Tracking medication pathway as per better securing drugs' use in three clinical departments at the University hospital of Monastir (Tunisia)

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Le suivi du circuit des médicaments pour améliorer sa sécurité au niveau de trois services cliniques de l'Hôpital Universitaire de Monastir (Tunisie)

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R É S U M É

Prérequis : En Tunisie, peu d'études se sont intéressées à l'évaluation des événements indésirables médicamenteux et à la mise en place de mesures préventives. L'objectif de ce travail était d'évaluer les obstacles existants dans le circuit des médicaments afin d'éviter les erreurs de médication et d'aider les institutions à faire des actions d'amélioration.

Méthodes : Première étape: un audit clinique a été menée par l'observation d'un ensemble de normes qui sont représentant une ligne directrice.

Deuxième étape: entretien avec les professionnels de santé afin d'identifier leurs perceptions au sujet de la sécurité des médicaments.

Troisième étape: dans cette étape, nous avons développé divers scénarios d'événements indésirables en fonction des résultats de l'audit clinique afin d'être étudié sur terrain.

Quatrième étape: l'organisation d'une réunion de restitution professionnels de santé pour les sensibiliser quand à la problématique des événements indésirables et leurs conséquences négatives et de les inviter à contribuer à la création et la mise en œuvre de mesures correctives.

Résultats : Dans les services participant, la prescription médicale ne comporte pas certaines informations concernant le patient (âge, poids, antécédents médicaux...). Les infirmières ne vérifient pas systématiquement la durée de prescription et la voie d'administration. L'entrevue avec les professionnels de santé a montré que les médecins ne sont pas sensibilisés sur les règles de prescription. Le manque de communication était le principal problème des infirmiers et qui nécessite une amélioration.

Conclusion : Ce projet est un premier aperçu du circuit des médicaments en Tunisie. Les résultats seront utilisés pour créer un processus dynamique visant à améliorer la sécurité médicamenteuse.

M o t s - c l é s

Circuit des médicaments à l'hôpital – Audit clinique – Evénement indésirable médicamenteux – Tunisie

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S U M M A R Y

Background: In Tunisia, few studies have an interest to the assessment of medication errors and the implementation of preventive measures. The aim of this study was to evaluate the barriers existing in hospital pharmacies in order to prevent medication errors and to help institutions to make improvement actions.

Methods: First step: a clinical audit was conducted by observation against a set of standards that are representing a guideline.

Second step: interview with health professionals to identify their perceptions about medication safety.

Third step: in this step we develop adverse events scenarios according to results of the clinical audit in order to be investigated by the field practice.

Fourth step: organizing a multi-professional feedback meeting to raise health professional's awareness and to make them more conscientious about adverse drug events negative consequences and invite them to contribute in the establishment and implementation of corrective solutions.

Results: In the participating departments medical prescription did not include patient information's (age, weight medical background). Nurses do not verify systematically duration of prescription and administration route.

Health professionals interview revealed that physician's have lack of awareness about prescription rules. Lack of communication was the main nurse's problem that requires improvement.

Conclusion: This project has led to a first overview of the situation of medication use in Tunisia. Results will be used to create a dynamic process to improve the medication system safety.

K e y - w o r d s

Medication Systems, Hospital – Clinical audit – Adverse drug events – Tunisia

Adverse drug events (ADEs) are an important problem in all hospitalized patients and growing amount of data suggests that medication in hospital settings are frequent and result in substantial harm. Patient harm varies from increased length of hospital stay to undue disability and increased mortality [1]. To improve medication safety effectively, one should systematically analyze and assess the risks for medication errors and determine the possible causes [2].

In Tunisia, very few data are available about the magnitude of the ADEs at the hospital level. The first evaluation of hospital ADEs has been described as part of the study of adverse events in the university hospital of Monastir. Results showed that ADEs is a priority in our hospital (21% of adverse events were related to ADEs with highly preventability) [3].

The objective of this study was to evaluate the barriers existing in hospital pharmacies to prevent medication errors and to help institutions to make improvement actions.

MATERIAL AND METHODS

Definitions

In our study, we used the following definitions:

- ***Adverse drug events***: any errors in medication ordering, transcribing, dispensing, administering or monitoring with significant potential to harm a patient [4]
- ***Clinical audit****:* it is defined as a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change. Clinical audit should be an objective way of measuring and monitoring practice against a set of agreed standards and of detecting mismatches between the written word and actual practice [5].

