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A Study On Utility of Web-Based Drug Warehouse Management System (E-Aushadhi) In A Peripheral Hospital of Metropolitan City of Maharashtra

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ABSTRACT

Introduction: An E-Aushadhi management system based on database was introduced in urban health centre for managing stock outs. This study was conducted to assess utility of web-based drug warehouse management system in a peripheral hospital.

Objectives: The objectives of this study were to assess the perceived benefits and difficulties by health care providers expected in introducing a web-based Supply Chain Management System (E-aushadhi) and to identify the factors which will govern successful transition from current system of drug logistics management to web-based system.

Methods and materials: In this study Focus Group Discussion was conducted with the staff members of an urban health centre who were working on a similar web-based platforms. There are four teams each comprising 3-5 members.

Results: Themes and subthemes were made based on the transcripts analysed. It is perceived that with introduction of web-based drug warehouse system, accuracy of the data can be well assured as manual errors can be reduced a lot. Quality of stock maintenance will increase and will prevent stock outs

Conclusion: The accuracy and transparency of drug stock maintenance will be increased while technical challenges such as internet availability, technician availability and training of personnel are perceived barriers.

Keywords: E-Aushadhi, drug warehouse, e-pharmacy, drug procurement, web-based system

INTRODUCTION

Government of India has introduced various schemes for facilitating easy access to health care. Availability of drugs has always been a challenge for implementation of various health programs that aimed at providing drugs free of cost. There are various reasons quoted for non-availability of drugs. Apart from financial constraints, one another major hurdle is a lack of a structured Drug Warehouse Management system and improper maintenance and monitoring of drug logistics from supplier to consumer chain. Procurement and supply chain systems involving public health-care institutions are weak and poorly governed. The work load on government hospitals is increasing by leaps and bounds along with population increase and pro-people policies of Central Government on Healthcare are mostly targeted to reach common people. Mainly down trodden masses are being served by government hospitals in rural and urban areas across the country. On the one hand, an inefficient medicine procurement system leads to suboptimal use of resources with poor value for money.[1]

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Drug warehouse management is being done manually which may lead to poor record keeping and inefficient communication and indenting procedure. The major hurdles of the current manual warehouse management system are fragmented nature of distribution network, limited advancement in regulatory platform and strong resistance from lobbies. To overcome such hindrance, a web-based application has been created. An e-pharmacy warehousing management system has been proposed based on database and website pages. The results showed that the proposed system has achieved high performance and accuracy.[2]

e-Aushadhi is a web based Supply Chain Management System that deals in Purchase, Supply, Distribution and Inventory Management of various drugs, sutures, surgical and consumable items by linking various Regional/ District Drug warehouses (DWH), District Hospitals (DH), their sub stores like Community Health Centre (CHC), Primary Health Centre (PHC) and Sub Centres.[3] The rationale behind the introduction of such a web-based system is to achieve transparency by way of implementing Barcode Standardization and Digital Signature and to bring in standardization in processes by making system more configurable. Nationwide Implementation of e-Aushadhi MoU with MOH&FW is being in progress. The common mission being procuring quality drugs in government run stores, asking doctors to prescribe generics drugs and create awareness among people for availing free drug facilities. The software framework consists of 5 major domains- procurement analysis, issue tracking of medicines, quality checking, payment modules and programmatic report of users.

The web-based model showed significant results in private set up, that is, more than 50% decrease in on-hand inventory, nearly 1 hour of time savings per day for restocking approximately 7–10 hours saved per day for administration tasks, so patients wait less and get treatments faster[4].

One of the major challenges in any program implemented by the government is insufficient supply of drugs. The existing inventory control techniques lack accuracy and efficiency based on expenditure (ABC), criticality (VED), and a combination matrix of ABC-VED. [5] There may be multiple reasons for the same such as shortage of fund, unstructured indenting procedure and poor inventory management. Excess out of pocket health expenditure pose a major hindrance for achieving Universal Health Coverage (UHC). Household's Out of Pocket Expenditure on health (OOPE) is Rs. 3,20,211 crores (60.6% of THE, 2.3% of GDP, Rs. 2,494 per capita)[6] which shows poor generic drug supply to the beneficiaries. A study on web based EMR system shows an efficient, customizable, and cost-sensitive PCIP can improve drug inventory management in a simplified and sustainable manner within a resource-constrained hospital.[7]

The system is being implemented in many states of India, out of which the process is being planned to be implemented in Maharashtra recently. The expected benefits of the software are transparency, smoothness in procurement, supply and distribution, modules like demand purchase challan, issues, transfer, quality check certificate, returns and payment to the supplier and MIS reports of end users. It allows easy access for searching of drug availability, ease of online indent and PO generation, has provision to maintain expiry and records, ability to track drug inventory, and data driven analysis (dashboard). It is expected that the system provides a safe, secure and verified platform for all parties which help to bridge the communication gap and provide legitimate drugs. If all recommendations are strictly adhered to, there will be strict monitoring and regulation of how drugs are circulated and a decrease in the spread of fake drugs.[8]

This study aims to assess the baseline views and concept perceptions of e-Aushadhi among health care personnel, which covers the entire strata of health care professionals and workers in an urban health centre. This study might be useful as a good source of baseline perceptions of health care workers in adapting a new technique of drug warehouse management. Furthermore, studies can be done in difficulties in practical implementation of the same after introduction of the software.

