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# Emergency Hospital Drug Cabinet Systems Managed by Hospital Pharmacists and ER Physicians: A Healthcare Management Model to Reduce Costs

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## Abstract

In hospital setting patients drug therapy are administered in continuous way: every night and day, every day in a year and in order to assure the continuity of a pharmacological treatment we have to make sure to have a pharmacy systems that provide drugs in continuous way.

**Background:** When hospital pharmacies are closed night-time or during weekend, in order to provide emergency service or dispense drugs, a 24-h pharmacist service (or on call) have been often used. Several pharmacists may be involved in this kind of service, generally from 4 to 6, and this is a cost for some hospital and institutions or government. A solution to cut or reduce such cost as an alternative service, without any risk to the safety of patients can be an interesting innovation in today's healthcare.

**Motivation:** Often the cost is not the only problem; in addition to that, those long hours were putting the pharmacist under pressure in covering the service. If we decide to introduce new systems then the most important thing to cover all the emergency case is to choose a small list of the most important drugs to put in emergency cabinets in order to cover the most critical cases. Since the number of the drugs available in a hospital pharmacy is too big for a cabinet.

**Problem Statement:** In this works, we analyze some article in biomedical database and guideline and we submit to the institution a management system to overtake the pharmacist. Presence during nighttime or in weekend, and were make also an economic evaluation in cost reducing using this system.

**Keywords:** After-Hour pharmacy access; ICT; knowledge management; Problem solving; Rational use of human resources

## Introduction

If the American Society of Hospital Pharmacists ASHP Guidelines Minimum Standard for Pharmacies in Hospitals is: "24-h pharmacy services should be provided when possible and should be employed in all hospitals with clinical programs that require intensive medication therapy. When are not feasible, a pharmacist shall be available on an on-call basis. Automated drug dispensing equipment and computer databases are also not a substitute for the skills and knowledge of a pharmacist and should not be considered alternatives to 24-h pharmacy services". When Hospital pharmacies are closed and the pharmacist is not available, the need of providing alternative services is still there.

And in ASHP guideline, we observe that "After-Hours Pharmacy Access. In the absence of 24-h pharmacy services, access to a limited supply of medications shall only be available to authorized, licensed healthcare professionals for use in carrying out urgent medication orders. Access to such medications shall be carefully monitored and documented, and after-hours access shall be reviewed regularly to ensure appropriate use. The list of medications to be accessible and the policies and procedures to be used (including subsequent review of all activity by an urgent medication orders are evaluated before by emergency physicians if drugs non present in local cabinets. Routine after-hours access to the pharmacy by non-pharmacists for access to medications shall not be permitted. The use of well-designed night cabinets, after-hours medication carts, automated dispensing devices, and other methods precludes the need for non-pharmacists to enter the pharmacy [1]."

Because the need of drugs in hospital settings is in a permanent way, in order to overtake the 24-h hospital pharmacist's service (if necessary) we have to choose between different alternatives and to do it we have to take several factors in consideration:

1. The size of the hospital need
2. Hospital specialization
3. Other local factors, such as number of pharmacist staff Involved.

If the best solution, which is 24-h service hospital pharmacist, cannot to be applied in practice, we'd suggest the use of a cabinet drug Cabinet, created by ICT management and coaching service clinical pharmacist, as a good replacement, in such cases.

In the past, some hospital used to have a service provided by after-hour pharmacists for dispensing some drugs in case of emergencies drugs, normally one pharmacist, was involved, for nightshifts and weekend, the task was divided by 4-6 pharmacists round the year.

We have observed that other hospital settings, however, have normally adopted another solution for dispensing emergency drugs, which is as follows:

- On call pharmacist service

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- Authorized nurse (or other health professional) to access to the hospital pharmacy during closed hours.
- An emergency drug Cabinet system with instant availability (in several cabinets).

In this paper we are interested in to analyze and develop the last choice (advantages and disadvantages). A new emergency drug Cabinet expert system can be used to support emergency hospital drugs need, in order to cover needs in closed during pharmacy closed hours and there is no pharmacist available.

This project can be applied in order to cover drug needs of some public branches of hospital and the task must be assigned to pharmaceutical department by Hospital General Manager under the authority of a chief medical officer. Is a general management choice with great responsibility?

The interest is mainly on these drugs classes:

1. Antidotes (A and B priority), Emergency drugs
2. Hemo-derivates
3. Some parenteral antimicrobials
4. Other necessary agents to cover emergency need (narcotics, compoundings, magistral formula) and few other classes.

