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Return and Disposal of Unused Medicines: A Customer Perspective of Reverse Logistics

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Abstract

Efficient and effective operations of supply chains have been a challenging task for practitioners. Management of a supply chain in reverse direction, referred to as reverse logistics, becomes more challenging, particularly, in the context of supply chains of perishable products. Disposal of the unused medicines, if not handled properly, may be harmful for the living beings in the system. Moreover, an in-efficient reverse process might lead to customer dissatisfaction. This paper has been extracted from a study of reverse logistics in Indian pharmaceuticals industry, recently conducted by the authors. The present portion of the study examines the relevance of some key issues of reverse chains in Indian pharmaceuticals from customer perspective. The data are collected using a structured closed ended questionnaire administered to different customers and consumers sampled on convenience basis from seven districts of an Indian State i.e. Uttar Pradesh. Data are analysed using descriptive and two independent sample t-test. The outcomes of this study are expected to help retailers, manufacturers, and policy makers modify their policies in order to improve the customer satisfaction and reduce the environmental hazards.

Keywords: Reverse logistics; customer satisfaction; environmental hazards; pharmaceutical supply chain.

1. Introduction and Previous Studies

Globalizations, the advancement of technology, fierce competition, higher levels of product variety, global marketplaces, shorter product life cycles, and higher customer expectations are exerting more and more pressure on companies and their supply chains to execute operations more effectively and efficiently [1 &2]. One option for companies is to excel in reverse logistics. Rogers and Tibben-Lembke [3] defined reverse logistics as "the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal." The literature relevent to the concept of reverse logistics deals with a variety of issues which include return reasons [4, 5, 6, 7, 8, 9 & 10], drivers for companies [4, 5, 6, 7, 10, 11 & 12], facilitators [13], barriers [6, 10, 11 & 12], return policies [6, 12, 14, 15 & 16], return rate [6 & 9] reverse logistics practices/activities [11, 4, 5, 6, 7 & 10], various disposal practices and their relationship with environment [4, 5, 6, 12, 17, 18 & 19], outsoercing [4, 6, 7 & 11], benefits [4, 12 & 20] and performance eveluation [4, 6, 21, 22 &23]. A company's supply chain has never been limited to delivering products to the end consumers. Particularly in pharmaceutical industry where the complexity of

pharmaceutical supply chains is an important issue, return and recall create another major challenge. Here customers, after purchasing the medicines, have four options to deal with their unused medicines namely return [24], store for further use [24], donate [24] and dispose [24]. These are known as the reverse logistics practices of customers. However, in this study, we are only concerned about the return and disposal practices of the customers. Sartori, G. [25] reported that Healthcare Distribution Management Association (HDMA) estimated 3-4% of products going out from pharmaceutical warehouses ultimately coming back. Recent publications indicate that manufacturers currently spend up to 4% of cost of goods sold (COGS) on non-value-add distribution functions like returns and reverse logistics. Jesson et al. [26] outlined the reasons for the occurrence of returnable stock of medicines at customers' end which included death, overstocking at home, changed prescription, expired medicines, medication stopped by patient, adverse effect from drugs, error of prescription, order or supply. The driver/purpose of return is only one i.e. refund/exchange of such unused medicines while the same for receiving these returns include economic factors, legislation, business strategy and customer service initiatives [27]. No system is perfectly smooth; barriers/obstacles exist everywhere. The return process of medicines also encounters several barriers throughout the reverse supply chain. Denial for a customer's return despite fulfilling the return policy conditions indicates towards the existance of some factor(s) impeding the smooth functioning of return process. In almost all such cases with some exceptions, customer does not apparently know about the actual reason behind the stockists' denial for his otherwise returnable medicines. In case of those medicines which are declared as non-returnable either by the customer itself or by the stockists, based on the expiry, integrity and its further usability, the customer may decide to dispose of. Report on the San Francisco Bay Area's Safe Available literature suggests four disposal practices for customers namely trash (throwing in the garbage) [28], flush [28, 24], donate [28], household waste collection event [28]. In this study, there are four disposal options used by customers; throw in the garbage, flush, bury and burn. Since these disposal practices have certain environmental implications, it becomes a matter worthy of investigation as to how much the customers are aware about their disposal practices. Resource recovery, valuable information, satisfaction of supply chain partners, regulatory compliance, reduced total cycle time, and improved company image may be some of the major benefits for companies implementing reverse logistics program. It has been found that for reaping these benefits, simplicity of return process, affordability of return costs, and high responsiveness are the main prerequisites. Since customers' satisfaction is one of the most important performance yardsticks of a supply chain, this study attempts to measure the performance of reverse logistics in pharmaceutical supply chains using two performance indicators namely the simplicity of return process and their responsiveness. After a comprehensive literature review, the authors found that the entire concept of reverse logistics got a very little attention from the viewpoint of customers. Moreover, in the context of Pharmaceutical industry, researchers found no relevent study dealing with the concept of reverse logistics from this viewpoint. This study is an attempt to fill this research gap. This research focuses mainly on two reverse logistics practices- return and disposal. A numbers of research papers have been reviewed to arrive at the present work but the studies 4, 5, 6, 7, 10, 11, 12, 17, 18, 19, 21 & 23 form the base of the present study.

