

## Prevention of medication errors made by nurses in clinical practice

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### ABSTRACT

**Background:** Medication administration to patients is a part of clinical nursing practice with high risk of errors occurrence. The causing factors of medication errors are either individual or systemic. In order to prevent errors before, the establishment of protective measures is pivotal.

**Purpose:** To explore the protective measures taken by nurses to prevent medication errors in clinical practice.

**Method and material:** A search of Medline, Science Direct and Cochrane Library was conducted to retrieve literature published from January 2000 until August 2011.

**Results:** The protective measures against medication errors are related with the preparation and administration of medications, the dosing calculations skills of nurses, the nursing education, the oral medication orders, the interdisciplinary collaboration, the manager nurses and changes in health systems' issues relevant with medication management.

**Conclusions:** This review paper summarizes the preventive measures of medication errors made by nurses. As it is obvious, there is a plenty of factors that need to be applied in health units to succeed low medication error rate. Because of the significance of the subject, further research is warranted to prove the effectiveness of every measure in the prevention of medication errors.

**Key words:** Medication errors, prevention, nurses.

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### INTRODUCTION

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medical/nursing interventions or patient hospitalization have drawn health researchers' attention over the last decade. Errors appearing in the hospital settings concern a lot of incidents like patients falls, use of wrong equipment, sores, hospitals infections, improper management of clinical situations and medication errors. Medication error defined as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of health professional, patient or consumer".<sup>1</sup>

It is estimated that medication errors in USA account 7000 deaths annually. However, this estimation represents the number of medication errors that resulted in death. Actually, the possibilities of medication errors to result to death is 0,1%.<sup>2</sup> Mostly medication errors are identified before they reach the patient, or they reach the patient but do not cause harm, or cause permanent harm and required prolonged hospitalization. Moreover, there are medication errors that

require necessary interventions to sustain life.<sup>3</sup>

Studies that examined the types of medication errors divided them in categories, according to the description of the event: omission error, wrong drug error, wrong patient error, wrong route error, wrong time error, wrong technique error, wrong dosage-form error and extra dose error.<sup>4</sup> Thus, to avoid any type of medication error made by nurse, the implementation of preventive measures is undoubtedly beneficial. Nurses taking into account all precautions for medication errors, reduce firstly the incidence of medication errors, maintain the culture of safe hospital environment and ensure safe medications management by them.

A breakdown of the relevant literature showed that the protective measures for medication errors are related with the preparation and the administration of medications, the dosing calculations skills, the nursing education, the oral medication orders, the interdisciplinary collaboration,

the administrative nursing staff and other measures.

## **Medication preparation and administration**

Medication safety aims at the reduction of medications errors rates, their earlier identification before patient gets harm and their timely treatment.<sup>5</sup> Preventive strategies of medication errors include the standardization and the simplification of medication procedures and others. Medication preparation and administration are parts of medication procedures, which involve the follow measures:

- the ensurance of a safe environment for the medication preparation by placing labels ("Do not disturb", to discourage visitors to interrupt the nurse thattime) and also to remind nurses the importance of concentration during medication preparation,<sup>6,7</sup>
- the reduction of distractions and interruptions during medication administration,<sup>7</sup>
- the assistive use of calculator to facilitate the resolution of the

calculations.<sup>8</sup> Using a calculator, however, requires knowledge of the existing data management, the way data will be used and the conversions that are required.<sup>9</sup> Thus, the use of calculator will serve as a "useful tool" for resolving the various mathematical functions and conversions,<sup>10</sup>

- the delivery of premixed medications from pharmacy to nursing wards without needed any further dialysis or special preparation by the nursing staff (especially pediatrics medications that require precision in dosage calculation),<sup>11</sup>
- the mandatory double-checking of medication by two separate nurses (particularly in high risk medications, which are usually responsible for adverse events or errors),
- the implementation of "five rights" (right medication, right dose, right route, right time, right patient) when preparing medications (although this factor focuses on individual performance and does not reflect the

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complexity of medication procedure),<sup>12</sup>

- the apparent separation of medications with similarities either in color or in name, by putting a label on them,<sup>13</sup>
- the preparation and the administration of medication the same time,<sup>14</sup>
- and the check if medication had been administrated to the proper patient.<sup>15</sup>

