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Treatment adherence in patients more than 65 years who experience early readmissions

Adherencia al tratamiento en pacientes mayores de 65 años que sufren reingresos precoces

Sergio Vicente-Sánchez[1], Raquel Olmos-Jiménez[2], Cristina Ramírez-Roig[2], María José García-Sánchez[3], Manuel Valderrey-Pulido[1], Amelia de la Rubia-Nieto[1]

[1]Servicio de Farmacia, Hospital Clínico Universitario Virgen de la Arrixaca, Murcia. Spain. [2]Servicios Centrales, Servicio Murciano de Salud, Murcia. Spain. [3]Gestión Hospitalaria, Hospital de los Arcos, Murcia. Spain.

Author of correspondence
Sergio Vicente Sánchez
Avenida Don Juan de Borbón N.º 18 3ºF
30007 Murcia. España.

Correo electrónico:
sergiovicente87@hotmail.com

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Abstract

Objective: To analyse the rate of therapeutic nonadherence in patients who experience early readmissions, and identify the factors associated with nonadherence.

Methods: An observational descriptive 3-month study (March-May 2014), which included all patients more than 65 years who were readmitted between 3 to 30 days following the last hospital discharge. Exclusion criteria: programmed re-admissions and readmissions to the Intensive Care Unit. Variables included in the study: age, sex, medical service, major diagnostic category, polypharmacy, number of days since the last hospital discharge, and hypertension and diabetes. Therapeutic adherence and difficulty in taking medication were assessed using the Morisky-Green test and the Haynes-Sackett test, respectively. A descriptive analysis of the variables was conducted, showing they were associated with therapeutic adherence. Statistically significant variables were included in a multivariate logistic regression model.

Results: In total, 57% of the patients were nonadherent to pharmacological treatment; 23% had difficulty taking their medication; 86% had comorbidities (hypertension and diabetes); 79% had a caregiver; and 86% were polymedicated (≥ 5 medications). There was an association between lack of adherence and difficulty in taking medications (P = 0.021), polypharmacy (P = 0.002), and diabetes mellitus (P = 0.018).

Conclusions: Polymedication, diabetes mellitus, and difficulty in taking medication were shown to be prognostic factors of lack of adherence to treatment in patients more than 65 years.

KEYWORDS
Aging; Readmission; Medication adherence; Patient adherence; Polypharmacy.

Resumen

Objetivo: Analizar la frecuencia del incumplimiento terapéutico en pacientes que sufren reingresos hospitalarios precoces e identificar los factores asociados al mismo.

Método: Estudio observacional descriptivo de tres meses de duración (marzo–mayo de 2014). Se incluyeron todos los pacientes mayores de 65 años que reingresaron en los 3-30 días siguientes al alta hospitalaria. Fueron excluidos los reingresos programados y los reingresos en la Unidad de Cuidados Intensivos. Las variables recogidas fueron: edad, sexo, servicio médico, categoría diagnóstica mayor, polimedicación, número de días desde el alta, presencia de hipertensión y/o diabetes. Se evaluó el cumplimiento terapéutico y la dificultad en la administración de medicación mediante el test de Morisky-Green y el test de Haynes-Sackett, respectivamente. Se realizó un análisis descriptivo de las variables y se relacionaron estas con la adherencia terapéutica. Las variables con significación estadística se incluyeron en un modelo de regresión logística multivariante.

Resultados: El 57% de los pacientes presentaron falta de adherencia al tratamiento farmacológico. El 23% presentaba dificultad en la administración de la medicación. Un 86% presentaba comorbilidades (hipertensión y/o diabetes) y el 79% tenía cuidador. El 86% de los pacientes estaban polimedicados (≥ 5 fármacos). Existe relación entre la falta de adherencia y la dificultad en la administración de los medicamentos (p=0,021), la polimedicación (p=0,002) y la presencia de diabetes *mellitus* (p=0,018).