2. Objectives and Research Methodology

For this study, researchers framed its objectives as (a) to conceptualize the reverse logistics practices in pharmaceutical supply chains from a customer's perspective, (b) to measure the environmental awareness of customers about their various disposal practices, and (c) to measure the performance of reverse logistics in the pharmaceutical supply chains from a customer's perspective. The primary data have been collected using a structured questionnaire consisting of seven distinct questions dealing with reverse logistics practices, return rate in terms of purchased medicines, return reasons, return conditions, customers' disposal practices and their awareness about environment, and measurement of reverse logistics performance. The data was gathered from two respondent groups from seven cities (District Headquarters) of Uttar Pradesh using convenience sampling technique. On the basis of their personal observation and experience, researchers defined those respondents as

less educated whose educational qualification was below high school, and moderately or well qualified whose educational qualification was high school or above. The rationale for doing so was that researches wanted to know how these two groups act and perceive; whether their educational qualification has something to do with what they percieve about the various disposal practices and, what treatment they receive when they visit the medical stores for returning their unused medicines. As per the initial target, researchers contacted 500 customers at the medical stores but they could only collect 339 usable responses (82 from less qualified customers). The sufficiency of this sample size is derived from previous studies where the initial size for customers ranges from 267 [29], 350 [26], 301 [19], and 539 [30]. In any research which is based on the collection of primary data, the big issue is the response rate. When calculated, the response rate for this study comes out to be 79.2% which is considered quite satisfactory [31]. The non-response rate of 20.8% is very low and doesn't seem to produce any effect on the sample estimates. For this reason, analysis of non-response bias is not supposed to be necessary here. Prior to the collection of data, a pilot survey was done in Aligarh to judge the suitability of the questionnaire. In addition to the information gathered through literature survey, Guidelines for the Safe Disposal of Unwanted Pharmaceuticals in and after Emergencies [28] has been used as a source for secondary data. In the light of the objectives listed above, an exploratory-cum-descriptive type of research design has been considered suitable for the study. While working for the first objective, the approach was exploratory whereas, the rest of the work has been based on descriptive design of research [31].

3. Data Analysis and Interpretation

The primary data is analysed using Simple % Analysis, Weighted Scores Analysis and t-test. Simple % analysis is aimed at providing an approximation of returns and finding out the different statistics associated with the frequency distribution. Weighted Scores analysis is aimed at simplyfying the ranking procedure where each cell frequency is multiplied by the rank of that cell. For the purpose of finding out the ranks, these scores are horizontally added. t-test is generally applied to test the differences of means among the two categories of independent variable. To work out the first objective, the respondents were asked to indicate their preference about the four reverse logistics practices namely return (for refund or exchange), store (for future use), donate (if safe) and dispose on a four point scale [where 1-most preferred, 2-next preferred, 3-next to next preferred and 4-least preferred]. Thereafter, weighted scores were calculated for each of these four practices by multiplying their respective frequencies under different preference categories by their preference level and adding these products horizontally. The practice with least total score, therefore, was considered to be the most frequent reverse logistics practice. Hence, "Return (Take money back or other medicines in exchange)" is the most preferred reverse logistics practice of the customers (Table-1).

