issues worldwide, including in the Philippines, with well-known adverse effects for morbidity, mortality, and disease epidemiology. This complicates medicine delivery for healthcare units and makes it challenging to get therapy when medications are unavailable, and no substitutes are supplied. The research was conducted in a tertiary government hospital in the Philippines. Respondents included in the survey are personnel involved in the pharmaceutical supply chain for three years. The study assessed the impact of medicine shortages and stockouts on a patient's healthcare and generated policy recommendations for the better supply chain management. The researcher used structured questionnaires for the survey to facilitate data gathering. The statistical analysis was used to develop a policy framework to address the issues. Results showed that changes in the procurement and inventory practices in the hospital must be improved. The hospital is recommended to focus on training and capacity building on the pharmaceutical supply chain stakeholders, strengthen internal pharmacy strategies to make operations more efficient, engineering and administrative support, maximize information technology, maximize available funds, and enhance good governance.

Keywords

Drug Stockouts, Drug Shortages, Medicine Stockouts, Medicine Shortages, Pharmaceutical Supply Chain Management

1. Introduction

Medicines are essential components of health care, and access to them is a fundamental human right (Hogerzeil, 2006). Based on World Health Organization (WHO), essential drugs are those that "satisfy the population's priority health care needs" (De Weerdt et al., 2015). The current medicine shortages, on the other hand, pose significant issues to the healthcare system.

Drug shortages have been reported in high, middle, and low-income nations worldwide. Compared to other locations, the medication shortage has received undue attention in high-income countries. Manufacturing concerns, corporate choices, raw material shortages, and regulatory issues are the causes (Ventola, 2011). To address this issue, various agencies, groups, and governments have established policies, initiatives, research studies, and guidelines (Ferrario et al., 2017; Bochenek et al., 2018). Drug shortages, on the other hand, continue to cause severe health and economic challenges (Dill and Ahn, 2014; Dave et al., 2018).

The Philippines has seen over the last decade an increase in drug shortages, particularly for vaccines in the national immunization program and supply failures of essential life-saving medicines in our public hospitals. The recently enacted Universal Health Care Law, commonly known as Republic Act 11223, assures that all Filipinos have fair access to high-quality, low-cost health care and are safeguarded from financial risk. Drug shortages and stockouts may prevent patients from receiving necessary care, making it impossible to meet UHC's goals and objectives.

The study aims to evaluate the specific impact of medicine stockouts and shortages on a patient's healthcare and develop a policy framework for optimal supply chain management. The following is a list of the study's contributions to the available research: First, the results of the paper may be used as a basis to further improve the pharmaceutical

supply chain management in one of the 500-bed, level 3 teaching-training and tertiary government hospitals in the Philippines. Second, this study hopefully creates a strategy that can assist other government hospitals and health facilities for efficient and improved supply chain management of drugs and medicines. Third, this research involved pharmaceutical procurement procedures that allow the government to assure quality control and provide a cost-effective pharmaceutical product to its citizens. The researcher anticipates the findings can be helpful to practitioners and researchers dealing with similar issues and professions.

2. Literature Review

A "drug stockout" is when a facility lacks a particular pharmaceutical formulation and dose (Hwang, Bella, et al., 2019). On the other hand, a drug shortage is defined as "a scenario in which the total supply of all clinically interchangeable forms of an FDA-regulated drug product is insufficient to satisfy predicted demand at the user level" (Schwartzberg et al., 2017).

Inventory management is critical for the pharmaceutical supply chain since it entails administering the regular pharmaceutical ordering procedure. It assists in maintaining a consistent supply to patients, hence eliminating product stockouts and lowering inventory holding expenses (Management Science for Health, 2012). Stock records that are accurate and up to date are essential for good inventory management since they are used to calculate future demands. Stockpiling is necessary to guarantee that vital commodities are available practically all of the time. The importance of the item to public health and the amount of consumption should guide the selection of products to stock (Management Science for Health, 2012; Management Science for Health, 1995). Inventory management is critical to providing adequate healthcare in three key areas: availability, safety, and price of medicinal supplies utilized in health institutions. These are the essential factors that influence the quality of care and patient satisfaction with public health services (Narkotey, A.M., 2012; Aronovich, G.D. and Kinzett, S., 2001). Poor inventory management may result in overstocking or understocking of EMs, resulting in resource waste and increased morbidity and death as a result of a lack of life-saving medications (Kagashe, G.A.B., and Massawe, T., 2012; Whitney, 2010; Dar es salaam, 2008; Tumwine et al., 2010; Ventola, 2011).

On the contrary, procurement processes have been identified as a source of stockout and shortages of drugs in studies conducted in low and middle-income nations, such as Fiji, Pakistan, Kenya, and Sub-Saharan (Malik et al., 2013; Walker et al., 2017). The medicine procurement process requires a certain amount of time; however, inadequate communication across departments caused the procedures to be delayed, resulting in a shortage. Local medicine purchases at higher prices are a financial strain in this case. Still, extending the procurement procedure beyond the Bid validity period increases bidders' expenses at stated rates, aggravating the issue (Herath et al., 2011). Multiple and diverse factors influence drug availability. However, in a decentralized system, there are two compelling causes: 1) insufficient financial support and entitlement for pharmaceuticals to cover the poor and vulnerable, and 2) weak procurement and supply networks. In 2006, the WHO Office of the Representative in the Philippines commissioned a case study in 19 devolved health facilities around the Philippines, employing a basket of 30 critical medications and a variety of LGU income categories. According to the findings, the availability ranged from 0% to 33%. During a visit to one district hospital, an ocular check revealed that none of the 30 critical drugs were available at all during the visit. Inadequate procurement methods also have a negative impact on the supply of essential medicines. Long procurement processes of up to 480 days cause frequent stockouts of crucial medications in local health institutions. (Parafina, 2003).

