



Implementation and evaluation of the medication management in nursing units of a university hospital by means of a quality improvement cycle



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ABSTRACT

Aims: The aim of this study was to improve compliance with protocols for the correct handling and storage of medication, both in medication rooms and on resuscitation trolleys in order to reduce the level of adverse effects on inpatients.

Background: The most frequent adverse effects in healthcare are due to medication errors.

Methods: Twenty hospital units were studied in 2012. Their medication rooms and resuscitation trolleys share the same medication supply system. Twelve criteria were evaluated and in the first assessment, corrective measures were implemented and criteria were evaluated again.

Results: In the first evaluation, the total amount of cases of noncompliance was 153 (65.38%). Seven corrective measures were implemented on the 6 criteria which accumulate 60% of the noncompliance cases. After that, 81 noncompliance cases (34.62%) were obtained. Almost all of evaluated criteria showed an improvement. Nine of the 12 criteria evaluated showed a statistically significant improvement in the second assessment.

Conclusions: A quality improvement cycle is a useful tool to identify safety problems, related to management of medication rooms and resuscitation trolleys of nursing units. It is possible to identify and implement improvement measures without any additional cost.

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1. Introduction

The most frequent adverse effects in healthcare are due to medication errors which are reported to produce up to 40% of the total damage to inpatients (ACSNS, 2008a; Aranaz-Andrés, 2006). The briefing sheet of AHRQ (2010) summarizes the economic impact of medication errors in its title: “Preventing Medication Errors: A \$21 Billion Opportunity”. Some studies suggest that the cost of preventable inpatient medication errors in the USA is \$16.4 billion annually (\$4.2 billion for outpatients). Moreover, in the USA, every year about 7000 deaths may be due to preventable medication errors (IOM, 1999) while 3.8 million inpatients are affected and, on average, inpatients are exposed to two medication errors every day (Barker, Flynn, Pepper, Bates, & Mikeal, 2002).

Although it is difficult to estimate precisely the economic cost of medication errors, the recent study of Samp, Touchette, Marinac, and Kuo (2014) shows an estimated cost of about \$90 per occurrence.

In Spain, the number of inpatients affected by medication errors is thought to be approximately 12.8% (Blasco et al., 2001). Pinilla, Murillo, Carrasco, and Humet (2006) estimated an annual cost of €76,000 for a Spanish hospital, equivalent to double the total cost per inpatient, and they highlighted the fact that hospital managers are usually unaware of the economic impact of these errors.

The term “medication error” means an avoidable adverse event due to its misuse by healthcare personnel (Hartwig, Denger, & Scheeneider, 1991) although the term includes various elements (Otero-López, Codina-Jané, Tamés-Alonso, & Pérez-Encinas, 2003). Some may be the lack of essential information in decision-making by professionals involved in medication handling and administration in nursing units, while other causes include professionals' limited training, inadequate protocols for diagnostic and therapeutic procedures related to the administration of medication, poor organization and communication among healthcare staff and inappropriate storage and identification in medication rooms (Salas, Grau, Mateu-de Antonio, & Pellicer, 2008). On the other hand, the level of complexity of patients' clinical conditions is increasing and, as a result, it is necessary to improve and upgrade professional training in new diagnostic and therapeutic procedures (Aranaz et al., 2006).

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has assessed the causes of medication errors and adverse events in the United States and the most common were professionals'

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lack of training (65%) and poor communication (63%), with 26% due to inappropriate medication storage and access and 18% to labelling (ACSNS, 2008a; The Joint Commission, 2002). Moreover, several studies have shown that medication errors are preventable in at least 50% of documented cases (ACSNS, 2008a; Aranaz-Andrés, 2006).

As regard errors due to medication storage, several studies have highlighted the existence in nursing units of expired medicines, narcotics without any special monitoring system or with inadequate administration records, unidentified high risk medication and multi-dose presentations without a record of the opening date (ACSNS, 2008b). Furthermore, not only a lack of supply but also excessive storage is a determining factor in medication errors because of increased expenditure on purchase and maintenance (Oliva-Contero et al., 2011).

Because of this, some Spanish hospitals have introduced automatic dispensing devices so that medication rooms are no longer necessary (Salas et al., 2008; Sánchez et al., 2002). These are not available in our hospital, although it does have a dispensing system for unit-doses (SDMDU), so that they coexist with stock in medication rooms, thus increasing the volume of medication managed in nursing units.