Setting and sampling

The study was carried out in the university hospital of Monastir (Tunisia). It is a general public university hospital, including 18 clinical departments. The total number of admissions was 20 000 / year with a mean length of stay about 6 days [6].

Three clinical departments (surgical diseases, infectious diseases and pediatrics) were included in this study on voluntary basis. The possible differences between infants and adults in a first part, medical and surgical specialties in another part were also considered in our selection strategy.

We performed a four phase study that refers to the use of the HACCP method a long with observational audit framework. A similar design was previously used by "SECURIMED project" developed by the «Comité de Coordination et d'Evaluation Clinique et de la Qualité en Aquitaine« (CCECQA), in France [7].

First phase: Observation Auditing of medication administration

This phase was aiming at assessing possible vulnerabilities and defenses throughout medication circuit. The clinical audit was performed in three departments to record all actions of the nursing staff from the time the intravenous drug prescription was received to the time it was delivered to patients. A sample of 60 drug administrations was audited in each department to identify gaps by reference to a set of explicit criteria. The observational audit method was performed over the self reporting of medication errors or the questionnaire survey method as it has been shown to provide the most reliable data.

Second phase: interviewing health professionals

We conducted interviews with health professionals (pharmacists, physicians and nurses in each department) using three types of questionnaires one for each category of professionals to identify their perceptions about medication safety in their work environment.

Third phase: developing scenarios

The scenarios were developed after analyzing the data collected by the observational audit as well as the interviews with the health professionals (phases one and two). In this phase we came to a list of seven realistic scenarios as they were developed from the field practice. The purpose of this phase was to make health professional as much aware as possible regarding medication errors in terms of frequency, negative consequences and the importance of collaborative team work as well as strengthening barriers to prevent ADEs occurrence Scenarios.

Fourth phase: organizing feedback meeting

Two feedback meetings were conducted with a multidisciplinary team (Department heads, residents, medical interns and pharmacists and nurses). During these meetings we presented and discussed the research findings. The constructed scenarios were also presented after in order to stimulate their attention about the importance of ADEs prevention. The health professionals (teams) were also invited to discuss the underlying root causes of the ADEs and brainstorm on corrective solutions that need to be implemented.

Statistical analysis

In this study we performed a qualitative analysis of the clinical audit results. The analyses of professional interview results were performed using usual descriptive statistics.

RESULTS

Results of the clinical audit

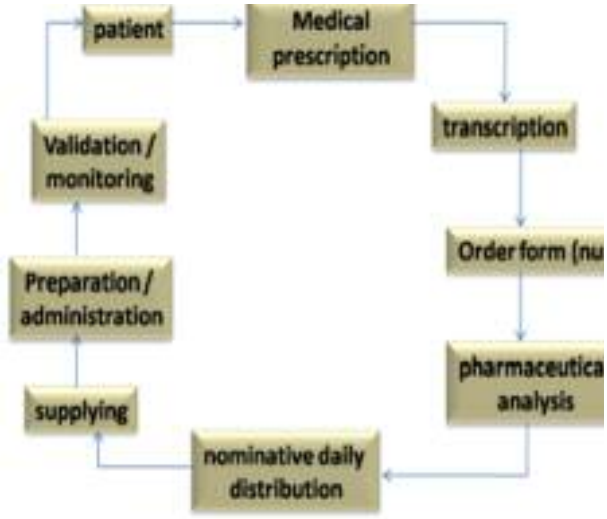
The audit was performed to comprehend the complex interactions of pharmacy and nursing processes involved with medication. During the audit we identified the medication circuit at the three departments from prescription to administration (figure 1).

Medication hand ordering

In the three departments prescription was always written with clear drug identification and without dangerous abbreviations. However, ordering did not include patient's age and weight

neither transmits patient medical background, diagnosis or allergies to the pharmacy (table I). A designated person was responsible for drugs ordering from the pharmacy and its storage in a cupboard in each department.

Figure1 : Medication circuit at the three departments



Pharmaceutical analysis
At the hospital pharmacy non-hazardous drugs were stored into drawers but hazardous drugs (hypnotics, anesthetics…) were stored in a locked cupboard.

Medication preparation and administration
Preparation of all doses to be administered was made by nurses at the treatment room in the three departments. Prior to administering medication, nurses routinely do not check expiration date, package integrity, product appearance and patient identity.

