PHARMACEUTICAL REVERSE LOGISTICS IMPLEMENTATION IN NORTHERN MALAYSIA

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Abstract. As in many other developing countries, the generation of pharmaceutical wastes in Malaysia has increased significantly over the last few years. Pharmaceutical wastes are the unwanted materials which can no longer be used in the manufacturing processes that can eventually be harmful to the living beings in the ecosystem. Even though the severe impact of pharmaceutical wastes is significant, however only minor attention is given to the pharmaceutical reverse logistics. Hence, this study seeks to investigate the associated factors which affect the implementation of pharmaceutical reverse logistics in Malaysia. The data are collected using questionnaire that contains both closed- ended and multiple-choice questions. Questionnaires are administered to respondents from medical service centres sampled on a convenience basis. A total of 400 samples were collected, and the data are analysed using the Pearson Correlation Coefficient and Multiple Linear Regression. Overall, the Cronbach's Alpha score was 0.880 . As a result, the findings indicated that all of the independent variables such as costs, personnel, lack of coordination and government have a significant relationship with the implementation of pharmaceutical reverse logistics. Lastly, the outcomes of this study are expected to help the medical service centre to improve the handling and disposal of pharmaceutical wastes in an effective, efficient and environmental friendly way.
Keywords: *reverse logistics, Pharmaceutical, medical services, product recall, waste management*

Introduction

In any nature of business besides the goods purchasing activities from the consumer, there has to be some activities that involved with goods returns due to issues such as incorrect goods or destination of shipment, quality problems, overstock or unsold goods, imperfect consumer goods, marketing returns, goods brought back for refurbishing or re-manufacturing, and trade in the older ones to exchange new goods (Kabir, 2013). The generally accepted definition of reverse logistics reveals that it consists of the process of planning, implementation and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and associated information from the point of consumption to the point of origin for the purpose of recapturing or creating a value or proper disposal (Rigers and Tibben-Lembke, 1998). It is important to learn and manage the reverse flow of logistics because it is one of the means for closing the loop of a typical forward supply chain (Guide and Wassenhove, 2002).

Furthermore, in the case of pharmaceutical reverse logistics among the medical service center, it means taking expired, damaged and excess medicines back to the warehouse for proper storage, redistribution and disposal (Chirwa, 2015). According to (Bhavin, 2010) pharmaceutical waste management is associated with damages and product expiry, counterfeits, product recalls and clinical trial recovery. Indeed, the medical service center able to reap the benefits from the point of view of the economic,

corporate image, customer satisfaction, environmental, competitive and social with the implementation of pharmaceutical reverse logistics (Jayaraman and Luo, 2016). The implementation of reverse logistics in this sector is more challenging than in any other sectors as they are barely involve repairing or reselling of return drugs (Tompkins, 2010).

Hence, this research intends to investigate factors affecting the implementation of pharmaceutical reverse logistics with four intended objectives; (1) to examine the relationship between cost and the implementation of the pharmaceutical reverse logistics of medical service center in Malaysia; (2) to examine the relationship between personnel and the implementation of the pharmaceutical reverse logistics of medical service center in Malaysia; (3) to examine the relationship between coordination and the implementation of the pharmaceutical reverse logistics of medical service center in Malaysia; and (4) To examine the relationship between government and the implementation of the pharmaceutical reverse logistics of medical service center in Malaysia.

Literature Review

Over the last few decades, pharmaceutical reverse logistics has been evolved and increased significantly in many countries. However, many organizations in the developing countries do not take reverse logistics as the primary consideration for harnessing the profitability and sustainability of the organization. According to the (World Health Organization, 2010), 10% of the global pharmaceutical companies have over $32 billion worth of medicines on sales which were considered as counterfeit. In this instance, the pharmaceutical firms did not exploit this opportunity by recalling back the counterfeits or substituting the counterfeits with genuine pharmaceutical products as well as creating a significant difference to identify between real or fake products by the company logo (Mogaka, 2015). In most countries, the compliance of pharmaceutical reverse logistics seems to be challenging for them. Countries such as Indonesia and India have the policy and legislation of the Medical Waste Management Rule for numerous years, but they are still struggling with their compliance.

