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Original article

Avoidable hospitalizations due to adverse drug reactions in an acute geriatric unit. Analysis of 3,292 patients☆

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ABSTRACT

Objective: To determine prevalence of admissions due to an adverse drug reaction (ADR) and determine whether or not admission was avoidable, and what drugs and risk factors were implicated.
Design: Cross-sectional observational study.
Study sample: All patients hospitalized in an acute geriatric unit during the period January 2001 to December 2010 were studied.
Measurement: To determine whether admissions were due to ADR, we used the World Health Organization-Uppsala Monitoring Centre criteria and the Naranjo scale. Beers criteria were used to detect potentially inappropriate medication.
Results: A total of 3292 patients (mean age 84.7 years, 60.1% women) were studied. Of these, 197 (6%) were admissions for ADR and nearly three quarters (76.4%, 152 cases) were considered avoidable admissions. The five most frequent drugs associated with admissions for ADR were digoxin, nonsteroidal anti-inflammatory drugs, benzodiazepines, diuretics and antibiotics. Independent risk factors for admissions for ADR were being female (OR 1.84; 95% CI: 1.30–2.61), inappropriate medication according to Beers criteria (OR 4.20; 95% CI: 2.90–6.03), polypharmacy (>5 drugs) (OR 1.50; 95% CI: 1.04–2.13), glomerular filtration rate < 30 mL/min (OR 3; 95% CI: 2.12–4.23) and sedative use (OR 1.40; 95% CI: 1–1.91).
Conclusion: ADR were responsible for 6% of admissions to an acute geriatric unit, and over 75% of these admissions were considered avoidable. Associated risk factors were being female, inappropriate medication, polypharmacy, renal insufficiency and sedative use.

Hospitalizaciones evitables por reacciones adversas a medicamentos en una unidad geriátrica de agudos. Análisis de 3.292 pacientes

Palabras clave:
Hospitalización
Ancianos
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Reacciones adversas a medicamentos

RESUMEN

Objetivo: Determinar la prevalencia de ingresos por reacciones adversas a medicamentos (RAM) y si el ingreso era evitable o no, y qué fármacos y factores de riesgo estaban implicados.
Diseño: Estudio observacional transversal.
Muestra de estudio: Todos los pacientes hospitalizados en una unidad geriátrica de agudos durante el período de enero de 2001 a diciembre de 2010 fueron estudiados.

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Mediciones: Para determinar si los ingresos se debieron a RAM se utilizaron los criterios de la World Health Organization-Uppsala Monitoring Centre y la escala de Naranjo. Para detectar los medicamentos potencialmente inadecuados se utilizaron los criterios de Beers.
Resultados: Se estudió un total de 3.292 pacientes (edad media 84,7 años, 60,1% mujeres). De estos, 197 (6%) fueron ingresos por RAM, de los cuales 152 (76,4%) se consideraron ingresos evitables. Los 5 grupos de fármacos más frecuentemente asociados a los ingresos por RAM fueron digoxina, antiinflamatorios no esteroideos, benzodiacepinas, diuréticos y antibióticos. Los factores de riesgo independientes de ingreso por RAM fueron el sexo femenino (OR 1,84; IC 95% 1,3–2,61), la medicación inadecuada según los criterios de Beers (OR 4,2; IC 95% 2,9-6,03), la polifarmacia (> 5 fármacos) (OR 1,5; IC 95% 1,04-2,13), el filtrado glomerular < 30 ml/min (OR 3; IC 95% 2,12-4,23) y el uso de sedantes (OR 1,4; IC 95% 1-1,91).
Conclusión: Las RAM fueron responsables del 6% de los ingresos en una unidad geriátrica de agudos, considerándose evitables tres cuartas partes de estos ingresos. El sexo femenino, la medicación inadecuada, la polifarmacia, la insuficiencia renal y el uso de sedantes fueron factores de riesgo independientes de ingreso por RAM.

