Original Article

Influence of the writing of the medical orders on the administration of medications at the wrong schedule time*

Influência da redação da prescrição médica na administração de medicamentos em horários diferentes do prescrito

Influencia de la redación de la prescripción médica en la administración de medicamentos en horarios diferentes al prescripto

Fernanda Raphael Escobar Gimenes[1], Thalyta Cardoso Alux Teixeira[2], Ana Elisa Bauer de Camargo Silva[3], Simone Perfuro Optiz[4], Maria Ludermiller Sabóia Mota[5], Silvia Helena De Bertoli Cassiani[6]

ABSTRACT

Objective: To evaluate the influence of the writing of medical orders on the administration of medications in medical units from five brazilian hospitals. **Methods:** This descriptive study used a secondary analysis of data from a multicenter study conducted in 2005. the sample consisted of 1,084 medication orders that had been administered at the wrong schedule time. **Results:** The great majority of medical orders (96.2%) had acronyms and/or abbreviations, 7.8% of them had incomplete schedules for administration of the medication, and 4.8% had been marked out. in addition, there was no schedule for the administration of the medication in 1.9% of the medical orders. **Conclusion:** Implementation of electronic prescribing and continuing education of health care providers can minimize the administration of medication at the wrong schedule time.

Descriptors: Medication errors; Drug prescriptions; Nursing records; Medical records

RESUMO

Objetivo: Analisar a influência da redação da prescrição médica na administração de medicamentos em horários diferentes do prescrito ocorridas em unidades de clínica médica de cinco hospitais brasileiros. **Métodos:** Trata-se de estudo descritivo que utilizou dados secundários obtidos de uma pesquisa multicêntrica realizada em 2005. A amostra foi composta por 1084 doses de medicamentos administradas em horários diferentes do prescrito. **Resultados:** Do total analisado**,** 96,2% apresentavam siglas e/ou abreviaturas; 7,8% apresentavam o registro do horário de administração incompleto e 4,8% destes registros estavam rasurados. Ainda, faltou o horário e/ou a freqüência de administração em 1,9% das prescrições. **Conclusão:** Com a implantação do sistema computadorizado de prescrições, associada à prática da educação permanente será possível minimizar a administração de medicamentos em horários diferentes do prescrito.

Descritores: Erros de medicação; Prescrição de medicamentos; Registros de enfermagem; Registros médicos

RESUMEN

Objetivo: Analizar la influencia de la redacción de la prescripción médica en la administración de medicamentos en horarios diferentes al prescripto ocurridas en unidades de clínica médica de cinco hospitales brasileños. **Métodos:** Se trata de un estudio descriptivo que utilizó datos secundarios obtenidos de una investigación multicéntrica realizada en el 2005. La muestra estuvo compuesta por 1084 dosis de medicamentos administradas en horarios diferentes al prescripto. **Resultados:** Del total analizado**,** el 96,2% presentaba siglas y/o abreviaturas; el 7,8% presentaba el registro del horario de administración incompleto y el 4,8% de estos registros estaban borrados. Aun más, faltó el horario y/o la frecuencia de administración en el 1,9% de las prescripciones. **Conclusión:** Con la implantación del sistema computarizado de prescripciones, asociada a la práctica de la educación permanente será posible minimizar la administración de medicamentos en horarios diferentes al prescripto.

Descriptores: Errores de medicación; Prescripción de medicamentos; Registros de enfermería

---

* *Article based on a Master's dissertation submitted at Ribeirão Preto School of Nursing, Universidade de São Paulo (USP), 2007.*

1 *Master's degree in Nursing, Professor at Universidade Castelo Branco (UNICASTELO), Descalvado Campus, Brazil.*

2 *Master's degree in Nursing, Nurse at Vera Cruz Hospital (HVC), Campinas, Brazil.*

3 *Master's degree in Nursing, Professor at Universidade Federal de Goiás (UFG), Goiânia (GO), Brazil.*

4 *PhD in Nursing, Professor at Universidade Federal do Acre (UFAC), Rio Branco (AC), Brazil.*

5 *PhD in Pharmacology, Professor at Universidade de Fortaleza (UNIFOR), Fortaleza (CE), Brazil.*

6 *Full professor at Ribeirão Preto School of Nursing, Universidade de São Paulo (USP), São Paulo (SP), Brazil.*

Corresponding Author: **Fernanda Raphael Escobar Gimenes**
R. Bezerra Paes, 2358 - Descalvado (SP), Brazil
Cep: 13690-000. E-mail: fer_gimenes@yahoo.com.br

Received article **22/07/2008** and accepted **18/11/2008**

INTRODUCTION

Scientific and technological advances in health have brought about significant development in clinical interventions favoring health promotion, protection, and recovery. However, the latest therapies not always benefit patients as many of them can be involved in the development of new conditions, sometimes irreversible, and that may even lead to death.

