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ORIGINAL

Emergency stock in a resource-constrained acute care unit: analysis of the medication management process

Stock de urgencias de una unidad de atención al grave con recursos limitados: análisis del proceso de gestión de medicamentos

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ABSTRACT

Introduction: the research is based on the evaluation and analysis of drug stock management in the Emergency Department of Peltier University Hospital Center in Djibouti.
Method: an observational, longitudinal and descriptive study was conducted from December 1, 2023 to April 30, 2024. The aim was to describe the diseases with the highest incidence in the emergency department and to organize a stock of medicines.
Results: the health problems that contributed the greatest number of patients were cerebrovascular diseases and renal failure with a length of stay of 27 and 66 hours respectively. In relation to the stages of drug acquisition management, it was possible to analyze that, although there are most of the drugs in the institution, their use and consumption is deficient since there is no physical or documented existence of a stock of drugs in the emergency department, which is expressed in the prolongation of the stay in the service. A medication guide was developed to improve the emergency stock and better patient management.
Conclusions: the lack of a stock of medicines in the emergency department affected the stage (use - consumption), which is the most important for the adequate management of the patient, thus prolonging the stay in the service.

Key words: Drug-Related Problems; Drug Stock; Emergency Department; Drug Management.

RESUMEN

Introducción: la investigación está basada en la evaluación y análisis de la gestión del Stock de medicamentos en el Servicio de Urgencia del Centro Hospitalario Universitario Peltier en Djibouti.
Método: se realizó un estudio observacional, longitudinal y descriptivo en el periodo comprendido del 1ro de diciembre 2023 al 30 de abril del 2024. Con el objetivo de describir las enfermedades de mayor incidencia en el servicio de urgencia y organizar un stock de medicamentos.
Resultados: los problemas de salud que mayor número de pacientes aportaron fueron las enfermedades cerebro vascular y la insuficiencia renal con una estadía de 27 y 66 horas respectivamente. En relación a las etapas de gestión de adquisición de medicamentos se pudo analizar que, aunque existen la mayoría de los medicamentos en la institución, el uso y consumo es deficiente pues no se constata la existencia física

o documentada de un stock de medicamentos en urgencia, lo que se expresa en prolongación en la estadía del servicio. Se desarrolló una guía de medicamentos para perfeccionar el stock de urgencia y mejor manejo de los pacientes.
Conclusiones: la no constatación de un stock de medicamentos en Urgencias, provocó que se viera afectada la etapa (uso – consumo) siendo esta la más importante para el manejo adecuado del paciente, prolongando así la estadía en el servicio.

Palabras clave: Problemas Relacionado con los Medicamentos; Stock de Medicamentos; Urgencias; Gestión de Medicamentos.

INTRODUCTION

Measure The concept of drug-related problems (DRP) has been used since 1975, but it was not until 1990 that it was described in detail, and the first classification of eight categories appeared. This has been continuously transformed and updated, but there is no doubt that DRP increases morbidity and mortality and the cost of health care.[1,2] Every year, infectious diseases kill some 13 million people, which is equivalent to 30 000 deaths per day. Nearly half of the victims are children under 5 years of age, the vast majority from developing countries. Many of the premature deaths and disability associated with infectious diseases could be avoided if the poor had access to medicines. In the developing world, family poverty, inadequate public spending, and lack of health infrastructure combine to put people experiencing poverty beyond the reach of adequate medical treatment. According to the World Health Organization (WHO), some 2 billion people in developing countries lack access to essential medicines.[3] The present study accepts the concept that DRP is a health problem resulting from failures in pharmacotherapy, which, due to various causes, lead to failure to achieve therapeutic objectives or undesirable effects. The six-category classification of the Granada Consensus in Spain, modified in the Second Granada Consensus, is assumed. It consists of six categories based on three basic needs of pharmacotherapy: necessity, effectiveness, and safety.[4,5,6]

