

Evaluation of Medicines Forecasting and Quantification Practices in Various Public Sector Hospitals Using Indicator Based Assessment Tool

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ABSTRACT

An effective medicines quantification process seeks to ensure the availability of the right medicines in the right quantities, at reasonable prices, and at recognized standards of quality. This prospective study was carried out for a period of one year, from January 2013 to January 2014 to evaluate various medicines quantification practices prevalent at various public health facilities of District Srinagar, the summer capital of J&K state. One super speciality children's tertiary care hospital, one Govt. Medical College Hospital, one District Hospital, one Sub District Hospital and one Primary Health Centre were selected for the study. A set of 27 qualitative and 05 quantitative indicators were developed, validated and used to study the availability of quantification data for forecasting needs, various quantification procedures/methods adopted and financial transactions involved in drug quantification practices. Indicator based assessment showed that, Average monthly consumption, distribution data, seasonal variations, stock in hand and purchase orders were used for assessment of quantification and forecasting of drug needs at study health facilities. Only Children's Hospital was found to have records for actual drug needs, however, current medicine usage records including daily patient visits and monthly work done reports were found to be available and accurate at every health facility surveyed. Average monthly consumption was used as a standard method for quantification in all facilities where as maximum and minimum stock levels were not defined including delayed payments resulting into frequent stock outs except at Children's Hospital. Quantitative assessment found the actual lead time of 30 days at Medical College Hospital followed by 25 days at District Hospital and 15 Days at Children's Hospital.

INTRODUCTION

Drug quantification is a process used to determine how much of a product is required for the purpose of procurement. But more specifically, quantification involves estimating not only the quantities needed of a specific item, but also the financial means required for purchasing the item. Accurate drug quantification requires various pieces of information, which include the Essential Medicines List (EML), average

consumption, epidemiological information, prescription patterns, minimum and maximum stock levels, frequency of stock-outs and length of the procurement cycle (MSH, 2009). The method for quantification should always be selected in light of the resources and information available. The morbidity method quantifies the theoretical quantity needed for the treatment of specific diseases (Osore, 1989; Allers, 2006). If no reliable information is available on past consumption or morbidity, medicine use can be extrapolated from the data of other facilities, regions, or countries (WHO, 1988). Quantification can be centralized, or decentralized to staff of peripheral warehouses and health facilities. The personnel and time requirements depend on the quality and accessibility of source data and on the type and scope of quantification (Hogerzeil, 1986).

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Logistic systems for public health facilities have been found inefficient and in many cases incapable of providing adequate supplies on a timely basis (Bates *et al.*, 2000). It was found that out of the 100 percent budget allocated for medicines, 10 percent was lost through inadequate buying practices and 14 percent through quantification problems (Matse, 2005a).

Pharmaceutical supply systems in many developing countries including India have severe problems, including ineffective procedures in selection, poor quality control, and economically inefficient procurement (Holloway and Green, 2003). Literature review revealed that there is a paucity of published literature with respect to medicines management activities like drug selection, quantification, procurement, storage and distribution currently being followed in our public health facilities. Furthermore it was found that there are no performance measures/tools available by which our on-going medicines management activities at our public health facilities can be assessed and evaluated. Therefore this study was taken up to initiate a process of developing an indicator based assessment tool which can be used to carry out an in-depth assessment of the system and will help in providing information for targeted interventions in strengthening the system and current practices.

OBJECTIVES

- To develop and validate an indicator based assessment tool using various national and international guidelines.
- To carry out in-depth evaluation and assessment of current medicines quantification practices prevalent at study public health facilities.

MATERIAL AND METHODS

Qualitative cum semi-quantitative, descriptive, cross-sectional approach was adopted for carrying out the study. This study design was followed to essentially ensure that the data acquired for the study could be evaluated, compared and measured so that qualitative cum quantitative postulations could be made.

The study was undertaken across the different levels of care including one super speciality Children's Hospital (CH), one Govt. Medical College Hospital (MCH), one District Hospital (DH), one Sub District Hospital (SDH) and one Primary Health Centre (PHC). CH, MC, DH were the only healthcare facilities available in their respective categories in the selected district.