Table 1. Reverse Logistics Practices

Reverse logistics practices	Preference				Total Weighted Score
	Most Preferred (1)	Next Preferred (2)	Next to next Preferred (3)	Least Preferred (4)	
Donate	21	156	417	404	998
Dispose	10	24	291	480	805
Store	9	470	261	32	772
Return	299	28	48	40	415

More than half of the respondents were such who were returning below 5% of their medicines to the medical stores. The respondents were also asked to mark the reasons for the occurance of such unused medicines. After a simple % analysis for each of the possible reasons, "Medicine was no more required", "Prescription changed during the treatment", "Medicines did not suit the patient" and "Medicines did not match theprescription" emerged as the main reasons for returning their medicines. Moreover, they were also asked to tick at the various conditions for a successful return. Simple % analysis revealed the "Resalable state of medicines" to be the most important condition for a return to be successful. After fulfilling the requisite

conditions, only a handful number of respondents reported the difficulties in the return process which indicates the existance of some conditions/factors influencing this process which has not been taken care of. In case of non-return, if a customer decides to dispose of these medicines, he/she has four options namely "throw", "flush", "bury" and "burn". Following the same methodology as used to find out the most frequent reverse logistics process earlier, we found that for majority of customers, the most exercised disposal practice was "throw in the garbage" (Table-2).

Table 2. Disposal Practices

Disposal Practice	Preferrence				Weighted Scores
	Most Preferred (1)	Next Preferred (2)	Next to next Preferred (3)	Least Preferred (4)	
Throw	311	28	15	36	390
Flush	10	438	254	104	806
Bury	8	48	324	796	1176
Burn	10	164	426	420	1020

Similarly, the researchers asked the respondents to show their opinion for each of these four disposal practice with respect to their impact on environment. The researchers found that "throw" is percieveed as the safest disposal method while "burn" as the most unsafe (Table-3).

Table 3. Customers' perception about the disposal pracices

Disposal Practices	Perception in relation to environment					Total
	Completely Safe (1)	Slightly Safe (2)	Slightly Unsafe (3)	Completely Unsafe (4)	Can't Say (5)	
Throw	94	260	33	396	25	808
Burn	4	48	48	1108	90	1298
Bury	18	46	66	1056	60	1246
Flush	21	172	78	756	85	1012

The below mentioned conceptual framework (Table-4) is based on the results of this study. The outcomes of the frequency distribution tables worked as the input to design and refine this framework.

Table 4. A conceptual framework of reverse logistics in pharmaceutical supply chains from the viewpoint of customers

Reasons for the occurance of the stock of unwanted medicines			
Rank	Reason	Rank	Reason
1.	Medicine was no more required	4.	Medicine didn't match prescription
2.	Prescription changed during treatment	5.	Packing was unreliable
3	Medicine didn't suit the patient	6.	Medicine was already expired
↓			
Actual Reverse Logistics Practices of the customers			
1.Return	2.Store	3.Dispose	4.Donate
↓			
Return		Dispose	
Return conditions	Customer Satisfaction	Disposal Practice	Disposal Practice & environment
1.Resalable state of Medicines	1. Ease of acceptability of returns	1.Throw	1

2.Availability of cash receipt		2. Flush	2
3.Certain minimum worth	2. Quickness in settlement of returns	3. Burn	4
4.Time passed between Purchase & Return		4. Bury	3