In this research, the stock or inventory in a company is the set of stored materials and articles, both those necessary for the production process and those destined for sale. Physical stock is the quantity of items available at a given time in the warehouse, characterized by the fact that they can never be negative. The stock needs periodic replenishment supported by various systems that consider the outputs produced; thus, optimizing the inputs of materials for its implementation is previously calculated by the order point and the order batch. It is accepted that the reorder point (PP) is the level of stock that indicates that it should be reordered in order to avoid stock shortages and breakage.[6]

The present research references the authors Ruiz, Morato, and Gaitán,[7] who consider different aspects of stock management as part of business logistics. The actions to maintain the stock volume at the lowest level, compatible with the regular supply of the hospital's needs, are called stock management. Their objectives are to minimize the total amount of inventory and stock breakage, to ensure efficient use of resources, and to make a projection of the evolution of consumption that allows the establishment of a purchasing program. Basic aspects of drug management. To achieve these objectives, consumption forecasts must be established based on the study of supplier delivery times, periodic inventories, and periodic consumption analysis.

At the Peltier University Hospital Center (CHU) of Djiouti, shortcomings have been identified in the process of Drug Management in the Emergency Department related to the different stages of selection, acquisition, storage, and use/consumption, aspects that should be adequately fulfilled for efficient patient care. It is frequently observed that the lack or absence of some medicine at the precise moment it is required by the professional to provide prompt patient care, as required by this department, thus showing deficiencies in some of the stages mentioned above and hindering the operation of the service and the efficient care of patients, as well as showing a low level of demand by the trained staff to ensure an adequate flow of drugs to their final destination.

In the daily observation during the development of the medical shifts of the Intensive Care and Emergency Medicine Specialists, based on the experience of the authors and the exchange with colleagues who work in the Emergency Department of the CHU, the following external manifestations have been observed:

- Shortages or absences of medications needed for specific diseases in the Emergency Department Drug Stock.
- Deficiencies in providing fast and efficient care due to delays in medication management, which causes a considerable increase in the patient's recovery and stay in the Emergency Department.

These problems have been addressed by authors such as Diaz Mojica and Yacarine Pasco,[8,9] who assume that it is a complex system that includes several stages to ensure that drugs reach patients and end consumers safely and efficiently. This pharmaceutical distribution process also involves regulators and health authorities, who

establish regulations and supervise compliance with quality and safety standards. They aim to protect public health and ensure that medicines are safe and effective. Consequently, the research objective was to analyze and evaluate the Drug Management Process for stock in the Emergency Department based on CHU Peltier's most common diseases.

METHOD

A descriptive longitudinal observational study was conducted at the Peltier University Hospital Center. The research universe consisted of 1843 patients admitted to the emergency department from December 1, 2023, to April 30, 2024. A data collection model was developed with the following variables of interest: Stages of medication management (Selection / Acquisition / Storage / Consumption) and Evaluation of Stages of medication management.

Percentages and frequencies were used to process and analyze the quality-quantitative data. The statistical data analysis was carried out using the professional software SPSSV.25.0 64 vit. The approval of the hospital management and its scientific advisory committee was taken. The research corresponds to the first 5 months after the Emergency Department was created.

RESULTS AND DISCUSSION

During the 5 months of work in the emergency department, starting from the present and complete records, the most frequent pathologies and the most frequently used drugs in each one of them were obtained as a result. The most frequent pathologies were: central nervous system disease, chronic renal insufficiency and hydroelectrolytic and acid-base imbalance. The month with the highest number of visits was December, when the service began.