At the outset qualitative cum quantitative indicators were developed and validated for carrying out evaluation and assessment of quantification practices prevalent at study healthcare facilities. To understand, assess and evaluate medicines supply chain management in public health settings various methods and procedures as per national and international guidelines were identified during literature review (WHO1999; WHO 2006; Trap *et al.*, 2010; Dargahi and Khosravi, 2010; Rutta *et al.*, 2006). Relevance, significance, acceptability and applicability were used as preset criteria in selecting various tools/guidelines. Various

elements and criteria for developing indicator based assessment tool were based on their Importance, measurability, reliability, and validity in the current settings.

Pretesting was done as per field pretesting method (Oksenberg *et al.*, 1991) by carrying out a peer review at PHC and SDH as focus centers. Based on the pretesting outcome a set of 27 qualitative and 05 quantitative indicators in quantification were developed, validated and used to study the availability of quantification data for forecasting needs, various quantification procedures/methods adopted and financial transactions involved in quantification of drugs in public health facilities. The study was carried out in a stepwise and systematic manner as shown in Fig.1

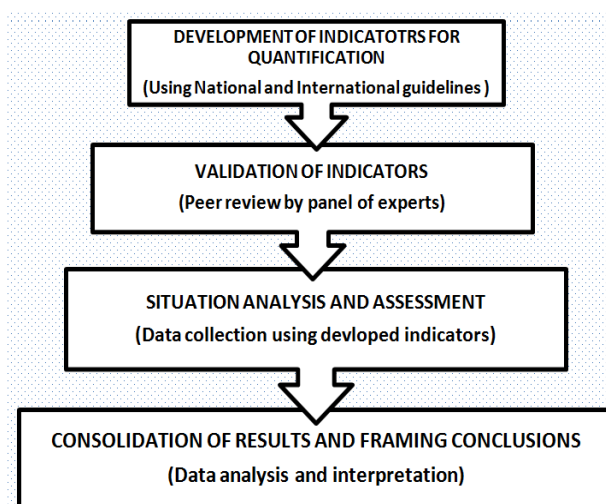


Fig. 1: Methodology adopted for indicator development and assessment.

Statistical Analysis

All data collected from qualitative and quantitative indicators during the study was captured in a Microsoft Excel and MS-Access spread sheets. Statistical analysis was of a descriptive nature with the responses to categorical variables summarized by frequency counts and percentages. All statistical procedures were performed on Statistical Analysis Software, Graphpad Instat 3.

RESULTS

Average Monthly Consumption (AMC), distribution data, seasonal variations stock in hand and purchase orders were used for quantification and forecasting of drug needs. Only CH had availability of proper records for actual drug needs however current medicine usage records including daily patient visits were found to be available and accurate at every health facility.

Table 2 of the present study gives an insight about the results obtained from various qualitative indicators used in the study. AMC data, distribution data, seasonal variations stock in hand and purchase orders were used for quantification and forecasting of drug needs. There was no formal committee or any standard process used for quantification and forecasting of drug needs at CH, MCH and DH.

Table 1: Information used by public health facilities in the quantification and forecasting of drug needs.

S. No.	Information Used	MCH	CH	DH	SDH	PHC
1.	Consolidating medicine requisitions	2	2	2	2	2
2.	Consolidating decentralized forecasts	NA	NA	NA	1	1
3.	Consolidating distribution data	1	1	1	2	2
4.	Average monthly consumption	1	1	1	2	2
5.	Donations provided by partners/donors	1	1	1	NA	NA
6.	Seasonal and regional variations	1	1	1	2	2
7.	Standard Treatment guidelines	2	2	2	2	2
8.	Quantities received	2	2	1	2	2
9.	Expired medicines	2	2	1	2	2
10.	Stock in hand	1	1	1	1	1
11.	Purchase orders	1	1	2	2	2
12.	Expiry dates	1	1	1	2	2

1=Yes 2=No NA=Not Applicable.

Table 2: Qualitative indicator based assessment of various drug quantification practices at public health facilities.

