RESEARCH

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Risk assessment of patient falls while taking medications ordered in a teaching hospital

Avaliação dos riscos de queda de pacientes em uso de medicamentos prescritos em hospital universitário

Evaluación de los riesgos de caída de pacientes en el uso de medicamentos prescritos en hospital universitario

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ABSTRACT

Objective: to stratify prescribed medication in a fall risk scale, identifying subgroups of drugs and inpatient units with higher risk of falls. **Method:** retrospective study on prescription order forms given by medical clinic, surgical clinic, and general intensive care unit. Risk factors under consideration: 1) orthostatic hypotension; 2) arterial hypotension; 3) arterial hypertension; 4) bradycardia; 5) psychomotor agitation; 6) mental confusion; 7) dizziness; 8) drowsiness/sedation; 9) reduced eyesight; 10) seizures; 11) atonia/dystonia/muscle weakness; 12) hypoglycemia; 13) urgent urination and 14) urgent defecation/diarrhea. Risk levels adopted: 0: 0 factor; I: 1-2 factors; II: 3-5 factors; III: 6-9 factors; IV: 10-14 factors. **Results:** 3893 drugs were analyzed and stratified in levels: 0 22.7%; I 33.5%; II 28%; III 15.1%; IV 0.7%. Levels III and IV more often refer to drugs for stomach acid disorders, 22.6%, and psycholeptics, 100%. **Conclusion:** knowing the risk factors associated with medication may help prevent and reduce falls, especially when therapeutic regimens cannot be modified.
Key words: Safety Management; Quality of Health Care; Accidental Falls.

RESUMO

Objetivo: estratificar medicamentos prescritos em escala de risco de queda, identificando subgrupos de medicamentos e unidades de internação com maior risco de queda. **Método:** estudo retrospectivo em prescrições de clínica médica, clínica cirúrgica, unidade de terapia intensiva geral. Fatores de risco considerados: 1) hipotensão ortostática; 2) hipotensão arterial; 3) hipertensão arterial; 4) bradicardia; 5) agitação psicomotora; 6) confusão mental; 7) tontura; 8) sonolência/sedação; 9) diminuição da visão; 10) convulsões; 11) atonia/distonia/fraqueza muscular; 12) hipoglicemia; 13) urgência micção e 14) urgência defecação/diarreia. Estabeleceu-se graus de risco: 0: 0 fator; I: 1-2 fatores; II: 3-5 fatores; III: 6-9 fatores e IV: 10-14 fatores. **Resultados:** foram analisados 3893 medicamentos, estratificados como graus: 0 22,7%; I 33,5%; II 28%; III 15,1%; IV 0,7%. Os graus III e IV referiram-se mais frequentemente a fármacos para distúrbios da acidez gástrica, 22,6%, e psicolépticos, 100%. **Conclusão:** conhecer fatores de risco associados aos medicamentos pode contribuir para prevenção e diminuição de quedas, sobretudo quando regimes terapêuticos não podem ser modificados.
Descritores: Gerenciamento de Segurança; Qualidade da Assistência à Saúde; Acidentes por Quedas.

RESUMEN

Objetivo: estratificar medicamentos prescriptos en escala de riesgo propuesta, identificando subgrupos de drogas y unidades de hospitalización con mayor riesgo de caídas. **Método:** estudio retrospectivo en prescripciones de clínica médica, clínica quirúrgica, unidad de cuidados intensivos. Factores de riesgo considerados: 1) hipotensión postural; 2) hipotensión arterial;

3) hipertensión arterial; 4) bradicardia; 5) agitación psicomotora; 6) confusión mental; 7) mareos; 8) somnolencia/sedación; 9) convulsiones; 10) disminución visión; 11) atonía/distonía/debilidad muscular; 12) hipoglucemia; 13) urgencia orinar; 14) urgencia defecar/diarrea. Grados de riesgo establecidos: 0: 0 factores; I: 1-2 factores; II: 3-5 factores; III: 6-9 factores, IV: 10-14 factores. **Resultados:** analizados 3893 medicamentos estratificados como grados: 0 22,7%; I 33,5%; II 28%; III 15,1%; IV 0,7%. Fueron más frecuentes para los grados III y IV: fármacos para trastornos de la acidez gástrica, 22,6%, y psicolépticos, 100%, respectivamente. **Conclusión:** conocer factores de riesgo asociados con la medicación puede contribuir para prevenir y reducir caídas, sobre todo cuando regímenes terapéuticos no pueden ser cambiados.
Palabras clave: Administración de la Seguridad; Calidad de la Atención de Salud; Accidentes por Caídas.

