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Article

Potential prescribing omissions according to *START* criteria at the time of hospital discharge

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The purpose of this study is to describe the frequency of potential drug prescribing omissions (PPOs) for elderly patients at the time of hospital discharge and to compare the frequency PPOs among different medical specialities. This cross-sectional study examined data from elderly patients when they were admitted for >24 h to a northeastern Brazil teaching hospital during June–December 2016. Were included in the study 227 patients, of whom 36.9% had at least one PPO. The highest number of PPOs was identified among those with at least 5 prescribed drugs. In total, 153 PPOs were identified at hospital discharge. In most cases (78.4%), patients were not evaluated by the specialist physician.The most commonly identified PPOs on discharge were: the omission of statin therapy in cases of diabetes mellitus plus one or more cardiovascular-associated factor; calcium and vitamin D supplements in patients with known osteoporosis; and angiotensin converting enzyme inhibitors in cases of chronic heart failure. The results of this study suggest that the frequency of prescribing omissions PPOs during patient discharge was high. This can be avoided by the careful evaluation by prescribers with experience in certain specialties where several prescribed omissions would be common.

Key words: Health Services for the Aged. Aged. Patient Discharge. Geriatrics. Patient Safety.

INTRODUCTION

Prescription errors can occur unintentionally when writing a prescription or during the therapeutic decision-making process when practitioners deviate from reference standards, such as current scientific knowledge, commonly recognised practices, and technical specifications of medicines and health legislation (Barker *et al.*, 2002). A prescription error may also be related to drug selection (considering indications, contraindications, allergies, patient characteristics, drug interactions, and other factors), as well as the lack of prescription of drugs needed to treat an already diagnosed disease or to prevent interaction with other medications (Ali *et al.*, 2017; Barker *et al.*, 2002).

Although drug use by elderly individuals is frequently studied, most studies discuss the prescription of drugs that are potentially inappropriate for the elderly, while few authors address problems related to drug prescription omissions (Dalleur *et al.*, 2012).

Potential prescribing omissions are defined as "not prescribing a beneficial medicine for which there is a clear clinical indication" (O'Connor MN, Gallagher P, O'Mahony D, 2012). This is an important issue and it may be related to the increasing number of hospital admissions and falls, exacerbation of chronic conditions, and development of secondary diseases (Dalleur *et al.*, 2012; Frankenthal *et. al.*, 2015). To determine drug prescribing omissions among the elderly, an instrument called "Screening Tool to Alert Doctors to the Right Treatment" (START criteria) was developed along with the "Screening Tool of Older Persons' Prescriptions" (STOPP criteria) and were validated in 2006 (Barry *et al.*, 2007). This instrument is a systematic method of identifying prescribing omissions based on physiological systems, and is considered valid, efficient and easy to use. In Brazil,

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the START criteria were validated for the Brazilian population reality in 2014 through the Delphi technique (Luz, Oliveira, Noblat, 2016).

The objective of this study is to describe the frequency of potential drug prescribing omissions for elderly patients at the time of hospital discharge and to compare the frequency of PPOs among different medical specialties.

METHODS

This study was conducted in the medical wards of a teaching hospital in the Northeast Region of Brazil. The institution has 289 beds, 130 doctors' offices, and medical residency programs in various specialties.

The data were prospectively collected during June–December 2016, using patients' electronic medical records. A standardized form from KoBoToolbox®,was used to register information regarding clinical history, current pathologies, reasons for hospitalization, medical treatment provided (medical specialty that provided care), who accompanied the patient during hospitalisation, drugs prescribed at the time of discharge, and the diagnosis at discharge.

Comorbidities were quantified using the Charlson comorbidity index (CCI) (Charlson *et al*., 1987). Potential prescribing omission was assessed according to the START criteria validated for the Brazilian population. According to these criteria, a potential prescribing omission is defined as the failure to use a drug that is considered necessary.

Patients were considered eligible if they were ≥60 years old and had been hospitalized for >24 h. Patients were excluded if they were transferred to other hospitals, discharged within 24 h, or died in the hospital. In cases of multiple admissions, only data from the first hospitalization were used.

For the purposes of this study, the following definitions were adopted:

1. Potential Prescribed Omission (PPOs), according to the *START* criteria validated for the Brazilian population, was defined as failure to use a drug deemed necessary (Barry *et al*., 2007).
2. Elderly: according to the Brazilian definition, "elderly" patients were defined as individuals aged ≥ 60 years (Ministry of Health, Brazil, 2013).
3. CCI: high number of comorbidities score ≥ 3 (Charlson *et al*., 1987).
4. Polypharmacy: defined as the daily use of five or more medications (Dalleur *et al*., 2012).

The data were analyzed using IBM SPSS software (version 23.0; IBM Corp., Armonk, NY). Descriptive analyses were performed using relative frequencies and average values to compare potential prescribing omissions at admission and discharge. The proportion of potential omissions was calculated as the number of patients who had at least one potential prescribing omission.