Antibiotics were the most commonly impacted pharmaceuticals in the United States in 2016, followed by electrolytes, chemotherapeutic treatments, cardiovascular meds, and CNS agents. However, because of the rising demand for COVID-19, analgesics, sedatives, and paralytics were in limited supply in 2020. Furthermore, injectable cardiovascular and CNS medications were also short (Pharmacists, 2020). CNS medications, on the other hand, were found to be the shortest in 2014 EU research, followed by anti-infectives, cardiovascular pharmaceuticals, antineoplastic/immunomodulatory compounds, and GIT drugs (Pauwels et al., 2014). However, the EAHP study in 2019 indicated that antimicrobial agents were on top, with cancer medications coming in second, followed by anesthetic agents. Oncology medicine shortages have grown since the EAHP survey in 2018. (Miljković et al., 2020a). In underdeveloped nations, drug stockouts and shortages result in improper prescription alternatives, degraded health, more extended hospital stays, readmission, morbidity, and death (Uganda, Fiji, Zambia, Nigeria, Egypt) (Malik et al., 2013; Walker et al., 2017). According to scientific investigations, there was a disrupted treatment of Antiretroviral therapy (ART) due to a medication shortage, which resulted in poor results, the buildup of drug resistance mutations, and treatment failure (Meloni et al., 2017). Surgical procedures will be canceled due to a scarcity of some vital drugs.

The lack of protamine sulfate, for example, will force the cancellation of heart surgery. Surgery postponement may aggravate the condition, lengthen the hospital stay, and expose patients to hospital-acquired infections (Burki, 2017; Khan, 2019). More significantly, a lack of some drugs may increase mortality. The death rate was significant due to a chemotherapeutic drug scarcity, but vital medications such as antibiotics, electrolyte solutions, phytomenadione, analgesics, and opioids were also implicated (Mazer-Amirshahi et al., 2014).

Drug stockout and shortages are a diverse problem that affects people all around the world. The establishment of various groups, governmental agencies, platforms, and policies in most high-income nations has gotten a lot of attention (Acosta et al., 2019). On the other hand, some middle-income countries have a few research studies found; furthermore, there is a paucity of research in low-income nations. (Schwartzberg et al., 2017). The accessibility and price of essential medicines remain priority issues in low-income countries like the Philippines. Evidence from all countries, particularly low-income countries, is required to compare and build global mitigation methods in order to address medicine shortages. This emergent phenomenon is likely to persist or even increase if no means of prevention are identified. This study created a strategy that will assist the hospital in efficient, undisruptable, and improved supply chain management of drugs and medicines.

3. Methods

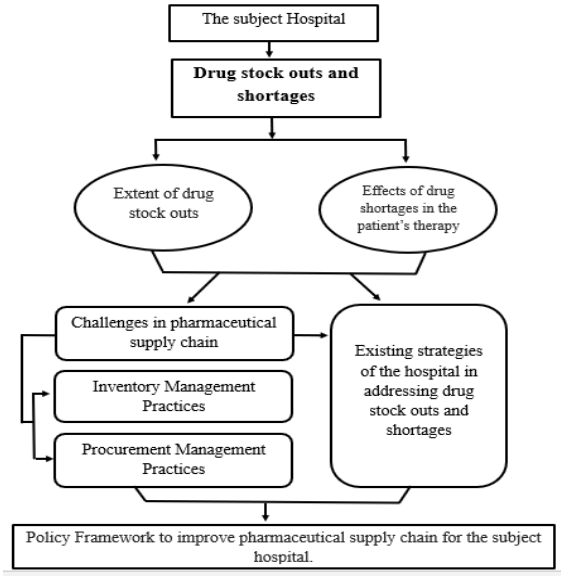

Figure 1. Methodology flow diagram

Figure 1 illustrates the methodology flow diagram of the study. It summarizes the materials used, data gathering and analysis, and the outcome of the study. The computed sample size is at least 249 respondents, and the sampling technique is stratified random sampling. A total of 303 hospital employees participated in the survey. Participants of the study should be at least three (3) years tenured, full-time permanent personnel in the sections and divisions who have been involved in the process flow of pharmaceutical supply chain management. These sections and divisions are as follows: Bids and Awards Committee, Procurement Department, Pharmacy Department, Materials Management Department, Doctors, and Nurses. These respondents are assumed to be knowledgeable about the hospital's supply chain procedures.

