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Drug Supply Shortages in Pharmacies: Causes and Solutions; A Case Study in King Khaled Eye Special Hospital

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Abstract: King Khaled Eye Special Hospital in Riyadh, Saudi Arabia is suffering fromfrequent drug supply shortages in the pharmacy. We conducted this survey to identify the causes of drug supply shortages and to look for solutions to prevent this problemin the KKESH pharmacy. The survey questions were adapted and modified from questions in a study published on the causes of drug supply shortages and their effect on patients; some questions were added to address human factors that lead to drug supply shortages. The first part of the questionnaire collected information on demographics and personal characteristics. The second part of the questionnaire assessed drug supply shortages in the KKESH pharmacy. A five-point Likert scale was used to score the responses. The third and final part of the questionnaire is an open-ended question for participants to suggest solutions according to his/her experience to minimize drug supply shortages in the KKESH pharmacy. There were 41 respondents (100%), due to the small population. Almost all (90.2%) respondents are aware of drug substitutions. Most participants learn a drug is in short supply when it becomes a zero stock (53.7%). The 87.8% of the participants agreed that the lack of computerized alert system for low stock of medications is one of the primary causesfora drug supply shortage in the KKESH pharmacy; the lack of effective communication among pharmacy, pharmaceutical warehouse and purchasing departments is the most common cause of shortage in drugsupplies in the KKESH pharmacy; according to participant's opinions, 33 out of 41 (80.49% and the mean 4.27) agreed. Fourteen participants suggestedthat good communication among the pharmacy, pharmaceutical warehouse and purchasing departments is important in the case of any shortage in drug supplies.

Key words: Pharmacy, drug substitutions, Likert scale, solutions, supply

INTRODUCTION

The shortage in drug supplies has a direct impact on patients and health care providers. A shortage in drug supplies can be seen in many hospitals which may cause problems to the patient. The medication maynot be available in a government hospital which should provide the medications free; sometimes the cost of medications is high.

In spite of huge budgets set by the government which represent a high percent of the budget spending, funds are allocated annually for medicines and medical supplies in the ministry. However, this problem is still affects each patient; for this reason, the study will be carried out to determine the causes behind these shortages and to find necessary solutions to prevent such shortages.

It is difficult to estimate the real effect of a shortage resulting from this deficiency because each person affected from this issue has a different perspective (Chisholm-Burns *et al*., 2012). There is no awareness of drug manufacturers and wholesale buyers in regards to the risk of this deficiency on the patient. Therefore, when this happens, the blame is usually on the pharmacy, without considering other factors. As a result, we see healthcare providers under great pressure, especially pharmacists responsible for drug dispensing to patients.

It was not until recent years that the magnitude and impact of drug shortages progressed to critical levels. While the annual new drug shortages list remained fairly stable prior to 2005, a rapid, steady increase has been observed over the second half of the past decade. In 2010, there were 211 newly reported drug shortages, triple the amount in 2006 with almost 75% being sterile injectables (Kaakeh *et al*., 2011; Gu *et al*., 2011). The shortage is present in all healthcare practice settingsand affects nearly all drug classes with critical therapeutic areas such

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as oncology and antimicrobials (Cherici *et al*., 2013). As of October 2011, 232 shortages have been reported from multiple resources, exceeding records from 2010; it is estimated that 360 products will be in shortage by the end of 2011 (Ventola, 2011; Kweder and Dill, 2013).

The problem of shortages in drug supplies will be worse if it reaches zero stock for any reasonbecause it would result in nonreceipt of the necessary medication to treat the patient; then, it may lead to a worsening of the patient's condition for some cases and this is what must be avoided in any way possible.

Problem statement: Drug supply shortages are recognized as a global problem by the World Health Organization (WHO). Drug supply shortages can be defined as a shortcoming in the supply of medications which makes it impossible for suppliers to meet the demand for the product at the patient level. It affects all stakeholders patients, pharmacists, clinicians and the pharmaceutical industry in the health care system. Patients need to switch to an alternative therapy which may cause adverse effects such as increased incidence of medication errors and disease progression (McBride *et al*., 2013). Additionally, drug shortages will bring along monetary costs due to switchovers to alternative therapies and increased workload to manage the shortage (Rider *et al*., 2013).