Ethics committee approval

This study was approved by a local ethics committee.

RESULTS AND DISCUSSION

During the study period, 344 elderly patients were admitted to the hospital and 227 patients met the inclusion criteria, of whom 131 were women (57.7%). The mean age was 71 ± 8.2 years and 176 patients (77.5%) had a CCI≥3. At the time of hospital discharge, 115 patients (50.7%) were using polypharmacy. (Table I).

Of the 227 patients included in the study, 90 (36.9%) had at least one potential drug prescribing omission. In addition, the highest number of PPOs was identified among those with at least 5 prescribed drugs (Table I). Some authors state that prescribing omissions may be related to the prescriber's strategy of reducing the number of drugs used by the elderly in order to prevent polypharmacy (Dalleur *et al*., 2012; Baker *et al*., 2002). However, in cases of elderly patients with several comorbidities, it may be impossible to find an ideal prescription that will meet all the patient's needs while limiting the number of drugs to five. (Mortazavi *et al*., 2016). This concern with polypharmacy may be related to previous discussions about the problems and sources of adverse reactions in elderly patients (Mortazavi *et al*., 2016). Although elderly patients are more susceptible to develop adverse reactions, and the number of prescribed drugs may increase the occurrence of these side effects, we know that, in order to meet all the needs of patients with multiple comorbidities, it may be necessary not to limit our concerns to the number of prescribed medication (Mortazavi *et al*., 2016). Thus, instead of limiting prescriptions to 5 medications, polypharmacy should be redefined as the use of one or more drugs without indication to the patients (Mortazavi *et al*., 2016; Mori *et al*, 2017).

In total, 153 PPOs were identified according to the *START* criteria at hospital discharge (Table I). Prescribing omission may be associated with negative outcomes, such as hospital readmissions, increased length of stay, reduced quality of life, and increased health-related costs (Dalleur *et al.*, 2012). These issues may be explained as an attempt to avoid polypharmacy, treatment complexity, and cost of palliative or prophylactic medication (Frakenthal *et al.*, 2015).

In most cases (78.4%), patients were not evaluated by the specialist physician (Table II). The most commonly identified PPOs on discharge were: the omission of statin therapy in cases of diabetes mellitus plus one or more cardiovascular-associated factor; calcium and vitamin D supplements in patients with known osteoporosis; and angiotensin converting enzyme inhibitors in cases of chronic heart failure (Table III).

TABLE I – Clinical characteristics of the study population

	n (%)
Age in years (Mean ± standard deviation)	71± 8.2
Age by age-group:	
60-65	75 (33.0)
66-70	51 (22.5)
>70	101 (44.5)
Charlson Comorbidity Index ≥ 3 (High)	176 (77.5)
Patients with polypharmacy discharged from hospital	115 (50.7)
Patients with PPOs discharged from hospital	90 (39.6)
Amount of PPOs per patient:	
1	50 (56.0)
2	25 (28.0)
3	9 (10.0)
4	4 (4.0)
5	2 (2.0)

PPOs: Potential Prescribed Omission

(continuing)

TABLE II – Potential Prescribed Omission according to the START criteria, validated for the Brazilian reality related to the specialty of the prescriber

Physiologic System	Potential Prescribed Omission	Medical Assistant Specialist	
		Yes	**No**
Cardiology	57	29 (50.9%)	28 (49.1%)
Endocrinology	71	4 (5.6%)	67 (94.4%)
Pneumology	11	-	11 (100.0%)

(continuing)

TABLE II – Potential Prescribed Omission according to the START criteria, validated for the Brazilian reality related to the specialty of the prescriber

Physiologic System	Potential Prescribed Omission	Medical Assistant Specialist	
		Yes	**No**
Neurology	1	-	1 (100.0%)
Rheumatology	10	-	10 (100.0%)
Gastroenterology	3	-	3 (100.0%)
Total	153	33 (21.6)	120 (78.4%)

TABLE III – Main drugs or therapeutic classes that presented possible prescribing omissions at hospital discharge, according to the START criteria, validated for the Brazilian reality

Physiological system	**Drug or therapeutic class**	**Clinical status**	**Number of patients with indication**	**Number of possible omissions**	**Frequency**
Cardiovascular system	Warfarin	chronic atrial fibrillation	30	3	10.0%
Cardiovascular system	Aspirin	chronic atrial fibrillation, when warfarin but not aspirin was contraindicated	4	3	75.0%
Cardiovascular system	Aspirin or clopidogrel	history of coronary artery disease, cerebral, or peripheral vascular disease plus a sinus rhythm	31	8	25.8%
Cardiovascular system	Antihypertensive therapy	in cases with a systolic blood pressure that consistently greather than 160 mmHg	149	6	4.0%
Cardiovascular system	Statin theraphy	cases of peripheral or cerebral vascular disease when the patient's "functional status" remains independent for daily activities and life expectancy is >5 years	29	7	24.1%