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INTRODUCTION

A fall is an unintentional displacement of the body to a level that is lower than the initial position without having the ability to timely correct it. It is determined by multifactor circumstances that compromise stability[1].

Patient falls are the most frequent adverse events in hospitals, with consequences such as the compromise of physical and mental well-being of patients and increased inpatient time and economic and social costs[2-3]. With this concern in mind, national[4-7] and international[2,8] accreditation and regulatory bodies recommend that health care services establish strategies and actions for fall prevention.

Most falls have multifactor etiology. These events may come as a result of several risk factors that must be known in order to reduce its probability of occurrence[9-11].

Risk factors for falls can be categorized as intrinsic, which are those directly associated with the individual, or extrinsic, which are those related to environmental factors. Intrinsic factors include age, sex, certain drug effects, and clinical conditions, such as heart disease, osteoarticular disorder, neurologic and mental state, gait disorders, sedentary lifestyle, and nutritional deficiency. Extrinsic factors include poor lighting, obstacles, irregular or slippery floor, protection bars without elevation, and the lack of banisters[3,9-15].

Most inpatient adult falls, 85-90%, are related to intrinsic factors[9]. This information is very important, because extrinsic factors may be changed, or even eliminated, but intrinsic factors many times cannot be modified.

Several studies indicate drugs as important intrinsic factors for the risk of falls[11-12,15-16]. The relevant ones are: antidiabetics[11]; drugs acting on the cardiovascular system, especially those for hypertension[3,11], diuretics[3,11,16-17] and beta blockers[11]; drugs acting on the central nervous system, in particular benzodiazepines[11-12,15-17]; antipsychotics[11,15-17], and antidepressants[12,16], especially selective serotonin reuptake inhibitors[11].

The purpose of this study was to verify the frequency of drugs ordered in medical clinic, surgical clinic, and general intensive care unit, stratified in a scale of risk for patient falls.

METHOD

A retrospective study was conducted on prescription order forms of inpatients of a teaching hospital at the countryside the state of Paraná, Brazil, which were sent to the Hospital Pharmacy Service between June 1st and 15th of 2013, totaling 309 prescription orders.

Data collection included a structured form, divided into two parts: 1) inpatient units and 2) risk levels for falls of patients under ordered drugs.

Inclusion Criteria

All standard drugs of the institution that were ordered for adult male and female inpatients who were at the medical clinic, surgical clinic and general intensive care unit (ICU) during the data collection period were analyzed.

Standard drugs in use were considered, as approved by the Institutional Therapeutics and Pharmacy Commission.

Exclusion Criteria

Medical prescription orders of inpatients of units that were not included in the study and non-standard ordered medications were excluded.

Drug Classification

Drug assessment was based on the Anatomical Therapeutic Chemical (ATC) Classification System of the WHO Collaborating Centre for Drug Statistics Methodology - World Health Organization - Drug Utilization Research Group (WHO-DURG). ATC divides and codes drugs into 14 main anatomical groups (1st level of classification), according to the body or system on which they act. The drugs in each anatomical group are arranged in therapeutic subgroups (2nd level) and sequentially in pharmacological (3rd level) and chemical (4th level) subgroups, and the 5th level is the drug itself. Based on the ATC, the drug N05BA01, for example, corresponds to: N nervous system, 05 psycholeptics, B anxiolytics, A benzodiazepine derivatives and 01 diazepam.

This investigation adopted the 2nd level of classification: therapeutic subgroups.

Risk Factors

The determination of risk factors for patient falls was done by reviewing the relevant literature.

The effects of drugs most often described in the studied literature were considered as risk factors for patient falls: 1) orthostatic hypotension[2,6,12,17-18]; 2) arterial hypotension[18]; 3) arterial hypertension[13,17]; 4) bradycardia[3,13]; 5) psychomotor agitation[2-3,12,14]; 6) mental confusion[2-3,12,14]; 7) dizziness[3,6,12,17];

8) drowsiness or sedation[2-3]; 9) reduced eyesight[3,10,12-13,18]; 10) convulsion[2-3,12,14]; 11) atonia, dystonia or muscle weakness[3,10,12,17]; 12) hypoglycemia[2,6]; 13) urgent urination[2,6,12,14] and 14) diarrhea or urgent defecation[2,14].

Verification of the effects of the drugs classified as risk factors for patient falls

The internet-based Micromedex® 2.0 Truven Health Analytics Inc database was used to verify the effects of drugs classified as risk factors for patient falls upon review. Only the effects in recommended dosage and described as the most common or that took place 5% of the time or more were considered. Effects described as rare, very rare, occasional, isolated or not proven were excluded.

Levels of risk for falls

Risk levels for patient falls were described as: Level 0: 0 factor; Level I: 1-2 factors; Level II: 3-5 factors; Level III: 6-9 factors, and Level IV: 10-14 factors.