Introduction

An adverse drug reaction (ADR) is a non-negligible cause of morbidity and mortality[1] and a contributor to increasing healthcare costs.[2] It has been estimated that ADRs are responsible for 0.32% of hospital deaths and for some 100,000 deaths annually in the USA.[1] The prevalence of ADR-related admissions is estimated to account for around 7% of total admissions, with age groups and methodologies accounting for reported rates of 3–17%[1–6]; most of the corresponding studies used administrative hospital discharge data, which yield lower prevalence rates than reviews of medical records and patient interviews. Over 50% of ADR-related admissions are considered to be avoidable.[3,4] The main factor associated with hospitalization for an ADR is polypharmacy.[5–8] ADR risk increases exponentially with the number of drugs ingested by an individual, given that the risk inherent to each drug is compounded by potential interactions between drugs.[12]

Older people have an increased risk of both ADRs and ADR admissions; this is primarily because they have more diseases and more chronic diseases and, consequently, are often treated with several drugs. Pharmacodynamic and pharmacokinetic changes related to physiological ageing can favour ADRs, which is why administered drugs require dosage adjustments. The changes include slower drug absorption, drug distribution alterations due to changes in body composition and in serum albumin concentrations, decreased liver metabolism and a lower glomerular filtration rate (GFR).[9] Data regarding ADR admissions in the scientific literature do not always agree regarding prevalence, risk factors and the drugs most commonly implicated.

The aims of our study were (a) to determine the prevalence of admissions in an acute geriatric unit due to ADRs, (b) to determine the proportion of avoidable ADRs, (c) to identify the drugs most frequently implicated, and (d) to identify risk factors for ADR admission.

Material and methods

Study design and population

We conducted an observational cross-sectional study in which we retrospectively reviewed and recorded data from medical records for patients aged 70 years and older hospitalized for a medical problem in an acute geriatric unit in the Hospital de Mataró (Barcelona, Spain) in the period between January 2001 and December 2010. The study protocol was approved by the hospital research ethics committee (CSdM CEIC code 13/15).

Main outcome measures

The main outcome measures were the prevalence of ADR admissions and the number of avoidable ADR admissions. An ADR was defined as any unintended or unwanted harmful effect of a drug that occurred at normal dose levels for prophylaxis, diagnosis or treatment purposes. Deliberate overdoses were not rated as ADRs. In order to decide whether an admission should be classified as ADR-related, three researchers (MC, LE and MG) assessed admission reasons and circumstances using the probability criteria of the World Health Organization – Uppsala Monitoring Centre (WHO-UMC).[10] To assess the likelihood that an adverse reaction was drug-related, the same three researchers used the Naranjo scale[11] to classify the association between an adverse reaction and a drug as 'definite', 'probable', 'possible' or 'doubtful'. Admissions were first reviewed by 2 researchers and, in case of doubt or dispute, the third researcher reviewed the data and a final decision was agreed by all 3 researchers. The avoidability of an ADR was categorized, according to Hallas et al.[12] criteria, as 'definitely avoidable', 'possibly avoidable' or 'unavoidable'. When the three researchers failed to reach a unanimous decision, the ADR was classified as unavoidable. The appropriateness of pre-admission medication had been evaluated prospectively applying an updated version of the 1991 Beers criteria[13] and was evaluated retrospectively applying the STOPP (Screening Tool of Older Persons' Potentially Inappropriate Prescriptions) criteria.[14]

Study variables

The main study variables were as follows: sociodemographic factors (age, sex); comorbidities and Charlson comorbidity index; nutritional status (Mini Nutritional Assessment); number and type of pre-admission drugs ingested; and kidney function (GFR calculated using the Cockroft–Gault equation and the Modification of Diet in Renal Disease (MDRD) formula). Polypharmacy was defined as the concomitant prescription of 5 or more drugs to the same patient.

Statistical analysis

Categorical variables were described as percentages, and continuous variables as means and standard deviations. The ADR and non-ADR admission groups were compared using the chi-square test or Fisher's exact test for categorical variables, and the Student-*t* test or Mann–Whitney *U* test for continuous variables. The odds ratio (OR) was calculated, using logistic regression, as a measure of the strength of the association between the different study variables and ADR admissions. Multivariate analyses were performed in which the effects of all variables associated with ADR admissions in