Tracking
At the department A, all drug administrations were validated in the nursing records. However, in departments B and C the validation was done only once a day in the morning.
The clinical audit involved 60 medication administrations in each department. Among the 180 administration, 87.7% were intravenous injections followed by oral therapy (8.9%). Medication errors were observed in 15 cases (8.4%) that included administration of wrong dose, wrong drugs or wrong technique or omission errors.

Results of health professional interview
In total 61 health professionals (21 physicians, 9 pharmacists and 31 nurses) answered a questionnaire related to their daily clinical practice. Based on gathered responses half of physicians (n = 10) reported had prescribed drugs for patients they haven't seen or know and 14 out of the 21 physicians reported had made verbal or phone drug ordering (table II).
Among the 31 interviewed nurses 16 reported not requesting the physician name and signature before ordering a drug and 12 did not ask for drug's treatment duration.Nurses mentioned also that they did not inform anyone of the care team if the pharmacist had changed patient prescription (table II).
The nine interviewed pharmacist's stated that drug interactions were systematically sought and expired treatments were renewed. Six out of nine pharmacists felt that medication transportation to clinical wards was not secured and the cold chain was not respected (table II).

Table 1 : Results of clinical audit in the three departments of the study

	Department A	Department B	Department C
Prescription phase			
- Patient identification	Yes	Yes	Yes
- Patient age and weight	No	No	No
- Drug identification	Yes	Yes	Yes
- Updated protocols	No	No	No
- Availability of information on patient' record	No	No	No
- Systematic proofreading of prescription	No	No	No
- Drugs booklet available in each department	No	No	No
- Treatment protocols available	Yes	No	No
Hazardous Abbreviations	No	No	No
Transmission to pharmacy			
- Nominative transmission	Yes	Yes	Yes
- Hazardous Abbreviations	No	No	No
- Transmission to the pharmacy of patient information (diagnosis allergies...)	No	No	No
Drug administration			
- Identity verification before administration	No	No	No
- Monitoring allergies before administering	No	No	No
- Equipment always available for drug administration	No	No	No
- Checking the expiration date, the package integrity and appearance of the product before administering	No	No	No

Table 2 : results of the interview with health professionals of the three departments

	Yes	No
Physicians responses (21)		
Prescribing drugs for unknown patients	10	11
Made verbal or phone drug ordering	14	7
Systematically inquire patient name	19	2
Systematically inquire patient age	21	0
Systematically inquire patient drugs	21	0
Use information sources about a new medication	18	3
When prescribing, take account of the drug availability	19	2
Authorizing the use of patient personal drug during hospitalization	20	1
Authorizing the use of patient personal drug and mentioning information in the medical record	21	0
Nurses responses (31)		
Requesting the physician name and signature before ordering	15	16
Preparing patient drugs from the nominative order written by the physician	31	0
Preparing patient drugs from the nurse transcription	4	27
Administering patient drugs from a phone drug ordering	7	24
Administering a non prescribed drug	7	24
Informing the team care if the pharmacist had changed patient prescription	13	18
Informing the patient about his treatment	4	27
Pharmacists responses (9)		
Pharmacists knows the medical order used in the care units	8	1
On a medical prescription, systematically items were:		
- Patient's name	9	0
- Age	2	7
- Sex	9	0
- Dose	7	2
- Administration route	9	0
- Duration of treatment	6	3
- Date of the prescription	9	0
- Name of the prescriber	6	3
- Signature of the prescriber	6	3
Analysis of prescriptions by a pharmacist	7	2
Analysis of prescriptions by the pharmaceutical preparer	9	0
Drug interactions are checked on prescriptions	9	0
Expired drugs can be delivered to care units	0	9
Using information sources to learn about a drug when needed	9	0

Developing scenarios

According to the observed practice in the two previous phases with a literature review we simulated different clinical scenarios (appendix 1). They were validated by different experts and then discussed with health professionals involved in the medication pathway.

Organizing feedback meeting

The working group has identified several actions to enhance medication safety.

- Patient information and education was considered by the team as an important component of medication safety pathway.
- Quality of physician drug ordering should be improved (detail relating to patient and treatment should be included on the prescription to avoid adverse events).
- We have to revise the structure of the drugs' ordering sheet in a way that would enable nurses to better and complete validation of all administrated drugs throughout the patient's hospital stay.
- Color coded cards should be used to mention allergy problems if any, that should be used at medical offices, pharmacies or hospitals
- Shift to the utilization of a structured patient file that would better highlight most important patient's clinical information.
- Avoid drug's storing problems such as look-alike and sound-alike medication by redesigning storage into separated locations
- Hospital pharmacy drugs delivery system should be through labeled boxes with proper patient identification.

