REUE | Brief Report

Managing hyperglycemia under the sepsis code

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BACKGROUND. The sepsis code is a tool for the early detection and treatment of patients with sepsis. Hyperglycemia is a known risk factor for poor in-hospital prognosis in the management of sepsis. We do not currently know if hyperglycemia is being treated in patients assessed under the code and if treatment has an impact on prognosis.

MATERIALS AND METHODS. Retrospective observational study of all patients over the age of 18 years treated under the sepsis code in an emergency department from May to September 2018.

RESULTS. Data for 128 patients were included. Most infections involved the respiratory tract (55%). Hyperglycemia was present in 37.5%, and 19% of them received treatment for it. Although mortality tended to be lower in patients whose hyperglycemia was treated, the difference was not statistically significant.

CONCLUSIONS. Hyperglycemia is not being treated in sepsis-code cases. Further studies are needed to understand the prognostic implications.

Keywords: Code sepsis. Hyperglycemia. Sepsis.

Manejo de la hiperglucemia en el código sepsis (HYSE-Code)

INTRODUCTION. El código sepsis es una herramienta para la detección y el tratamiento precoz del paciente séptico. La hiperglucemia, conocida como factor de mal pronóstico intrahospitalario, no entra dentro de esta guía terapéutica. Se desconoce si actualmente la hiperglucemia es tratada en esta entidad clínica y si tiene su tratamiento implicación pronóstica.

MATERIAL Y MÉTODO. Estudio retrospectivo analítico y observacional que incluyó a todos los pacientes mayores de 18 años admitidos en el servicio de urgencias en los que se activó el Código Sepsis durante su estancia en el periodo comprendido de mayo de 2017 a septiembre de 2018.

RESULTADOS. Se incluyeron 128 pacientes. La infección más frecuente fue la respiratoria (55%). El 37,5% de los pacientes presentó hiperglucemia, de los que un 19% recibió tratamiento para la misma. Los pacientes en los que se trató la hiperglucemia presentaron una mortalidad menor, sin resultados estadísticamente significativos.

CONCLUSIÓN. La hiperglucemia no es tratada dentro del Código Sepsis. Se necesitan más estudios para conocer su implicación pronóstica.

Palabras clave: Código Sepsis. Hiperglucemia. Paciente séptico.

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Introduction

Infectious diseases are a common reason for consultation in emergency departments (EDs).[1] Among these patients, a non-negligible proportion meet sepsis criteria upon arrival—a condition associated with high mortality—and this proportion has increased vs former studies.[2]

The Sepsis Code program was developed to improve the management, early detection, and initiation of therapeutic measures for patients with severe infectious disease, with the goal of reducing the high morbidity and mortality associated with this clinical condition.[3]

Hyperglycemia, previously identified as an independent predictor of poor prognosis in hospitalized patients,[4] was included as a general diagnostic criterion for sepsis in the early Sepsis Code Consensus Documents.[3] However, neither in those documents nor in the current Consensus Document is hyperglycemia incorporated into the recommended early treatment of the septic patient.[5]

In this context, we considered it important to determine whether hyperglycemia is currently being treated in the ED in this patient population and whether such treatment at the time of Sepsis Code activation has prognostic implications.

Material and methods

We conducted a retrospective, analytical, observational, single-center study in the ED of a tertiary hospital in Madrid. The recruitment period extended from May 16th, 2017 through September 30th, 2018.

All patients ≥ 18 years admitted to the ED in whom the Sepsis Code was activated during their hospital stay were included.

Demographic and clinical variables collected included: age, sex, hypertension, diabetes mellitus and its treatment, dyslipidemia, active alcohol use, prior diagnoses of ischemic heart disease, heart failure, peripheral vascular disease, stroke, chronic obstructive pulmonary disease (COPD), cognitive impairment of any kind, chronic kidney disease, chronic liver disease, active cancer with or without metastases, HIV, immunodeficiency, prior admissions, antibiotic use within the previous month, baseline functional status, Charlson comorbidity index score, vital signs, and laboratory results upon ED arrival.

