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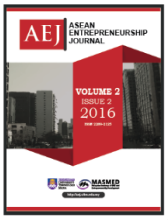

Do Inventory Practices Correlate with Inventory Management Performance?: A Cross-Sectional Study in Malaysian Public Hospitals

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ABSTRACT

The study is aimed to evaluate the correlation between inventory management practices, represented by inventory control towards inventory management performance. A cross-sectional, descriptive study was undertaken. 143 public hospitals in Malaysia were approached for the study using an online questionnaires. Descriptive statistics were used for elaborating demographic characteristics while for inferential statistics, a Pearson Correlation Analysis was used to test the effects of inventory control on inventory management performance. Analysis were performed using SPSS 21.0. Out of 103 online questionnaires, 81 were returned with a response rate of 78.64%. Positive linear correlations between inventory control($r = 0.799$, $n=81$, $p < 0.01$) towards inventory management performance were observed. Therefore, the results as portrayed showed that by increasing the inventory control, it will lead to increasing inventory management performance. Positive correlation between both variables will further help in the prevention and management of inventory (drugs). Therefore, a good practice of controlling drug management should be implemented by public hospitals in Malaysia. Also, learning on drugs management from Pharmacy Department of public hospitals could be transferable to pharmacy department of private hospitals and inventory department of other organisations. This study is limited to the Malaysian public

healthcare sector. In order to improve generalisability, this study could be replicated in private hospitals and other industries sector. The findings shed light and provided useful guidelines to the Main Medical Store (MMS) of public hospitals to better improve the inventory control (drug management) towards inventory management performance. Suggestions for future research are also included.

Keywords: Inventory practices, inventory performance, public hospitals, drugs management

1. INTRODUCTION

Multiple issues threaten the performance and sustainability of Malaysia's healthcare system against a background of rising health expenditure. Even though the global healthcare industry is among the most dynamic and rapidly growing industries in the world economy, unfortunately the healthcare delivery system in Malaysia has been far from efficient and that there has been a tremendous wastage of resources within the public and private sector (Medical Development Division, 2011). Among the current issue that can be highlighted is in relation to wasted and stolen or missing inventory, is the National Audit Chief Report 2013 on the lack of control and administration. A total of RM1, 692125.00 was lost due to being stolen and mismanagement involving medicine.

Due to the above situation, it showed that the issue is critical and needs the implementation of proper inventory management practices. The medicine or drugs which are not properly controlled may lead to an excess in stock. Furthermore, this excess or surplus will lead to the reduction in the number of drugs ready to be served to the patients and due to that, the quality of healthcare would be negatively affected (Kagashe & Massawe, 2012). In viewing that, the healthcare sector must transform to be an extra effective and efficient healthcare providing system in ensuring that the healthcare services are widely utilised and must speedily react to the changes in products and services in order to be at the forefront of advanced technologies, and in applying innovative processes to substitute past processes (Medical Development Division, 2011).

Based on the above discussions, it is noted that public hospitals, as the general healthcare providers, are important contributors to the Malaysian economic growth and in relation to their inventory management practices, it is vital for the public hospitals to move up their service standards to a higher value chain. To do so, this service needs a systematic approach of inventory management practices that would accelerate service (inventory management) performance, thus would lead to excellence in healthcare. The study by Anil, Aubid, Rashid, A, & At (2012) revealed that inventories should be allocated without incurring any

waste. However, it was later shown that the pharmacy department faced difficulty in managing the inventory after investing in it (M. Ali et al., 2012). Among the reasons that have led to waste and economic inefficiency as highlighted by Romero (2013) are, (1) inadequate and incompetent workforce, (2) poor supply chain and the presence of mismatched services, (3) underutilized and unused high-end equipment when skilled specialists resigned from the public sector, (4) some hospitals in the public sector had low bed occupancy ratio and (5) the lack of clinical quality.

Since drug expenditure is the main component of the hospital's spending, drug inventory management practices is an interesting area, as investigated by Theptong (2010). Romero (2013) discovered that very limited study has been circulated on the major concerns towards the administration of drugs in public hospitals. Furthermore, a study by Ann, Victoria, & Ukpere (2014) recommended that organizations should adopt inventory keeping method that best suit their operations. Thus, clearly the study on inventory management practices represented by inventory control are highly needed and will be the scope of this research to ensure a better inventory management performance focusing on drugs management in Malaysian public hospitals. Inventory management practices could be implement in system, administration and control but however this study will focus on inventory control.