DISCUSSION

Our study was among the few studies that addressed explored the safety issues of drug ordering pathway in a Tunisian hospital. It enabled us to have an overview regarding drug's pathway within three clinical wards at the hospital level. Analysis has identified some high risk for error steps from drugs ordering to drugs administration. Identified weaknesses were then presented to the teams working in the selected wards and then integrated into realistic scenarios to represent an awareness raising tools as per team better compliance with available protocols and recommendations.

The objective of our study was to describe drug pathway

essential steps (prescription, pharmaceutical analysis, dispensing…). This study showed that current systems for drug pathway did not minimize patient safety risks and the overall system needs to be improved.

Identifying failures was based on clinical audit that is an evaluation method using several tools (consulting documents, standardized questionnaires, interviews with actors…) [8]. It is a scientifically proven methodology in the evaluation of care processes [8]. The prospective approach enabled us to easily track the different phases of medication pathway and facilitated the capture of important information that would provide meaningful insight into the nature of underlying systems defects [9].

However, this evaluation method has some weaknesses. In fact, selected clinical wards were previously informed about the audit (risk visit) this might lead to an observational bias which was shown through some changing behaviors of the observed staff.

According to literature review, ADEs are an important problem in all hospitalized patients as these events represent medication-related patient harm [10]. In our case, the tracking of the drugs pathway was motivated by the results of our hospital on the types of adverse events (21% of the identified AEs were related to medication) [3].

Medication errors can occur when prescriptions or orders are written or transcribed from medication chart to the nursing notes [11]. During transcription dose, units, route of administration, and administration interval can be modified [12]. Several studies mentioned that prescription and transcription errors were frequent and often preventable [12, 13]. In our study we have noted that several key elements like patient name, medication dose and duration were not systematically mentioned on the prescription sheet. Thus enhancing medication prescription would require several actions targeting the training of junior doctors [14]. Pharmacists have direct and frequent contact with prescribers can also play a crucial role in promoting medication safety by alerting doctors about incomplete prescriptions. Recent studies showed that Pharmacist participation with the medical rounding team contributes to a significant reduction in preventable ADEs [15].

To ensure safe administration of medications in clinical practice, nurses were also involved in the hospital drug pathway. In fact, recent studies have demonstrated that appropriate educational preparation of student nurses is the key to ensuring them to become future safer practitioners in the workforce [16]. Thus, a good collaboration, nurse/pharmacy and nurse/physician communication remains the key components to safe and timely medication administration [17].

In conclusion, our study has mapped some uncontrolled risks throughout the studied drug pathway. It must be regarded as a high risk activity where the use of risk management procedures to minimize risk to patients is seen as a high priority by all those involved with these duties. There is a requirement to develop better national policies and procedures for safe medication use. These procedures can be used to train, maintain, and audit practice.

Appendix 1: examples of constructed scenarios

Scenario N°1

82 year old patient with antecedents of renal failure was admitted in the infectious disease department for a painful oropharyngeal candidiasis lasting for one week. Injectable fluconazole was prescribed in a dose of 100 mg the first day then 50 mg daily. The nurse takes a bottle of fluconazole (100 mg) from the drug cupboard. The following day, the same nurse prepared half the dose from bottles taken in the same box. On the fourth day the patient developed nausea, vomiting and jaundice. We realized later that behind the bottle the fluconazole 100 mg there are bottles of Fluconazole 200 mg. The diagnosis of drug-induced hepatitis was confirmed.

Scenario N°2

80 year old patient was transferred from the cardiology department at the infectious diseases for treatment of erysipelas of the lower limb. In the transfer letter is written that the patient is treated by digitoxin 50µg/1ml. The nurse transcribes digitoxin 1 pill / day (one pill = 250µg/1ml). After one week the patient developed signs of digitalis toxicity and died.

Scenario N°3

A patient aged 39 years, having a previous immune deficiency; urinary tract infections; recurrent pneumonia and allergy to cotrimoxazole, is followed in internal medicine for lupus.

The allergy to cotrimoxazole was not mentioned in the special character of the file to be quickly noticed by doctors. Patient consulted for burning after micturition and treated by cotrimoxazole. In the evening, patient was presented to the emergency in serious condition. A Lyell syndrome was diagnosis and patient died in the intensive care unit.

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