4. Data Collection

A structured survey questionnaire was used in this research as the instrument in gathering data to provide answers to the objectives of this study. The questionnaire checklist was answered by putting a checkmark on the list of answers given and writing their answer on the "others" if the answer is not given. There is no limit on how many answers the respondents would give. The survey questionnaire is divided into several parts: the Extent of drug stockouts in the subject hospital, effects of drug stockout and shortages in the patient's therapy, challenges in the pharmaceutical supply chain in terms of inventory management practices and procurement management practices, and lastly the existing strategies of the hospital in addressing drug stockout and shortages in the hospital. The researcher decided to apply

the Likert Scale in most of the questions, wherein the respondent rated their agreement or disagreement with the questions laid out in the survey. It is composed of five response choices designated from strongly disagree (1) to agree (5) strongly. The questions that were asked to the respondents were adapted and constructed by the researcher, who included relevant questions and can achieve the objectives of this study. The list of questions adapted and constructed by the researcher was submitted to the proponent's adviser for corrections and suggestions. The reliability testing was conducted in the subject hospital with 30 respondents. Reliability was analyzed using Statistical Package for the Social Science (SPSS) using Cronbach's alpha, giving a coefficient of 0.935. The following statistical measures were used for accurate and reliable presentation analysis and interpretation of the data retrieved to arrive at the findings and conclusions of the study: The use of descriptive statistics – Mean, Standard Deviation and Percentage technique are the most suitable type of statistical tool to measure the data or results from the survey. The Mean and Standard Deviation were used to treat questions with Likert Scale of Measurement answers, while Percentage was used to compute for the questions with Non- Likert Scale of Measurement. These three statistical tools were performed in a Microsoft Excel and Statistical Package for the Social Science (SPSS) V20.

5. Results and Discussion

5.1 Validation

In order to determine the reliability of the questionnaire, the researcher conducted a pre-test among 30 respondents. Responses were encoded, and the Cronbach Alpha coefficient was obtained. The said coefficient enabled the researcher to establish reliability. As defined, having a reliable questionnaire meant obtaining the same results even when the survey was conducted several times.

The coefficient obtained near to 1 or 100 when converted to Percentage. The SPSS output generated for the pre-test is shown below;

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.935	74

Figure 2. Result of Cronbach Alpha

As observed in Figure 2, the alpha coefficient computed was 0.935 or 93.50%. This means that the questionnaire generated a 93.50% reliability rate. Hence, the questionnaire is deemed reliable.

5.2 Numerical Results

The main objective of the research is to improve the pharmaceutical supply chain management in one of the 500-bed, level 3 teaching-training and tertiary government hospitals in the Philippines. A structured survey was deployed to 303 hospital personnel involved in the pharmaceutical supply chain for the past three years. The questionnaire applied to obtain the objective was divided into four parts: determine the Extent of drug stockouts in the subject hospital, effects of drug stockouts and shortages in the patient's therapy, challenges in the pharmaceutical supply chain in terms of inventory management practices and procurement management practices and lastly the existing strategies of the hospital in addressing drug stockout and shortages in the hospital.

Table 1. Results on the Extent of drug stockouts and shortage in the subject Hospital

Statements on the Extent of drug stockouts in the subject Hospital	Mean	Std. Deviation	Qualitative Interpretation
A "drug stockout" was described as a facility's complete lack of a specific pharmaceutical formulation and dose (Hwang, B. et al., 2019). Based on the definition of drug stockouts, the hospital is experiencing this kind of scenario.	3.75	1.000	Agree
A "drug shortage" is a scenario in which the overall supply of all clinically interchangeable variants of an FDA-regulated drug product is insufficient to satisfy expected demand at the user level" (Schwartzberg et al., 2017). Based on the definition of drug shortages, the hospital is experiencing this kind of scenario.	3.70	.919	Agree

Table 1 illustrates the extent of drug stockouts and shortages in the hospital. The definition of drug stockout and drug shortages was cited in the questionnaire to achieve respondents' uniform understanding. As shown in Table 1, the majority of the respondents answered that drug stockout is happening in the subject hospital with a mean rating of 3.75 and a standard deviation of 1.00. On the other hand, drug shortage is also present in the hospital, with a mean rating of 3.70 and a standard deviation of .919.

Table 2. Results on the effects of drug stockouts and shortages in the patient's therapy

Statements on the Effects of drug stockout and shortages in the patient's therapy	Mean	Std. Deviation	Qualitative Interpretation
The medical doctors in the hospital conduct suboptimal treatment in using alternative drugs when the drug of choice for the treatment is not available.	3.57	.873	Agree
Quality of care is one of the compromised factors when drug stock is out and shortages that result in increased patient monitoring, prescription inaccuracies, and dispensing errors.	4.05	.762	Agree
Due to drug stockouts and shortages, the patients may experience delayed care or treatment to hamper their recovery.	4.43	.639	Agree
Patients may increase the length of stay in the hospital if there are no sufficient drugs and medicines that will treat their conditions that may result from exposing hospital-acquired infections.	4.39	.721	Agree
When medications are unavailable for a period of time, there is a risk that patients will develop drug resistance and treatment failure.	4.50	.682	Agree
More significantly, a lack of some drugs may result in increased mortality and, in the worst-case scenario, death.	4.27	.806	Agree

Table 2 assesses the impact of drug stockout and shortages. Given the possible effects of unavailability of medicines shown in Table 2, all respondents agreed that patients may develop drug resistance and treatment failure when medicines are not available for a period of time. This construct has the highest mean rating of 4.50 with .682 standard deviation.