2. LITERATURE REVIEW

2.1 Entrepreneurial self-efficacy

Inventory Management Practices: Ali (2012) stated that the efficient and effective management of inventories will lead to higher satisfaction level in customers. Thus, the use of proper practices in inventory management especially at hospital pharmacies can enhance inventory management performance of the drug management process. A study done by Anil et al., (2012) has proposed a necessary effective and efficient management of drug stores, in order to make sure the performance of medicine is high. Among the ideas are efficient priority setting, purchase decision-making, specific drug distribution, higher supervision of drugs, and avoidance of pilferage of drugs. Inventory management practice in the healthcare segment is more difficult if compared with the rest of the industries due to the patients' needs for an accurate service, particularly in providing sufficient medical supply (Hani, Basri, & Winarso, 2013). Improving the control of drugs management in Malaysian public hospitals require a good indicator to measure and to support a reduction in wastage.

Inventory Control and Inventory Management Performance: A successful service in organizations would depend on many reasons, one of the factors being a consistent system of inventory management control which offers information to smoothly manage the materials, to fully utilize the people and equipment, to communicate with customers and to coordinate the internal activities. Studies have found that inventory control is used in analysing product sales, in detecting popular items in stock and in readying to instantly fulfil any customer's order (M. Ali et al., 2012). Therefore, having a good inventory control enables the organizations to keep track on their inventory levels as low as possible at minimum cost and to be more efficient. A good inventory control system means that the organization have an up-to-date inventory count at all times, giving good customer service, giving accurate information to customers and would improve the image of the organizations (A. K. Ali, 2011). It is vital that inventory control may allow managers to receive real time information on inventory status. This will assist the management to accurately make informed decisions, anywhere, anytime and would save time and cost used for labour and thus work be working on inventory management properly (Mathaba, Dlodlo, Smith, & Adigun, 2011). A properly managed inventory control system can considerably improve the firm's performance and availability of items to customers (Koumanakos, 2008; Tony Wild, 2002). Thus, it is material managers are suggested and give more focused and more attention to the areas of inventory control as good inventory control means that time to fulfil orders stays low (M. Ali et al., 2012). The pharmaceutical department is one of the important departments supplying medicine to patients and also is one of departments incurring high expenses in the purchase of drugs. An inventory control practice in pharmacy is the process of managing inventory (drugs) in order to meet customer demands at the lowest possible cost and with minimum investment (Anil K et al., 2012). The pharmacy department is most often charged with the responsibility for managing drugs and delivery system costs. Therefore, the pharmacy management team should focus on developing effective strategies to maximize leverage on drugs and human resource costs (Anil K et al., 2012).There is no doubt that inventory needs proper control, due to it being the largest assets of a business (Deveshwar & Modi, 2013) and the alignment of supply chain strategy, inventory management and product characteristics are extremely important for the successful operations of a company (Srinivas, 2013), even the upgrade of technology as a change will increase the expenditure of health care, but the best part and among the benefits from its would be that the

technologies would become cheaper, faster, more mobile and having more features (Medical Development Division, 2011). The following hypothesis is proposed:

H_1: Inventory control has a significant correlation towards inventory management performance

3. RESEARCH METHODOLOGY

Study Design and Settings: The study was designed as a questionnaire-based cross-sectional descriptive analysis.143 public hospitals in Malaysia combining Hospital Kuala Lumpur and state hospitals, major specialist hospitals, minor specialist hospitals, special hospitals/institutions and non-specialist hospitals were approached for data collection. The population frame is derived from the Health Ministry of Malaysia directory according to the number of specialists and quantity of the beds (Medical Development Division, 2011) and currently providing services to the community.

Ethical Approval: In Malaysia, an ethical requirement is compulsory for conducting clinical and non-clinical observational studies. Permission and approval to conduct this study was taken from the Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia through the National Medical Research Register (NMRR). In addition, written consent was also obtained from the Directors of the selected public hospitals prior to data collection. Then, The Head of Pharmacy are informed about the research initiatives and confidentiality of their responses.