#### **Dosing calculation skills and nursing education**

Another protective measure against medication errors consider to be the improvement of dosing calculation skills through nursing education. This can make nursing students prepared for their clinical duties afterwards. Directly related to the above, are the mathematical competencies of the nursing students.<sup>16</sup> Skills involving fractions, decimals and percents, are examples that complicate the application of mathematic operations, as Brown mentioned.<sup>17</sup>

The article entitled: "Clinical skills: a practical guide to working out drug calculations" written by Trim,<sup>18</sup> analyzed

thoroughly all types of medication calculations. Emanuel and Prynce-Miller, considered the establishment of protocols in clinical practice, as a duty. So, it would be easier for nursing students to meet correctly dosing calculations.<sup>19</sup>

Both students and professional nurses, believe that what they knew was sufficient to calculate doses (tablets, injections), the way of medication administration, medication terms and medication abbreviations was known almost from both groups. Subjects in which knowledge was lessen were pharmacodynamics and pharmacokinetics,<sup>20</sup> dosing calculation of liquid solutions and dilutions.<sup>16</sup> In a study, to assess unsafe events for patients, found that 56% of unsafe events related to medication errors and 20% of those associated with lack of nursing student skills.<sup>21</sup>

Attendance of educational courses that improve dosing calculation skills through mathematical tests seems useful. Particularly, the provision of books with exercises examples and recommendations of some books to study are enhancing

students' skills of learning.<sup>22</sup> Strengthening nursing students' theoretical pharmacological background will help them to recognize medication errors, as they will become future nurses. Alongside the theoretical background is the clinical practice. At this point enters the role of clinical nurses' educators to teach all required skills to their students to avoid any type of error in the future.<sup>23-25</sup>

## **Oral medication orders and interdisciplinary collaboration**

Oral medication orders transmitted by phone from a doctor to a nurse are hiding risks. The existence of voices or noises in the environment of the speakers, the unfamiliarity with patients' situation, bad phone connection and rapid way of speaking, are some factors that make communication through phone difficult.<sup>26</sup> So as to avoid errors in these cases, it is important firstly to write down the order, then confirm patients' name, medications' name, the precise dosing and the reason of administrate this medication to the patient. All

these actions, is proposed to take place before the doctor hang up the telephone.<sup>27,28</sup>

Particularly valuable is the cooperation of doctors, nurses and pharmacists for establishing policies, strategies and systems that will reduce the incidence of medication errors.<sup>12</sup> Interdisciplinary cooperation needs to obtain a comprehensive view about the issue of medication errors, their causes and the way every health care professional faces medication errors.<sup>29</sup>

## **Measures concerning nursing administrators**

There is growing evidence that nursing administrators possess central role in the management of medication errors.<sup>30</sup> The head nurses have strong influence in clinical nurses' conduct to keep positive attitude towards the reporting of medication errors.<sup>30,31</sup> The cooperation of head nurses and nurses aims to the understood of each group beliefs of creating a safe environment of health care.<sup>32</sup>

The head nurses decision to minimize phone calls during drug administration time (8:30-10:00

am, 8:30 to 10:00 pm) is necessary.<sup>7</sup> In the duties of nursing administrators include also the creation of a safety culture of hospitalized patients, the motivation of managers to be constantly vigilant and to promote conditions that enable the treatment of medication errors by the nursing staff of each clinic.<sup>29</sup>

### Other measures

Fundamental is the establishment of a system to report medication errors anonymously. By providing to nurses the opportunity of voluntary report their medication errors without mentioning their name, makes them feel comfortable and increases the possibilities to report their error. Also, aiming at the success of this reporting procedure, nurses' feedback with information about medication errors is essential.<sup>30,31,33</sup>

Other strategies to prevent medication errors include:

- the nurses access to patients' information (height, weight, allergies, laboratory tests),<sup>34</sup>
- the establishment of hospital intranet, a service which

offers rapid access, information and gathering of all details around the patient,<sup>11</sup>