Table 3. Results on the Challenges in the pharmaceutical supply chain in terms of Inventory Management Practices

Statements on the Challenges in the pharmaceutical supply chain in terms of Inventory Management Practices	Mean	Std. Deviation	Qualitative Interpretation
The hospital's system has auto indenting/requisition of medicines once the reordering level is reached.	3.31	1.150	Neutral
The deliveries of medicines are always on time with the given time of 7 calendar days upon sending Advice for Delivery to the suppliers.	3.03	1.300	Neutral
There is a separate compartment for expired drugs.	3.03	1.208	Neutral

In the storage room, segregation of drugs from toxic, nontoxic, injectable, etc., in the storage room, is being practiced.	3.39	1.006	Neutral
In the storage room, there is no indication of rodents or insects.	3.22	1.200	Neutral
There is enough space for drugs and medicines in the storage area	2.91	1.298	Neutral
The storeroom is spotless, with all waste gone, no signs of food or beverages, items housed on strong shelves/bins, and boxes properly sorted.	3.28	1.295	Neutral
There is a sustained training program for the Pharmacists and other MMD personnel involved in the inventory and warehouse management of drugs and medicines.	3.13	1.058	Neutral
The hospital has adopted a better management security system under RFID technology that help for the better performance of Supply Chain Management Practices	2.97	1.295	Neutral
In my opinion, I am confident that under external uncertainties such as pandemics, the hospital's inventory management practices will not be affected.	3.38	1.248	Neutral

There were two challenges focused on this research, first is on the Inventory Management Practices of the hospital. Out of thirty (30) statements given to the respondents on these criteria, Table 3 illustrates the significant weaknesses. Areas for improvements are the hospital's system in reordering, timely delivery of the medicines, facility and warehouse expansion, and training of personnel involved in the inventory and warehouse management. Proper inventory management is vital for the long-term success and profitability of the hospital. The Pharmacy can automate the reorder points, view inventory counts in real-time at the stock keeping unit (SKU) level, and report inventory trends and predictions if the establishment has the necessary inventory management software. Using the correct stock control tactics can help the hospital maintain a healthy inventory turnover and keep shelves supplied with just the right amount of medicines.

Table 4. Results on the Challenges in the pharmaceutical supply chain in terms of Procurement Management Practices

Statements on the Challenges in the pharmaceutical supply chain in terms of Procurement Management Practices	Mean	Std. Deviation	Qualitative Interpretation
The number and qualifications of the staff are sufficient to undertake the procurement required for the proposed project for the medicines.	3.34	0.822	Neutral
The unit has adequate PCs, internet connections, photocopy facilities, printers, etc., to undertake the expected procurement.	3.38	.697	Neutral
The supplemental request for drugs and medicines were always funded.	3.40	0.807	Neutral
There is a turnaround time for the documents submitted in the office.	3.33	1.144	Neutral
The hospital religiously follows all the scheduled procurement activities for drugs and medicines based on its timeline	3.38	1.230	Neutral
Under Annex C of the 2016 Revised IRR of the Procurement Law, the earliest possible time frame for the procurement of goods and services such as medicines is 26 calendar days. I believe that the hospital's procurement process can be done in this given time frame.	3.34	0.822	Neutral
In my opinion, I am confident that under external uncertainties such as pandemics, the hospital's procurement management practices will not be affected.	3.20	1.022	Neutral

The second challenge discussed in the study was Procurement Management Practices. There are twenty-eight statements given to the respondents. Highlighted in Table 4 are areas that might be strengthened on Procurement Management Practices: the hiring of additional human resources, granting of additional office supplies and equipment, maximizing fun available, and timeliness on conducting procurement process—diversified procurement management guarantees that all commodities and services are procured correctly for projects and techniques to run smoothly and successfully. More than just a corporate need, procurement may be used to gain a competitive edge when optimized to save money, time, and resources.

Table 5. Results on the existing strategies of the hospital in addressing drug stockout and shortages in the hospital

Statement on the hospital's existing strategies in addressing drug stockouts and shortages.	Mean	Std. Deviation	Qualitative Interpretation
The doctors in the hospital may use the same treatment BUT given another strength/dosage when their first drug of choice is not available.	3.85	.716	Agree
The doctors in the hospital may use alternative drugs to treat the patient when their first drug of choice is not available.	3.97	.576	Agree
The Pharmacy Department is assigned in buying unavailable medicines good only for 24 hours through Emergency Purchase	4.22	.852	Agree
The Pharmacy Department invites suppliers to stock their medicines in the hospital through Consignment.	3.89	.712	Agree
The Pharmacy Department initiates to borrow drugs and medicines from other government hospitals and returns the stock loan once it is available.	4.01	.690	Agree
The hospital accepts near expiry medicines as donations from private/government to aid stockouts and shortages.	3.83	.920	Agree
The hospital is referring patients to another facility when patient treatment cannot be done due to the unavailability of medicines.	3.29	1.048	Neutral
In my opinion, the hospital is pursuing the best Pharmaceutical Supply Chain Management Practices.	4.01	.665	Agree

Table 5 analyzes the stakeholders' awareness of the hospital's existing strategies in addressing drug stockout and shortages in the hospital. With all the listed strategies that have been given away, all respondents agreed to all seven statements with only one neutral result, which is to refer patients to another facility when treatment of the patient cannot be done due to unavailability of medicines. This means that stakeholders maximize the available approach in addressing stockouts and shortages in the hospital.