Table 1. Morbidity in the emergency department of the Djibouti General Peltier University Hospital. December 2023 - April 2024

Initial diagnosis	Cases (%)						Average length of stay (hours)
	December	January	February	March	April	Total	
DMd	40 (8,9)	41 (13,5)	24 (7,61)	39 (10,7)	28 (9,96)	172	24
IRC	60 (13,8)	37 (12,2)	46 (14,6)	44 (12,0)	35 (12,4)	222	66
IMA	12 (2,69)	5 (1,65)	26 (8,25)	25 (6,86)	12 (4,22)	80	46
dH-M	29 (6,51)	16 (5,28)	31 (9,84)	34 (9,34)	37 (13,1)	147	27
SNC	76 (17,0)	48 (15,8)	40 (12,6)	47 (12,9)	38 (13,5)	249	12
EH	42 (9,43)	21 (6,93)	24 (7,61)	13 (3,57)	17 (6,04)	117	73
Malaria	31 (6,96)	26 (8,58)	23 (7,30)	23 (6,31)	16 (5,69)	119	12
Polytrauma	30 (6,74)	11 (3,63)	23 (7,30)	17 (4,67)	11 (3,91)	92	36
Tuberculosis	10 (2,24)	9 (2,97)	6 (1,90)	6 (1,64)	8 (2,84)	39	25
Sepsis	12 (2,69)	7 (2,31)	5 (1,58)	10 (2,74)	5 (1,77)	39	2
Shock*	13 (2,92)	6 (1,98)	6 (1,90)	24 (6,59)	14 (4,98)	63	72
IRA	19 (4,21)	24 (7,92)	14 (4,44)	23 (6,31)	19 (6,76)	99	42
IRA/VMA	44 (9,88)	20 (6,60)	18 (5,71)	15 (4,12)	10 (3,55)	107	46
Acute abdomen	5 (1,12)	12 (3,96)	8 (2,53)	12 (3,29)	8 (2,84)	45	22
PCR	22 (4,94)	20 (6,60)	21 (6,66)	32 (8,79)	23 (8,09)	118	13
Total	445 (100)	303 (99,9)	315 (99,8)	364 (99,83)	281 (99,65)	1708	518

DMd: decompensated diabetes mellitus. CKD: Chronic renal insufficiency. AMI: Acute myocardial infarction. dH-M: Hydro-mineral imbalance. CNS: Central nervous system disease. HD: Hypertensive emergency. ARI: Acute respiratory infection. ARF/AVR: Respiratory failure with need for invasive mechanical ventilation. CRA: Cardio-respiratory arrest. * Any etiology.

Table 2 analyzes the existence or non-existence of the emergency stock related to the stages of drug acquisition management in the three most frequent conditions: diseases of the central nervous system, chronic renal failure, and water and electrolyte imbalances.

In the case of diseases of the central nervous system, we detected that drugs such as Phenytoin, Labetalol, Enalapril, Sodium Metamisole, and Sodium Valproate are not in stock in the intra-hospital pharmacy; therefore, in any service, deficiencies are determined in the stages of acquisition, storage, and use-consumption, and the case of others such as Diazepam the drug is not available directly in the emergency service so that the last stage is affected in the same way. In the case of Lasilix and Mannitol, there are problems in the flow of the drug to the patient, as the drug is occasionally available in the hospital, but not in the emergency pharmacy or stock, thus affecting the use-consumption stage.

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Table 2. Stages of Drug Acquisition Management in relation to the existence or not in the Peltier Hospital emergency room

Stages of drug procurement management	Medications that required their use Existing in the hospital	Medications that required their use Not available in the hospital
Selection	Potassium chloride, lasilix, mopral, protamine sulfate, NaCl 20 %, diazepam, mannitol, hydralazine, nimodipine, nitroglycerin, dexamethasone, hydrocortisone, atracurium, fentanyl, ketamine, midazolam, rocuronium, amiodarone.	
Acquisition	Potassium chloride, lasilix, mopral, protamine sulfate, NaCl 20 %, diazepam, Mannitol, Enalapril and captopril (NE), hydralazine, nimodipine, nitroglycerin, dexamethasone, hydrocortisone, methylprednisolone, ketorolac, atracurium, fentanyl, ketamine, midazolam, rocuronium, amiodarone.	Labetalol, NaCl 0,45 %, phenytoin, metamizole, sodium nitroprusside, Enalapril, captopril.
Storage	Protamine sulfate, mopral, NaCl 20 %, diazepam, nimodipine, dexamethasone, atracurium, fentanyl, ketamine, midazolam, amiodarone.	
Use / consumption	Potassium chloride, lasilix, mopral, protamine sulfate, NaCl 20 %, diazepam, phenytoin (NE), Mannitol, Enalapril and captopril, hydralazine, nimodipine, nitroglycerin, dexamethasone, hydrocortisone, methylprednisolone, ketorolac, atracurium, fentanyl amiodarone, ketamine, midazolam.	