- the use of bar coding technology,<sup>1</sup>
- the design of an electronic medication system for each clinical setting, where nurses have access and the capability to derive essential information on medications,<sup>35</sup>
- the increase of patient-nurse ratio in each shift,<sup>14</sup>
- the attendance of educational programs with pharmacology topics and provision of educational opportunities concerning all procedures involving the use of medication,<sup>36</sup>
- the differentiation of medication package with similar name, but different medication concentration,<sup>37</sup>
- the establishment of medication administration policies,<sup>5,12, 25</sup>
- and the placement of colored labels upon syringes, when medications are preparing in the operation room.<sup>38</sup>

A study that examined patients' perceptions of the safety in medication administration,

patients consider two ways to improve the medication safety. The first way is about the communication of patient and the nurse during medication administration. The second one is in the same range, but refers after the medication administration.<sup>39</sup>

## Conclusion

The present review article highlights nurses' contribution in the reduction of medication errors rate. Nurses' vigilance and adoption of precaution measures about medication errors are key factors for preventing medication errors. With exception of clinical nurses' role in the medication errors prevention, as well as pivotal significance have manager and educator nurses. Researchers also claimed that changes at health systems' characteristics concerning the medications management consists another factor to protect patients from medication error. The elimination of medication errors of course is difficult to be successful, but the reduction of their frequency remains still achievable. In conclusion, it is

clear that the reduction of all types of errors during the delivery of nursing care, promotes a safe environment of hospitalization.

## REFERENCES

1. USA National Coordinating Council for Medication Error Reporting and Prevention. The First Ten Years. 2005 [cited 2011 Jun 1] Available from: <http://www.nccmerp.org/pdf/reportFinal2005-11-29.pdf>
2. Hubble MW, Paschal KR, Sanders TA. Medication calculation skills of practicing paramedics. *Prehosp Emerg Care*. 2000;4(3):253-260.
3. USA National Coordinating Council for Medication Error Reporting and Prevention. Index for Categorizing Medication Errors. 2001 [cited 2011 August 17] Available from: <http://www.nccmerp.org/pdf/indexColor2001-06-12.pdf>
4. Cohen MR. Medication errors, 2<sup>nd</sup> edition. Washington: American Pharmacists Association; 2007.
5. Paparella S. Choosing the right strategy for medication error reduction: Part I. *J*

- 
- Emerg Nurs. 2008a;34(2):145-146.
6. Pape TM, Guerra DM, Muzquiz M, Bryant JB, Ingram M, Schraner B, Alcala A, Sharp J, Bishop D, Carreno E, Welker J. Innovative approaches to reducing nurses' distractions during medication administration. J Contin Educ Nurs. 2005;36(3):108-116.
7. Conrad C, Fields W, McNamara T, Cone M, Atkins P. Medication room madness: calming the chaos. J Nurs Care Qual. 2010;25(2):137-144.
8. Wright K. Student nurses need more than maths to improve their drug calculation skills. Nurse Educ Today. 2007;27:278-285.
9. Pentin J, Smith J. Drug calculations: are they safer with or without a calculator? Br J Nurs. 2006;15(14):778-781.
10. Michaels AD, Spinler SA, Leeper B, Ohman EM, Alexander KP, Newby LK, et al. American Heart Association Acute Cardiac Care Committee of the Council on Clinical Cardiology, Council on Quality of Care and Outcomes Research; Council on Cardiopulmonary, Critical Care, Perioperative, and Resuscitation; Council on Cardiovascular Nursing; Stroke Council. Medication errors in acute cardiovascular and stroke patients: a scientific statement from the American Heart Association. Circulation. 2010;121(14):1664-1682.
11. McMullan M. Exploring the numeracy skills of nurses and students when performing drug calculations. Nurs Times. 2010;106(34):10-12.
12. Choo J, Hutchinson A, Bucknall T. Nurses' role in medication safety. J Nurs Manag. 2010;18(7):853-861.
13. Institute for Safe Medication Practices. ISMP's list of confused drug names. 2010 [cited 2011 Jun 8] Available from: <http://www.ismp.org/tools/confuseddrugnames.pdf>
14. Kim KS, Kwon SH, Kim JA, Cho S. Nurses' perceptions of medication errors and their contributing factors in South
-



