Endocrinol Nutr. 2016;63(4):145–156

ENDOCRINOLOGÍA Y NUTRICIÓN

www.elsevier.es/endo

ORIGINAL ARTICLE

Effective adverse event reduction with bolus-basal versus sliding scale insulin therapy in patients with diabetes during conventional hospitalization: Systematic review and meta-analysis☆

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Received 24 September 2015; accepted 28 November 2015
Available online 25 April 2016

KEYWORDS
Diabetes;
Hospital medicine;
Meta-analysis

Abstract
Introduction: The aim of this review was to assess the effectiveness to reduce clinical adverse events and safety of insulin administered in basal-bolus-corrector or basal-corrector regimens (BB) versus a sliding scale scheme (SS) in patients with diabetes or newly diagnosed hyperglycemia admitted to a conventional (not critical) medical or surgical hospital ward.
Method: A Medline search was conducted. The Odds ratio was the main summary measure. A random effects model with the Mantel–Haenszel procedure was used.
Results: A total of 957 citations were collected, of which nine were finally included in the systematic review. Patients in the BB group had better blood glucose control than those with SS. Overall, there was a nonsignificant trend to a lower risk of adverse events in the BB as compared to the SS group (OR 0.67 [95% CI: 0.22–2.04], [I^2 = 71%]). There was a nonsignificant trend to an increased risk of hypoglycemia in the BB group (OR 2.29 [95% CI: 0.50–10.49] [I^2 = 70%]).

☆ Please cite this article as: Gómez Cuervo C, Sánchez Morla A, Pérez-Jacoiste Asín MA, Bisbal Pardo O, Pérez Ordoño L, Vila Santos J. Eficacia en la reducción de eventos adversos de la insulinoterapia en pauta bolo-basal frente a la pauta deslizante en pacientes con diabetes durante la hospitalización convencional: revisión sistemática de la literatura y metaanálisis. Endocrinol Nutr. 2016;63:145–156.

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Conclusion: Despite its benefit for glycemic control during hospitalization, this review did not show that use of the BB scheme decreases clinical events in patients hospitalized in a conventional ward. Because of heterogeneity of the results, we think that clinical trials are needed addressing its effect in patient subgroups in which the BB scheme may be used safely and with longer follow-up periods.

PALABRAS CLAVE
Diabetes;
Medicina hospitalaria;
Metaanálisis

Eficacia en la reducción de eventos adversos de la insulinoterapia en pauta bolo-basal frente a la pauta deslizante en pacientes con diabetes durante la hospitalización convencional: revisión sistemática de la literatura y metaanálisis

Resumen
Introducción: El objetivo de esta revisión es evaluar la efectividad para disminuir los eventos adversos clínicos y la seguridad de la insulinoterapia en régimen bolo-basal-corrector o basal-corrector frente a la insulinoterapia en «pauta deslizante», en pacientes con diabetes o con hiperglucemia de reciente diagnóstico ingresados en una planta de hospitalización convencional, no críticos, tanto médica como quirúrgica.
Método: Se realizó búsqueda en Medline. La *odds ratio* fue la medida resumen principal. Se empleó un modelo de efectos aleatorios con la técnica de Mante-Haenszel.
Resultados: Novecientas cincuenta y siete citas de las cuales 9 fueron finalmente incluidas en la revisión sistemática. Los pacientes en el grupo BB tuvieron un mejor control glucémico que aquellos con PD. Globalmente, se objetiva una tendencia no significativa hacia un menor riesgo de eventos adversos en el grupo BB frente a PD (OR 0,67 —IC 95%: 0,22-2,04— [I^2 = 71%]). Existe una tendencia no significativa hacia un mayor riesgo de hipoglucemia en el grupo BB (OR: 2,29; IC 95% 0,50-10,49 [I^2 = 70%]).
Conclusión: A pesar de su beneficio para el control glucémico durante la hospitalización, esta revisión no ha objetivado que el uso de la pauta BB disminuya eventos clínicos en pacientes hospitalizados en planta convencional. Debido a la heterogeneidad en los resultados, consideramos que se requieren ensayos clínicos que contemplen su efecto en subgrupos de pacientes en los que la pauta BB se pueda usar de forma segura y con períodos de seguimiento más prolongados.

Introduction

Diabetes mellitus (DM) is a disease with an increasing prevalence and a strong impact on health systems in most countries with stable economic development. In Spain, 14%[1] of the population is estimated to have DM, accounting for 5809 million euros in direct costs and 17,650 million euros in indirect costs (including work absenteeism, sick leave, early retirement, and early mortality).[2] Diabetes also causes a wide range of both acute and chronic complications, and its prevalence in the hospitalized population is therefore even greater. A cross-sectional study conducted in Spain found that up to 26% of patients hospitalized in both medical and surgical wards experience hyperglycemia during their hospital stay,[3] and a rate up to 38% may be seen in data reported in the United States.[4]

Pathophysiologically, hyperglycemia leads to cell damage and causes immune dysfunction by several mechanisms (the release of pro-inflammatory cytokines, impaired neutrophil function, the release of oxygen free radicals, amongst others).[5] Thus, the harmful effect of hyperglycemia during hospitalization has been established in various clinical settings in both critically ill and non-critically ill patients.[4] Higher postoperative rates of complications (including infections) and mortality are seen in patients with poor glycemic control at admission,[6,7] which is also a mortality predictor in patients admitted for myocardial infarction[8] or stroke.[9] Hyperglycemia is also related to greater infection rates in patients undergoing bone marrow transplant,[10] and to shorter complete remissions and greater mortality in patients admitted for the treatment of acute lymphoblastic leukemia,[11] among other examples.

Hyperglycemia occurring during hospital admission was traditionally controlled using the so-called ''sliding scale insulin'' (SSI) regimens, consisting of the administration of regular insulin only based on blood glucose control before meals. The value of such regimens, inconsistent with physiological insulin secretion, has been widely refuted.[12] Observational studies have failed to demonstrate the efficacy of SSI for blood glucose control,[13,14] and more recent clinical trials have shown its inferiority to so-called basal-bolus (BB) regimens.[15,16] Despite the foregoing, because of its simplicity and, probably, because of the fear of hyperglycemia by clinicians, SSI continues to be widely used