Thus, what are the causes that lead to drug supply shortages in the KKESH pharmacy? Moreover, what are the organizational and human causes that lead to drug shortage supply in the KKESH pharmacy.And what solutions will help prevent this drug shortage supply?

Significance of study: Through the completion of this study, two sides of this contribution will be accomplished by the researcher. The first side is the theoretical dimension through enriching the scientific side in detecting the reasons behind drug supply shortages and researching the subject from another perspective and the effect of shortages in field of health administration.

People typically believe that a drug shortage could affect the patient alone financially but the hospital may be effected financially as well because some medicine may be expensive if bought by direct purchasing compared with the drug wholesale price. Therefore, the financial impact will affect both the hospital and the patient.

The drug supply shortage will affect the quality of health carebecause drug supplies are used to treat heart disease, cancer and nerves; other drugs treat health emergencies and have a major impact on patient health. The practical dimension is applied through putting solutions for the drug supply shortage with the health care services provided by (KKESH).

In this study, the researcher will try to find the underlying causes of a drug supply shortage in the KKESH pharmacy thus, organizationalor human causes to minimize the consequences of a supply shortage and to prevent reaching zero stock for any drugsand to finda solution for these causes.

Objectives:

- Identify the real causes behind drug supply shortages in the KKESH pharmacy
- Identify the organizational factors behind the drug supply shortage in the KKESH pharmacy
- Identify the human factors behind the drug supply shortage in the KKESH pharmacy
- Look for possible solutions to prevent the drug supply shortage in the KKESH pharmacy

Questions of the study:

- What are the causes behind drug supply shortages in the KKESH pharmacy?
- What are the organizational factors that lead to drug supply shortages?
- What are the human factors that lead to drug supply shortages?
- What are the solutions to prevent drug supply shortages in KKESH pharmacy?

Terminology:

- KKESH: King Khaled Eye Special Hospital
- Drug shortage: A supply issue that affects how the pharmacy department prepares or dispenses a product or influences patient care when prescribers must choose an alternative therapy because of supply problems. (Fox *et al*., 2014)
- Healthcare provider: a person who helps in identifying, treating, or preventing disease or illness
- SFDA: Saudi Food and Drug Authority

Literature reviews: Many studies were conducted to determine the causes of drug supply shortages and the researcher tried to find similarities and differences among these studies and this study. These studies are arranged depending on the date of the study. (Computerized Reminders Reduce the Use of Medications During Shortages, (Bogucki *et al*., 2004; Drug Shortages: A Complex Health Care Crisis, Erin R. Fox, PharmD; Burgunda V. Sweet, PharmD and Valerie Jensen, RPh,

2014; 3-Drug Shortages in Developed Countries Reasons, Therapeutic Consequences and Handling, Dill and Jin Ahn, 2014; RolaKaakeh, Burgunda V. Sweet, Cynthia Reilly, Colleen Bush, Sherry DeLoach, Barb Higgins, Angela M. Clark and James Stevenson, 2014).

A study was performed to quantify the personnel resources required to manage drug shortages; define the impact of drug shortages on health systems nationwide; assess the adequacy of information resources available to manage drug shortages.

An online survey was sent to the 1322 members of the American Society of Health-System Pharmacists who were identified as pharmacy directors. Survey recipients were asked to identify which of the 30 most recent drug shortages listed affected their health systemsin order to identify actions taken to manage the shortageand to rate the impact of each shortage. Employees responsible for completing predefined tasks we re-identified and the average time spent by each type of employee completing these tasks was estimated. Labor costs associated with managing shortages were calculated.

A total of 353 respondents completed the survey, yielding a response rate of 27%. Pharmacists and pharmacy technicians spent more time managing drug shortages than did physicians and nurses. There was a significant association among the time spent managing shortages and the size of the institution, the number of shortages managed and the institution's level of automation. Overall, 70% of the respondents felt that the information resources available to manage drug shortages were not good. The labor costs associated with managing shortages in the United States is an estimated $216 million annually (Fox and Tyler, 2003).

Drug shortages are a global problem. While extensively studied in the United States, numbers regarding drug shortages in European countries are scarce. This study aims to collect and present data about drug shortages in European countries.

A reporting template for the collection of data about drug shortages was designed based on a literature search. Countries offering a reporting system for drug shortages such as Belgium, The Netherlands, England, Italy, France, Germany and Spain were included in this study. Data about the characteristics of the drugs in shortage and the causes of the shortage were collected from publicly available online reporting systems. Descriptive analyses were performed.

