

**EFFECT OF THE SUPPLY CHAIN SYSTEMS [“PULL OR PUSH”] ON AVAILABILITY OF ESSENTIAL MEDICINES IN THE PUBLIC HEALTH FACILITIES IN UGANDA**Olido K¹, Mshilla M.M², Okello T.R^{3*}¹ Lecturer and Head of Department (Marketing and Entrepreneurship) Gulu University Faculty of Business and Development Studies, Uganda² DBA, Senior Pharmacist and Lecturer Gulu University Faculty of Business and Development Studies, Uganda^{3*} Senior Consultant Surgeon, Head of department of surgery at Lacor Hospital and Senior Honorary lecturer Gulu University Medical School, Uganda***Corresponding author e-mail:** okellotomrich@yahoo.co.uk**ABSTRACT**

The study sought to examine the extent to which the supply chain system of essential medicines, “pull” or “push”, ensures availability of essential medicines in the public health facilities. Using a cross sectional design availability of essential medicines was appraised and compared between the public health facilities that uses the pull or push supply system between May and July 2014. The pull system ensures better availability of essential medicine compared to the push (P value 0.001). The pull system is also associated with better planning and efficiency compared with the push system (P value = 0.034). The key problems in the supply of essential medicines include inadequate essential medicine (37.4%), delayed supply (11.5%) and supplying unsolicited medicines 9.9%. The pull system is better and superior to the push system in availing and management of essential medicines in the public health facilities. Policy makers should build capacity and use to the pull supply system in all facilities.

Keywords: essential medicines availability and supply chain system, the pull and push systems of medicine supply, Challenges in supply of medicines public health units, Gulu, Uganda

INTRODUCTION

Essential medicines are medicines that satisfy the health needs priority of a country and must be available at all times in adequate amounts, dosage forms, quality, and at a price the individual and the community can afford ^[1]. Unavailability and inaccessibility to essential medicines by any one is now considered a violation of fundamental human right ^[2]. However, essential medicines have remained unavailability for example; a study in Malawi found the median period of its non-availability as being 240 days per year ^[3]. In Ethiopia, essential medicines’ unavailability is 99.2 days per year ^[4]. In Uganda the average lead time from ordering to receiving essential medicines at the health centers is 61.2 days ^[5], and its unavailability in the public health units as being 32-

50% ^[6]. Often essential medicines are supplied to the health facilities using the pull or push supply chain system ^[7,9,22]. Uganda adopted the dual of pull and push system policy in 2010 with the lower health facilities of health center IIs and IIIs using the push system and the higher facilities of health center IV and hospital using the pull ^[7]. However it has used each of the systems singly in the past but it was riddled with medicine unavailability challenges. Hence despite their individual merits, both systems are prone to challenges. Whereas there is a big public out-cry of essential medicines unavailability, it has remained controversial as to which of the supply chain systems; “Push” or “Pull” can solve the problem ^[7,8,9]. There is also scanty literature as to

how the supply system impact on the availability of essential medicines in the public health sector. Hence the need to examine the extent to which the supply chain system of essential medicines; “pull” or “push”, ensures availability of essential medicines in the public health facilities

OBJECTIVES

- i. To examine availability of essential medicines in the lower health centers IIs and IIIs in the public health facilities that uses the “push” supply system and its challenges.
- ii. To examine availability of essential medicines in the higher health IVs in the public health facilities that uses the “pull” supply system and its challenges

MATERIALS AND METHODS

A prospective survey was done between May to July 2014 to find out the relationship between the pull and push supply chain systems and the availability to essential medicines in the public health facilities of Gulu District. The independent variables consisted of the “pull” and “push” supply chain system currently being used in Uganda to provide essential medicines to the public health sector. Six tracer medicines recommended by the ministry of health Uganda were used to measure availability of essential medicine as the dependent variable. Quantitative research method was employed in order to collect data from the public health facilities. A random samples of health center

IIs, IIIs and IVs in Gulu district from which 131 respondents were prospectively studied using a coded and pretested questionnaire of Cronbach’s Alpha = 0.813 was used. The following variables were appraised to measure availability: number of drugs in stock & duration the drug is out of stock, quality of medicines, planning and efficiency of medicines management, drug quantification method, ordering, lead time, stores & storage practices & use of stock cards, health worker availability & training support supervision, physical access, affordability and acceptability.

The data was descriptively and inferentially analyzed and presented in tables and charts. Correlation regression and chi-square test was used to test level of significance ($P\text{-value} < 0.05$) of the relation and association.

RESULTS

Out of 131 total respondents, 73(55.7%) were from Health Center (HC) IIs, while HC IIIs had 33(25.2%) and HC IV had 25(19.1%). The majority of respondents were females (61%) while the male gender made up only 39% ($P\text{-value} = 0.011$). A significant proportion of the respondents had a working experience ranging between 6 to 10 years ($P\text{-value} = 0.000$) or held administrative position like being the in-charge of the unit. Therefore most of the respondents were knowledgeable about medicines availability hence gave reliable information (Table 1).

