

## **Tackling Supply Chain Bottlenecks of Essential Drugs in Primary Health Centers: A Case of Eastern Uttar Pradesh, India**

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**Abstract:** *There are structural supply chain constraints in the supply of essential drugs in India hence calling for interventions and policy direction. Government's effort to improve drug access and availability has been too late and too little. A cross sectional survey is planned on 195 respondents in four districts of eastern U.P. Structural bottlenecks at each stage of the supply chain is planned to be identified. The sampling method used for the research is convenience and method used is factor analysis. Result can help us in identifying bottleneck in supply chain of medicine in primary health centres. Recommendations will provide guidelines for policy interventions aimed at strengthening programmes at local governments, investing resources in collaborative services, training staff in procurement best practices, and logistical management.*

**Keywords:** *logistic management, supply chain, forecasting, bottleneck*

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### **I. Introduction**

Governments world over, in a bid to have a healthy population and wealthy nations, have continued to strive to ensure that supply chains of essential drugs are effective and efficient for improved health care. This is after the realization that the supply, availability and accessibility of these drugs can improve the quality of lives of the people<sup>1</sup>.

Supply Chain of essential medicine is critical in developing countries, if drugs don't arrive at their destination on time, the process will come to the halt and links within the supply will break causing problem for other entities like health centres (TenNet Consultation 2008). Copacino (1996) has stressed the importance of well managed supply chain for efficient drug delivery while Fundafunda<sup>ii</sup> (2007) asserts that availability of essential drugs and supplies in the public health sector is a continuing problem due problems which ought to be tackled to avert disastrous outcomes though supply chain accountability.

In developing countries corruption is another rampant issue in drug delivery chain. There have been repeated episodes of government bodies conducting investigations for wrong doings. Recently East Champaran (Bihar) DM Abhay Kumar Singh has ordered an inquiry into much publicized supply of expiry medicines in 2012 worth Rs 14 lakh to the primary health Center (PHC) of Chhoradano by the central store of health department, Motihari, on the direction of state health department<sup>iii</sup>.

#### **PHC Model in India:**

Long before the Declaration of Alma Ata, India adopted a primary health care model based on the principle that inability to pay should not prevent people from accessing health services. Derived from the recommendations of the Health Survey and Development Committee Report (the "Sir Joseph Bhore Committee Report") of 1946, the Indian Government resolved to concentrate services on rural people. With programs such as the national family planning program, launched in 1952, and the policy of one community health worker per 1,000 people in the 1970s, India had already committed to most of the Alma Ata principles when the global primary health care movement began<sup>iv</sup>.

Right from its inception, this noble mission has been plagued with mismanagement and corruption. The problem here isn't a lack of funds. In fact, nearly three-fourths of the country's health budget goes into addressing PHC through the National Rural Health Mission (NRHM). The country spent close to Rs 21,000 crore in 2012-13 alone<sup>v</sup>.

#### **IPHC Guidelines on essential Drugs:**

Government has issued revised Indian Primary Healthcare Center Guidelines in 2012 to insure the availability of essential drugs in primary health centres. The details of the guiding statements are ensuing:

1. All the drugs available in the Sub-Centre should also be available in the PHC. All the drugs as per state/UT essential drug list shall be available.

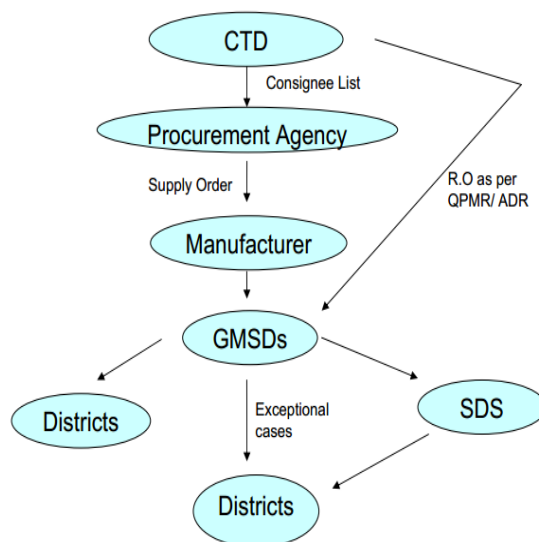
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2. In addition, all the drugs required for the National Health Programmes and emergency management should be available in adequate quantities so as to ensure completion of treatment by all patients.
3. Adequate quantities of all drugs should be maintained through periodic stock-checking, appropriate record maintenance and inventory methods. Facilities for local purchase of drugs in times of epidemics/outbreaks/emergencies should be made available.
4. Drugs of that discipline of AYUSH to be made available for which the doctor is present<sup>vi</sup>.