OBJECTIVES

This stud was aimed to assess utility of web-based drug warehouse management system in peripheral hospitals. The objectives of this study were to assess the perceived benefits and difficulties by health care providers expected in introducing a web-based Supply Chain Management System (E-aushadhi) and to identify the factors which will govern successful transition from current system of drug logistics management to web-based system.

METHODOLOGY

This study is approved by Institutional Ethics committee under EC / OA-46/2020.

To gather views and perceptions of staff members about web based drug warehouse management system, a qualitative study was conducted in which Focus Group Discussion with 16 health staff of the said peripheral hospital

Participant recruitment: The said urban health centre (UHC) is attached to a tertiary care hospital. Participation was absolutely voluntary and participants were recruited by purposive sampling. The health care personnel of the UHC who were either involved directly in E Aushadhi management and had received orientation for the same or already working in similar web based drug management platforms or

medical professionals involved in supervision and management of functioning of the said peripheral hospital were recruited for the study. A total of four focus group discussions were conducted on a total of 16 participants. The participants were grouped as teams based on the health service sections they were working in the said peripheral hospital and are of equal cadre to ensure autonomy in sharing their comments. FGD 1 was conducted among 4 participants who are working in NIKSHAY aushadhi. Second FGD was conducted among 3 participants working in link ART centre of UHC who are involved in procurement and distribution of Anti-retroviral therapy (ART) drugs on web based system. Third FDG was conducted among the pharmacist, Community Development Officer (CDO) and Public Health Nurse (PHN) of UHC. Fourth FGD was conducted among 6 resident doctors of UHC who are involved in supervision and management of health services of the centre.

Focus group discussion guide: The FGD guide was designed which included open ended questions focussing on discussing their views on existing drug procurement and logistics management methods and their perceptions on implementation of E aushadhi. The questions also had additional prompt questions on challenges faced and expected with implementation of a web-based drug management system in terms of material, manpower and time management and the possible benefits of this system compared to the existing manual maintenance. The questions were pilot tested and peer reviewed.

Ethical clearance for the study was obtained from Institutional Ethics Committee (IEC) of Seth G S Medical College and KEM Hospital. After ensuring privacy and confidentiality of the participants, written informed consent was obtained. Each FGD was conducted in a separate room for 30 minutes in the presence of an investigator, moderator and data recorder. FGD guide was prepared under the following topics- the participant perception regarding introduction of a web-based supply chain management for drug inventory maintenance, the possible ways for implementation and maintenance of the same in a peripheral centre, the possible difficulties in adopting the system

RESULTS

Based on the transcripts made from the focus group discussion, themes and subthemes were formulated. Four major themes were identified such as A- resource utility, B-Efficiency in drug warehouse management, C- Impact on Health outcomes and D- Staff preparedness. The responses were analysed and inference was made based on the subthemes given below in Table 1.

Based on the responses and discussions, the perceived benefits and difficulties in E aushadhi in peripherals centres are as shown in Fig 1. It is believed that accuracy and transparency in drug procurement will be enhanced on implementing E aushadhi.

Though it is a known fact that in initial phases both manual and web based has to be maintained simultaneously, these factors are identified governing the successful transition to web-based system. They are as follows-

1. Hands on training of existing staffs and effective training of newer staffs to improve technical skills.

2. Setting up standard criteria of buffer stock level for indenting and drug procurement

3. Provision of effective guidelines for maintenance of dead stock

4. Ensuring prescription of generic drugs by treating physicians

5. Provision of technical personnel support to solve software and hardware issues

6. Uninterrupted logistic support as well as continuous network provision from the central warehouse.

DISCUSSION

In this study it was found that, E aushadhi will be helpful in drug procurement and distribution throughout the chain of health care system. The study done by Himani G. et al also support the theme of easy procurement and distribution of pharmaceutical products with use of electronic and web-based warehouse management system.[1] This can be due to the notification system working centrally with the store when compared with the manual call system in routine warehouse management.