In Malaysia, issues like clinical waste from healthcare establishment are growing in direct proportion with the increasing demand for medical service (Ghafar, 2017). It is estimated that by the year 2020, biomedical waste from Malaysian hospitals will hit 33,000 tonnes annually (Ambali et al., 2013). Should this biomedical waste be improperly handled, it will create a negative impact on the health of people and environment in long-term. The rate of implementation of pharmaceutical reverse logistics of the medical service center in Malaysia is low (Shaharudina et al., 2013). The reason is the process of pharmaceutical reverse logistics deployment always associated with barriers (Ravi and Shankar, 2004). According to Tan and Hosie (2010), the lack of financial resource, lack of commitment from top management, and human resource problem are the barriers in the implementation of pharmaceutical reverse logistics in the medical service center. Indeed, all these problems are caused by various factors which have affect the implementation effective reverse logistics in the pharmaceutical industry in Malaysia.

In this study, Agrawal et al. (2016) model to identify twelve crucial success factors for reverse logistics implementation have been adopted.

i. Economic factors – Direct and indirect economic benefits like profitable business opportunities, green image, and tax benefits.
ii. Legislation – Policies or acts regulated by the government authorities to minimize the effect of disposed of life products on environment.
iii. Contract terms & conditions – Collaboration among members of supply chain especially with suppliers in pharmaceutical reverse logistics.
iv. Direct and indirect taxes – High degree of tax complexity due to involvement of import-export of pharmaceuticals.
v. Integration of forward and reverse supply chain – Simultaneous management of material, information and monetary flows through greater resource utilization.
vi. Vertical integration – Efficient in handling returns like having a common collection center.
vii. Process capabilities and skilled workers – Workers must be skilled to work simultaneously on manufacturing and re-manufacturing because of uncertainty of product returns.
viii. Consumer awareness and social acceptability – Increasing customer demand for green products and for companies to engage in environmental supply chain practices.
ix. Management information system – Prompt communication and accurate information helps to develop linkages to achieve efficient reverse logistics operations.
x. Resource management – Availability and effective utilization of property-based resources (physical facility, automated machines and equipment, human resource) and knowledge-based resources (managerial resources, technology).
xi. Top management commitment – Provides a clear vision and value to reverse logistics programs and motivates employees to achieve the aligned goals.
xii. Environmental concerns – A significant force that shapes the economy of a country.

However, for this research, four factors are adopted and adapted for the framework. They are cost, personnel, coordination and government. The reason of choosing only four factors is because based on previous study related to reverse logistics adoption; these four are the significant influencers on implementing reverse logistics.

For cost factor, previous studies found out that there is a tendency that the financial position of a company positively affects its strategic business policy such as it influence manager's investment decision in adopting reverse logistics (Grenadier, 2002) (*Figure 1*). As for personnel factor, there is a strong relation between awareness and practice of reverse logistics which is why higher awareness should be generated from within an organization first. This can be done by developing and training the employees to be competent during managing reverse logistics activities. Next, coordination factor. According to Álvarez-Gil et al. (2007), supply chain players are suggested to be the motivators of reverse logistics implementation. Finally, the government factor. Appropriate legislations are generally credited as having the greatest influence on a firm's reverse logistics activities (Carter and Ellram, 1998). Previous studies reveal that most firms who are practicing reverse logistics practices are doing so only because they are trying to avoid violating environmental-related regulations (Luken and Rompaey, 2008).