5.3 Graphical Results

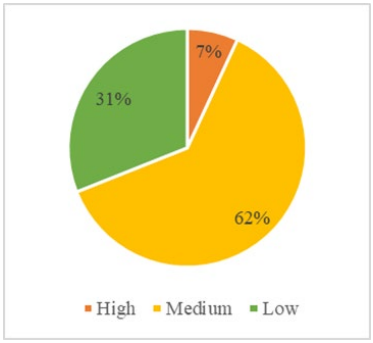

Figure 3. Impact category of drug stockouts in the subject hospital

Table 6. Impact Category of drug stockouts

Impact category*	Facility action	Quantity of medicine dispensed to patient
High	Patients referred elsewhere OR turned away	No medication
	Dispensed only part of the formulations constituting a full regimen	A smaller OR full supply
Medium	Patients referred elsewhere OR turned away	A smaller supply
	Borrowed from another facility	A smaller supply
	Substituted by the same regimen but a less optimal dosage OR a less optimal formulation OR pill burden increased	A smaller OR full supply
	Switched to a less optimal regimen	A smaller OR full supply
Low	Switched appropriately to a different regimen, dosage or formulation	A full supply
	Borrowed from another facility	A full supply

Reference: Hwang, B., Shroufi, A., Gils, T., Steele, S. J., Grimsrud, A., Boulle, A., Yawa, A., Stevenson, S., Jankelowitz, L., Versteeg-Mojanaga, M., Govender, I., Stephens, J., Hill, J., Duncan, K., & van Cutsem, G. (2019). Stock-outs of antiretroviral and tuberculosis medicines in South Africa: A national cross-sectional survey. PloS one, 14(3), e0212405. https://doi.org/10.1371/journal.pone.0212405

Table 6 differentiates the category of drug stockouts. Given the clear picture of each category, the subject hospital was categorized under Medium classification, as shown in Figure 3. It was also matched on Table 5, on which respondents were well aware that doctors in the hospital are using the same treatment but given another strength/dosage when their first drug of choice is not available. That hospital borrows drugs and medicines from other government hospitals and returns the stock loan once it is available.

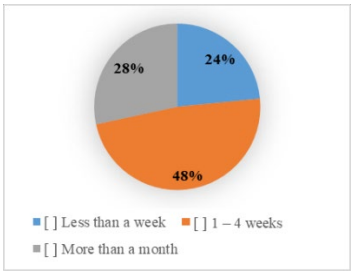

Figure 4. Duration of drug stock out and shortage

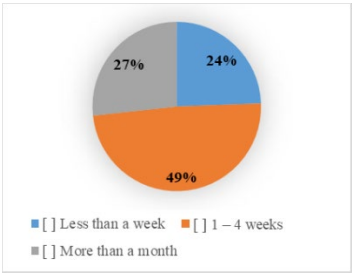

Figure 5. Duration on replenishment of drugs that were out of stocks and in shortage

Portrayed in Figures 4 and 5, to compare the duration of drug stockout and shortage in the hospital and the duration of replenishment of drugs and medicines, respondents answered 1-4 weeks for both questions. At this time, the Pharmacy Department is buying the unavailable medicines good only for 24 hours through Emergency Purchase. It initiates to borrow drugs and medicines from other government hospitals and returns the stock loan once it is available to address the problem. This was also corresponding to Table 5.

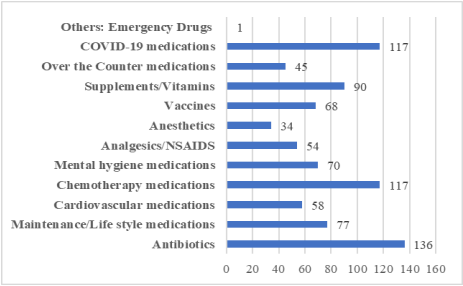

Figure 6. Group of drugs frequently out of stock and in shortage on the subject hospital

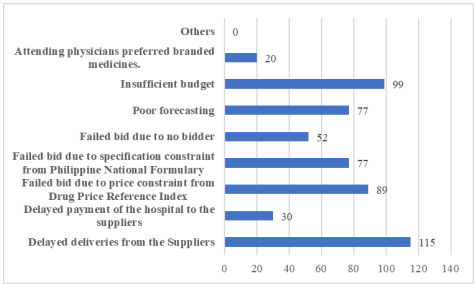

Figure 7. Common causes of drug stockouts and shortage on the subject hospital

Figure 6 illustrates that antibiotic, medications for COVID-19, and chemotherapy topped as the group of drugs that are frequently stocked out and in shortage. These life-saving medications can cure, halt, or prevent disease; ease symptoms, or help in the diagnosis of illnesses. Unavailability and insufficient inventory of these medicines will disable the doctors and other healthcare workers from curing many diseases and saving lives.

Delayed delivery from the suppliers, insufficient budget, and failure of bid due to drug price was ranked as the highest common causes of drug stockouts and shortages in the subject hospital, as depicted in Figure 7. These external factors are one of the most significant challenges for supply chains in a government hospital. The procurement department needs to plan to manage resource scarcity to minimize the disruption of the availability of drugs and medicines.

Based on the analyses above, drug and stockouts shortages impact both the patient's health and recovery and impedes the hospital's objective to delivery timely quality care and service. Regardless of the origin, the consequences of a medicine scarcity are severe that the majority of health-care workers are affected and are fully aware of the long-term disastrous results.

5.3 Proposed Improvements

The problem identification and analysis have presented possible areas for improvement that the hospital can focus on. The proposed policy framework detailed in Table 7 is explained below with the ultimate goal of the availability of high-quality drugs and medicines 90% of the time and improving the pharmaceutical supply chain management.