In a study done by Marathe et al, they concluded that in primary health centre, with application of E aushadhi platform, the incidence of stockouts of essential medicines reduced significantly.[2] This finding is similar to our study. The ability to provide automated notifications on arrival of reorder level already uploaded on the system prevent stockouts.

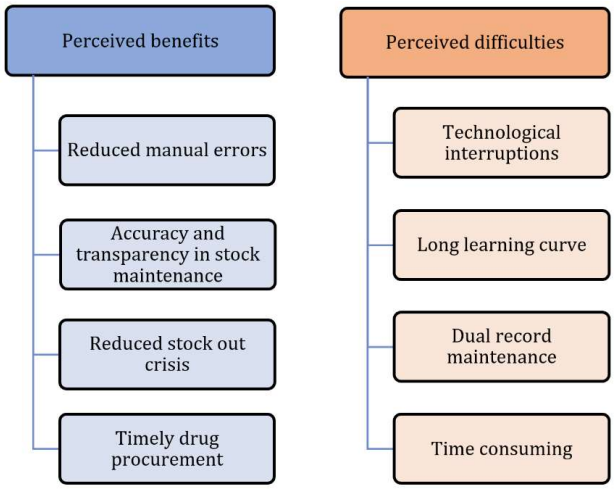
A benefit evaluation study conducted by Neha M et al suggested that it is a cost-effective solution provided the staff is trained and community are aware of the electronic portal. [3] A study done by Satia J et al. has found that quality improvement in the healthcare inventory can be achieved through utilising electronic warehouse system like E aushadhi.[4] This finding is similar to our study. A study done by V. Bhatia et al to find out use of digital warehouse management in a national iron plus initiative program it was found out that digital alarms on reorder level are most helpful to prevent stockouts.[7]

When the cost of travel and manual calling system is considered against the electronic system, e system carried an upper hand due to its automated alert system and it proved cost effective which was also perceived by our teams under study.

Table 1: Qualitative results of Focus group discussion regarding utility of e-Aushadhi in peripheral hospitals

Themes	Subthemes	Perceptions and Inference	Quotes by participants/Verbatims
A. Resource Utility	1.Time consumption	E aushadhi will be more time consuming than manual record maintenance, as in initial days of implementation both web based and manual methods will be simultaneously maintained.	"The work will be doubled as both methods of stock maintenance have to be followed." "The existing staff members will not be efficient in typing skills; hence more time will be consumed."
	2.Documentation	Data will be updated and readily available anytime and records can be retrieved whenever required. Web based system increases documentation and record maintenance in addition to the existing manual method.	"Though it is a web-based systems, hard copies of drug procurement has to be maintained for audit purpose."
	3.Manpower management	E aushadhi will increase the work burden of the staff members if work is allocated to the existing staffs. New recruitments with adequate technical skills have to be made for efficient implementation of the system.	"The staff members of peripheral urban and rural centers will be overworked as most of the centers have a single pharmacist who maintains drug indenting and dispensing."
	4.Technical utility	The system is cost effective as web-based platforms are already in practice in public health system for other health programs like RNTCP, ART etc.	"Computers with internet connectivity is available in most of the peripheral centers."
B. Efficiency in drug warehouse management	1.Drug procurement	Alertness about the stock in E aushadhi facilitates timely drug procurement.	"They won't be any delay in drug procurement as happens in manual indenting."
	2.Quality of data	Quality of drug stock maintenance will be enhanced in terms of accuracy and transparency with web based platform than manual work.	
	3.Chance of errors	Manual errors are greatly reduced with technical method which improves the efficiency.	"Computerized calculations are way far accurate than manual calculations"
	4.Coordination between stakeholders	Ease of communication will be attained between the central warehouse and peripheral centers in online mode. Delay in manual indenting and procurement can be reduced greatly with E aushadhi.	"The central warehouse can get notified easily about stock alerts on web platform than personal approach through letters or phone calls."
	5.Accessibility of services	A central web based stock maintenance will ensure equitable distribution of drugs and surgical utilities according to the requirements of respective centres. This avoids frequent stock outs and patient referral for the same.	"Fair drug distribution prevents pooling of patients in few centres which has continuous supply."
C. Impact on Health outcomes	1.Health impact	Uninterrupted drug supply has positive health outcomes especially beneficial for chronic illness like diabetes, Hypertension and cardiovascular diseases etc. Drug Compliance among such patients will improve. Availability of Surgical utilities ensures safe inpatient and obstetric care in peripheral centres.	"Low income families in rural and urban slum pockets discontinue their BP and diabetic medications if there is a stock out in their registered centre."
	2.Impact on out of pocket expenditure	Out of pocket expenditure (OOPE) will be reduced as continuous supply of drug and surgical utilities are ensured. E aushadhi encourages prescription of generic drugs by practitioners which greatly reduces OOPE. This will be highly beneficial for patients of chronic illness.	"This system reduces prescription of private pharmaceutical products, thus patients money will be saved."
D. Staff preparedness	1.Burden of work	Work stress on staff members will increase with existing manpower in peripheral centres.	
	2.Technical ability	Web based system has a long learning curve. Adequate technical training is needed for effective implementation of the system.	
	3.Autonomy of staff	Autonomy of staff members may be restricted in maintaining drug reserve when compared to manual method.	