Participants and Sampling Criteria: The unit for analysis that was chosen is the Logistics Pharmacy Unit of public hospitals in Malaysia. The target respondents are those who are directly involved in implementing and maintaining the inventory management control at the drug stores. In this context, data will be collected from the Head Officers of the Pharmacy who are directly related in implementing inventory management control and they would be directly involved in the inventory management (drug management) activities of the department.The study was conducted from mid October 2015 to end of December 2015. This study is proportionately stratified and with the sample being randomly based. The samplings are based on the 143 public hospitals, combining Hospital Kuala Lumpur and state hospitals (14), major specialists hospitals (25), minor specialist hospitals (27), special hospitals/institutions (11) and non-specialist hospitals (66) that are located in Malaysia.

Data Collection: Online questionnaires were emailed personally to the respondents, which are the Heads of Pharmacists at the Pharmacy Store within the public hospitals. Out of 103 online questionnaires, 81 were returned and usable for analysis (SPSS 21.0) with a response rate of 78.64%. Missing data cannot be avoided in survey research (Stumpf, 1978). Due to that, online questionnaires were chosen for data collection to overcome the problem. If there are missing answers in the questions, it will be displayed again

until all the data have been filled in. Respondents are only allowed to re-submit if all the data have been completed. In addition, online questionnaires can minimize errors as researchers manually enter data, because this data can be transferred directly to the analysis software (Mohd Asaad, 2012).

4. RESULTS

Demographic Description: The profiling of respondents' and organizations' demographics information is important to academic research since this study represents pioneering work that conducts surveys of the inventory control towards inventory management performance focusing on drugs management among Malaysian public hospitals. It can be concluded that the majority (36.3%) of the Heads of Pharmacy have had more than 16 years of experience in the pharmacy area, 32.1% between 11-15 years, 24.7 between 6-10 years and only 5% have an experienced between 1-5 years. Further analysis on the number of years that the Main Medical Store has been in operations shows that the majority (78.8%) haves operated for more than 16 years, 9.9% between 11-15 years and 11.1% between 6-10 years. The majority (68.8%) of the Main Medical Store have between 1 to 2 pharmacists, while 23.8% have 3 to 4 pharmacists, 23.8% between 5-6 pharmacists and only 5% have 7 pharmacists and above depending on the category of the hospital. In terms of the number of administrative staff involved in medical store management, the majority (85%) are managed by 1 to 10 staff, 12.5% by 11-20 staff and 2.5% by 21-30 staff. Lastly, the majority (45.7%) of hospital category are from the non-special hospitals, with the remaining 21% are from major hospitals, 16% are from minor hospitals, 14.8% are from HKL/state hospitals and 2.5% from special hospitals involved in this study represent the other categories of public hospitals in Malaysia.

Goodness of Measure: The goodness and suitability of the respondents' data were examined by using the reliability and validity test. According to Zikmund, Babin, Carr, & Griffi (2010), good measures should be both consistent and accurate. Reliability test were conducted to determine the consistency of the inventory control and inventory management performance constructs using Cronbach's Alpha.

Table 1: Cronbach's (α) score

VARIABLES	NO. OF ITEM	Cronbach's Alpha (α)
Inventory Control	26	0.932
Inventory Management Performance	18	0.878

Result of Cronbach's Alpha in Table 1 was 0.932 for inventory control and 0.878 for management performance. It exceeded the minimum acceptable value of 0.60 threshold as recommended by Nunally and Bernstein (1994). Thus, the results indicated that this measure is reliable.

Validity Test: The construct of the questionnaires was subjected to validity and reliability tests. One of alternative in testing the constructs is through factor analysis. The objective is to examine the underlying patterns or relationships for a large number of variables and to determine whether the information can be condensed or summarized in a smaller set of factors or components (Hair, Money, Samouel, & Page, 2007). Kaiser-Meyer Olkin (KMO) was employed to measure multi- collinearity issue that helped the researcher to identify the fitness of items and the value of KMO should be more than 0.5. Subsequently, the value of Bartlett's Test of Sphericity (BTS) was used to clarify the inter-correlation between the items whether it is adequate or not. Inter-correlation between the items is enough for running a factor analysis if the value of $p < 0.05$, which is significant.