The opening of such service in some hospital not only made possible to save the cost for 24-h service pharmacist, but also at the same time we think it can give a good level of response in 99% cases. The after-hour emergency drug dispensing service (with inventory zone, supplying commonly required for instant-use drugs when the pharmacy is closed and when pharmacist in charge is not on duty) provide very good results, which can be used in other healthcare settings, as well.

For better explanation and understanding the basis on which we have founded problem-solving and decision-making process, we refer also to some scientific articles to be added to ASHP guideline and practical experience provided by other relevant hospitals and to the specific need of the local setting:

- Stratton demonstrated that: Using Internet-based health IT, pharmacists from a metropolitan (hub) hospital with round-the-clock pharmacist coverage participated in the care of patients at a number of small, rural hospitals and helped ensure that those patients received safe and effective medication therapy. The coverage provided by pharmacists at the hub hospital improved nursing satisfaction with the overall quality of pharmacy services provided by both the hub hospital and the local onsite pharmacists [2].
- Keeys et al., described "A night-time tele-pharmacy service serving a community hospital. After-hours access to medications was mostly the responsibility of nursing and medical staff using a separate night Cabinet, automated dispensing machines, and limited floor stock. An innovative practice model that combined an outsourced tele-pharmacy service and the traditional on-call pharmacist service was implemented to improve services at night. A nighttime tele-pharmacy service was successfully implemented at a community hospital to provide medication order review, resolution of drug-related problems, and drug information and clinical pharmacy services [3]."
- Chapuis demonstrated that "The implementation of an automated dispensing system reduced overall medication errors related to picking, preparation, and administration of drugs in the intensive care unit. Furthermore, most nurses favored the new drug dispensation organization [4]."
- N.W.TSAO decentralized Automated Dispensing Devices: "Systematic Review of Clinical and Economic Impacts in Hospitals All 3 of the studies that examined "cost-effectiveness" or cost offsets after ADD implementation reported positive results [5]".
- And in The pharmacy department of the University of Maryland Medical Center (UMMC), a 750-bed hospital located in Baltimore, for example is employing an RFID based solution to aid in the stocking of medication kits transported around the hospital for use with patients in the event of emergencies [6].
- Alsultan et al., in 2012 wrote "Hospital pharmacies in the Riyadh region are fairly well developed in providing dispensing and administration services. Further improvement can be achieved by increasing the use of new technologies such as bar-code technology, unit dose drug distribution systems, pharmacy-based IV admixture services, smart infusion pumps, and automated medication distribution [7]".

We came to the conclusion that in order to cover the service and at the same time to make it economically more feasible, reducing significantly hospital over-head costs, without risking patients' lives, our choice is a better suited one.

## Materials and Methods

A biomedical database research must be observed some works involved. Then we submit a specific project (goal, resource, costs, time request, risk management, quality). An economic analysis is necessary: cost analysis of the services (Active Guardian Pharmacists), searching of the best practice and equipment technology. Choose the best tailored solution to the specific location, prepare software customized to the specific needs, SOP, apply the new procedure and monitor the related effect.

- Then Management Strategies help in the practical application: Multidisciplinary Working Groups (Physicians, Pharmacists, Head Nurses, Bioengineers, Informatics), Need Analysis, Problem Solving Process, risk management assessment, costs analysis, change management, ICT management, coaching methods, monitoring. Total quality management.
- A Quality Cycle (Plan, Check, Act), learning by practical experience and principle of Risk Management must be used, in order to collect different emergency responses and to efficacy monitoring the system.

First a minimum list of the most commonly (as quantity and type) used drugs must to be chosen:

1. To narrow down the number of agents or drugs commonly and already used in emergency to a smaller list and compare to the following prospective agents:
2. Drug List must be developed by local hospital physicians, pharmacist manager and chief hospital officer.
3. Pharmacist experience in years ago in emergency calling (qualitative and quantitative list of drugs, cabinets and service high involved).
4. Antidotes class A, B must be select by emergency physicians referee. According international, national regional and local guideline.

5. Narcotic drug: must to be asking to head nurse a little cabinets to add the normally level in cabinet.
6. Magistral formula: In example for pediatrics need (a cabinet of most common request must be created in pediatric cabinet)
7. Other

We need to conduct an assessment of drug demand (based on the ones with higher priority as demanded), from 5 years ago till now, in the Hospital under this changing (historical request analysis).

We need also to continue our research observing other larger hospital organization. After that, specifically to facilitate and make possible both loading of the drugs in shelves and entering the information in the computer inventory IT system, with a goal of setting up a model system, we need a biomedical informatics-engineering company to develop a dedicated software and the same time developed official hospital procedure, as a protocol for emergency drugs loaded in both shelves and entering in the computer inventory list.