Drug shortages included in the considered reporting systems can be characterized as branded, oral drugs that affect different disease domains. When considering essential medicines and oncology drugs, generic injectables are more involved. Causes for drug shortages are largely underreported. In case the cause is known, production problems take the lead.

Reporting of drug shortages in Europe needs to be standardized and more transparent in order to investigate the problem. A link among production problems and market attractiveness and market capacity is recognized to be at the root of drug shortages in the United States. Such insights are highly lacking in Europe. Monitoring of the effect of national and European health policies on the sustainability of the drug market is required to present fundamental solutions and to tackle the problem of drug shortages in Europe.

Medication supply chain management through implementation of a hospital pharmacy computerized inventory program in Haiti Michelle R. Holm1*, Maria I. Rudis (Gu *et al*., 2011) and John W. Wilson Department of Pharmacy, Mayo Clinic, Rochester, MN, USA; 2Department of Emergency Medicine, Mayo Clinic, Rochester, MN, USA; 3Division of Infectious Diseases, Department of Internal Medicine, Mayo Clinic, Rochester, MN, USA (Holm *et al*., 2015).

Background: In the aftermath of the 2010 earthquake in Haiti, St. Luke Hospital was built to help manage the mass of casualties and subsequent cholera epidemic. A major problem faced by the hospital system was the lack of an available and sustainable supply of medications. Long-term viability of the hospital system depended largely on developing an uninterrupted medication supply chain.

Objective: We hypothesized that the implementation of a new Pharmacy Computerized Inventory Program (PCIP) would optimize medication availability and decrease medication shortages.

Design: We conducted the research by examining how medications were being utilized and distributed before and after the implementation of PCIP. We measured the number of documented medication transactions in both Phase 1 and 2 as well as user logins to determine if a computerized inventory system would be beneficial in providing a sustainable, long-term solution to their medication management needs.

The PCIP incorporated drug ordering, thus filling drug requests, distribution and dispensing of the medications in multiple settings; inventory of currently shelved medications; and graphic reporting of "real-time" medication usage. During the PCIP initiation and establishment periods, the number of medication transactions increased from 219.6-359.5 (p_0.055), respectively and the mean logins per day increased from

24.3-31.5, pB0.0001, respectively. The PCIP allows the hospital staff to identify and order medications facing a critically low supply as well as track usage for future medication needs. The pharmacy and nursing staff found the PCIP to be efficient and a significant improvement in their medication utilization.

An efficient, customizable and cost-sensitive PCIP can improve drug inventory management in a simplified and sustainable manner within a resource-constrained hospital.

In the previous studies, most studies mention the common classes of drugs affected by drug supply shortages and its effects, clinically, economically and financially; thus, the researchers only focus on the manufacturing causes and the manufacturing quality issues that lead to a drug supply shortage only.

Computerized reminders typically reduce the use of medications during shortages (Benjamin Bogucki, BS, Brian R. Jacobs, MD, John Hingle, RPH and the clinical informatics outcomes research group, 2004). The researchers focus on one solution of drug supply shortages in hospitals, thus an alert designed and implemented in a computerized order entry platform. The alert resulted in cost reduction to the institution. Similar alert applications have great potential for effectively altering physician-prescribing behavior. However, the researcher will find another solution not costly to prevent a shortage of drug supplies in pharmacies.

In addition, researchers in a study of drug shortages in European countries (A Trade-Off Between Market Attractiveness and Cost Containment? Kim *et al*. (2014) tried to quantify the personnel resources required to manage drug shortages, define the impact of drug shortages on health systems nationwide and assess the adequacy of information resources available to manage drug shortages. However, the researchers investigated organizational and human causes to find the best solution other than labor costs and the time required to manage drug supply shortages.

Researchers in a study of medication supply chain management through implementation of a hospital pharmacy computerized inventory program in Haiti (Michelle R. Holm, Maria I. Rudis and John W. Wilson) tried to prove the role of PCIP (pharmacy computerized inventory program) to improve drug inventory management in a simplified and sustainable manner within a resource-constrained hospital. Thus, the researcher can suggest this type of program as a solution for drug supply shortages by allowing the hospital staff to identify and order medications facing a critically low supply as well as track usage for future medication needs. In this study, the researcher will focus on the organizational and human causes that lead to shortages and its solutions in the KKESH pharmacy.