Table 1: Biographic Character of respondents

		Frequency	Percent (%)
Gender	Male	51	38.9
	Female	80	61.1
Years worked in current	Less than 5 years	36	27.5
	6-10 years	61	46.6
	11-15 years	15	11.5
Position	Over 15years	18	13.7
	Missing data	1	0.8
Current post	Head of unit/ in-charge	42	32.1
	Dispenser	8	6.1
	Nurse	55	42
	store manager	4	3.1
	Clinical officer	7	5.3
	Non specific	10	7.6
	Nurse assistant	5	3.8
Total		131	100

Table 2: Availability of essential medicines under the pull and push system (ANOVA)

		N	Mean	Std. Deviation	Sum of Squares	Df	Mean Square	F	Sig.
Availability of essential medicine	Pull system	25	4.20	.500	3.056	1	3.056	10.882	.001
	Push system	106	3.81	.537	36.226	129	.281		
	Total	131	3.89	.550	39.282	130			
Efficiency of supply system	Pull system	25	3.60	.500	3.116	1	3.116	4.597	.034
	Push system	106	3.21	.881	87.434	129	.678		
	Total	131	3.28	.835	90.550	130			
Duration of Stock out of Essential Medicines	Pull system	25	3.40	.816	.840	1	.840	1.889	.172
	Push system	106	3.60	.628	57.358	129	.445		
	Total	131	3.56	.669	58.198	130			
Essential medicines quantification	Pull system	25	3.28	.678	.106	1	.106	.212	.646
	Push system	106	3.21	.713	64.474	129	.500		
	Total	131	3.22	.705	64.580	130			
Essential Medicines ordering method	Pull system	25	2.72	.678	1.548	1	1.548	2.459	.119
	Push system	106	2.44	.817	81.200	129	.629		
	Total	131	2.50	.798	82.748	130			
Lead time for essential medicine	Pull system	25	2.16	.688	.463	1	.463	.765	.383
	Push system	106	2.31	.797	78.086	129	.605		
	Total	131	2.28	.777	78.550	130			
The use of stock card and book	Pull system	25	3.44	.712	.543	1	.543	1.308	.255
	Push system	106	3.60	.628	53.518	129	.415		
	Total	131	3.57	.645	54.061	130			
Stores Management	Pull system	25	3.68	.690	.113	1	.113	.180	.672
	Push system	106	3.75	.814	81.063	129	.628		
	Total	131	3.74	.790	81.176	130			
Quality assurance of Essential Medicines	Pull system	25	2.64	.569	1.748	1	1.748	3.868	.051
	Push system	106	2.93	.694	58.298	129	.452		
	Total	131	2.88	.680	60.046	130			
Personnel for essential Medicines in the HC	Pull system	25	3.28	.678	.024	1	.024	.045	.833
	Push system	106	3.25	.754	70.663	129	.548		
	Total	131	3.25	.737	70.687	130			
Funding and budget for essential medicines	Pull system	25	3.52	.823	.018	1	.018	.041	.839
	Push system	106	3.49	.605	54.731	129	.424		
	Total	131	3.50	.649	54.748	130			
Support supervision	Pull system	25	3.16	.624	.145	1	.145	.382	.537
	Push system	106	3.08	.613	48.756	129	.378		
	Total	131	3.09	.613	48.901	130			

Table 3: The main Problem affecting supply of essential medicines in the public Health sector

Main problem affecting supply of essential medicines		Our health unit receives essential medicine through		
		Pull system	Push system	Total
Delayed supply of medicines	Count	2	13	15
	% within What do you see as the main problem affecting supply of essential medicines to your unit	13.3%	86.7%	100.0%
	% of Total	1.5%	9.9%	11.5%
Inadequate EM supply	Count	11	38	49
	% within What do you see as the main problem affecting supply of essential medicines to your unit	22.4%	77.6%	100.0%
	% of Total	8.4%	29.0%	37.4%
Missing drug	Count	1	7	8
	% within What do you see as the main problem affecting supply of essential medicines to your unit	12.5%	87.5%	100.0%
	% of Total	.8%	5.3%	6.1%
Push system	Count	0	17	17
	% within What do you see as the main problem affecting supply of essential medicines to your unit	.0%	100.0%	100.0%
	% of Total	.0%	13.0%	13.0%
Short expiry	Count	2	3	5
	% within What do you see as the main problem affecting supply of essential medicines to your unit	40.0%	60.0%	100.0%
	% of Total	1.5%	2.3%	3.8%
“Unwanted” medicines	Count	0	13	13
	% within What do you see as the main problem affecting supply of essential medicines to your unit	.0%	100.0%	100.0%
	% of Total	.0%	9.9%	9.9%
Others	Count	9	15	24
	% of Total	36%	14%	18.3%
Total	Count	25	106	131
	% within What do you see as the main problem affecting supply of essential medicines to your unit	19.1%	80.9%	100.0%
	% of Total	19.1%	80.9%	100.0%