The natural flow of events is also taken care of to the utmost extent. For example; first of all a customer has certain unwanted/unused medicines. There are some reasons as to why he/she has such medicines. What should be done with these extra medicines is largely decided on the basis of the reasons of their occurance. Customers have four options here discussed earlier. If he decides either to store or to donate, its safer usage is perhaps the only issue which we are not concerned about. But if he decides either to return or to dispose of such medicines, there are concerns related with the conditions for successful return, customer satisfaction with the return process, preferred disposal practices and their impact on environment. This conceptual model ranks the various reasons for the occurance of the stocks of unwanted medicines and the actual reverse logistics practices of customers regarding such medicines on the basis of their respective frequencies and their weighted scores respectively. In case of return for refund or exchange, it contains the various conditions of returns in order of their reported necessities. In case of disposal, the same model ranks the various disposal practices on the basis of their frequency of usage. These practices are once again ranked on the basis of their impact on environment (safest to most unsafe). In one portion, it also contains the two key parameters to measure the performance of reverse logistics. On the basis of experts' opinions and researchers' personal observation about the four disposal practices studied here, it can be easily said that all of these have more or less impact on the environment. Therefore, with respect to environment, it becomes necessary to investigate as to how the most frequent disposal practice is percieved by the customers when it comes to its impact on the environment. For this purpose, we have formulated and tested the null hypothesis of no bearing of customers' educational qualification on their perception about the harmfulness of the most frequent disposal practices using two independent sample t-test, the results of which are shown in table 5. From table 5, it is quite clear that F test of sample variances has a probability that is more than the significance level (0.05). Therefore, we failed to reject the null hypothesis of equal variance. And therefore, t-test based on "equal variances" is used. The t-value of -0.750 (df 337) gives a probability greater than 0.05. So the null hypothesis of no bearing of educational qualification on their perception about the impact of most frequent disposal practice on environment could not be rejected. Hence, one can say that educational qualification of customers has no bearing on their perception about the impact of most frequent disposal practice on environment.

Table 5. Perception about the most frequent disposal practices [Two Independent Samples t-Test]

Group Statistics

	Qualification	N	Mean	Std. Deviation	Std. Error Mean
Throw	Below High School	82	1.11	.472	.052
	High School and above	257	1.16	.590	.037

	Levene's Test for Equality of Variances		t-test for Equality of Means					
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference

									Lower	Upper
Throw	Equal variances assumed	2.167	.142	-.750	337	.454	-.054	.072	-.194	.087
	Equal variances not assumed			-.842	168.818	.401	-.054	.064	-.180	.072

The mean value of their perception which was measured on a five point scale [where 1-completely safe, 2-slightly safe, 3-slightly unsafe, 4-completely unsafe and, 5-can't say] came out to be very close to 1 which means that they percieve it to be completely safe. Moreover, for the respondents group (below high school) this value is lesser than the other group which means that this group pecieve it to be more safe than other group.

To judge the health of any process/program, it is important to measure its performance at certain time intervals. Many a researchers focussed upon the various performance indicators for the pharmaceuticals reverse logistics. However, in our study, we have measured it in terms of customers' satisfaction. Since it has been a common experience that a customer while returning his unused returnable medicines is only concerned about ease of return process and quick settlement of its returned medicines, we have considered these two as the parameters for measuring the customers' satisfaction. Based on this point, the researchers have formulated and tested two hypotheses about the customers' perception about the two performance parameters as independent of their educational qualification. From Table 6 & 7, it can be said that the p-value for F-test in case of both the performance parameters is less than 0.05 (α). Therefore, we considered the t-test based on "equal variances" in both the cases. In first case, the t-value is 1.478 (df 337) with probability greater than the level of significance [Table 6], so the null hypothesis of no bearing of customers' educational qualification with the ease of acceptability of their returns could not be rejectd.

Table 6. Ease of acceptability of returns [Two Independent Samples t-Test]

Group Statistics

	Qualification	N	Mean	Std. Deviation	Std. Error Mean
Ease of Acceptability of returns	Below High School	82	3.48	.633	.070
	High School and above	257	3.33	.812	.051

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Ease of Acceptability	Equal variances assumed	3.242	.073	1.478	337	.140	.145	.098	-.048	.338

Of returns	Equal variances not assumed	1.678	173.335	.095	.145	.086	-.026	.315

From Table 7, it can be seen that the t-value is -0.248 (df 337) with probability much greater than 0.05. Therefore, the hypothesis of no bearing of customers' educational qualification on their experience about the quick settlement of their returns is failed to be rejected. Failure to reject these two hypotheses about the two tested performance parameters means that the educational qualification of customers has no bearing with their return experience.