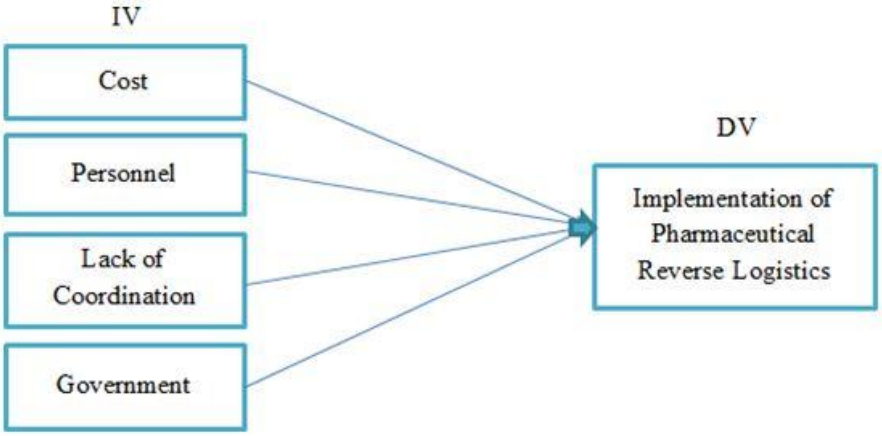

Figure 1. *Research framework.*

Materials and Methods

This research study is an exploratory study because researchers explored and analyzed the current status of implementation of pharmaceutical reverse logistics of the medical service centers in Malaysia. The type of investigation is a correlational study. In this research, the time horizon used by the researchers is a cross-sectional study. Data gathered from the stakeholders of medical service centers from the first week of November until the third week of November in 2018.

Quantitative research design was adopted for this research by obtaining useful information from primary and secondary data. For primary data, researchers collect the data themselves using questionnaire. Questionnaire is administered electronically via Google Form, by mail and face to face. The questionnaire were in two types which are closed-ended questions and multiple-choice questions. The questionnaire is distributed during the pilot test (via Google Form) and field survey which was conducted at medical centers at Changlun, Jitra and Alor Setar in Kedah state. The total response obtained during the pilot test and field survey were 25 and 400 respectively. The cronbach score was 0.87.

The target population comes from medical service centers such as staffs working at pharmacy, hospitals and clinics. Hence, the unit analysis is individual. A convenient sampling technique like non-probability sampling method is used for choosing the respondents in this research study because the sample units are determined based on the convenience of identifying the respondents at the data-collection venue and group email of the centers staffs.

Results and Discussion

Correlation analysis to establish the possible connections between variables and to study the strength of the relationship between variables (*Table 1*).

Table 1. *Correlation analysis*.

	Cost	Personnel	Lack of coordination	Government	Implementation of pharmaceutical

						reverse logistics
Cost	*P*	1	0.758**	0.565**	0.528	0.542
	S					0.000
Personnel	*P*		1	0.590**	0.560**	0.558**
	S					0.000
Lack of coordination	*P*			1	0.723**	0.564**
	S					0.000
Government	*P*				1	0.582**
	S					0.000
Implementation of pharmaceutical reverse logistics	*P*					1
	S					

P means Pearson correlation; S means n-Sig. (2-tailed).

Based on the result from the correlation analysis, the p-value for all the independent variables against the dependent variable is 0.000 which is smaller than α value of 0.01. Thus, all the null hypotheses are rejected since there is a significant relationship between all the independent variables with the implementation of pharmaceutical reverse logistics. Furthermore, the significant relationship between the variables is positive. The variable of cost shared 0.294% of its variability with the dependent variable after computed the value of r2 while the variable of personnel shared 0.311%, variable of lack of coordination shared 0.318% and the variable of government shared 0.339%.

Multiple linear regressions is to test how the dependent variable is affected by two or more independent variables. This type of statistical test also pointed out the relationship between the variables with discuss on the total variance between the items (*Table 2, Table 3, Table 4*).

***Table 2**. Multiple linear regression analysis: Model summary[b].*

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.666[a]	0.444	0.438	0.622

a. Predictors: (Constant), Government, Cost, Lack of coordination, Personnel.
b. Dependent variable: Implementatiuon of pharmaceutical reverse logistics.