(continuing)

TABLE III – Main drugs or therapeutic classes that presented possible prescribing omissions at hospital discharge, according to the START criteria, validated for the Brazilian reality

Physiological system	Drug or therapeutic class	Clinical status	Number of patients with indication	Number of possible omissions	Frequency
Cardiovascular system	Angiotensin-converting enzyme inhibitors	in cases of chronic heart failure	57	28	49.1%
Cardiovascular system	Angiotensin-converting enzyme inhibitors	After acute myocardial infarction.	7	1	14.3%
Cardiovascular system	Beta-blockers therapy	in cases of stable chronic angina	2	1	50.0%
Endocrine system	Metformin	in cases of type 2 diabetes or metabolic syndrome in the absence of renal dysfunction	44	16	36.4%
Endocrine system	Statin therapy	in cases of diabetes mellitus plus one or more cardiovascular associated factor	52	25	48.1%
Endocrine system	Antiplatelet therapy	in cases of diabetes mellitus plus one or more cardiovascular associated factor (e.g., hypertension, hypercholesterolemia, history of smoking)	49	30	61.2%
Respiratory system	beta-2 agonists or anticholinergic agents	Regular inhalation in cases of mild to moderate asthma or chronic obstructive pulmonary disease	19	7	36.8%
Respiratory system	Corticosteroids therapy	Regular inhalation in cases of moderate-to-severe asthma or chronic obstructive pulmonary disease when the forced expiratory volume in one second is <50%.	12	2	16.7%
Central nervous system	Antidepressant drugs	in cases with moderate-to-severe depressive symptoms during the last 3 months	12	1	8.3%

(continuing)

TABLE III – Main drugs or therapeutic classes that presented possible prescribing omissions at hospital discharge, according to the START criteria, validated for the Brazilian reality

Physiological system	Drug or therapeutic class	Clinical status	Number of patients with indication	Number of possible omissions	Frequency
Musculoskeletal System	Calcium and vitamin D	in diagnosed cases of osteoporosis (radiological evidence or fracture due to previous fragility or acquired dorsal kyphosis)	19	10	52.6%
Gastrointestinal system	Proton pump inhibitors	in cases of severe gastroesophageal reflux disease or peptic stenosis requiring dilatation	11	2	18.2%
Gastrointestinal system	Fiber supplementation	in cases of chronic symptomatic diverticular disease presenting with constipation	4	1	25.0%

Our literature review showed that most of the studies evaluated only the frequency of possible prescribing omissions at hospital admission. However, other studies indicate that these same PPOs occur at hospital discharge (Frankenthal *et al.*, 2015; Dalleur *et al.*, 2012).

Adequate prescribing for elderly patients is complex and requires extensive experience with geriatric pharmacotherapy among prescribers of all specialties as well as a holistic view (Dalleur *et al.*, 2012; Mori *et al*, 2017). This is because elderly patients are a heterogeneous group who often have many chronic diseases and are more likely to develop adverse reactions than younger patients, as well as other complications related to drug use, due to changes in pharmacodynamics and pharmacokinetics (Barry *et al.*, 2007; Mori *et al*, 2017).

Consequently, the use of the *START* criteria may help the prescriber, during drug prescription, to avoid omissions and contribute to improved quality of care for this population. However, we emphasise that the final decision to initiate any therapy depends entirely on the prescriber.

Another relevant finding in the present study was the high number of comorbidities (CCI $\geq$ 3) and polypharmacy (Table I) in most patients. These findings, as well as age, sex, diagnosis of diabetes mellitus, and length of hospitalisation, have been cited by other authors as risk factors for the prescription of inappropriate medications or potential prescribing omissions (Dalleur *et al.*, 2012; Mori *et al*, 2017). Some authors justify PPOs by suggesting that the life expectancy of these patients was insufficient for the possible treatment benefit, and that they were trying to avoid polypharmacy and adverse effects caused by the usage of multiple drugs (Mori *et al*, 2017). Nevertheless, it is important to note that the optimisation of a prescription does not necessarily lead to a reduction in the number of drugs prescribed, and polypharmacy is often unavoidable and justified in the elderly population (Barry *et al.*, 2007).

The results of this study suggest that the frequency of prescribing omissions PPOs during patient discharge was high and that hospitalization did not improve the quality of the prescription. For elderly patients, this can be avoided by the careful evaluation by prescribers with experience in certain specialties where several prescribed omissions would be common.

Our study has some limitations. It is a cross-sectional, observational and monocentric study. By the

use of START, we may not have considered the specific clinical situations of each patient, where the prescriber has used his or her clinical judgment not to prescribe certain drugs. In addition, a possible absence of records justifying omissions may have occurred.

The present study demonstrates the importance of the application of explicit criteria such as the START to improve health care of elderly patients. Most elderly patients have several comorbidities and use a large number of medications, which can increase the chance of a potential omission of prescription.

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