Table 7. Proposed Policy Framework

Objective	Activities / Strategies	Person Responsible	Budget	Timetable	Monitoring Tool
Training and Capacity Building	Training of stakeholders in Pharmaceutical Supply Chain	Training Office, Civil Service, Philippine Pharmacists Association, GPPB, External Speaker	It depends on the available external training provider	2nd quarter (ideally May), conducted annually (ideally), but maybe done every other year if resources are limited	Training proposal, HPO of participants, Registration sheet, Training report
Internal Pharmacy Strategies to Make Operations More Efficient	Inventory Management Techniques (ABC+VED Analysis)	Pharmacy	Salaries of staff (already inherent in the job)	All year	Inventory reports, Consumption reports, ABC+VED Analysis
	Implementation of Advanced Notification System	Materials Management Department, Pharmacy	Salaries of staff (already inherent in the job)	All year	Integrated Inventory reports, Integrated Consumption reports
Engineering support	Expansion of Storage Facility	Engineering and Facilities Management Department	It depends on the approved allotted amount for the renovation and expansion of storage areas	3rd quarter of the year	Notice of Award (NOA) to winning contractors.
Administrative Support	The hiring of additional administrative officers and administrative assistants	Human Resource Department	Costs of Recruitment, Selection, Placement	After the election ban, hopefully within the year	Appointment papers, Assumption to duty
	Grant of additional office supplies and equipment	Requesting Department, Budget Office	Depending on the approved allotted amount for the supplemental request	3rd quarter of the year	Approved SPPMP, Certificate of Availability of Funds (CAF)
Maximizing Information Technology	Strengthening the hospital information technology system to make it more responsive to the needs of end-users and to ease and facilitate workload, monitoring, and evaluation	Central Communications-Integrated Hospital Operations Management (CCIHOM), Pharmacy, Clinical Departments, Accounting, Nursing	Salaries of staff (already inherent in the job)	All year	Integrated Inventory reports, Integrated Consumption reports, Integrated Pharmacy, and accounting reports
Maximizing available funds	Stratification of the procurement strategy Strengthening the competitive bidding	Pharmacy, Consignment Committee, BAC, Procurement	Salaries of staff (already inherent in the job)	All year	Decrease in petty cash usage, Decrease in expiring meds, Increase in bidded meds, Increase in consignment meds,

	and consignment systems				Consumption reports.
Good Governance	Implementation of pharmacy policies	Pharmacy	Salaries of staff (already inherent in the job)	All year	Implementation of pharmacy policies
	BAC mandates the deadline of submission of PPMPs, and the start of the procurement process	BAC, Pharmacy, All Clinical Departments	Salaries of staff (just a matter of issuing a Hospital Memo and following up; already inherent in the job)	Late 2nd or early 3rd quarter of every year	Timely start of the procurement process by the BAC, Stringent Turn Around Time of all activities
	Use of algorithm for the failure of bid and inventory is either zero or near zero.	Pharmacy, BAC, Procurement	Salaries of staff (already inherent in the job)	All year	Consignment Request Form, Emergency Purchase Request

1. Capacity building of stakeholders in the Pharmaceutical Supply Chain is one of the easy solutions that can be implemented, with readily available resources, hopefully resulting in a significant impact. Below are the proposed workshop and pieces of training shown in Table 8 for the stakeholders of the supply chain.

Table 8. Proposed Workshop and Training

No.	Training Subject	Target Group	Purpose
1	Preparation of PPMPs	12 Clinical Departments x 4 representatives (2 Medical Specialists + 1 Chief Resident + 1 Medical Officer)	To train Clinical Departments in preparing accurate and appropriate PPMP
2	Procurement Law	Procurement Department, BAC, TWGs, and Pharmacy	To ensure compliance with laws, rules, and regulations on procurement and ensure effective and efficient economic and ethical operations in the respective areas of responsibility.
3	Inventory Management System	Pharmacy department and Materials Management Department	To become familiar with the new program and all of its modules.
4	Warehouse Management	Pharmacy department and Materials Management Department	To comprehend the storage procedures required for effective implementation, such as reception, inspection, tracking, labeling, segregation, cold-chain, trash, and so on.
5	Logistic and supply chain management	Pharmacy department and Materials Management Department	Understanding and implementing logistical and supply-chain protocols personnel appropriate for the operation

Medical residents are responsible for preparing the Project Procurement Monitoring Plan (PPMP) for Drugs and Medicines. Residents have temporary items only, and they graduate after 3-5 years of training. The training should be done yearly, or every other year at the latest., to ensure that the ones who prepare the PPMP are adequately trained on technical specifications, essential forecasting, and relevant regulations like the Government Procurement Reform Act, the PNF, and the DPRI. It is necessary for the hospital to include and train all stakeholders with procurement duties. As a result, reasonable procurement targets can be established. This will also make it easy for the team to develop and enhance a list of all procurement areas. A foundation in Inventory Management, Warehouse Management, logistics, and supply-chain management aids in better stock planning and ordering. Having trained personnel in these areas can quickly track the drugs and medicines in the warehouse with an excellent inventory management system.