We, therefore, decided to try to find a system to help reduce medication errors without additional economic cost or major structural or organizational changes.

For this reason, the specific aim of our study was: to improve compliance with protocols for the correct handling and storage of medication, both in medication rooms and on resuscitation trolleys in order to reduce the level of adverse effects on inpatients.

2. Methods

2.1. Design

This was a quality improvement study with quasiexperimental design, before-and-after study of the assessment of compliance of 12 criteria.

2.2. Hospital

The Hospital General Universitario José M^a Morales Meseguer is a large University hospital with 426 inpatient beds, 18 nursing units belonging to different medical and surgical specialties and eight nursing units related to central services. It also has a large out-patient department.

Its workforce includes 1823 healthcare and non-healthcare professionals, 508 of them nurses and 405 nursing assistants (Servicio Murciano de Salud, 2011) and they work a morning, afternoon and evening rotating shift pattern.

2.3. Units under study

Twenty hospitalization units were assessed, including all the medical and surgical speciality units and the coronary and general intensive care unit.

The inclusion criterion was uniformity in medication room management. Therefore, units under study were those hospital nursing units which shared the same medication supply system provided by the Pharmacy Service Unit by means of monthly or weekly arrangements. Those units without a medication room with this system were excluded from the study.

2.4. Medication management

In the hospital, there is a single Pharmacy Service Unit, which manages all medical supplies. In each nursing unit there are three types of medication to be managed. The first includes medication stored in medication rooms, which includes those used most frequently in the

different formulations available in the hospital and include high risk medication and narcotics. The second group encompasses medication in resuscitation trolleys and the third includes unit-dose medications which are specific for each patient but this latter group was not included in this study since the unused stock was returned to pharmacy at the end of the day.

In each nursing unit, the head nurse is in charge of stock control and he/she liaises with the Pharmacy Service Unit. The task of medication replacement in the medication rooms is assigned to nursing assistants and qualified nurses are in charge of their administration.

The hospital has protocols for the storage and preservation of medicines, as well as for their correct identification, preservation of high risk medication and narcotics and psychotropics control and record in nursing units' medication rooms. Although healthcare personnel have free access to this room, narcotics and psychotropics are stored in a safe located within the room. Also, Spanish legislation establishes the importance of an appropriate record of administration of narcotics and a senior nurse is responsible for access and content control and any misuse is a criminal offence (Spanish Act, 1967; Spanish Legislation, 1977).

In 2009, the Pharmacy Service Unit established its own replacement and control system for medication and infusion bags for resuscitation trolleys which included the addition of transparent plastic cases with the necessary medication and infusion bags in the event of a cardiorespiratory arrest. These are always sealed before use and are immediately restocked through the established internal replacement system.

2.5. Variables

A work team, made up of two nurses of unit, the person in charge of patient safety in the hospital, and people belonging to the Pharmacy Service staff, developed 12 assessment criteria, according to references and the current protocols of the Pharmacy Service:

- C1: High risk medication is appropriately labelled according to an agreed protocol.
- C2: Nursing units have a current list of high risk medication.
- C3: Records made in the narcotics record book comply with a protocol.
- C4: Stocks of morphine hydrochloride and Pethidine (Demerol®) that appear in the last record coincide with the current amount.
- C5: All medication is stored according to its active ingredient, dose and route of administration.
- C6: Potassium chloride is stored separately from other medication.
- C7: There is no medication on the shelves outside the boxes.
- C8: Antiseptics in use are appropriately covered or protected.
- C9: The date of opening of multi-dose formulations is recorded.
- C10: Medication vials in use do not have a needle attached.
- C11: Packaging of medication and infusion bags on the resuscitation trolley is intact.
- C12: Non-standard additional medication and infusion bags on the resuscitation trolley are appropriately labelled and stored.

The use of general criteria (Saturno, 2008) was avoided and, in order to facilitate measuring and to ensure criteria reliability, a detailed description of the clarifications and exceptions to each one was carried out (Appendix).

Data for the assessment of all the criteria were obtained by direct observation by the assessor who was a highly experienced nurse and unit leader.

2.6. Assessment and improvement method

Two assessments were made at a 3 month interval, the first in March 2012 following which the data were analyzed and later reassessed following remedial measures being implemented by the work team. The

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