Data Analysis

Data were typed, revised, processed and analyzed using the program Microsoft® Office Excel 2010, and submitted to descriptive analysis.

This study was approved by the Research Ethics Committee of the State University of Ponta Grossa, as per Opinion No. 347625/2013.

RESULTS

This study analyzed 309 prescription orders; of these, 138 (44.7%) came from the medical clinic, 77 (24.9%) came from the surgical clinic, and 94 (30.4%) came from the general intensive care unit of a teaching hospital.

During data collection, 3893 drugs were ordered, out of which 46.2% (1797/3893) in the medical clinic, 10.4% (406/3893) in the surgical clinic, and 43.4% (1690/3893) in the general intensive care unit.

Table 1shows that from the total of 3893 ordered drugs, 22.7% (883) were stratified as Level 0, 33.5% (1304) as Level I, 28.0% (1090) as Level II, 15.1% (588) as Level III, and only 0.7% (28) as Level IV.

When analyzing the ordered medication stratified as Level 0 for risk of falls (0 factor), 84.4% (745/883) belonged to the therapeutic subgroup B05 Blood substitutes and perfusion solutions. Of the 1304 ordered drugs stratified as Level I for risk of falls (1-2 factors), those that belonged to the corresponding therapeutic subgroups were: 22.7% (296) to B05 Blood substitutes and perfusion solutions, 20.4% (266) to B01 Antithrombotics, 16.7% (218) to N02 Analgesics, according to Table 2. Out of the 1090 ordered drugs stratified as Level II for risk of falls (3-5 factors), 18.6% (203) were part of the subgroup A10 Drugs used for diabetes, and 16.2% (177) belonged to C03 Diuretics. Regarding the ordered medication stratified as Level III for risk of falls (6-9 factors), the most often observed therapeutic subgroups were A02 Drugs for stomach acid disorders, with 22.6% (133/588), A03 Drugs for functional gastrointestinal disorders, with 22.4% (132/588), and N05 Psycholeptics, with 19.7% (116/588). As for the 28 ordered drugs stratified as having the highest risk of falls, Level IV (10-14 factors), 100% (28) belonged to the therapeutic subgroup N05 Psycholeptics (Table 2).

At the medical clinic, 34.6% (622/1797) of the drugs were stratified as Level I (1-2 factors) and 29% (521/1797) as Level II (3-5 factors).In the surgical clinic, 32.0% (130/406) of the ordered drugs were stratified as Level I (1-2 factors).With respect to the drugs ordered in the general intensive care unit, 32.6% (552/1690) were stratified as Level I (1-2 factors) and 29.5% (498/1690) as Level II (3-5 factors). (Table 3).

Table 1 - Number of risk levels and factors for patient falls and medication ordered. HURCG, Ponta Grossa, Paraná, 2013

Number of risk factors for patient falls	Levels of risk for patient falls	Ordered drugs	
		n	%
0	Level 0	883	22.7
1-2	Level I	1304	33.5
3-5	Level II	1090	28.0
6-9	Level III	588	15.1
10-14	Level IV	28	0.7
Total		3893	100

Table 2 - Therapeutic subgroups of ordered medications and levels of risk for patient falls, HURCG, Ponta Grossa, Paraná, 2013

Therapeutic Subgroups	Levels of risk									
	Level 0		Level I		Level II		Level III		Level IV	
	n	%	n	%	n	%	n	%	n	%
A02 Drugs for stomach acid disorders	0	0	90	6.9	13	1.2	133	22.6	0	0
A03 Drugs for functional gastrointestinal disorders	5	0.6	2	0.2	145	13.3	132	22.4	0	0
A10 Drugs used for diabetes	0	0	1	0.1	203	18.6	0	0	0	0
B01 Antithrombotics	2	0.2	266	20.4	0	0	0	0	0	0
B05 Blood substitutes and perfusion solutions	745	84.4	296	22.7	6	0.6	0	0	0	0
C03 Diuretics	0	0	0	0	177	16.2	0	0	0	0
N02 Analgesics	17	1.9	218	16.7	48	4.4	52	8.8	0	0
N05 Psycholeptics	0	0	0	0	50	4.6	116	19.7	28	100
Others	114	12.9	431	33.0	448	41.1	155	26.5	0	0
Total	883	100	1304	100	1090	100	588	100	28	100

Table 3 - Levels of risk for patient falls on medication ordered at inpatient units, HURCG, Ponta Grossa, Paraná, 2013

