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Effects of hyperpolypharmacy and potentially inappropriate medications (PIMs) on functional decline in older patients discharged from acute care hospitals

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ABSTRACT

Aim: To comparatively investigate the effects of hyperpolypharmacy and potentially inappropriate medications (PIMs) on functional decline in older patients after hospital discharge.

Methods: Our series consisted of 733 patients aged ≥65 consecutively enrolled in a multicenter observational longitudinal study. PIMs were defined on the basis of updated versions of Beers and STOPP criteria. The occurrence of functional decline was defined as the loss of independency in at least 1 basic activity of daily living (BADL) from discharge through 3-month follow-up visit.

Results: After adjusting for several potential confounders, hyperpolypharmacy (OR = 2.20; 95%CI = 1.11–4.37) and Beers violations (OR = 1.99; 95%CI = 1.17–3.49) were significantly associated with functional decline, while STOPP (OR = 1.10; 95%CI = 0.64–1.88) and combined Beers + STOPP violations (OR = 1.72; 95%CI = 0.97–3.05) were not. In logistic regression models simultaneously including both hyperpolypharmacy and PIMs, hyperpolypharmacy was always associated with functional decline (OR = 1.98; 95%CI = 1.0–3.97 in the model including Beers violations; OR = 2.19; 95%CI = 1.11–4.35 in the model including STOPP violations; OR = 2.04; 95%CI = 1.02–4.06 in the model including combined Beers and STOPP violations). Beers violations (OR = 1.89; 95%CI = 1.09–3.28) also remained significantly associated with the outcome in this latter analysis, but not STOPP or combined Beers and STOPP violations.

Conclusions: Hyperpolypharmacy, and to a lesser extent Beers violations predict functional decline in older patients discharged from acute care hospitals, whilst STOPP criteria are no longer associated with the outcome after adjusting for potential confounders. Hyperpolypharmacy is associated with functional decline independent of PIMs.

1. Introduction

Hyperpolypharmacy is highly prevalent in older patients secondary to the increasing number of comorbid diseases. Indeed, it has been estimated that people aged 65 or more will spend 8 of their remaining life expectancy years with hyperpolypharmacy (Wastesson, Canudas-Romo, Lindahl-Jacobsen, & Johnell, 2016). Although medications are an important factor in improving and maintaining health status and quality of life in older patients, both the use of multiple drugs and suboptimal prescribing may negatively increase the risk of negative outcomes, including morbidity and mortality, adverse drug reactions (ADR) and longer hospital stay (Cherubini, Corsonello, & Lattanzio, 2016; Corsonello et al., 2009). Additionally, hyperpolypharmacy increases the likelihood of receiving potentially inappropriate medications (PIMs) (Lattanzio et al., 2012). However, the impact of hyperpolypharmacy and PIMs on outcomes relevant to older patients has

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not been comparatively assessed in former studies.

Hyperpolypharmacy was found associated with instrumental activities of daily living decline (Magaziner, Cadigan, Fedder, & Hebel, 1989), and short physical performance battery (SPPB) score decline (Pugh et al., 2007) in community dwelling older people. On the other hand, PIMs were found not associated with functional decline in either community dwelling older individuals (Hanlon, Fillenbaum et al., 2002) or hospitalized patients (Corsonello et al., 2009). Nevertheless, only one study provided a comparative analysis of the association of hyperpolypharmacy and PIMs with changes in functional status, showing that hyperpolypharmacy, but not PIMs was found associated with functional decline in community-dwelling older adults with dementia (Lau, Mercaldo, Shega, Rademaker, & Weintraub, 2011). Finally, none of the above studies was carried out using the recent updates of PIMs criteria.

Therefore, the aim of the present study was to comparatively investigate the effects of hyperpolypharmacy and PIMs, defined on the basis of updated Beers (By the American Geriatrics Society Beers Criteria Update Expert Panel, 2015) and STOPP criteria (O'Mahony et al., 2015), on functional decline in older patients discharged from acute care hospitals in a large multicenter observational study.