In order to create central emergency pharmacy cabinet systems, clearly and easily accessible, by all the hospital medical staff, including physicians and nurses, we had to select and place specific critical zones.

The zones chosen for these cabinet systems we think initially 3, as follows: Emergency cabinets, ICU, blood bank, and later on, for antidotes only, a 4$^{th}$ cabinet was added which was located in 2 separate locations:

1. Emergency Room ER: held priority A and B antidotes
2. Pharmacy: Priority C antidotes, accessible by all the healthcare professionals in the hospital, including physicians and nurses, even after-hours, when the pharmacy is closed
3. ICU
4. Blood bank

But other solution can be the same. The pharmacists along with the head nursing staff went through a comprehensive training course to both fully understand how to work with software and use the place drugs in cabinet systems and enter the data in computer IT inventory. The purpose of this application and software is not only to load the shelves and list the drugs (qualitative and quantitative), but also to continually monitor the movement of the items.

A team of combined of Main Hospital pharmacists and chief medical officers must write a comprehensive procedure protocol for the healthcare professionals to implement such cabinet system, step by step. Every time the pharmacy reopens, the software left a note for the pharmacist, indicating the overnight cabinet movement with all the details, such as: name of drugs, amount, data and time. In addition, the software to allow the pharmacist not only monitor to these movements, on a distant and online fashion, when he/she is at home but also to place reloading parcel orders.

The arrangement of the drugs on the shelves as well as the loading and reloading, if needed, into the inventory, is performed by a computerized system, with a Drugs Check-in e check-out IT procedure, while monitored by and under direct control of the pharmacist in charge.

Except the antidotes in emergency room cabinets which are controlled by the head nurse, the management and the monitoring of the cabinets is responsibility of the hospital pharmacist in charge. In order to boost the best use of the novel computerized system, the healthcare professionals must be proactively going under an intensive training course, using the new procedure.

After the course, the head nurse is updated with emails to and periodic pharmacist's inspections of the cabinets to double check if there are any needs. Every time drugs were taken out of the cabinets, they had to be entered into the computer, using the software and an automatic order was sent to the pharmacy, in order to replace them with new ones.

The communications, regarding the computerized cabinet system must be made via direct visits, mails, phone calls and faxes.

If we do not have a 24/7 pharmacy in example in smaller hospital, in rare cases, at closing hours, when ER needs an item that may not be in their brief cabinet list, a manual safeguard system must be created.

Meaning: they will place an urgent order, from the main provincial hospital 100 km radius. This might happen 1-2 times, in a year and it constitutes only 1% of the classified emergency cases. The item will be delivered no later than a 2 h timeframe.

The decision of which drug to be included in the brief cabinet list is made by a team of clinical pharmacists and physicians. Under strict supervision of the chief medical officer and the head nurse, the training course must to be performed, by the software developer company, on those staff involved in using the system, which is not necessarily medical staff; in fact it can include even the delivery driver.

While the software is created and developed by the biotech firm, the manual which is practically a complete protocol of the entire procedure was developed by a team of the biotech company, the chief medical officer and the clinical pharmacists.

At closing hours, there will be one healthcare professional, who is given authorization of accessing into the pharmacy where antidotes cat C is located. To limit mistakes in orders placed for emergency room, the orders are first evaluated by clinicians. Every emergency order was monitored and documented during the observation periods of this study.

Also, the pharmacist in charge was regularly and strictly monitoring and reviewing the appropriate use of the cabinet medicines, in ER, and any problems were controlled and troubleshot.

The cabinet medications in the list were made accessible to emergency room i.e., ER, ICU as well as any other involved department. Access to medications should be limited only to the cases, determined by physicians, which they may establish the clinical urgency, required quantities, and the type of dosage form. Expect rare cases evaluated by emergency physician, after-hours access to the pharmacy by non pharmacist professionals is not authorized, even for emergency drugs.

Any drug request, must be either in written or by phone (but then written) and the mobility records of all items were ultimately made into the computer system. Every time an item was taken from the cabinets, the personnel must record it in the computer. Consequently replacement orders were automatically sent to the pharmacy by software itself, to refill the cabinets. Besides annual inventory and drug expiration data plan, pharmacist was also responsible for periodic inspections.

## Results and Findings

The introduction of work flow of a new computerized emergency ER cabinet system in some kind of Hospital (with an operative procedure),

which made possible a balance of an inter-unit exchange, as well as established the possibility of orders from proximity main hospital for rare emergency cases during pharmacy closing hours was outlined. The achievement is that such computerized system can save the non-negligible costs, caused by an emergency on call guardian pharmacist, during pharmacy closing hours. In this way, not only we've turned the pharmacy service into a cost-effective system, while the safety of the patients has remained equal, but also the pharmacists don't have to work in weekends and nights.