Levels of risk for falls	Inpatient Units					
	Medical Clinic		Surgical Clinic		General ICU	
	n	%	n	%	n	%
Level 0	397	22.1	99	24.4	387	22.9
Level I	622	34.6	130	32.0	552	32.6
Level II	521	29.0	71	17.5	498	29.5
Level III	232	12.9	106	26.1	250	14.8
Level IV	25	1.4	0	0	3	0.2
Total	1797	100	406	100	1690	100

DISCUSSION

The highest number of ordered drugs took place in the medical clinic (46.2%) and in the ICU (43.4%). The use of drugs is an intrinsic factor strongly related to patient falls[13,15], and the risk of falls increases with the number of ordered drugs. Ziere et al (2006)[17]analyzed falls in a population aged 55 years or older and found a higher percentage of falls, 60% versus 25% respectively, in individuals who received six or more drugs than those who received only one. In another study[11] 81 drugs with risk associated with patient falls were analyzed. During the period of study, 151 patients fell, and out of these, 144 (95.4%) were taking at least 1 drug classified by the authors as a high-risk medication.

The frequency of ordered medications stratified as Level II (3-5 factors) at the surgical clinic (17.5%) was lower when compared to the medical clinic (29.0%) and to the ICU (29.5%). However, the ordered drugs stratified as Level III (6-9 factors), therefore with higher risk, were more often ordered (26.1%) at the surgical clinic, in comparison with the ones ordered at the medical clinic (12.9%) and the UCI (14.8%).

Regarding the ordered medication stratified as Level III, we noted that the therapeutic groups most often observed were A02 Drugs for stomach acid disorders (22.6%) and A03 Drugs for functional gastrointestinal disorders (22.4%). However, they were not mentioned in the studied literature, although drugs in these subgroups, such as ranitidine and metoclopramide, show many of the risk factors included in this study.

Several studies have shown that drugs acting on the central nervous system have higher risk for patient fall, especially benzodiazepine and antipsychotics[10-12,15,17]. In this investigation, 19.7% of the psycholeptics showed6-9 risk factors for

falls (Level III). Psycholeptics alter cognitive function such as attention, memory and orientation, which are important for postural control and balance. In addition, they cause sedation, psychomotor changes, muscle relaxation and adrenergic blockade, which increase orthostatic hypotension[13], regarded by many authors as a great risk factor for falls[2,6,12,17-18].

In this study, only 0.7% of the ordered drugs were stratified as having a higher risk for falls, Level IV (10-14 factors); however, 100%belonged to the therapeutic subgroup N05 Psycholeptics. As for the inpatient units, only 1.4% and 0.2% of the total medication ordered at the medical clinic and the ICU, respectively, were stratified as Level IV. This is important information because inpatients under intensive care, despite having more severe clinical conditions, are assisted full time, and in most cases they are sedated, and so they have a lower risk of falling. Inpatients of medical clinic units may feel self-sufficient to perform basic activities, such as walking around and going to the toilet, and therefore they are more exposed to extrinsic risk factors.

It was also noted that 18.6% of the ordered medications stratified as Level III belonged to the subgroup A10 Drugs used for diabetes. The main effect of this therapeutic subgroup that may cause falls is hypoglycemia. In the work of Johnston et al.[19], patients with episodes of hypoglycemia had 70% higher probability of having fall-related fractures than patients without hypoglycemia.

Some authors point toC03 Diuretics as high-risk drugs for falls[3,11,17]. In this research, diuretics were stratified as Level II (3-4 factors) and accounted for 16.2% of the ordered medications in this category. Diuresis is associated with arterial hypotension, atonia, dystonia or muscle weakness, urgent urination and, like many N05 Psycholeptics, with orthostatic hypotension.

It is important to stress that falls are a multifactor care risk that may occur due to previous patient conditions, that is, conditions that were present at the time of admission to the hospital, as well as when care was provided during the stay. During the development of this study, the authors did not consider causal or interfering factors such as age, clinical condition, pathologies, and especially medication currently in use or previously used by the patient. The focus of this study was to contribute to the knowledge about the medication used in the hospital so that specific safety prevention measures could be implemented in order to preserve the health of patients and quality of care.

CONCLUSION

Although this research had a descriptive nature whose purpose was not to infer cause and effect among the several risk factors for falls, it was possible to find results that were similar to the ones found in the scientific literature on the subject.

The knowledge of risk factors associated with medications can contribute to the prevention and reduction of falls, especially when therapeutic regimes cannot be changed.

It is important to constantly train all healthcare professionals on the intrinsic and extrinsic risk factors to implement prevention strategies including not only actions toward medications but also the rehabilitation of the functional capacity, education for self-care and increased surveillance of nurses in times and places with the highest number of falls, thus decreasing these adverse events and walking the path toward excellence in care.

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