Conclusiones: La polimedicación, la presencia de diabetes *mellitus* y la existencia de dificultad en la administración de la medicación se evidencian como factores pronósticos de la falta de adherencia al tratamiento en pacientes mayores de 65 años.

PALABRAS CLAVE
Envejecimiento; Reingresos; Adherencia a la medicación; Cumplimiento del paciente; Polimedicación.

Introduction

Increased life expectancy in developed countries is accelerating growth in the percentage of people more than 65 years of age, resulting in an aging population. According to the Spanish National Institute of Statistics, the population more than 65 years rose from 7% in 1950 to 18% in 2014, and it is estimated that this figure will increase to 25% in 2029 and to 39% in 2064[1].

The progressive aging of the population is leading to a significant increase in chronic diseases associated with poor health status and, as a consequence, a significant increase in the number of people who spend their final years in a state of dependency and in need of continuous quality health care. Chronic diseases, therefore, represent the greatest current challenge for health services: in this setting, conventional healthcare models have clearly failed, which translates into an endless cascade of avoidable hospitalizations and failures in the continuity of care with a direct impact on patients[2].

Currently, therapeutic failure is considered to be one of the factors that has the greatest negative impact on the health of patients with chronic diseases. According to a World Health Organization (WHO) report, therapeutic adherence in patients with chronic diseases is only 50% in developed countries[3]. Nonadherence to therapy can lead to severe clinical consequences, including adverse effects or drug inefficiency, which can lead to an increase in the hospital admission rate and in early hospital admissions[4,5,6]. Data on the association between therapeutic nonadherence and hospital readmission are scarce in the literature. Thus, we designed a study to analyse the rate of therapeutic nonadherence in patients readmitted to hospital and to identify the factors associated with nonadherence.

Methods

Design and study population. An observational cross-sectional 3-month study (March-May 2014), which included all patients more than 65 years who experienced early readmission to any hospital clinical service. Early readmission was defined as readmission between 3 and 30 days after the last hospital discharge.

Exclusion criteria were: patients readmitted for programmed diagnostic or therapeutic procedures; and patients fulfilling criteria for direct readmission to Intensive Care Units. Patients were selected on the basis of a daily review of readmissions during the previous 24 hours.

Study Variables. The following variables were included in the study:

- *Demographic, clinical, and healthcare variables:* Age, sex, number of days between the last hospital discharge and readmission, medical readmission service, Major Diagnostic Category (MDC; diagnoses coded by the Ministry of Health through the ICD-9-CM standardized classification system), presence of common comorbidities such as hypertension (HBP) or diabetes mellitus (DM), number of prescribed medications, polymedication (≥ 5 medications/d), and the person responsible for administering the medication (when the patient was unable to fulfil this role, the caregiver was considered to be this person).
- *Variables associated with adherence to treatment:* Morisky-Green test and Haynes-Sackett test.

Clinical interview. The pharmacist conducted a clinical interview with the patient or, failing this, with the person responsible for administering the medication. Two validated questionnaires were used in the interview to assess therapeutic adherence[7,8].

1. Haynes-Sackett test. This test comprises a single question: "Most patients have difficulty taking all their pills; Do you have difficulties in taking yours?"
2. Morisky-Green test. This test comprises 4 questions with a dichotomous answer (yes/no). To be considered adherent, the patient must answer "Yes" to question 2 and "No" to the other three. Table 1 shows the Morisky-Green test.

Statistical analysis of the data. We conducted a descriptive analysis of the study variables. Qualitative variables are expressed as absolute frequencies and as relative frequencies (percentages). All continuous variables followed a normal distribution and are expressed as mean (x) ± standard deviation (SD).

We analysed the association between the study variables and therapeutic adherence. Qualitative variables were analysed using Pearson's chi-square (χ^2), applying Yates correction for continuity in the case of 2x2 tables and Fisher tables when more than 20% of the cells in these contingency tables had an expected frequency of less than 5. The Student *t-test* was used to analyse a quantitative variable with a normal distribution in relation to a dichotomous qualitative variable, and an ANOVA test was used when the qualitative variable comprised 3 or more categories.