MATERIALS AND METHODS

Study tools: In this study, the researcher will use the survey as a tool to collect data, thus a descriptive approach used as a method to achieve the objectives of the study.

Instrument: Survey questions were adapted and modified from questions in papers published on the causes of drug shortages and its effect on patients; some questions were added to address human factors that lead to shortages of drug supplies.The first part of the questionnaire collected information on demographics and personal characteristics including gender, qualifications and current job titles. The second part of the questionnaire assessed the drug shortage supply in the KKESH pharmacy. A five-point Likert scale was used to score the responses. The scale ranged from 1-5, where 5 = strongly agree, 4 = agree, 3= don't know, 2 = disagree and 1 = strongly disagree. The third and final part of the questionnaire is an open-ended question for the participants to suggest solutions according to his/her experience to minimize the drug supply shortages in the KKESH pharmacy.

Instrument pre-test: Pre-testing of the data-collection tools for their validity and appropriateness was conducted in the KKESH pharmacy department and pharmaceutical purchasing and warehouse. Six pharmacists and pharmacist technicians were selected as pilot sites and were interviewed. After that pre-tested tools were revised and restructured for data collection. This study has approval by HEC/IRB from KKESH.

Study site: This study was conducted in King Khaled Eye Special Hospital in Riyadh.

Study participants: This study involved all pharmacists working in the pharmacy of King Khalid Eye Special Hospital and in the warehouse and purchasing department. Study participantswere interviewed through questionnairesin order to obtain the information required to identify the causes of drug supply shortages in KKESH pharmacy and its solutions.

Study period: This study took approximately three months for its completion. This period included preparation of proposal, data collection and final report submission.

Sample size: Because the population of this study is small, all 41 employees will be included from KKESH pharmacy, purchasing and warehouse. It further includes the director of pharmaceutical services, pharmacists, pharmaceutical technicians, purchasing and pharmaceutical warehouse.

RESULTS

A total of 41 persons responded to the survey. The overall response rate was 100%, due to the small population. Among the respondents, 18 (43.9%) were males and 23 (56.1%) were females. There are six sections related to the pharmacy, 14 (34.1%) were in inpatient, 12(29.3%) were in outpatient, 4(9.8%) were intake home discharge, 4(9.8%) were in IV admixture, 2(4.9%) were in pharmaceutical purchasing and 5(12.2%) were in pharmaceutical warehouse. Based on their current professional title, the survey was comprised of five pharmacy administrators (12.2%), 3 clinical pharmacists (7.3%), 21 pharmacists (51.2%) and 12 pharmacist technician (29.3%). Regarding participant experiences in their work, 14 (34.15%) from 0-3 years, 13 (31.71%) from 4-7 years, 4(9.76%) from 8-11 years and eight (19.51%) from 12 years and above (Table 1).

Descriptive statistics of responses to questions were used in this study. Almost all (90.2%) respondents are aware of drug substitution. Most practitioners learn the drug is in shortage when it becomes zero stock only (53.7%) followed by email and the drug becomes zero stock(12.2%), by phone, email and the drug becomes zero stock(9.8%), by phone only (7.3%),and by phone and email and by phone and when the drug becomes zero stock (2.4%) (Table. 2).

SD(Standard Deviation): The average Likert score ranged from 2.78-4.37. Finally, 87.8% of the participants agreed that the lack of a computerized alert system for low stock of medications is a primary cause of drug supply shortages in the KKESH pharmacy. A total of 22 out of 41 participants (53.66%) answered "strongly agree," while 14 (34.15%) answered "agree." Also, the participants agreed that unavailability of alternative medications, a total of 9 (21.95%) answered "strongly agreed" while 21 (51.22%) answered "agreed." Participants do not know if relying on the SFDA website for an advanced notice about drug shortages is a primary cause of drug shortage supply in KKESH pharmacy, a total of 17 out of 41 (41.46%) answered "don't know," while 15 out of 41 participants

Table 1: Descriptive Statistics of Study Participants (n = 41)