When each stage of drug procurement management was evaluated individually and related to the most frequent health problems in the Peltier Hospital emergency department (table 3), it was found that drug selection was always rated as good, procurement and storage were rated as fair, and use and consumption were rated as poor. This indicates an adequate selection of medicines according to the health problems. However, the use and consumption were not, since it was found that most of the medicines were available in the hospital warehouses while the emergency department was out of stock, which hindered the proper and rapid management of patients.

Table 3. Evaluation of the Stages of Drug Acquisition Management with the Health Problems Arriving at the Peltier Hospital Emergency Department

Health problem	Stages of drug procurement management												Stay (hours)
	Selection			Acquisition			Storage			Use-consumption			
	B	R	M	B	R	M	B	R	M	B	R	M	
DMd	3				2			2				1	24
IRC	3				2			2				1	66
IMA	3				2			2				1	46
dH-M	3				2			2				1	27
SNC	3				2			2				1	12
EH	3				2			2				1	73
Malaria	3				2			2				1	12
Polytrauma	3				2			2				1	36
Tuberculosis	3				2			2				1	25
Sepsis	3				2			2				1	2

DMd: decompensated diabetes mellitus. CKD: Chronic renal insufficiency. AMI: Acute myocardial infarction. dH-M: Hydro-mineral imbalance. CNS: Central nervous system disease. HD: Hypertensive emergency. ARI: Acute respiratory infection. ARF/AVR: Respiratory failure with need for invasive mechanical ventilation. CRA: Cardio-respiratory arrest.

In the general evaluation of the stages of drug management, following the criteria previously assumed, the drug selection stage is evaluated as good, the acquisition and storage stages as fair, and the use and consumption stage as poor (figure 1).

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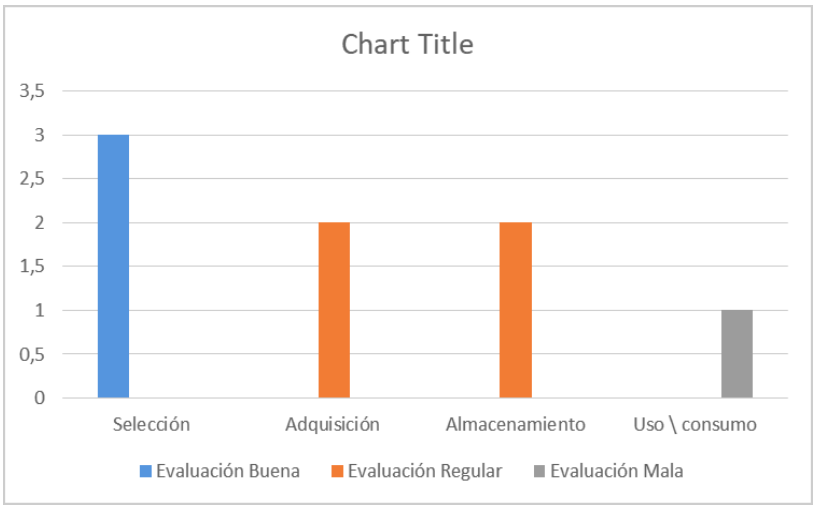

Figure 1. General evaluation of the stages of drug management

DISCUSSION

A study carried out in Spain in 2023 indicates that the emergency department provides 71 % of hospital admissions; the diseases that occupy the first causes in order of frequency are digestive and circulatory disorders and respiratory conditions. In Mexico, the Automated Subsystem of Medical Emergencies describes that the first causes of emergency care are trauma, acute respiratory infections, and obstetric conditions.[10,11]

In the present study, diseases of the central nervous system, chronic renal insufficiency, and water and electrolyte imbalances, in that order of frequency, are the main causes of admission to the emergency department.

