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ORIGINAL ARTICLE

Prognostic importance of glycemic variability on hospital mortality in patients hospitalized in Internal Medicine Departments☆

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KEYWORDS
Hospital mortality;
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Hospital management of hyperglycaemia

Abstract
Introduction: The objective was to assess the prognostic importance of various glycaemic control measures on hospital mortality.
Materials and methods: Retrospective, analytical cohort study that included patients hospitalised in internal medicine departments with a diagnosis related to diabetes mellitus (DM), excluding acute decompensations. The clinical endpoint was hospital mortality. We recorded clinical, analytical and glycaemic control-related variables (scheduled insulin administration, plasma glycaemia at admission, HbA1c, mean glycaemia (MG) and in-hospital glycaemic variability and hypoglycaemia).

The measurement of hospital mortality predictors was performed using univariate and multivariate logistic regression.
Results: A total of 384 patients (50.3% men) were included. The mean age was 78.5 (SD, 10.3) years. The DM-related diagnoses were type 2 diabetes (83.6%) and stress hyperglycaemia (6.8%). Thirty-one (8.1%) patients died while in hospital.

In the multivariate analysis, the best model for predicting mortality ($R^2 = 0.326$; $p < .0001$) consisted, in order of importance, of age ($\chi^2 = 8.19$; OR = 1.094; 95% CI 1.020–1.174; $p = .004$), Charlson index ($\chi^2 = 7.28$; OR = 1.48; 95% CI 1.11–1.99; $p = .007$), initial glycaemia ($\chi^2 = 6.05$; OR = 1.007; 95% CI 1.001–1.014; $p = .014$), HbA1c ($\chi^2 = 5.76$; OR = 0.59; 95% CI 0.33–1; $p = .016$), glycaemic variability ($\chi^2 = 4.41$; OR = 1.031; 95% CI 1–1.062; $p = .036$), need for corticosteroid treatment ($\chi^2 = 4.03$; OR = 3.1; 95% CI 1–9.64; $p = .045$), administration of scheduled insulin ($\chi^2 = 3.98$; OR = 0.26; 95% CI 0.066–1; $p = .046$) and systolic blood pressure ($\chi^2 = 2.92$; OR = 0.985; 95% CI 0.97–1.003; $p = .088$).

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Conclusion: An increase in initial glycaemia and in-hospital glycaemic variability predict the risk of mortality for hospitalised patients with DM.

PALABRAS CLAVE
Mortalidad hospitalaria;
Diabetes;
Insulina;
Variabilidad glucémica;
Manejo hospitalario de la hiperglucemia

Importancia pronóstica de la variabilidad glucémica sobre la mortalidad intrahospitalaria en pacientes ingresados en Medicina Interna

Resumen
Introducción: El objetivo fue evaluar la importancia pronóstica de diversas medidas de control glucémico sobre la mortalidad intrahospitalaria.
Material y métodos: Estudio de cohortes retrospectivo analítico con inclusión de pacientes ingresados en Medicina Interna con algún diagnóstico relacionado con la diabetes mellitus (DM), excluyendo descompensaciones agudas. El punto final clínico fue la mortalidad intrahospitalaria. Se recogieron variables clínicas, analíticas y relacionadas con el control glucémico (administración de insulina programada, glucemia plasmática al ingreso, HbA1c, glucemia media (GM) y variabilidad glucémica (VG) intrahospitalarias e hipoglucemias).

La determinación de los factores predictivos de mortalidad intrahospitalaria se realizó mediante regresión logística uni y multivariante.
Resultados: Se incluyó a 384 pacientes (50,3% varones). La edad media ± DE fue de 78,5 ± 10,3 años. Los diagnósticos relacionados con la DM fueron diabetes tipo 2 (83,6%) e hiperglucemia de estrés (6,8%). Se produjo el fallecimiento intrahospitalario en 31 (8,1%) pacientes.

En el análisis multivariante el mejor modelo predictivo de mortalidad (R^2 0,326; p < 0,0001) fue el compuesto, por orden de importancia, por la edad (χ^2 = 8,19; OR = 1,094; IC del 95%, 1,020–1,174; p = 0,004), índice de Charlson (χ^2 = 7,28; OR = 1,48; IC del 95%, 1,11-1,99; p = 0,007), glucemia inicial (χ^2 = 6,05; OR = 1,007; IC del 95%, 1,001-1,014; p = 0,014), HbA1c (χ^2 = 5,76; OR = 0,59; IC del 95%, 0,33-1; p = 0,016), VG (χ^2 = 4,41; OR = 1,031; IC del 95% 1-1,062; p = 0,036), necesidad de tratamiento con corticoides (χ^2 = 4,03; OR = 3,1; IC del 95%, 1-9,64; p = 0,045), administración de insulina programada (χ^2 = 3,98; OR = 0,26; IC del 95%, 0,066-1; p = 0,046) y presión arterial sistólica (χ^2 = 2,92; OR = 0,985; IC del 95%, 0,97-1,003; p = 0,088).
Conclusión: Un incremento de glucemia inicial y de VG intrahospitalarias predice el riesgo de mortalidad en pacientes hospitalizados con DM.

Background

Diabetes mellitus (DM) is a chronic carbohydrate metabolism disease whose incidence and prevalence have undergone a marked increase in the last 2 decades. Although recent data from the United States indicate stabilization since 2008, the prevalence is currently very high.[1] An epidemiological study published in 2012 measured the prevalence of DM in Spain to be 13.8%.[2]

The hospital treatment of patients with DM is a frequent problem, given that it is estimated that DM affects between 30% and 40% of patients treated in emergency departments and up to 25% of hospitalized patients, both in medical and surgical wards.[3] Despite the lack of evidence that intensive treatment of glycemia reduces the mortality of hospitalized patients,[4] there are epidemiological studies that have demonstrated that various glycemic control parameters, such as mean glycemia (MG),[5] can influence patients' prognoses.

Patients with similar MG levels can have very different glycemic profiles. Although there is no standard of reference for quantifying glycemic variability (GV), there is increasing data that suggest its prognostic importance. Recent data from the ADVANCE study[6] have shown that an increase in the visit-to-visit variability (standard deviation) of HbA1c and glycemia levels in fasting conditions is associated with an increase in the risk of microvascular and macrovascular complications. The importance of in-hospital GV, in the development of cardiovascular episodes in the medium term[7] (1 year) and mortality at 90 days,[8] has also been recently recognized. Intervention studies are therefore needed to definitely answer the question of whether the reduction in GV can decrease the risk of complications in DM.[9]

The aim of this study was to assess mortality predictors in patients with hyperglycemia who were hospitalized in a department of internal medicine. We specifically analyzed the prognostic importance of various glycemic