Table 7 Quickness in the settlement of returns [Two Independent Samples t-Test]

Group Statistics

	Qualification	N	Mean	Std. Deviation	Std. Error Mean
Quick Settlement of returns	Below High School	82	3.24	.695	.077
	High School and above	257	3.27	.806	.050

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Quick Settlement of returns	Equal variances assumed	2.290	.131	-.248	337	.804	-.025	.099	-.219	.170
	Equal variances not assumed			-.268	156.409	.789	-.025	.092	-.206	.157

Moreover, from the descriptives, it is clear that irrespective of their classes, the mean value for all the respondents comes out to be between 3 & 4 as far as the "Ease of Acceptability" as well as "Quick settlement of returns" is concerned. This shows that customers have almost same opinion about the ease of acceptability and quick settlement of returns and irrespective of their educational qualifications; they are very much of the nuteral opinion about the ease of acceptability and quick settlement of returns by the medical stores. Moreover, on the basis of t-test results where $p>0.05$ (Table 6 & 7) for both the performance satisfaction parameters (Ease of acceptability of returns and Quick settlement of returns), we failed to reject the null hypothesis. To reject the related null hypothesis, we need certain additional information. It means that for these respondents, there is no significant difference between the two groups as far as the ease of acceptability of returns and their settlement is concerned. Also, from descriptives (Mean values), it can be said that customers are more satisfied on one performance parameter "ease of acceptability" than other. On this ground, it can be said that the overall satisfaction level for the two samples also doesn't vary.

4. Concluding Remarks

On the basis of the above discussion, we can easily say that majority of the customers wish to return their unwanted medicines for refund or exchange with other medicines of use. Usually their return rate of medicines is vey less in comparision to their average purchasing. “Medicine was no more required”, “Prescription changed during the treatment”, “Medicines did not suit the patient” and “Medicines did not match theprescription” are found to be the main reasons for returning their medicines. In order to make their returns successful, “Resalable state of medicines” was the most important condition to be fulfilled by the customers. After fulfilling the requisite conditions, majority of the respondents reported no problem in the return process. In case of non-return, if a customer decides to dispose of, their most preferrable disposal practices is “throw in the garbage” as they percieve it to be the safest disposal method. When their responses were tested to find out any difference between the two groups for their perception about the mostly followed disposal practice using two independent sample t-test, the mean values for both the groups were found very close to 1 (Completely Safe). Therefore, one can easily say that these respondents percieve their most exercised disposal practice to be environmentally safe. The researchers measured the performance of the reverse logistics (return process), using two performance parameters namely “ease of the return process” and “timely settlement of the returned medicines”. Majority of the respondents were of the nuteral view about the ease of acceptability and quick settlement of their returns. From t-test results, it is clear that irrespective of their classes, customers have almost same opinion about the ease of acceptability and quick settlement of returns. They are very much of the opinion that returns are easily accepted and quickly settled by the medical stores which all shows the overall satisfaction level for the two samples also doesn’t vary. On the basis of these results, the researchers drew and explained a conceptual framework of reverse logistics for the Pharmaceutical Supply Chains from the viewpoint of customers.To conclude, we can say that while “return or exchange” is the most frequent reverse logistics practice on one hand, “throw in the grabage” is the most frequent and comparatively the safest disposal practice on the other hand. Customers generally do not face any problem if they fulfill all the necessary return conditions. Their reported level of satisfaction with the entire return process is very nuteral which calls upon the polcy makers to bring certain changes related with the return process of unused medices by customers. This study is subject to a number of major limitations which include limited geographical coverage, sample size determined through non-statistical technique, convenient sampling technique, very broad classification of respondents, and various categories of medicines being taken togather. The future researchers may extend this study by working on these highlighted limitations.

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