***Table 3**. Multiple linear regression analysis: Anova[a].*

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	121.923	4	30.481	78.832	0.000[b]
	Residual	152.728	395	0.387		
	Total	274.651	399			

a. Dependent variable: Implementation of pharmaceutical reverse logistocs.
b. Predictors: (Constant), Government, Cost, Lack of coordination, Personnel.

***Table 4**. Multiple linear regression analysis:Coefficients[a].*

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		Beta	Std. error	Beta		
1	(Constant)	0.964	0.170		5.676	0.000
	Cost	0.166	0.059	0.167	2.826	0.005
	Personnel	0.191	0.064	0.181	2.975	0.003

Lack of coordination	0.149	0.053	0.164	2.833	0.005
Government	0.270	0.055	0.274	4.891	0.000

a. Dependent variable: Implementation of pharmaceutical reverse logistics.

From the analysis above, the R2 value is 0.444 which represents that all the independent variables explain 44.40% of the implementation of pharmaceutical reverse logistics variable. Moreover, the model is significant with F (4, 395) = 78.832 and p-value smaller than 0.001. Based on the result from the multiple linear regressions analysis, the p-value for all the independent variables is smaller than α value of 0.01. Therefore, the null hypotheses are rejected. Each of the predictor variables is significantly related to the dependent variable. Therefore, the regression coefficient equation will be:

Implementation of pharmaceutical reverse logistics score
= 0.964 + 0.166 (cost) + 0.191 (personnel) + 0.149 (lack of coordination) + 0.270 (government) + e

The objectives of this research are to examine the relationship between cost, personnel, lack of coordination and government with implementation of pharmaceutical reverse logistics in medical service centers in Malaysia. The findings showed that the four independent variables have positive relationship with implementation of pharmaceutical reverse logistics in medical service centers in Malaysia and were significant. Based on the result from multiple linear regression analysis Table 4, it shows a significant relationship between cost variable and implementation of pharmaceutical reverse logistics. The higher the allocation of funds, the higher the tendency to be implement reverse logistics. Hence, financial constraint has a direct influence on the implementation of reverse logistics. Besides, there is also a significant relationship between personnel variable and implementation of pharmaceutical reverse logistics. The lack of dedicated workers from management team in a company will influence a successful implementation of reverse logistics. Lack of proper capabilities will hinder the implementation of reverse logistics practices because without sufficient human resources, talent and knowledge, companies would not be able to efficiently carry out reverse logistics activities.

Based on the result from multiple linear regression analysis Table 4, it shows a significant relationship between lack of coordination variable and implementation of pharmaceutical reverse logistics. Companies concern with issues like asset and information sharing, collaboration, trust and having similar perspectives. Therefore, this concern refrains and affects the successful implementation of reverse logistics. A significant relationship between government variable and implementation of pharmaceutical reverse logistics is shown based on the result from multiple linear regression analysis. If there is lack of legislative incentives imposed by the government, it will cause hesitation or inefficiency during the implementation of reverse logistics. Hence, the lack of enthusiasm from the government will affect the implementation process of reverse logistics.

Conclusion

This study seeks to examine the associated factors that affect the implementation of pharmaceutical reverse logistics in Malaysia. The independent variables were selected after reviewing of numerous past related studies. Concerning that, the key finding of this research study is the cost, personnel, lack of coordination, and government is significantly related to the implementation of pharmaceutical reverse logistics. Therefore, the related parties that are in touch with the pharmaceutical reverse logistics should paid attention to those factors in order to bring about desirable outcome to the organization, environment, and health.

Last but not least, this study can serve as a reference for others to conduct the future research to extend the investigation and knowledge about the topic. Additionally, this study would be beneficial for the practitioners to improve their implementation and practices of pharmaceutical reverse logistics as several recommendations are suggested to enhance the waste management process of pharmaceutical products.

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