2. Internal pharmacy strategies to make operations more efficient are also a crucial area that the hospital may focus on. Pharmacy policies, implementation, monitoring, and evaluation of inventory management (weekly physical

inventory, perpetual computerized inventory, computerized hospital ordering system), and forecasting of annual quantities need to be strengthened. In terms of inventory management, the hospital is currently using ABC analysis. Still, maybe it is time to explore vital, essential, and desirable (VED) drugs and medicines analysis and cross-match it with the ABC analysis to inform these strategies on drug and medicine selection and prioritization. Also, unfilled medications are underestimated, with only the needs of NBB inpatients captured, non-NBB inpatients, plus OPD and ER gaps are not recorded. To avoid disruption in the delivery of drugs and medicines, the hospital must impose on its suppliers to conduct an advanced notification system where it is enforced for the suppliers to give notice to regulatory authorities in case of any disruption. Because of the early notice mechanism, the United States FDA avoided 170 shortages in 2013. (Dill and Ahn, 2014; Fox et al., 2014). A study conducted in Europe and Israel stated that the respective authority usually gets notification two months before shortage (Miljković et al., 2020b).

3. Another critical area that needs immediate attention for growth and upgrading is the hospital's storage facilities. A comprehensive GAP analysis is strongly advised to identify the infrastructural and process level gaps that must be rectified, keeping the following principles in mind. A distinct temperature zone and moisture, rodent, and seepage-free environment are required to maintain the quality of the drug during its useful life. (a) A hospital's central warehouses must have enough space to carry at least six months' worth of goods (2 months for safety stock + 4 months for consumption). Warehouses must have distinct demarcations for vital and essential supplies, damaged and expired medications, poisonous substances, and high-volume commodities, (b) Each warehouse must have at least two months' worth of storage capacity. Cold-chain products, damaged and expired drugs, high-volume commodities, and other dangerous chemicals must all be kept in their area of the shop, (c) Warehouses, Facility-level stores must have appropriate racking systems and handling equipment for easy handling and access, and (d) To ensure that warehouse/store management rules and principles are understood and consistently followed, a complete examination of training needs is necessary.

4. Investing in the appropriate health human resource should also be done. As a 500-bed capacity level 3 hospital, the hospital is allowed for one administrative officer III, two administrative assistant III, and four administrative assistants I. Currently, the hospital only has 1 out of 2 administrative assistants III and 3 out of 4 administrative assistants I for Procurement Department. This lack of actual people to do the work compromises those that are currently employed, possibly resulting in poor quality of work, employee dissatisfaction and burnout, and poor patient service. Also, sufficient office supplies and equipment are required to increase the productivity of the employees in the workplace. One simple thing that can keep the office running smoothly has the right supplies on hand. Sufficient office supplies and equipment contribute to everything from efficiency to accuracy.

5. Health information technology should ideally decrease and streamline the workload because it automates what would have been done manually. This would also address some of the gaps that a lack of human health resources would necessarily have. However, the IT system of the hospital, while owned by the hospital, is proprietary by nature, and the external provider is not very responsive in addressing the requests for customization. These requests for customization would comply with changing government regulations and also provide management with the knowledge necessary for evidence-based management. By modifying the purchase plan according to consumption, the inventory management system will enable indenting based on actual demand. If necessary, the inventory management system will permit the inter-faculty transfer to improve pharmaceutical availability throughout the facilities.

6. Insufficient funds are a reality for any government enterprise. Hence, it is incumbent upon the hospital to ensure that whatever funds given are used efficiently to provide the necessary services to result in better health outcomes for our patients. The competitive bidding process and the consignment system should be strengthened, with the petty cash fund usage being the absolute last resort, as the latter method is costlier for both the government and patients.

7. Lastly, the importance of good governance in leading the way to efficient, responsive, and quality use of resources for the provision of drugs and medicines cannot be emphasized enough. Looking at it from a hospital-wide perspective, medical specialists should be encouraged to take on a more active role in the management of hospital affairs. The other departments and committees, e.g., BAC, Procurement, Materials Management, Human Resources, CCIHOM, etc., should also study their own internal structure and policies and act on opportunities for improvement. While national regulations are not within the hospital’s purview, constant feedback to the policy-makers should be

done, backed up by hard evidence. Stakeholder meetings, with a view to policy formulation, should be conducted, policies set should be implemented, monitored and evaluated regularly, and adjusted accordingly.

Table 9. Protocols, Forms, and Formats

No.	Area	Purpose	Primary Benefit
1	Planning and management guidelines for rational procurement.	Finalization of the "Annual Procurement Plan" on time by collecting, synthesizing, and rationalizing facility-wise information and stringent monitoring at various stages.	Accurate yearly demand forecasting, Involvement of practitioners/doctors in the indenting procedure, Quantity information aids in procurement scheduling, Expiry management control.
2	Disposal of damaged and outdated medications and consumables guidelines	Expired and damaged drugs must be disposed of in a timely and proper manner in accordance with environmental and other regulations.	Better space management, Contaminant prevention, Adherence to environmental and other legislative standards
3	Storage and Warehouse Management Protocol	Observance of storage guidelines relevant to each drug. Separation of drugs based on scientific standards.	Waste and damage management, Space management, Easy access, and physical control
4	Procurement Procedures	Define the process and procedures to be used—standard tender terms and conditions in terms of eligibility, quality, and so on.	Competition as a result of clarity and transparency, Economy and process efficiency

There shall be standard procedural guidelines, forms, and formats, which shall be followed uniformly at all levels. The policies/protocols which need to be developed immediately are as shown in Table 9.

This algorithm shown in Figure 8 reflects the alternative procurement process that the hospital may use in instances where a failure of bid and inventory of stocks are either zero or near zero. This flowchart shows step-by-step procedures on how the hospital can deliver drugs and medicines to its patients and minimize unfilled medications.