- Korea. J Nurs Manag. 2011;19(3):346-353.
15. O'Connell B, Crawford S, Tull A, Gaskin CJ. Nurses' attitudes to single checking medications: before and after its use. Int J Nurs Pract. 2007;13(6):377-382.
16. Grandell-Niemi H, Hupli M, Puukka P, Leino-Kilpi H. Finnish nurses' and nursing students' mathematical skills. Nurse Educ Today. 2006;26(2):151-161.
17. Brown DL. Does 1 + 1 still equal 2? A study of the mathematic competencies of associate degree nursing students. Nurse Educ. 2002;27(3):132-135.
18. Trim J. Clinical skills: a practical guide to working out drug calculations. Br J Nurs. 2004;13(10):602-606.
19. Emanuel V, Pryce-Miller M. Exploring the factors contributing to drug errors and how to improve knowledge. Nurs Times. 2009;105(46):16-18.
20. Grandell-Niemi H, Hupli M, Leino-Kilpi H, Puukka P. Finnish nurses' and nursing students' pharmacological skills. J Clin Nurs. 2005;14(6):685-694.
21. Gregory D, Guse L, Dick DD, Davis P, Russell CK. What clinical learning contracts reveal about nursing education and patient safety. Can Nurse. 2009;105(8):20-25.
22. Wright K. An investigation to find strategies to improve student nurses' maths skills. Br J Nurs. 2004;13(21):1280-1287.
23. Warburton P. Numeracy and patient safety: the need for regular staff assessment. Nurs Stand. 2010;24(27):42-44.
24. Paparella S. A Safe Haven for Nurses to Report Medication Errors? Clarian and Spectrum Health Systems Prove It Is Possible!. J Emerg Nurs. 2005;31(4):373-375.
25. Luk LA, Ng WI, Ko KK, Ung VH. Nursing management of medication errors. Nurs Ethics. 2008;15(1):28-39.
26. Allinson TT, Szeinbach SL, Schneider PJ. Perceived accuracy of drug orders transmitted orally by telephone. Am J Health Syst Pharm. 2005;62(1):78-83.

- 
27. Cohen H, Shastay AD. Getting to the root of medication errors. *Nursing*. 2008;38(12):39-47.
28. Lambert BL, Dickey LW, Fisher WM, Gibbons RD, Lin SJ, Luce PA, McLennan CT, Senders JW, Yu CT. Listen carefully: the risk of error in spoken medication orders. *Soc Sci Med*. 2010;70(10):1599-1608.
29. Bohomol E, Ramos LH, D'Innocenzo M. Medication errors in an intensive care unit. *J Adv Nurs*. 2009;65(6):1259-1267.
30. Kagan I, Barnoy S. Factors associated with reporting of medication errors by Israeli nurses. *J Nurs Care Qual*. 2008;23(4):353-361.
31. Chiang HY, Pepper GA. Barriers to nurses' reporting of medication administration errors in Taiwan. *J Nurs Scholarsh*. 2006;38(4):392-399.
32. Lowe GS, Schellenberg G, Shannon HS. Correlates of employees' perceptions of a healthy work environment. *Am J Health Promot*. 2003;17(6):390-399.
33. Joolae S, Hajibabae F, Peyrovi H, Haghani H, Bahrani N. The relationship between incidence and report of medication errors and working conditions. *Int Nurs Rev*. 2011;58(1):37-44.
34. Paparella S. Choosing the right strategy for medication error prevention-Part II. *J Emerg Nurs*. 2008b;34(3):238-240.
35. King RL. Nurses' perceptions of their pharmacology educational needs. *J Adv Nurs*. 2004;45(4) 392-400.
36. Anselmi ML, Peduzzi M, Dos Santos CB. Errors in the administration of intravenous medication in Brazilian hospitals. *J Clin Nurs*. 2007;16(10):1839-1847.
37. Mullan J. Technology as an aid to the nurse-patient interaction at the bedside. *Am J Nurs*. 2005;105(Supplement)3:39.
38. Jensen LS, Merry AF, Webster CS, Weller J, Larsson L. Evidence-based strategies for preventing drug administration errors during anaesthesia. *Anaesthesia*. 2004;59(5):493-504.
39. Walrath JM, Rose LE. The medication administration process: patients'
-

perspectives. J Nurs Care

Qual. 2008;23(4):345-352.