2. Methods

2.1. Sample and study setting

This study uses data from the CRiteria to Assess Appropriate Medication Use among Elderly Complex Patients (CRIME) project, a multicenter prospective observational study aimed at collecting data about the patterns and quality of prescriptions among older patients admitted to seven geriatric and internal medicine acute care wards throughout Italy. The methods of the CRIME study have been extensively described elsewhere (Tosato et al., 2013). Briefly, all patients consecutively admitted to participating wards between June 2010 and May 2011, were asked to participate in the study. Exclusion criteria included age < 65 years and unwillingness to participate in the study. After obtaining a written informed consent, all participants were assessed within the first 24 h from hospital admission and followed until discharge. Information was collected on demographic, socioeconomic, and clinical characteristics, with detailed data collection on pharmacological therapy and comprehensive geriatric assessment. After discharge, patients were reassessed at 3, 6, and 12 months. All Ethics Committees at participating institutions approved the study

Overall, 1123 patients were enrolled in the study. Patients with incomplete baseline data (N = 3), those who died during hospital stay (N = 39), as well as those with complete dependency at discharge (N = 165) and those with incomplete follow-up data (N = 269) were excluded, leaving a sample of 733 patients to be included in the analysis.

2.2. Outcome

The outcome of the present study was the decline in functional status from discharge to three month follow-up. Such an outcome was formerly reported as an important outcome in several different populations of older patients discharged from hospital (Hoogerduijn et al., 2012; Sager et al., 1996). Functional decline was defined as the loss of independency in at least 1 basic activity of daily living (BADL) (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963).

2.3. Study variables

The main study variables were hyperpolypharmacy and use of PIMs. The number of medications prescribed at discharge was calculated, and hyperpolypharmacy was defined as the use of more than 10 medications (Sganga et al., 2014). To identify PIMs two sets of criteria were adopted: (i) Beers criteria 2015 version (By the American Geriatrics Society Beers Criteria Update Expert Panel, 2015) and (ii) STOPP criteria 2014 version (O'Mahony et al., 2015). Two separate analytical variables were prepared to identify patients receiving at least 1 Beers or STOPP medication. The analytical variable for Beers PIMs was calculated considering both diagnosis/syndrome-dependent and diagnosis/syndrome-independent criteria violations. STOPP criteria evaluating appropriateness based on time of exposure to specific drugs (e.g. PPI for uncomplicated peptic ulcer disease or erosive peptic oesophagitis at full therapeutic dosage for > 8 weeks) were not analysed in the present study because duration of exposure after discharge was not assessed. Similarly, STOPP criteria for which complete data were not available (e.g. oral oestrogens without progestogen in patients with intact uterus) were also excluded from the analysis. Therefore, 72 out of 80 STOPP criteria were analyzed.

Potential confounders included in the analysis were age, gender, and number of lost BADL at discharge. Selected diagnoses known to affect functional status, including heart failure, coronary artery disease, stroke, infectious diseases, chronic obstructive pulmonary disease, diabetes and cancer were also considered in the analysis. The number of diagnoses was calculated and included in the analysis as an index of cumulative comorbidity. Living alone, admission from emergency room, and destination at discharge were also considered as potential confounders. Comprehensive geriatric assessment variables were collected at the time of discharge planning (i.e. when patients reached clinical stability), usually the day before discharge. Cognitive impairment was defined as age- and education-adjusted Mini Mental State Examination (MMSE) score < 24 (Folstein, Folstein, & McHugh, 1975). Depression was ascertained on the basis of Geriatric Depression Scale (GDS) score > 5 (Lesher & Berryhill, 1994), and was also included in the analysis.

2.4. Analytic approach

First, we analyzed the characteristics of patients grouped according to functional decline status at three month follow-up. In order to investigate the impact of hospitalization on the use of PIMs or hyperpolypharmacy, we compared their frequency at the time of admission versus discharge. The frequency of most frequently prescribed PIMs, as well as their prevalence in declining versus non-declining patients was also investigated. Chi-square test was used for categorical variables, and ANOVA one-way for continuous ones.

In order to obtain a deconfounded estimate of the association between study variables and functional decline, hyperpolypharmacy, Beers violations, STOPP violations, and combined Beers/STOPP violations were separately included in logistic regression models. Analyses were initially adjusted for age and gender, and then fully adjusted including age, gender, living alone, admission from emergency room, destination at discharge, cognitive impairment, depression, number of lost BADL at discharge and number of diagnoses. Diagnoses significantly distinguishing groups in univariable analysis were also included in the fully adjusted model.

The analysis was also repeated by simultaneously including hyperpolypharmacy and use of PIMs in order to investigate the independent contribution of each other in the observed associations. This latter analysis included three different logistic regression models: Model 1, including hyperpolypharmacy and Beers violations; Model 2, including hyperpolypharmacy and STOPP violations; Model 3, including hyperpolypharmacy and combined Beers + STOPP violations. Each model was fully adjusted as above described.

Statistical analysis was carried out using SPSS for Win V21.0 (SPSS Inc, Chicago, IL, USA).

3. Results

General characteristic of patients included in the study are reported