Characteristics	N	Percentage
Gender		
Male	18	43.9
Female	23	56.1
Working years		
0-3	14	34.15
4-7	13	31.71
8-11	4	9.76
12 and more	8	19.51
Department		
Inpatient	14	
34.1Outpatient	12	29.3
Take home discharge	4	9.8
IV admixture	4	9.8
Pharmaceutical purchasing	4	4.9
Pharmaceutical warehouse	5	12.2
Professional title		
Pharmacy administration	5	
12.2Clinical pharmacist	3	
7.3Pharmacist	21	
51.2Pharmacist technician	12	29.3
How do you usually learn that a drug is in shortage?		
By phone	3	7.3
By e-mail	5	12.2
When drug become zero stock	22	53.7
By phone and e-mail	1	2.4
By phone, e-mail and when drug become zero stock	4	9.8
By phone and when drug become zero stock	1	2.4
By e-mail and when drug become zero stock	5	12.2

N = Number

Table 2: Respondents' Organizational Causes That Lead to Drug Shortage Supply

Causes	Likert scale/SDDN	ASA	Mean×SD
Q1. Lack of computerized alert system for low of stock drugs	023	1422	4.370.831
Q10.Unexpected delay in drug delivery	025	2113	4.10.8200
Q4.Pharmaceutical warehouse is not being under the direct supervision of pharmacy department	137	1515	3.981.043
Q7.Complexity of pharmaceutical purchase orders process process.	0311	1611	3.850.914
Q13.Not knowing the expected duration of the drug supply shortage	148	1612	3.831.055
Q6.Unpredictable factors influence drug demand.	055	247	3.800.876
Q2.Unavailability of alternative medications.	074	219	3.780.997
Q11.Delaying of drug clearance by the health authority.	179	159	3.591.098
Q12.Manufacturer changes in product formulation manufacturing.	3413	174	3.371.049
Q9.Potential safety concerns (major drug recalls).	1127	201	3.200.9810
Q8.Specifications of received drugs have not met international quality standards.	2617	160	3.150.8511
Q5.High prices of medications.	61010	123	2.91.212
Q3.Rely on the SFDA website for an advanced notice about drug shortages.	51017	72	2.781.0413

1 = SD and 5 = SA, Abbreviation: SD (Strongly Disagree), D (Disagree), N (Don't know), A (Agree), SA (Strongly Agree)

Table 3: Respondent's Human Causes That Lead To Drug Supply Shortages

Causes	Likert scale SDDN	Mean ASA	SD Rank
Q14.Lack of effective communication among pharmacy, pharmaceutical warehouse and purchasing departments.	224	8254.27	1.141
Q18.Staff shortage in pharmaceutical warehouse and purchasing departments.	645	10163.63	1.462
Q15.Improper drug purchase order Request by the assigned staff.	385	1963.41	1.183
Q17.Lacking a good relationship with pharmaceutical companies or other hospitals.	389	1653.29	1.154
Q16.Inadequate follow-up by pharmacy, pharmaceutical warehouse and purchasing departments regarding the requested drugs	3108	1463.2	1.25

1 = SD and 5 = SA

answered"disagree" (36.59%), 10 participants (24.39%) answered "disagree," and 5 (12.2%) answered "strongly agreed."

In addition, 73.18% of participants agreed that the pharmaceutical warehouse not being under the direct supervision of the pharmacy department is a primary cause of drug supply shortages; thus, a total of 15 out of 41 (36.59%) answered "strongly agreed,"which is the same as the previous (36.59%) answer, "agreed."

In addition, 39.02% of participants disagreed that the high prices of medications is a primary cause of drug shortage supply in KKESH pharmacy. Six participants (14.63%) answered, "Strongly agree," while 10 (24.39%) answered "agree,"and 10 out of 41 answered, "don't know." Most participants, 75.61%, agreed that unpredictable factors that influence drug demand is a primary cause of drug supply shortages in KKESH pharmacy. A total of 7 out of 41 participants (17.07%) answered, "strongly agree," while 24 (58.54%) answered "agree" (Table 3).

Abbreviation: SD (Strongly Disagree), D (Disagree), N (Don't know), A (Agree), SA (Strongly Agree) SD(Standard Deviation): Also, many participants (80.49%) agreed that the lack of effective communication among pharmacy, pharmaceutical warehouse and purchasing departments is a primary cause of drug supply shortages. A total of 25 out of 41 participants (60.98%) answered"strongly agree," while 8 (19.51%) answered "agree."