The prolonged stay at the start of the delay in administering medications in admitted patients should be highlighted, which causes inefficient effectiveness and efficiency in the care of admitted patients. We agree with the studies conducted by Ceballos, Velásquez, and Jaén[12] on the worldwide concern about the prolongation of hospital stay, manifesting itself more intensely in the emergency services, because it generates negative effects on patients and the health system, affecting high costs, poor accessibility to hospitalization services and saturation in the emergency services.

In the medicines used for emergency treatment in chronic renal insufficiencies, there are also incorrectnesses in the different stages of medicine management, with shortages of sodium bicarbonate, omeprazole, and paracetamol. Lasilix, as described above, has affected the storage and use/consumption stages, but in others, such as Protamine Sulfate, in most cases, it is not in stock in the emergency department, there is a periodic shortage, and when it exists in the hospital it is controlled by the nephrology department, which is on call. This aspect delays the initiation of treatment for patients in need, exposing insufficiencies in the management stages of acquisition, storage, and use/consumption. In the case of Labetalol, there is a lack of it in the intra-hospital pharmacy, affecting all stages.

Deficiencies are also detected in the drugs for the treatment of hydro-electrolyte imbalances, such as the lack of distilled water used for the preparation of 0,45 % NaCl solutions, which shows problems in the Acquisition, Storage, and Use/consumption stages, and in the case of 20 % NaCl, with a temporary shortage, an aspect that exposes disorders in the use/consumption stages.

The use of drugs is elementary in medical procedures for treating diseases, not only in emergency services but also to compensate for them and avoid their complications, which leads to the development of pharmacology and drug control. With correct and efficient use, substantial losses of this resource are minimized.[13,14]

There is a need in emergency departments for an adequate flow of drugs in order to be able to carry out their proper and rational use, with the objective of rapid and efficient care. We agree with the Spanish Society of Hospital Pharmacy criteria, which instituted drug stock guidelines for all emergency departments in the country, guaranteeing the correct flow of drugs through the different management stages.[15] Likewise, we accept the contributions of Pérez-Reyes et al. at the Higher Institute of Military Medicine of Cuba, which implemented a system that facilitates drug search by alphabetical order according to generic and commercial names.[16]

In addition, the implementation of guides to assist professionals in the administration of drugs in a fast and safe manner is also allowed. These are based on periodic therapeutic updates, such as the one carried out by Drs. Vera Navarro and Vera Carrasco provide conclusive scientific evidence with a thorough review of the updated literature aimed at medical and nursing staff in emergency departments, constituting an instrument of great value for quality care. To update drug availability, there should be periodic updates in prescribing

practices, guidelines or protocols, as well as in the availability and supply of drugs to the center. In addition, a medication administration guide should be created that is regularly renewed and adapted to the needs of the Emergency Department in particular.[17]

Evaluations of drug selection processes are carried out by different institutions, such as the European Community, which carries out budget support projects for financing and strengthening the supply of drugs.[18]

CONCLUSIONS

The pathologies that contributed the greatest number of cases to the emergency department were diseases of the central nervous system and chronic renal disorders, followed by hydroelectrolyte and acid-base imbalances. An inadequate stock of drugs in the emergency department was caused by poor drug management. The stage of medication management in which the greatest number of deficiencies were found was the use-consumption stage, which is considered to be of great importance for the adequate management of the patient. The existence of inefficiencies in the management of medications and in the flow of these to their final destination results in an increase in the length of stay in the emergency department.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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