In this kind of project we can authorize access to the pharmacy to healthcare professional (authorized for extremely rare request). The total savings made on on-call 4-6 guardian pharmacist, during closing hours, is about 15,000 euro (plus tax) per year, which makes it to 75,000 euro for 5 year. While the safety of patients was equal, the pharmacists were not required to stay on call for 24 h and weekend service which made their working lifestyle considerably more satisfactory.

## Discussion

The need to have drug therapy in continuous way in hospital setting and related is a real priority and to choose systems that make possible this without pharmacist presence during night-time or in weekend can reduce the costs but without risk for patients and institutions. The different solution showed has some limits and the choice must be taken with a balance of cost, risks and benefit.

## Conclusion–Implications

The introduction of expert systems, the application of a novel computerized pharmacy-cabinet system for some Hospital can completely overtake and replaced the service by active pharmacist guardian system. A reduction of about 75,000 euro, which is the average cost in an Italian hospital, per 5 years in cost, covered by 4-6 postgraduate hospital pharmacists (initially there are the costs for software and other technology: about 5000 euro).

The new system covers the 99% of the emergency needs and only 1% needs safeguard system activation. According to these results, we firmly and confidently believe that such system not only can or must be taken as a successful model, for some kind of hospitals, but it may find advantages and applications in many other similar situations. We think that psychological and behavior skills in team working give a rapid collaboration in the emergency stoke equipe [8,9].

And a discipline named Clinical pharmaceutical care [10] can be a useful instrument that adds the ICU and management tools to the classic clinical pharmacist competencies also in management of drugs emergency stokes. The use instruments as dedicated software, automatized drugs stokes systems, dose unit systems, informatics prescription and other ICT tools make a more safe systems and reduce risk. The safeguard systems cover the 1% of cases out of these systems.

- Minimum standard for pharmacy service ASHP
- Standard operative procedure (SOPS), chain for drug emergency call
- Software (by a IT company)
- Drug emergency list (refrigerator and not) Hemoderivates, Antidotes et al.
- Management sciences for health 2012 chapter 45 hospital pharmacy management
- The Manitoba Pharmaceutical Association: Hospital Standards of Practice 2002

### References

1. ASHP Guidelines: Minimum Standard for Pharmacies in Hospitals.
2. Stratton TP, Worley MM, Schmidt M, Dudzik M (2008) Implementing after-hours pharmacy coverage for critical access hospitals in northeast Minnesota. Am J Health Syst Pharm 65: 1727-1734.
3. Keeys CA, Dandurand K, Harris J, Gbadamosi L, Vincent J, et al. (2002) Providing nighttime pharmaceutical services through telepharmacy. Am J Health Syst Pharm 59: 716-721.
4. Chapuis C, Roustit M, Bal G, Schwebel C, Pansu P, et al. (2010) Automated drug dispensing system reduces medication errors in an intensive care setting. Crit Care Med 38: 2275-2281.
5. Tsao NW, Babich M, Bansback NJ (2014) Decentralized Automated Dispensing Devices: Systematic Review of Clinical and Economic Impacts in Hospitals. Can J Hosp Pharm 67: 138-148.
6. Swedberg C (2012) Hospital Pharmacy Keeps Emergency Medication Kits in Check. RFID.
7. Epub 2012 May 14. Alsultan MS, Khurshid F, Mayet AY, Al-Jedai AH (2012) Hospital pharmacy practice in Saudi Arabia: Dispensing and administration in the Riyadh region. Saudi Pharm J 20: 307-315.
8. Gordon JO, Hadsall RS, Schommer JC (2005) Automated medication-dispensing system in two hospital emergency departments. Am J Health Syst Pharm 62: 1917-1923.
9. Mauro luisetto, Luca Cabianca (2016) Psychological and Behavior Skills for Ph. Care Practice in Medical Team 2016. Ijppr 5: 1-4.
10. Luisetto M, Sahu RK (2016) Clinical Pharmaceutical Care: A New Management Health Care Discipline in 2016. UKJPB.

**Citation:** Luisetto M, Nili-Ahmadabadi B (2016) Emergency Hospital Drug Cabinet Systems Managed By Hospital Pharmacists and ER Physicians: A Healthcare Management Model To Reduce Costs. J App Pharm 8: 229. doi: 10.21065/1920-4159.1000229