Analysis of essential medicines availability variables verses the supply system

Table 2 shows measure of availability of essential medicines under the pull and push system. It is observable that the pull system of essential medicine supplies is significantly associated with better availability of essential medicines compared with the push system (*P-value* 0.001). Furthermore, better planning and efficiency is demonstrable in the pull system compared with the push system (*P-value* 0.034). However, there was no significant difference between the pull and push systems with respect to lead time (*P-value* 0.383), duration of stock out (*P-value* 0.172), quantification method (*P-value* 0.646), ordering method (*P-value* 0.119), store management (*P-value* 0.672), personnel and training (*P-value* 0.883), funding (*P-value* 0.839), support supervision (*P-value* 0.537), medicine quality (*P-value* 0.051). Hence these parameters can challenge the pull as well as to push system in ensuring essential medicines availability.

Problems affecting supply of essential medicines in the public health facilities

According Table 3, the system of push and pull supply of essential medicine is faced with varying magnitudes of problems as perceived. Overall, inadequate essential medicine supply accounted for 37.4% of the problems, followed by the push system itself (13%), delays of medicines supply (11.5%), supply of unwanted medicines which is inconsumable in the area (9.9%), missing medicines in the package sent (6.1%) and supply of medicines of short expiry dates (3.8%). However, delays of medicines supplies is more prevalent in the push system (86.7%) compared with the pull system (13.3%). Furthermore, the push system is weakened by higher prevalence of the following problems: supplying unwanted or unsolicited medicines (100%), less or inadequate medicines deliveries than those ordered (77.6% vs 22.4% in the pull system), missing drug (87.5% vs 12.5% in the pull system) and supply of medicines with short expiry dates compared to the pull system. It can hence be inferred that the problem of essential medicines supply is more prevalent in the push system. Furthermore the respondents perceive that the pull system is preferable and ensures better performance of essential medicines supply and availability in the public health facilities.

DISCUSSION

Table 1 show a significant proportion of respondents had long working experience of 6 to 10 years and above while health workers of less than 5 years'

experience made up only 27.5%, *P-value* 0.000. The majority of respondents were females (61%) while the male gender made up only 39% and the sex difference was significant (*P-value* 0.011). Other studies have also found that female tend to predominate amongst health workers [10]. Nurses dominated in numbers because in any health unit they tend to dominate the human resources and most of them are females. Nurses are also the ones who dispense medicines to patients hence also have knowledge of medicines which are available or not. The role of work experience in ensuring essential medicines quality, rational use, availability was also reported separately by Kar, Pradhan and Mohanta, (2010) [11] and Yang, Liu, Ferrier, Wei and Zhang, (2012) [12].

From Table 2, it can be inferred that pull system of essential medicine supplies in the public health facilities is significantly associated with better availability of essential medicines compared with the push system (*P-value* 0.001). Tumwine, Kutuyabami, Odoi, and Kalyango, (2010) [9] also report the pull system to significantly improved availability of essential medicines compared to the push (*P-value* = 0.001). Thus essential medicines availability is related to the supply chain system as also observed by other authors [3,5,13,14,15]. While agreeing to that, Manual (2008) [16], emphasized that the solution to improving health supply chain is to adapt a demand driven supply (pull system) and increase collaboration between the various parties and visibility of the inventory.

By WHO standards and definitions [1,17,18], essential medicines should be available and accessible to the population of a country all the time but in Uganda, this raises concern in the public health facilities of health centers II and III which uses the push system of supply hence more likely to experience shortage of medicines. Furthermore, this study demonstrated that better planning and efficiency is seen in the pull system compared with the push system (*P-value* 0.034). This is attributable to its being highly intensive because every clinic [health unit] procures according to need that relate to client load and disease burden with the consequences need to stock and pack the right quantities and right medicine [7].

According to Table 3, the current supply system is faced with lots of challenges. Overall, inadequate essential medicine supply accounted for 37.4% of the main problems the system brings, followed by the push system itself (13%), delays of medicines (11.5%), supply of unwanted medicines which is not consumed in the area (9.9%), missing medicines in the package sent 6.1% and supply of medicines of short expiry dates 3.8%. These problems are more prevalent in the push compared to the pull system.

While SURE, in 2010 ^[25] also found that sometimes Ugandan National Medical Store (NMS) delivers items not ordered, non conformity of quantities delivered to orders and delays in delivery and other similar problems were also reported to be more prevalent in the push system by other authors ^[9,14,20,21,22,23,24] hence apparently, problems of essential medicine supply is worst in the push system.

CONCLUSION

The pull supply chain system is associated with better availability of essential medicine in the public health facilities compared with the push system (*P-value 0.001*) and is associated with better efficiency and

planning compared with the push system (*P-value 0.034*). The commonest problem of the current hybrid supply system is inadequate supply essential medicines (37.4%), delay of medicines (11.5%) and supply of unwanted medicines (9.9%) and these problems were more prevalent in the push compared with pull supply system.

Recommendation

Policy makers and stake holders need to refocus efforts on developing capacity and adopt the pull supply system of medicine supply across all public health facilities.

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