The policy framework developed a proactive system for advance notification, reporting, and tracking of drug shortage information through maximizing information technology. Effective policies and good governance should be implemented to monitor the timely procurement of drugs and medicines stringently. To reduce health loss, particular emphasis must be paid to the clinical side through training and educating the stakeholders of the pharmaceutical supply chain. Inadequate financing and underbudgeting can result in insufficient funds to meet the needs of the patients in the hospital. Two important initiatives that can be leveraged are engineering and administrative support that can be obtained from the management of the institution.

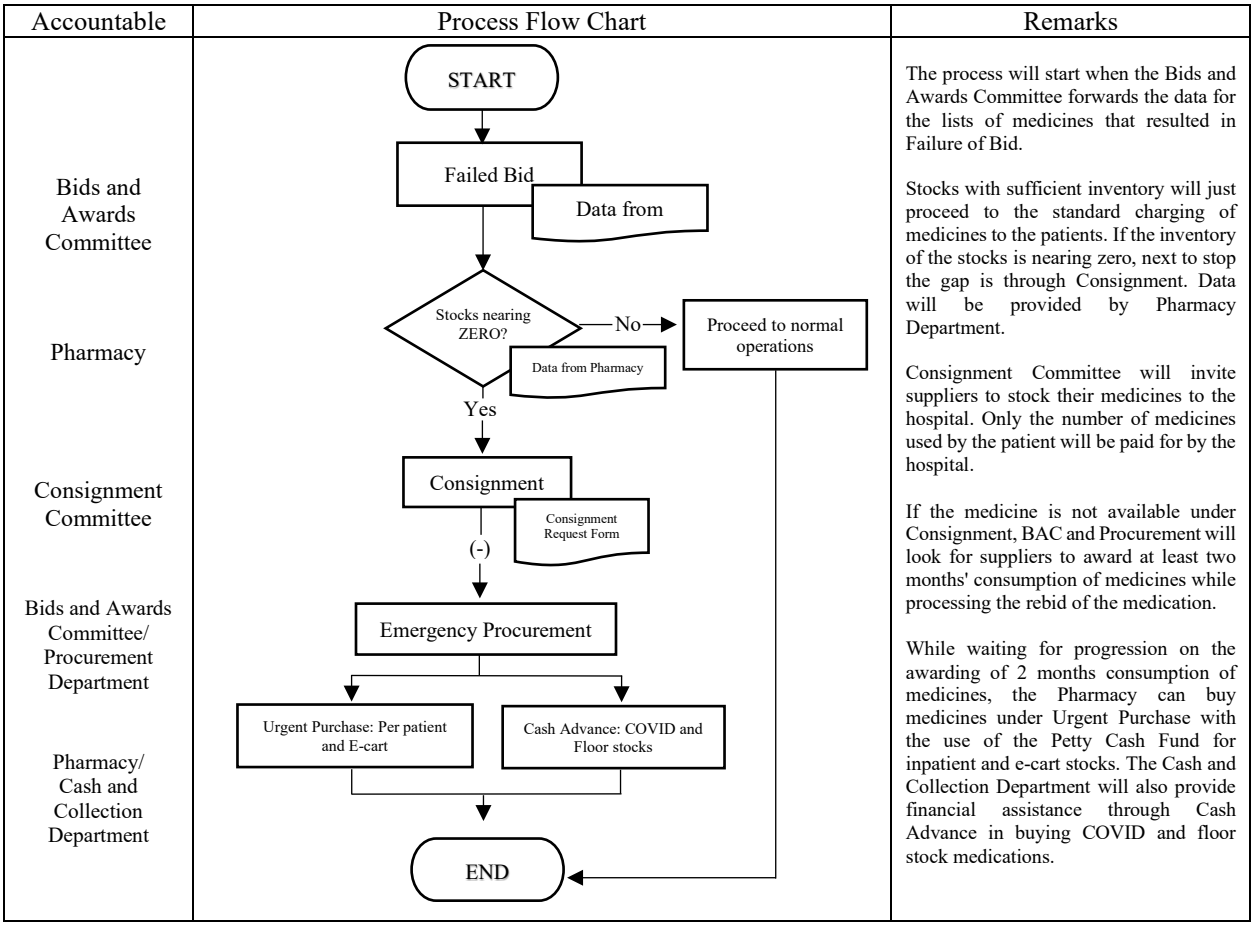

Figure 8. Algorithm for the failure of bid and inventory when stocks are either zero or near zero

6. Conclusion

Overall, the survey analysis revealed that medicine stockouts are widespread in the subject institution, with a mean of 3.75 and a standard deviation of 1.00. However, there is a medicine shortage in the hospital, with a mean rating of 3.70 and a standard deviation of.919. When medications are unavailable for an extended length of time, all respondents agreed that patients may develop drug resistance and treatment failure. This build has the highest mean rating of 4.50 and the smallest standard deviation of.682. In conclusion, the subject hospital, as a 500-bed, level 3 teaching-training, and tertiary government hospital, aims to provide patients with a continuous supply of high quality, safe, and effective drugs and medicines at least 90% of the time. Gaps in the current system have been identified, and solutions have been proposed. Hopefully, these would result in achieving the target, or even exceeding it, with the provision of 100% of drugs and medicines to all patients, helping in achieving the goals of the Department of Health of better health outcomes, financial risk protection, and a more responsive health system for all Filipinos.

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Biography

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