A statistical analysis was performed using a logistic regression model of all the variables with adherence as the dependent variable (i.e., the result of the Morisky-Green test). The variables that reached a P value of < .05 in the univariate analysis were included in a multivariate logistic regression model. The odds ratio (OR) and its respective confidence interval (95%CI) were used to estimate the independent effect of each explanatory variable. A P value of < .05 was used as a cutoff for statistical significance.

All data were processed using the SPSS 19.0 statistical package.

Table 1. Morisky-Green Test

Item	Answer
Do you ever forget to take your medications?	YES/NO
Do you take your medications at the indicated times?	YES/NO
When you feel well, do you stop taking your medications?	YES/NO
a If you ever feel unwell, do you stop taking them?	YES/NO

Results

During the study period, there were 5849 hospital admissions, of which around 7% (427) involved patients more than 65 years. The rate of early hospital readmissions in patients more than 65 years was 29% (124) (Table 2). The mean age of the study patients was 77 ± 7 years (range: 65-93 years), and 56% (69) were men. In total, 86% (107) of the patients had HBP or DM or both: only HBP, 36% (45); only DM, 8% (10); and HBP and DM, 42% (52). The mean number of medications used during chronic treatment was 9 ± 4 (range 1-19). In total, 86% (107) of patients were polymedicated (≥ 5 medications), and 79% (98) of the patients were dependent on another person to administer medication. The mean number of the days from last discharge to readmission was 14 ± 8 days. A total of 53.9% of the patients were grouped into 3 MDCs: diseases of the circulatory system (21.8% [27]), diseases of the respiratory system (18.5% [23]), and diseases of the digestive system (13.7% [17]). The majority of patients were admitted to Internal Medicine (31.5% [39]), followed by Cardiovascular Surgery (8.9% [11]), Digestive Medicine (8.1% [10]), Cardiology (8.1% [10]), Oncology (6.5% [8]), and Respiratory Medicine (5.6% [7]).

The Haynes-Sackett test showed that 23% (29) of the patients had difficulty in taking their medication. The Morisky-Green test showed that 57% (71) of the patients were not adherent to their chronic treatment.

When analyzing the factors that were related to the lack of adherence (Table 3), no statistically significant differences were found between lack of adherence and age (P = 0.245), sex (P = 0.363), hypertension (P = 0.840), and having a caregiver (P = 0.19). However, statistically significant differences were found between lack of adherence and difficulty in the administration of medications (Haynes-Sackett test; P = 0.021),

Table 2. Type of readmission in patients more than 65 years of age during the study period

Type of Readmission	N (%)
Early readmission (3–30 d)	124 (29%)
Readmission > 30 d from last hospital discharge	202 (47.3%)
Programmed readmission	72 (16.9%)
Re-admission < 3 d from last hospital discharge	23 (5.4%)
Readmission to the Intensive Care Unit	6 (1.4%)

number of medications (P=0.002), polypharmacy (P=0.002), and DM (P=0.018). The multivariate analysis showed that the variables predictive of non-adherence were difficulty in medication administration, polypharmacy, and DM (Table 4).

Discussion

In the present study, the rate of hospital readmissions in patients more than 65 years of age was around 7%. This figure is similar to that found in other studies (i.e., 5-14%)[9]. Quispe *et al.*[10] suggested that this rate varies considerably because it can be influenced by a range of factors, such as the age and sex of the patient, the disease leading to admission, comorbidities, the patient's level of health education, the management of the therapeutic regimen, and the definition of early readmission. In the present study, 29% of these patients met the inclusion criteria. The size of the sample was determined by the definition of early readmission and the age threshold used for inclusion.

