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Medication errors in Parkinson's disease inpatients in the Basque Country

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ABSTRACT

Introduction: Parkinson's disease (PD) medication errors, including both missing dopaminergic drug doses and antidopaminergic usage, have been suggested as risk factors for prolonged hospital stays. The objective of this study was to evaluate the prevalence of such errors in PD patients admitted to public acute-care hospitals in the Basque Country over a two year period and their association with clinically relevant adverse health outcomes, such as length of hospital stay and mortality.
Methods: All PD patients admitted to any of the 11 public acute-care hospitals in the Basque Country in 2011–2012 were included. Medication errors involved incorrect timing or the complete omission of administration for dopaminergic drugs, and the administration of centrally acting antidopaminergics. A logistic regression and a competing risk analysis were applied to verify whether those errors affected intrahospital mortality and length of stay.
Results: The study included 1628 patients admitted 2546 times. Medication errors, affecting almost one third of admissions and half of patients, were associated with higher mortality: inappropriately omitted dopaminergic drug doses OR = 1.92 CI 95% (1.34–2.76); inappropriate antiemetic administration OR = 2.15 CI 95% (1.36–3.39); and inappropriate antipsychotic administration OR = 1.91 CI 95% (1.33–1.73). Inappropriately omitted doses and both inappropriate antipsychotic and antiemetic administration were associated with a significant 4-day increase in median hospital stay.
Conclusion: Medication errors (missing dopaminergic drug doses and centrally acting antidopaminergic use) are not only associated with increased length of hospital stays in PD patients, but also with a higher mortality rate.

1. Introduction

Parkinson's disease (PD) patients are hospitalized more frequently, have longer admissions, and suffer more complications during hospitalization than age-matched control groups [1–3]. The reason for hospitalization is frequently unrelated to PD, and clinicians treating Parkinson's disease often rate the care received by hospitalized PD patients be of poor quality [4,5].

PD medication errors, including both the incorrect timing of levodopa administration and prescription of contraindicated drugs (mainly haloperidol and metoclopramide), are the most important risk factors for motor function deterioration during hospital admissions [6]. Maintaining a patient's strict, complex levodopa schedule may be difficult in hospital, especially when a patient with must remain *Nil per os* (NPO) for several hours perioperatively [7].

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A recent study showed that both missing levodopa doses and antidopaminergic usage result in longer hospital stays for PD patients [8]. In a previous study carried out by our group in a regional hospital serving a population of 63,940 people, we also found that inpatient pharmacotherapeutic management was far from ideal, with a high prevalence of contraindicated antidopaminergic use [9]. Furthermore, PD medication errors have even been described in "centers of excellence" (widely renowned for outstanding performance in Parkinson's research by the National Parkinson Foundation). Indeed, 94% of these centers were not confident that patients received anti-parkinson medication in a timely manner when hospitalized, 71% were not confident that hospital staff knew that anti-emetics such as metoclopramide could worsen PD motor symptoms, and 80% were not confident that physicians knew that clozapine and quetiapine were the least likely antipsychotics to worsen PD symptoms [4].

The objective of this study was to evaluate the prevalence of medication errors, considering both the use of centrally acting inappropriate antidopaminergic drugs and non-compliance with levodopa administration schedules, in all PD patients admitted to all public acute-care hospitals in the Basque Country from January 2011 to December 2012. Moreover, the relationship between medication errors and clinically relevant adverse health outcomes, such as length of hospital stay and mortality rate, was also investigated.

2. Methods

2.1. Data source and study population

To conduct this study, we linked information from different administrative healthcare databases (e-Osabide, PRESBIDE) using unique encrypted identifiers containing information about the Basque Country, an autonomous region in northern Spain with a population of 2,173,210 [10]. A unique patient identifier (known as a CIC number) is used across the entire region allowing data from different databases to be linked.

First, we obtained data on all hospitalizations from the 11 public acute-care hospitals in the Basque Country occurring over two complete years: January 2011−December 2012. Data was obtained on primary diagnosis (leading to hospitalization), as well as all secondary diagnoses as per the Modified 9th International Classification of Diseases codes (ICD-9-CM).