**Intervention in Supply Chain:**

Ministry of health provides guidelines for distribution of medicine in major thrust area. This paper has taken drug distribution system for Tuberculosis medicine in India provided by Ministry of Health and Welfare in its policy manual as reference point:



**Figure 1:** Drug Distribution System in India (Gov. Manual 2008)

CTD	Central Tuberculosis Division
ADR	Additional Drug Request
GMSD	Government Medical Store Depot
SDS	State Drug Store

**Table: 1** Abbreviation Ministry of Health GOI Manual

Central TB division has set guidelines for various parameters for drug distribution of Tuberculosis drug in India. The major areas for which guidelines are provided are training, information sharing, transportation, storage, sudden inspection to check corruption, inventory management etc<sup>vii</sup>. The document provides us variables which policy maker thinks are important for drug delivery system in India.

**Scope of Study:**

There is lack of studies on supply chain bottlenecks in Eastern UP. This paper will contribute in theoretical framework for policy maker working in policy making for delivery of essential drug in the region.

**Objective of Study:**

To identify the intervention variables in supply chain of essential drugs and reduce the number of variables to detect structure in the relationships between variables that is to classify variables for better policy making.

**II. Methodology:**

A cross sectional survey research design was used adopting qualitative and quantitative techniques. Based on review of government policy literature eleven intervention variables were decided upon. The respondents were districts health officers, PHC health officers, Officers who have been posted on duty in PHC, Qualified doctors who have visited PHC at least two times in recent years. The questionnaire has structured questions and the responses to the questions were anchored on a five point Likert Scale 5-strongly Agree to 1-strongly disagree.

Four districts from eastern Uttar Pradesh (Azamgarh, Jaunpur, Mau and Varanasi) were chosen as case studies. Convenience-based sampling was adopted. This specific non-probability sampling technique was adopted for the purpose of gathering information about remote PHC's.

A total 280 questionnaires were issued (70 for each district) out of which 200 were returned representing 71.4%. Out of which 5 were further discarded for data incompleteness issue (69.6% success). Data for this study provide some insights into important bottlenecks faced by the different health centres in supply chain.

**Test of Validity, reliability and Data Analysis:**

To test validity of the instrument, it was first tested on five respondents from Jaunpur district. The option of vernacular language, researcher information and purpose of study was also included in the instrument.

To confirm the multi-collinearity in appropriate range we have calculated the determinant value of the correlation matrix, which is 0.197 for greater than 0.00001 the condition for permissible Multi-collinearity (Field 2000: 445).

The data passes the Bartlett's test of sphericity with KMO measure 0.50 and significance 0.000. (Field 2000: 444).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Approx. Chi-Square		308.186
Bartlett's Test of Sphericity	Df	55
	Sig.	.000

**Table 2:** Test of Sphericity for Data

**III. Results & Discussions:**

Factor analysis was done on all variables to identify the most important components in each of the variables. The main applications of factor analytic techniques are: (1) to reduce the number of variables and (2) to detect structure in the relationships between variables, that is to classify variables. Therefore, factor analysis is applied as a data reduction or structure detection method (the term factor analysis was first introduced by Thurstone, 1931)<sup>viii</sup>. Factor analysis attempts to represent a set of observed variables X1, X2 .... Xn in terms of a number of 'common' factors plus a factor which is unique to each variable<sup>ix</sup>.