Table 2: Factor Analysis of Inventory Control

Item Code	Item	Factor Loading
QID33	To what extent do recalled or expired medications remove from stock	.784
QID34	To what extent during dispensing, has the MMS given priority to medications with shorter shelf life	.763
SP43	To what extent are the drugs dispensed from MMS in a negotiable manner according to procedures	.752
PRD41	To what extent are pharmacy documents maintained in folders to avoid mix-up	.735
QID32	To what extent does the MMS have a system to monitor out of date medications or recently expired drugs	.731
SP42	To what extent is the drug supply order to the MMS managed at regular programmes	.719
PRD37	To what extent are all procurement invoices and supply vouchers kept in special files	.718
SP49	To what extent does the MMS have a contingency planning strategy in cases of drug shortages	.717
SP52	To what extent are all stocks inspected regularly to ensure the absence of outdated, unusable or mislabeled products	.716
QID30	To what extent are the drugs stored in a manner to protect their identity and integrity	.712
PRD36	To what extent are all medications recorded in the assigned supply ledgers	.674
QID28	To what extent does the MMS maintain sufficient stocks of medications to cover the monthly needs in addition to emergency stocks	.669

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)	0.859
Bartlett's Test of Sphericity (BTS)	1083.388
Significant	0.000

Table 2 illustrates the result of factor loading, KMO (Kaiser-Meyer-Olkin), MSA (Measure of Sampling Adequacy) and BTS (Bartlett's Test of Sphericity) of inventory control item. It can be seen that the value of factor loading was above 0.5, KMO (Kaiser-Meyer-Olkin), MSA (Measure of Sampling Adequacy) was (.859) for inventory control, which according to Kaiser (1974) is acceptable and for Hutchson & Sofroniou (1999) is a very reliable score. The BTS (Bartlett's Test of Sphericity) value was significant (.000) for the factor. The statistical results have proved that the data is free from the multi-collinearity issue and in having inter-correlation between the items. The results of factor loading, KMO, MSA and BTS values indicated that the inventory control item was fit for factor analysis and the sample was adequate to extract the results. The BTS (Bartlett's Test of Sphericity) was also significant ($p<0.05$) for all research instruments used.

Table 3: Factor Analysis of Inventory Management Performance

Item Code	Item	Factor Loading
DPOP1	To what extent can the complete supply of drugs supplied by Main Medical Store (MMS) can be accepted by sub-store	.548
DPOP2	To what extent can the correct supply and quantity of indented drugs influence the credibility of MMS	.584
DPOP5	To what extent does the accuracy and timeliness of drugs supplied is practiced to beat the demand of sub-store	.656
DPOP6	To what extent are the efficiencies of MMS achieved in reducing shortage, wastage, short expiry and excess of drugs	.655
DPOP8	To what extent does a sub-store complainthad led to an immediate action taken by MMS to solve the problem	.704
DPSP9	To what extent does the MMS swiftly figure out the problems about inventories	.699
DPSP10	To what extent does the person or unit that causes an inventory problem accept the responsibility immediately	.566
DPSP13	To what extent are inventory related problems solved faster	.706
DMPP15	To what extent are procedures reasonable to make inventory related decisions	.531
DMPP16	To what extent are scientific techniques used to make inventory related decisions	.606

DMPP17	To what extent are the inventory related with other department decisions not in conflict	.646
DMPP18	To what extent are the MMS and sub store informed about inventory related decisions	.733
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		0.833
Bartlett's Test of Sphericity (BTS)		709
Significant		0.000

Table 3 illustrates the result of factor loading, KMO (Kaiser-Meyer-Olkin), MSA (Measure of Sampling Adequacy) and BTS (Bartlett's Test of Sphericity) of inventory management performance item. It can be seen that the value of factor loading was above 0.5, KMO (Kaiser-Meyer-Olkin), MSA (Measure of Sampling Adequacy) was (.833) for inventory management performance, which according to (Kaiser (1974) is acceptable and for Hutchson & Sofroniou (1999) is a very reliable score. The BTS (Bartlett's Test of Sphericity) value was significant (.000) for the factor. The statistical result have proved that the data is free from the multi- collinearity issue and in having inter-correlation between the items.The results of factor loading, KMO, MSA and BTS values indicated that inventory management performance item was fit for factor analysis and the sample was adequate to extract the results. The BTS (Bartlett's Test of Sphericity was also significant ($p<0.05$) for all research instruments used.