DISCUSSION

Overall, the results indicate that the majority (90.2% and the mean 4.37) of participants are aware of drug substitutions for drug supply shortages. Moreover, more than half the participants (53.7%) usually learn that a drug is in short supply when it becomes zero stock on the shelves and 87.80% of participants agreed on the lack of a computerized alert system to indicate when a drug becomes low in stock. Also, 8 out of 41 participants suggest implementing a computerize alert system in the pharmacy and pharmaceutical warehouse to help them to know when stock of any drugs becomeslow which will help to control the stock of these drugs.

One precaution to control when drugs become low on stock is to provide an alternative or substitution for drugs having the same effect. Most participants, 37 out of 41 (90.2%), are aware of drug substitutions which can help pharmacies to minimize this shortage until the stock returnsto a regular level. Moreover, 30 out of 41 (73.18% and the mean 3.78) agreed the unavailability of drug alternatives is a cause of drug supply shortages in the KKESH pharmacy.

The pharmaceutical warehouse has become separated from the pharmacy department due to administrative orders from the general executive director of KKESH and 73.18% of the participants (a total of 30 out of 41) agreed the pharmaceutical warehouse should be under the direct supervision of the pharmacy department which was also suggested by two participants.

The delay in drugs delivery from the vendor is one cause of drug supply shortages in KKESH pharmacy, according to participants' opinions in the survey, 82.93%(34 out of 41 and mean 4.1) agreed and should follow up with the vendor to deliver the drugs on the promised date of delivery in order to avoid a shortage of drug supplies; 20 out of 41 participants (48.78% and mean 3.24) agreed and two participates suggest the follow up with the vendor regarding that the requested drug is an important way to avoid a drug supply shortage.

The lack of effective communication among the pharmacy, pharmaceutical warehouse and purchasing departments is the most common cause of drug shortage supply in KKESH pharmacy, according to participant's opinions, most of them, 33 out of 41 (80.49% and the mean 4.27), agreed. Fourteen participants suggestedthat good communication among the pharmacy, pharmaceutical warehouse and purchasing departments is necessary in the event ofa drug supply shortage.

Therefore, from these results, we can summarize the most common causes that lead to a drug supply shortage in KKESH pharmacy and make suggestions: lack of a computerized alert system for low stocks of medications; nowKKESH has already begun implementing electronic health records for all hospital departments and, because of the high cost of this computerized alert system, it will take a long time to implement.

Unexpected delay in drug delivery from vendors, which should be solved by continuing follow-up with vendor. In addition, good coordination between the

vendor and the pharmaceutical warehouse regarding any delay in delivery, depending on the stock remaining of drugs.

Lack of effective communication among pharmacy, pharmaceutical warehouse and purchasing departments. In addition, good communication among these departments can help to avoid any problem in drug supply shortages by control dispensing the drug that isin low stockand use alternative drugs as substitutes for the drugs that are already low in stock. Therefore, availability of the alternative drugs can help to prevent a drug supply shortage and also help to control dispensing of drugs that are in shortage until resolving the short supply.

We assess from this study that most common causes in the KKESH pharmacy that lead to drug supply shortagesare related to organizational causesand less related to human causes.

CONCLUSION

The cause of drug supply shortages has helped assess the overall causes of organizational and human error that leads to drug supply shortages in KKESH pharmacy. It is a preliminary step in the formative planning of a well-structured process which will address the needs and solutions in the KKESH pharmacyand will inform the KKESH pharmacy administration. The researcher plans to modify and extend the survey to include a larger population across the country.

RECOMMENDATIONS

The cause of drug supply shortages survey has helped assess the overall causes of organizing and human error that lead to drug supply shortages in the KKESH pharmacy. It is a preliminary step in the formative planning of a well-structured process that will address the needs and solutions in the KKESH pharmacyand will inform the KKESH pharmacy administration. Thus, the researcher suggests implementing a computerized alert system for lowdrug stocks while an electronic health system in a hospital can easily help to implement this and to activate and coordinate the communications among the pharmacy, purchasing and warehouse through multiple channels (such as email) to control any problem related to drug supply shortages.In addition, the researcher recommendsadding alternative drugs for at least the critical drug that can have an effect on patient health in case of shortage. The researcher plans to modify and extend the survey survey to include a larger population across the country.

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