Principal component analysis and VARIMAX rotations were used in the analysis. The criteria for the number of extracted components were based on the characteristic value variance percentage and component importance. Principal components were considered to be those with Eigen value greater than or equalling 1 and loading greater than 0.3. Five factors very extracted and rotation converged was converged in six iteration. The model was able to explain 61.2% of variance<sup>x</sup>. The statistic tool used for the study was IBM SPSS 20<sup>xi</sup>.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.938	17.619	17.619	1.938	17.619	17.619	1.903	17.300	17.300
2	1.354	12.312	29.931	1.354	12.312	29.931	1.271	11.554	28.853
3	1.283	11.660	41.591	1.283	11.660	41.591	1.265	11.498	40.351
4	1.100	10.001	51.592	1.100	10.001	51.592	1.214	11.037	51.388
5	1.056	9.602	61.194	1.056	9.602	61.194	1.079	9.806	61.194
6	.956	8.689	69.883						
7	.918	8.342	78.225						
8	.848	7.705	85.930						
9	.768	6.980	92.910						
10	.643	5.844	98.754						
11	.137	1.246	100.000						

Extraction Method: Principal Component Analysis.

**Figure 2:** Total Variance explained by the model

Rotated Component Matrix					
	Component				
	1	2	3	4	5
KNLW	-.089	.453	.035	.271	.107
FUND	.954	.006	.016	-.019	-.020
STRG	-.051	-.143	-.469	-.470	-.441
SPLY	.957	.017	-.036	.047	-.013
BRCY	-.009	.472	-.485	-.027	.054
CRPN	-.024	.197	-.192	-.070	.730
MGMT	-.215	.053	.685	-.330	-.034
TRNS	.101	.100	.533	.172	-.136
PRCR	.016	-.018	-.021	.860	-.125
FRCR	.089	.658	.121	-.163	.124
INFO	-.036	-.581	-.011	-.086	.534

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 6 iterations.

Figure 3: SPSS output for Rotated Component Matrix

On the basis of rotated component matrix various components were included in the four factors. The factor loaded with less than two components was excluded. Four selected factors were named Vendor Management, Demand Forecasting, Logistics Management and Inventory Management.

Name of the Factor	Component Included
Vendor Management	Lack of Funds, Supply
Demand Forecasting	Lack of Knowledge, Forecasting, Information Sharing
Logistic Management	Bureaucracy, Management, Transport
Inventory Management	Storage, Procurement
Excluded –Factor	Corruption

Table 3: Various Factors for the study<sup>xii</sup>



Figure 4: Model for efficient drug delivery system

#### IV. Limitation of the Study:

The sampling method used was non probabilistic and finding can't be generalised. It was hard to find out respondent working in PHC for the instruments first because they didn't want to reveal any information. The inclusion criteria for the research was modified later to get sufficient number of respondents. The research assistant first engaged with various stakeholders at each districts to address the aspects of confidentiality of information acquired from individual stakeholder.

## **V. Conclusions:**

The study identified four major thrust areas for supply chain intervention:

### **Vendor Management:**

Each PHC should have list of vendors (as per recommendation of ministry of health) and rate them as per their performance in past. This will help them in removing non-performing vendors and rewarding contacts to vendors who are performing better. The vendors should be judged upon:

1. Lead time of delivery
2. Length of Payment Cycle

Payment of vendors should be processed as per service level contact and without hitches. There should be information sharing, decision synchronisation and incentive alignment for highly rated suppliers<sup>xiii</sup>.

### **Demand Forecasting:**

Employees at PHC's should be trained for demand forecasting techniques. Use of (Information Communication Technology) ICT can enable them in sharing information up and down stream. Use of ICT for training of staffs will provide best trainers as well as reduce the cost of training.

### **Logistic Management:**

To remove the mismanagement and bureaucracy the order tracking process should be enabled. The government should create its own portal or integrate API of third party logistic providers like Gojavas<sup>xiv</sup>.

### **Inventory Management:**

Most of the PHC's lacks on storage capacity. Infrastructural intervention is required for saving drugs from theft, damage and fire. The vaccines and medicines like Polio drops and insulin need cold storage and many PHC's lack on it. There should be proper mechanism for disposal or return of expiry drugs. Unused or unutilized portion of prescribed medicines are often kept beyond expiry date without proper storage, for use subsequently and it should be avoided<sup>xv</sup>.

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