To identify our cohort of patients with PD admitted to acute-care hospitals, we applied the following inclusion/exclusion criteria:

We chose those admissions from acute-care hospitals where the 332.0 code was codified as the primary or secondary diagnosis during the study period. Subsequently, in order to increase sensitivity, all admissions of the same patients occurring after the first codification for PD were included (even if the 332.0 ICD-9-CM code was not used at discharge).

Patients having a code for secondary parkinsonism (332.1) at any visit were excluded, since administrative data has already shown that it is difficult to distinguish between these entities [11]. Additionally, individuals were excluded from the cohort if they had an ICD-9-CM code for primary psychiatric disorders (bipolar disorder, schizophrenia, psychotic depression) or psychosis that could require treatment with antipsychotics; the codes excluded due to their link to psychosis were: 293.81, 293.82, 297.0, 297.1, 297.2, 297.3, 297.8, 297.9, 298.0, 298.1, 298.2, 298.3, 298.4, 298.8, 298.9, 368.16, and 780.1. Patients who had an ICD-9-CM code for pituitary disorders (253*) were also excluded, because these are frequently treated with dopaminergic drugs.

Secondly, patients were required to have prescriptions for antiparkinson drugs (defined as any drug from the N04B group in the Anatomical Therapeutic Chemical (ATC) classification system) during their hospital admission. Dopaminergic medications have very limited, comparatively rare, uses other than for PD. We did not consider anticholinergics (N04A) because these are seldom used as *anti*-PD drugs [12], and are frequently prescribed to treat extrapyramidal symptoms in patients taking antipsychotics.

Next, we obtained drug prescription and administration data from computerized hospital order entry systems. Since 2011, all public hospitals (acute-care, psychiatric and long-term care) in the Basque Country have shared a single IT platform (*e-Osabide*) for inpatient pharmacotherapeutic management. In order to measure the omission of prescribed antiparkinsonian drugs, we decided to add those patients who, despite not being on a dopaminergic drug (N04B drug) while in hospital, had an active outpatient prescription for such medication. For this purpose, we collected data on all outpatient prescription medications funded by the autonomous drug benefit plan (PRESBIDE database). Only active treatments were taken into account, that is, those where the drug may be administered to the patient.

As far as the *e-Osabide* electronic administration record is concerned, there are four entry possibilities: 1) timely drug administration; 2) the dose was not administered (the reason for omission is also recorded); 3) no electronic registry of administration; and 4) the dose was administered at a different time than that prescribed.

2.2. Clinical and demographic data

Data on hospital, ward, type of admission (urgent or not), age, gender, principal diagnosis (reason for admission), admission outcome, and antiparkinson treatment were recorded. Opioid (N02A) and antidementia (N06D) drug prescription on the day of admission was also noted. The Charlson comorbidity index was calculated for each admission according to the algorithm published by Quan 2005 et al., using comorbidity ICD-9-CM codes at discharge [13]. The availability (or lack) of a neurology ward at each hospital was also recorded.

2.3. PD medication error definition

2.3.1. Centrally-acting, inappropriate antidopaminergic drugs

Any antipsychotic drug from the N05A ATC group, with the exception of clozapine or quetiapine, was considered inappropriate. Lithium, although classified as an antipsychotic by the WHO, was also excluded.

Any antiemetic drug from the A03F ATC group, with the exception of domperidone, was considered inappropriate.

2.3.2. Non-compliance with dopaminergic replacement administration schedules

Two different error types were recorded: complete omission of treatment, and omitted doses. The first group included patients with an active chronic outpatient prescription of a N04B drug who did not receive any dopaminergic replacement therapy during their hospital stay. The second group included patients with doses that were omitted because of the unavailability of the drug in time, the patient was out of the ward, or because of their NPO status and there was no alternative drug administered.

2.4. Ethical approval

The Clinical Research Ethics Committee of the Basque Country approved this study (PI201352).

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