We found that 57% of the patients were not adherent to treatment. Castellano Muñoz *et al.*[11] conducted a study in patients more than 65 years who had been readmitted to Internal Medicine. These authors suggested that 85% of the medications were administered incorrectly and that only around 9% of patients were adherent to treatment. Differences between the results of the present study and those of Castellano Muñoz *et al.* may be due to their use of objective methods to measure adherence (blister count, home visits, etc). However, our results are similar to those described by other authors (Kripalani *et al.*[12]; Nieuwlaat *et al.*[13]), who estimated that between 20% and 50% of patients with chronic pathologies do not adhere to their medical prescription.

The majority (79%) of the patients needed a caregiver to administer medication. This figure is similar to that obtained by Quispe *et al.*[10], who found that 66% of elderly hospitalized patients also had a caregiver. However, we found that the percentage of nonadherent patients was greater in those with caregivers, although this difference did not reach statistical significance. Castellano Muñoz *et al.*[11] found increased adherence in patients who received assistance in taking medication (OR=6; 95%CI: 0.7-54.6). Other authors have also found increased therapeutic adherence in patients with caregivers. Galindo *et al.*[14] found an association between having a caregiver and better therapeutic adherence (83% vs 65%; P=0.005). These results were similar to those obtained by Aggarwal *et al.*[15], who found a 40% lower probability of being non-adherent to medication in patients with a caregiver than in those without caregiver.

As in other studies[16], the main MDCs found in the present study were associated (in decreasing order of importance) with the circulatory, respiratory, and digestive systems. The majority of the study patients were admitted to Internal Medicine (more than 30%). Verma *et al.*[17] conducted a descriptive study of an Internal Medicine service, and found a predominance of elderly patients with multiple pathologies and diagnoses similar to those obtained in the present study.

In the present study, the mean number of medications consumed per patient per day was 9±4. This figure is higher than that observed by Garfinkel *et al.*[18], who found that the mean number of medications consumed per patient per day was 7.7±3.7 in chronic comorbid patients more than 70 years. Martín-Perez[19] *et al.* conducted a study in Spain on the prevalence of polypharmacy in patients more than 65 years, finding that around 36% of patients consumed 4 or more medications per day, whereas we found that 86% of patients consumed 5 or more medications per day. The elevated

Table 3. Comparison of the different variables according to the results of the Morisky-Green Test

		Morisky-Green (+) (n = 53)	Morisky-Green (-) (n = 71)	p
Sex	Men	50.9% (27)	59.2% (42)	0.363
	Women	49.1% (26)	40.8% (28)	
Age, y	65-74	49.1% (26)	40.8% (29)	0.245
	75-84	37.7% (20)	33.8% (24)	
	> 85	13.2% (7)	25.4% (18)	
Haynes-Sackett Test Results	YES	13.2% (7)	31% 22)	**0.021**
	NO	86.8% (46)	69% (49)	
No. days		14.11 ± 7.62	14.61 ± 8.31	0.74
No. medications		7.98 ± 4.30	10.19 ± 3.40	**0.002**
Polymedicated Patient	*YES*	75.5% (40)	94.3% (67)	**0.002**
	NO	24.5% (13)	5.6% (4)	
MDC	*DCS*	11.3% (6)	29.6% (21)	0.133
	DDS	20.8% (11)	8.5% (6)	
	DRS	20.8% (11)	18.3% (13)	
Medical Services	IM	26.44% (14)	38% (27)	0.461
	CVS	5.7% (3)	11.3% (8)	
	DIG	15.1% (8)	2.8% (2)	
	CAR	5.7% (3)	9.9% (7)	
	ONC	73.6% (39)	76.1% (54)	
Carer	YES	73.6% (39)	83.1% (59)	0.198
	NO	26.4% (14)	16.9% (12)	
Hypertension	YES	77.4% (41)	78.9% (56)	0.840
	NO	22.6% (12)	21.1% (15)	
Diabetes Mellitus	YES	37.7% (20)	59.2% (42)	**0.018**
	NO	62.3% (33)	40.8% (29)	

Abbreviations: MDC, Major Diagnostic Category; DCS, diseases of the circulatory system; DDS, diseases of the digestive system; DRS, diseases of the respiratory system; CAR, Cardiology; CVS, cardiovascular surgery; DIG, Digestive; IM, internal medicine; ONC, Oncology.