S. No.	Qualitative Indicators	Response					Percent Adherence
		MCH	CH	DH	SDH	PHC	
AVAILABILITY OF DATA							
	There is availability of current and accurate records of medicine needs.	1	2	2	2	2	20
	There is availability of current and accurate records of drug consumption.	1	1	1	1	1	
	Data and reports are maintained regularly on outpatient attendances, inpatient bed-days.	1	1	1	1	1	100
	Medicine demand estimation is done at the facility level.	2	2	2	1	1	60
	For many diseases reliable information exists on number of cases reported or treated annually	1	1	1	1	1	100
	There is availability of Policies and Procedures Manual (SOPs) for quantification of drugs.	2	2	2	2	2	0
	Percentage adherence	75	50	75	75	75	56
QUANTIFICATION MANAGEMENT							
	A formal work plan and schedule for quantification exists.	1	1	1	1	1	40
	There is a quantification committee in place with all round involvement of all stakeholders	2	2	2	2	2	0
	If no then quantification is done by chief pharmacist	1	2	2	2	2	0
	Warehouses and facilities have computerized quantification and inventory records	2	2	2	2	2	0
	Pre-printed quantification data collection forms are used in the facilities.	2	2	2	2	2	0
	All information on requisitions is complete, accurate, and written clearly	2	2	2	2	2	0
	Identified timelines in the supply chain that need to be taken into consideration in product forecasting.	2	2	2	2	2	0
	Percentage adherence	30	20	20	20	20	20
PROCEDURES/METHODS							
	There is a method in place for quantification	1	1	1	1	1	100
	Quantification is carried by AMC method	1	1	1	1	1	100
	Stock out periods taken into consideration when calculating AMC	1	1	1	2	2	60
	Order placed when stock balance is less than the minimum stock	1	2	2	2	2	60
	Maximum stock calculated and fixed for each item	2	2	2	2	2	0
	Actual procurement quantities & costs are compared each year against initial quantification estimates.	1	1	2	2	2	40
	Supply system does not face frequent or widespread pharmaceutical shortages.	1	2	2	2	2	0
	Shortages do occur only in case of certain medicines	1	1	1	1	1	100
	There is a hospital formulary that is used for quantification.	2	2	2	2	2	100
	Adjustment in initial estimates is done to conform to budget realities.	1	1	1	1	1	100
	Percentage adherence	70	70	50	30	30	60
ORDERING / FINANCIAL TRANSACTIONS TRACKING							
	There is no discrepancy between actual and expected lead times.	2	2	2	2	2	0
	There is no discrepancy between the value requisitioned and the value received.	2	2	2	2	2	0
	Drugs and supplies needed are ordered in a timely manner	1	2	2	2	2	20
	Drugs ordered are based on usage and expected needs of patients.	1	1	1	1	1	100
	Percentage adherence	50	25	25	25	25	30

1=Yes 2=No

Table 3: Quantitative indicator based assessment of various drug quantification practices at surveyed public health facilities.

S. No.	Quantitative indicators	Response				
		MCH	CH	DH	SDH	PHC
1.	Frequency of carrying out ABC/VED analysis.	A	A	A	-	-
2.	Frequency of carrying out medicine demand estimation	A	A	A	-	-
3.	Expected lead time in days	10	10	10	5	5
4.	Actual lead time in days	20	30	25	1	1
5.	Percentage of delayed hospital drug payments (one year)	40	60	40	NA	NA

A= Annually, NA=Not Applicable.

Table 3 shows various quantitative indicators used in the study. These indicators showed that AMC method was used for quantification at CH, MCH and DH whereas maximum and minimum stock levels were not defined anywhere.

Pharmacist's role was found to be subtle. Discrepancies were found in actual and expected lead times and also in values requisitioned and values received and there was no need-based ordering carried out except at CH hospital.

Financial constraints cause discrepancy in lead times and un-defined stock levels resulted in frequent stock-outs at these facilities.

Quantitative assessment revealed that maximum actual lead-time of 30 days was found at MCH followed by 25 days at DH, 15 Days at CH. However, a minimum of 2 days actual lead-time was found at SDH and PHC level. Delayed payments were found to be common and prevalent with highest number of 60 percent at MCH followed by 40 percent each at CH and DH.