Correlation: In this study, Pearson Correlation Test was conducted on two variables between the inventory control and inventory management performance. The result from Table 4 illustrated that there is a strong correlation as recommended by Cohen (1988) between the inventory control towards inventory management performance ($r = $ **.799,** $n = $ **81,** $p<$ **0.01)**.

Table 4: Pearson Correlation Test Result

Variables	**Inventory Management Performance**
Inventory Control	.799**

*****. Correlation is significant at the 0.01 level (2-tailed)***

5. DISCUSSION AND CONCLUSION

The result of the study showed that inventory control is found to have a strong correlation toward inventory management performance. This implies that an increasing of drugs management control will lead to the increasing of inventory management performance. Thus, the study can be concluded that for inventory management, there is evidence that the practice of inventory control is highly correlated to drug management performance in public hospitals in Malaysia. In particular, it seems that the more Heads of

Pharmacy practice the inventory control for the drugs, the greater their drug management performance would be. The study results agrees with the findings with other authors on the relationship between the variable. The finding of the significant correlation is in agreement with scholars like Stanger, Wilding, Yates, & Cotton, 2012; Mogere, Oloko, & Okibo, 2013; Khurana, Chhillar, Kumar, & Gautam, 2013; Kagashe & Massawe, 2012; Hsu-Hua Lee & Kleiner, 2001 who assert that both variables have a strong correlation. Waller, Nachtmann, & Hunter (2007) stated that inventory management represent a key success factor many companies and company's fate depends on how it manages its inventory. Therefore, the significant of monetary investment in inventory enhances the importance of proficient inventory management (Waller et. al. (2006). Inventory that is stored in large amount of quantities will result in waste and space usage. Besides that, in Japanese firm, the concept of keeping the inventory is a big waste in industry (Bon & Garai, 2011). Even there is a best strategy to increase the operation especially at the inventory management, however, if the raw material cannot be delivered during the production, there would be a big problem for inventory.

Previous research by Kagashe and Massawe (2012) has shown that there is a problem in maintaining stocks of drugs at the required level in Dar es Salaam region public hospitals of Tanzania. Hospitals are complex public service organisation providing large number of services of patients and drugs are part of link between the patient and the health care service. A comprehensive understanding of the impact of both variables will help public hospitals to create an effective inventory control in achieving its ideal stage and availability of drugs will contribute to the positive impact on patient health. Therefore, it can be concluded that, effective inventory control is recognized as one of the management areas of any organisation should acquire capability in order to gain some benefits such as optimal use of resources, reduction of waste, easy storage, increase ability of stock retrieval and high inventory utilization (Ann et al., 2014). The main medical store needs to properly manage the inventory through accountability, integrity, and following the current acts and rules in order to avoid misconduct, misuse of power and wastage (medical development division, 2011) in order to ensure that the standard of practice for medicine in malaysian public hospitals is maintained and at par with international standards

6. IMPLICATION OF THE STUDY

The result of this finding will help an organization in assessing their level of inventory management practices and will also be a guideline on what organizations need to do in order to go beyond their previous

inventory management performance by using proper inventory control as a tool. Furthermore, the findings of this study will help organizations move closer towards achieving levels of excellence in the business of providing services and would create an impact as part of the contribution to the Main Medical Store (MMS) of public hospitals in Malaysia.

7. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Study used the quantitative and cross sectional correlational survey research design. Meanwhile, there was limited literature due to the little research had been carried out in Malaysia on both variables, hence foreign studies was used in literature review. The similar empirical research by using longitudinal survey can be carried out in another area such as in private hospitals and service industries in Malaysia. Furthermore, the future study may look at other practices such as inventory system and inventory administration. Besides that, future study may focus on the perspectives of financial performance.

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