Table 4. Multivariate logistic regression model of the statistically significant variables associated with lack of therapeutic adherence

Variables	Multivariate	
	Adjusted OR (95%CI)	*p*
Haynes-Sackett	2.86 (1.08-7.57)	0.034
Polypharmacy	4.72 (1.36-16.40)	0.015
Diabetes *mellitus*	2.36 (1.09-5.10)	0.029

Abbreviations: 95%CI, 95% confidence interval; OR, odds ratio.

percentage of polymedicated patients, as well as the high number of medications consumed per patient per day, was probably due to the characteristics of the study population, who were all patients with comorbidities who experienced early readmission. Most of the patients with poor adherence to treatment had HBP or DM. A statistically significant association was found between DM and poor adherence (OR [95%CI] = 2.4 [1.1-5.1], P = 0.029), showing that DM was a risk factor for lack of adherence. These results could be due to the fact that asymptomatic but chronic pathologies are associated with taking long-term medications that do not immediately improve health, which may hinder adherence to the prescribed treatment. Several studies have found low therapeutic adherence in hypertensive patients[20,21,22] and in diabetic patients[23]. Although Kamran *et al.*[22] found that 24% of hypertensive patients were adherent, Tuesca Molina[21] found that 47% of the patients were nonadherent.

A statistically significant association was found between the number of medications consumed and adherence to treatment: patients who took more medications were less adherent (10.2 ± 3.4 vs 7.9 ± 4.3; P = 0.002). In addition, polymedication was a risk factor for lack of adherence (OR [95%CI] = 4.7 [1.4-16.4], P = 0.015). This result is similar to that reported by other authors. Anderson *et al.*[24] found that therapeutic nonadherence in elderly patients is associated with polypharmacy and that taking more than three medications a day results in worse therapeutic adherence. The study conducted by Leal Hernández *et al.*[25] showed that 30% of patients more than 65 years who took 8 medications knew the dosages of all of them, and that only 10% of those who took 9 medications and 20% of those who took 8 medications said they took them all correctly.

The Haynes-Sacket test showed that 23% of the patients experienced difficulties when taking their medication, showing that such difficulties were a risk factor for nonadherence (OR [IC95%] = 2.9 [1.1-7.6]; P = 0.034). This association was statistically significant; however, this aspect was not investigated in the reviewed studies.

The present was limited by the use of an indirect method of measuring adherence, and because these results were not compared with those of a direct method (e.g., pharmacological monitoring) or another indirect method (e.g., pill counts). In addition, sample size was not statistically calculated and the study had a short duration, which may have prevented finding statistically significant differences between the variables. Finally, we did not assess all the variables that may have affected patient adherence, such as the patients' level of knowledge about their pathology or medication, the medications that are most responsible for the lack of adherence, or their administration route.

Early readmission is experienced by one-third of patients more than 65 years, of whom 57% are nonadherent to their pharmacological treatment and 23% have difficulty in taking their medication.

Polymedication, DM, and difficulty in taking medication were shown to be risk factors for lack of adherence to treatment in patients more than 65 years.

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Contribution to the scientific literature

Nonadherence to pharmacological treatment is a serious public health problem and a challenge for health systems. Identifying the predictive factors of the lack of adherence would be of interest to health professionals, and hospital pharmacists in particular, and would help to improve healthcare in patients in need of increased quality and safety of their pharmacotherapeutic process. Thus, this article provides real results in healthcare on the association between these patients and adherence to pharmacological treatment. This information may be very useful in pharmaceutical interventions aimed at optimizing pharmacotherapy, thereby improving the patients' quality of life.

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