Patient safety has been extensively discussed in scientific and care settings after the publication of the report *To Err is Human* in 1999. It reported that around 44,000 to 98,000 people died every year in the US due to iatrogenic causes and that 7,000 of these deaths were drug-related[1].

Adverse drug events can occur at any step of the medication process, i.e., at prescription, transcription, distribution, administration, and monitoring of adverse reactions. An appropriate medication prescription is key for preventing these events because ambiguous, illegible or incomplete prescriptions as well as non-harmonized nomenclature of drug prescribed (brand vs. generic name), use of abbreviations and erasures are all well-known factors that can be associated with adverse events[2-3]. Studies have showed that the administration of medication at different times than what was prescribed is the most common adverse event during the administration step[4-5].

Brazilian regulations[6] establish that hospital prescriptions are required to be legible, clear, and complete, and they must include the patient name, record number and bed, date, name of the drug to be administered, dose, route of administration, frequency and/or time of administration, treatment duration (e.g., for antibiotics), legible physician's signature and their medical license number. Outpatient prescriptions are also required to include the patient's home address and the prescriber's home or office address.

The purpose of the present study was to assess how medical prescription writing influence medication administration at different times than what was prescribed in internal medicine units at five Brazilian hospitals.

METHODS

A descriptive study was conducted based on secondary data obtained from a multicenter study carried out in 2005[7]. The objective of that study was to identify medication errors during drug preparation and administration in internal medicine units at six Brazilian hospitals.

In the present study data from five public hospitals were used focusing on inconsistencies between prescribed and administered doses that might be associated with the quality of medical prescription writing.

The study population comprised 1,430 cases where drug administered was different than what was prescribed and the sample consisted of 1,084 doses of medication administered at times different than what was prescribed, i.e., with an advance or delay of 60 minutes.

Data stored in EPIDATA databases version 3.1 at the five hospitals studied were used and were collected in the data collection instrument of the multicenter study on medication dose prescription.

The study variables were defined based on items of medical prescriptions: date; drug information (time and/or frequency of administration); record of administration time (incomplete time record, erased time record, illegible time record); use of acronyms and/or abbreviations; drug switch and/or discontinuation; and erasures.

This information was then crosschecked using SPSS 11.5 (SPSS Inc., Chicago, II., USA). The results of this analysis are displayed in the Chart and Table, expressed as absolute frequencies and percents.

Data release for the study was authorized by the multicenter study team and managers of the hospitals studied. The present study was approved by the Research Ethics Committee of the applicable institutions in accordance with HCRP Protocol No. 12216/2004, CEP 1413/04, CEPMHA/HC/UFG Protocol No. 096/04, Public Notice No. 919-2004/GD and Protocol No. 174/2005.

RESULTS

Of a total of 1,084 drug doses administered at different times than what was prescribed, 63 (5.8%) were in hospital A; 255 (23.5%) in hospital B; 250 (23.1%) in hospital C; 328 (30.3%) in hospital D, and 188 (17.3%) in hospital E. Hospital D had the highest rate of wrong time errors and hospital A had the lowest rate.

Of 1,084 prescriptions examined, 1,043 (96.2%) showed acronyms and/or abbreviations; records of administration times were incomplete in 85 prescriptions (7.8%); they were erased in 52 (4.8%) or illegible in 23 prescriptions (2.1%). In addition, administration time was missing in 21 (1.9%) prescriptions; and information was changed in 18 (1.7%) and omitted in 10 (0.9%) (Table).

The Table shows these prescriptions items by hospital studied. Acronyms and/or abbreviations (e.g., dipyrone 35 drops ADD; dipyrone 1 ampoule IV A/N; folic acid 5 mg PO 1xday) were seen in 55 (87.3%) of 63 drug doses administered at times different than what was prescribed in hospital A; 255 (100%) prescriptions in hospital B; 232 (92.8%) in 250 prescriptions in hospital C; 325 (99.1%) in 328 in hospital D; and 176 (93.6%) in 188 prescriptions in hospital E. The lowest rate was found in hospital A where electronic prescription has been implemented.

With respect to administration time, the highest rates

of inadequate records were seen in hospital C; of 250 doses administered at times different than what was prescribed, 81 (32.4%) records were incomplete, i.e., nursing staff did not record the 24-hour administration schedule. In hospital C, each provider has to record administration times during their duty shift based on the frequency of administration prescribed or, when not available, on the administration times of the day before. In addition, 15 (6%) administration time records were erased and 9 (3.6%) were illegible. In hospital E, 4 (2.1%) records were incomplete, 3 (1.6%) were erased, and 6 (3.2%) were illegible.