Figure 1: Perceived benefits and difficulties in adoption of web-based drug warehouse system



In our study it was found that, the stakeholder is afraid of maintaining documentation and feel burden of extra training. This is temporary fear and it can be resolved with training at regular intervals. In a report by P Dutta et al. it was found that the digital based system carries a learning curve but have better utility in long run. [5] E aushadhi system still under implementation process. Any new process going to carry learning curve so it can be the reason for perceived burden of documentation and training among the study participants.

A study done in primary health care set up of rural India to evaluate effectiveness of electronic drug warehouse management, it was found that availability of trained staff along with provision of continuous access of electricity and digital network are biggest hurdle to implementation of e aushadhi in rural setting. [6] This finding was also under the theme of our study where participants discussed about power cuts and non-availability of digital modulator and demodulator devices and drops in the network while working on the system. During FGD it was found out that trained personnel for technical issues can be helpful for E aushadhi.

A longitudinal exploratory study done in Rajasthan to find out effectiveness of e aushadhi reported that e health initiatives like e aushadhi and e raktakosh are suitable to decrease the burden of continuous documentation and effective utilisation of resources. [8,9] This has resulted in an effective utilisation of warehouse with stockouts at rural hospitals. In our study it was perceived that the success of E aushadhi cannot be on scales of e raktakosh. The participants perceive that the implementation of E aushadhi can lead to double burden of technical entries and documentation both on digital portal and by manual methods as they donot have continuous access to network.

A literature review by Wadhava M for ICT interventions for improved health care for India highlights the barrier of apprehension among the pharmacists due to lack of skills while handling digital platforms. Wadhva M discusses and supports e governance by utilising available e aushadhi system to meet the sustainable goals. This was similar to our study where participants discussed about having technical knowledge and skills are important during implementation of E aushadhi . [10]

Muthappan S has discussed in his study for trained cadre to develop along with uniformity of operating interface and standard operating procedures. This was similar to our study. Participants discussed about development of a manual and field guides or ready reckoner for e aushadhi to solve troubles of handling e aushadhi at earliest at lowest levels.[11]

A case study on resource utilisation in the state of Rajasthan by Dixit A et al supported the use of color coded and alarm reorder level for preventing stock outs and easy visual interpretation by the manager at warehouse.[12] This was similar to our study where participants discussed about having easiest interpretation charts using colour for each action on the portal.

A study done by Kiran B et al discussed expanding the reach of software of digital drug warehouse management on mobile devices for better utilisation.[13] For expanding the reach of E aushadhi it is important to provide a user-friendly interface on mobile devices as these are handy tools and available with majority of staff of health centres. This was evident from discussion of focused groups in our study.

A study done by Gupta K et al discussed that a government initiative to strengthen the digital services will increase the availability of the generic drugs to local levels. [14] This strategy should be incorporated into already established health information management system software. In our study participants discussed about empowering all the employees towards E-aushadhi by government can be game changer for success of E aushadhi. They perceive that if Government stresses any activity to perform by employees, then only it gets properly implemented. There can be many factors for this perception one of the important factors for this is motivation and feeling of mandate.

RECOMMENDATIONS

Based on the responses given by the participants of the focus group discussion, the following recommendations are made for effective implementation of e-Aushadhi in peripheral hospitals.

- Adhering to a single method of stock maintenance through successful transition of manual method to web based system.
- Formulation of detailed Standard operating guidelines (SOPs) regarding effective flow of logistics management from warehouse to the peripheral dispensary.

- Enabling provisions for visual observation like colour coding of stocks and alert system for expiry and near expiry stocks.
- Integration with existing HMIS for effective monitoring of stocks utility in the health centre.

E-Aushadhi in Maharashtra Public health department has been given credit for 20% reduction in cost of drug procurement of the state. It is claimed that resistance among end users is a reason for ineffective expansion of the project. Addressing the abovementioned perceived difficulties from end user perspective might help in effective implementation of the project across the state and will be helpful in reducing OOP expenditure. Though availability of technical resources is challenging in a middle-income country like India, effective use of Information Technology in health will result in positive health outcomes. If provided structured operational guidelines and support, E aushadhi will serve as an effective, accurate and transparent mode of drug logistics management.

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