DISCUSSION

In many developing countries, logistic systems for public health facilities have been found inefficient and in many cases incapable of providing adequate supplies on a timely basis (Bates *J et al.*, 2000). It was found that out of the 100 percent budget allocated for medicines, 10 percent was lost through inadequate buying practices, 14 percent through quantification problems (Matse, 2005). Table 1 of the present study shows that AMC, distribution data, seasonal variations stock in hand and purchase orders were used for quantification and forecasting of drug needs. It would have been more appropriate to conduct regular drug utilization evaluation (DUE) studies on scientific lines to ascertain actual drug usage patterns and forecast needs.

Table 2 of the present study gives an insight about the results obtained from various qualitative indicators used in the study. AMC data, distribution data, seasonal variations stock in hand and purchase orders were used for quantification and forecasting of drug needs. There was no formal committee or any standard process used for quantification and forecasting of drug needs at CH, MCH and DH. Furthermore present study revealed that quantification and forecasting at these facilities was carried out locally by Medical Superintendents or Resident Medical Officers (RMO), however quantification and forecasting at PHC and SDH was done by collecting requisitions/indents annually. Present study suggests that the available methods need to be further assessed for their appropriateness and there should be a separate committee for quantification and forecasting drug needs. Furthermore there is a great need to emphasize on management information system because rational quantification and forecasting needs accurate records of previous drug consumption patterns, morbidity trends, identification of critical areas in the supply chain including calculation of lead times, re-order levels (RoL) and defined buffer stock levels.

Accurate quantification requires various pieces of information. These include the EML, average consumption,

epidemiological (morbidity) information, prescription patterns, minimum and maximum stock levels, frequency of stock-outs and length of the procurement cycle (MSH, 2009). In a study carried out in Rwanda by Lijdsman *et al.*, 2003, it was found that 95 percent of the facilities were using consumption data, while 14 percent used epidemiological data. Most facilities (95 percent) were using data on minimum and maximum stock levels in quantification. Moreover stock-out data was found to be used by only 41 percent of the health facilities in quantifying their health commodities. Furthermore eleven percent of facilities reported cross-checking quantification findings by using different quantification methods (Lijdsman *et al.*, 2003).

Table 3 shows various quantitative indicators used in the study. These indicators showed that AMC method was used for quantification at CH, MCH and DH whereas maximum and minimum stock levels were not defined anywhere. Pharmacist's role was found to be subtle. Discrepancies were found in actual and expected lead times and also in values requisitioned and values received and there was no need-based ordering carried out except at CH hospital. Financial constraints cause discrepancy in lead times and un-defined stock levels resulted in frequent stock-outs at these facilities. This can be avoided locally by adhering to good quantification practices and defining stock levels with their respective lead times. At government level only qualified and trained human resource most importantly pharmacists should be recruited and there should be sufficient and regular disbursement of funds so that sufficient quantities of drugs are procured and made available to the patients.

Tayob, 2012 found that between 2009 and 2011, there was a 12 percent stock-out of the 45 ARVs on tendering that was measured in 9 provinces (405 items). There was also a 21 percent stock out of the 35 TB drugs on tendering in 9 provinces (315 items). Quite often poorly trained prescribers prescribe irrationally resulting in drug shortages. In Kenya, Matse determined that inadequately trained staff members are an important contributing factor to drug shortages as a result of their irrational prescribing (Matse, 2005b). A study conducted in the Mopani established that none of the workers understood the method they claimed to use to determine quantities to be ordered (Tayob, 2012). The stock outs and overstocking found in Mopani was attributed to the lack of knowledge with regard to quantification method (Matse, 2005b).

CONCLUSION

Indicator tool developed for carrying out evaluation and assessment of medicines quantification practices at various public sector hospitals was found to be valid, reliable, and measurable. The results of this study call for a change and improvement in the present drug management practices being followed in our public health care facilities. Appropriate measures need to be taken for proper quantification, distribution and safe use of medicines in accordance with well established guidelines and practices to make the supply chain more efficient and robust. There is a dire need to devise hospital specific medicine management policy framework

which can guide hospitals in efficient management of medicine supplies. Allocation and disbursement of funds should also be sufficient and timely to cater to the needs of individual hospitals across all levels of care which would in turn help them to improve upon their medicines availability throughout the year without any stock outs.

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