In all remaining hospitals studied, there were seen mostly erased and illegible records. In hospital A, one record (1.6%) was erased; in hospital B, 12 records (4.7%) were circled and/or scratched while one (0.4%) was hardly legible due to poor handwriting. In hospital D, 21 records (6.4%) were erased and 7 (2.1%) were illegible.

In regard to time and/or frequency of drug administration, this information was missing in 21 prescriptions. Of these, 15 were from hospital C; 5 from hospital D and 1 from hospital E, and providers had to complete this information in the prescription sheet. In addition, drug switch and/or discontinuation throughout the day were seen in 8 prescriptions in hospital C; 4 in hospital E; and 3 in hospitals A and B.

The Chart presents some examples of doses administered at times different than what was prescribed in the hospitals studied along with a description of potential causes.

DISCUSSION

Although not formally harmonized, acronyms and/or abbreviations were widely used in prescription writing at the five hospitals studied. Studies have demonstrated that the use of acronyms and/or abbreviations is a major concern for safe drug administration as they are not widely known and easily understandable, particularly when associated to poor or illegible handwriting[8-9].

However, some of these acronyms and abbreviations are internationally accepted such as measurement units (mg for milligram, dL for deciliter) and routes of administration (PO for per os, IV for intravenous route).

Incomplete administration times can also cause

Table – Frequency of medication doses administered at times different than what was prescribed, by prescription items, in internal medicine units at five Brazilian hospitals, Ribeirão Preto, Brazil, 2006

Prescription items*	Hospital											
	A (n = 63)		B (n = 255)		C (n = 250)		D (n = 328)		E (n = 188)		Total (n = 1,084)	
	n	%	n	%	n	%	n	%	n	%	n	%
Missing date	-	-	-	-	4	1.6	1	0.3	5	2.7	10	0.9
Missing time	-	-	-	-	15	6	5	1.5	1	0.5	21	1.9
Incomplete time record	-	-	-	-	81	32.4	-	-	4	2.1	85	7.8
Erased time record	1	1.6	12	4.7	15	6	21	6.4	3	1.6	52	4.8
Illegible time record	-	-	1	0.4	9	3.6	7	2.1	6	3.2	23	2.1
Acronyms	55	87.3	255	100	232	92.8	325	99.1	176	93.6	1,043	96.2
Changes	3	4.8	3	1.2	8	3.2	-	-	4	2.1	18	1.7
Erasures	1	1.6	3	1.2	9	3.6	5	1.5	7	3.7	25	2.3

* Each prescription may have more than one inadequacy

Chart – Examples of inconsistencies between medication time prescribed and administered

Dose administered at a time different than what was prescribed	Prescription	Description
Case 1: Administered Antak 50 mg IV at 2:47pm when it was scheduled to 12 pm	Antak 50 mg IV	Missing frequency of administration in the prescription.
Case 2: Administered hydrochlorothiazide 25 mg PO at 10:45am	Hydrochlorothiazide 25 mg PO early	Time of administration was not specified in the prescription and it was up to the nursing staff to set a time.
Case 3: Administered Tramal 50 mg PO at 5:21pm	Tramal 50 mg PO at 3:00pm	Administration time was changed using erase ink (schedule: 15 – 21 – 03 – 09).
Case 4: Administered omeprazole 20 mg PO at 6:07pm	Omeprazole capsule 20 mg PO at 8:00pm	Nursing staff was verbally informed about the change in the administration time two days before, from 8:00pm to 6:00pm, but the original time was reproduced in the prescription.

iatrogenic events as they can lead to overdosing or skipped doses may result in ineffective treatment.

It should be noted that while scheduling administration times of a drug is a common routine task performed by the nursing staff it requires sound knowledge of pharmacology and physiology as well as of the main drug interactions and potential adverse reactions that can occur after drug administration. Hence, administration times should be recorded only by nurses as they have proper training and scientific knowledge and can anticipate risks and act to minimize adverse events.

Erasures have also been identified to affect patient safety because they may cause misreading of information included in the prescription[3,9].

There is a need to raise awareness of medical doctors to avoid erasures and, at the same time, health facilities have to take actions to prevent illegible prescriptions, for example, by implementing electronic prescription systems[10-11].

Missing information on medication administration times in prescriptions can also compromise the efficacy of a therapeutic regimen because medication doses may be administered at too short or too large intervals resulting in toxic effects to patient, and skipped doses to patients may even result in longer hospital stay[12-13].

Drug switch and/or discontinuation are quite common in hospitals, especially at units where the patient's clinical condition is constantly changing over treatment, such as in patients admitted to internal medicine units. However, many changes in medication are not reported to the nursing staff and this is extremely concerning particularly in settings where nursing providers routinely transcribe to labels and stickers the medications prescribed at the beginning of their working shift and, when preparing and administering these drugs, they do not usually double check them against the original prescription, which may result in the administration of drugs that were discontinued or the omission of drugs added to the list of prescribed medications.

The frequency of medication administration is generally recorded manually by nursing staff, mostly by nursing aids and clerks, but only after prescriptions are ready. This practice, i.e., delaying the recording of medical prescriptions, can delay drug distribution by the hospital pharmacy to the units and, consequently, cause delays in drug preparation and administration.

It was also found that some prescriptions had missing dates. Recording the date is crucial to assure patient safety during drug administration. Patients requiring highly complex treatment care are more likely to show changes in their clinical condition and their prescriptions are usually changed over a 24-hour period. When the date is missing in a prescription, nursing staff may follow a therapeutic regimen that is inadequate to the patient's current state[14] by not introducing the new drugs prescribed or by continuing the administration of medications that have been discontinued or switched.

CONCLUSION

In the present study there were examined 1,084 doses of drugs administered at times different than what was prescribed. It was evidenced that hospital D, which has both conventional handwritten and electronic prescriptions, showed the highest rate of inconsistencies between prescribed and administered medications; hospital A, which has an electronic prescription system, had the lowest rate of inconsistencies. The major issue identified in these prescriptions examined was the use of acronyms and/or abbreviations. This was the most common problem seen in hospital B which used conventional, handwritten prescriptions. There were cases where administration time records were incomplete, as mostly seen in hospital C. Erased and illegible administration time records were also common.

In the light of that, it is clear that the implementation of an automated prescription system can help reducing adverse events associated to drug administration as information would be legible and complete.

Nurses should take the responsibility of recording administration times as they are the providers in the patient care team with better training and scientific knowledge to prevent potential events associated to drug administration.

In conclusion, the implementation of these actions, along with consistent and continuous education of providers involved in the medication process can minimize injuries caused to inpatients due to drug administration and ultimately improve the quality of care provided.

REFERENCES

1. Leape LL, Berwick DM, Bates DW. What practices will most improve safety? Evidence-based medicine meets patient safety. JAMA. 2002;288(4):501-7.
2. Cohen M. Letter and number characters that run together may lead to serious errors. Int Pharm J. 1999;13(3):108-9.
3. Cassiani SHB, Freire CC, Gimenes FRE. A prescrição médica eletrônica em um hospital universitário: falhas de redação e opiniões de usuários. Rev Esc Enferm USP. 2003;37(4):51-60.
4. Santell JM, Hicks RW, McMeekin J, Cousins DD. Medication errors: experience of the United States Pharmacopeia (USP) MEDMARX reporting system. J Clin Pharmacol.

2003;43(7):760-7.
5. Prot S, Fontan JE, Alberti C, Bourdon O, Farnoux C, Macher MA, et al. Drug administration errors and their determinants in pediatric in-patients. Int J Qual Health Care. 2005;17(5):381-89.
6. Brasil. Lei n. 5.991, de 17 de dezembro de 1973. Dispõe sobre o controle sanitário do comércio de drogas, medicamentos, insumos farmacêuticos e correlatos, e dá outras providências. Diário Oficial da União, Brasília (DF) 1973; 19 dez. 152º da Independência e 85º da República.
7. Cassiani SHB, Gimenes FRE, Silva AEBC, Teixeira TCA, Opitz SP, Fakih FT. Identificação e análise dos erros de medicação em seis hospitais brasileiros. 2005.
8. Freire CC, Gimenes FRE, Cassiani SHB. Análise da prescrição médica informatizada, em duas clínicas de um hospital universitário. Medicina (Ribeirão Preto). 2004;37(1/2):91-6.
9. Gimenes FRE, Miasso AI, Lyra Júnior DP, Grou CR. Electronic prescription as contributory factor for hospitalized patients' safety. Pharm Pract. 2006;4(1):13-7.
10. Morimoto T, Gandhi TK, Seger AC, Hsieh TC, Bates DW. Adverse drug events and medication errors: detection and classification methods. Qual Saf Health Care. 2004;13(4):306-14.
11. Lisby M, Nielsen LP, Mainz J. Errors in the medication process: frequency, type, and potential clinical consequences. Int J Qual Health Care. 2005;17(1):15-22.
12. Crane VS. New perspectives on preventing medication errors and adverse drug events. Am J Health Syst Pharm. 2000;57(7):690-7.
13. Lyra Júnior DP, Prado MCTA, Abriata JP, Pelá IR. Recetas médicas como causantes de riesgo de problemas relacionados con medicamentos. Seguim Farmacoter. 2004;2(2):86-96.
14. Aguiar G, Silva Jr LA, Ferreira MAM. Ilegibilidade e ausência de informação nas prescrições médicas: fatores de risco relacionados a erros de medicação. RBPS. 2006;19(2):84-91.