We also recorded: the type of infection causing sepsis; treatments administered (antibiotics, IV fluids, vasopressors, oxygen therapy); and prescribed antihyperglycemic therapy, when applicable.

The primary endpoint was 90-day mortality. Secondary endpoints included hyperglycemia during hospitalization (venous glucose > 180 mg/dL at any time), documentation of hyperglycemia in the medical record, 30- and 90-day revisits, and 30- and 90-day readmissions.

Data were obtained by review of electronic ED reports, and complications during follow-up were identified through the electronic medical record. The study was approved by the Clinical Research and Ethics Committee of *Hospital Universitario Clínico San Carlos* (Madrid, Spain).

Table 1. Medical history

	Global N = 128 n (%)
Age (years)	81 RIC (68-87)
Sex	
Male	83 (64.3)
Female	45 (35.2)
Ischemic heart disease	21 (16.4)
Heart failure	28 (21.9)
Vascular disease	12 (9.4)
Acute stroke	32 (25)
Hypertension	83 (64.8)
Dyslipidemia	61 (47.7)
Diabetes mellitus	32 (25)
Type of diabetes mellitus (N = 32)	
Type I	0 (0%)
Type II	32 (100%)
HbA1c % (N = 29)	6.67 DE (1.05)
Dementia	35 (27.3)
Baseline functional status	
Independent in ADLs	78 (60.9)
Partially dependent in ADLs	17 (13.3)
Dependent in ADLs	33 (25.8)
Chronic obstructive pulmonary disease	28 (21.9)
Liver disease	7 (5.5)
Renal failure	35 (27.3)
Alcohol use	11 (8.6)
Thromboembolic disease	10 (7.8)
Arrhythmia	39 (30.5)
Oncologic disease	40 (31.3)
HIV	3 (2.3)
Immunodeficiency	5 (3.9)
Immunosuppressive therapy	16 (12.5)
Admission within the previous < 1 month	34 (26.6)
Antibiotic therapy within the previous < 1 month	37 (28.9)

ADLs: activities of daily living; SD: standard deviation; IQR: interquartile range.

Statistical analysis

Categorical variables were expressed as absolute and relative frequencies and the continuous ones as mean and standard deviation (SD) or median and interquartile range (IQR), depending on distribution. Comparisons were made 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. A logistic regression model was constructed to evaluate the adjusted effect of hyperglycemia treatment on 90-day mortality. Statistical analyses were performed using SPSS for Windows, version 20.0 (Chicago, IL).

Results

A total of 128 patients were included. Median age was 81 years (IQR, 68–87), and 64.8% were men. There were 48 deaths (33%). Baseline characteristics are shown in Table 1.

Regarding qSOFA criteria, altered mental status was present in 30.9%, tachypnea in 51.2%, and hypotension in 48%.

Blood glucose on arrival was measured as a vital sign in only 4 patients (3.1%). Mean leukocyte count was 11,697/mL (SD 6859.93); median C-reactive protein was 9.2 mg/dL (IQR, 2.34–20.42); median procalcitonin was

Table 2. Medical history in the hyperglycemia group according to whether they received treatment

	Hyperglycemia treatment N = 9 n (%)	Hyperglycemia treatment N = 39 n (%)	*P*
Sex			.7
Male	7 (77.8)	25 (64.1)	
Female	2 (22.2)	14 (35.9)	
Age	83 RIC (76-87)	82 RIC (75-86)	.78
Diabetes mellitus	8 (88.9)	14 (35.9)	.07
Hypertension	9 (100)	26 (66.7)	.09
Ischemic heart disease	1 (11.1)	5 (12.8)	1
Heart failure	0 (0)	10 (25.6)	.17
Acute stroke	6 (66.7)	7 (17.9)	.007
Dementia	3 (33.3)	15 (38.5)	1
Cardiovascular disease	1 (11.1)	5 (12.8)	1
Chronic obstructive pulmonary disease	4 (44.4)	4 (10.3)	.03
Ulcus	0 (0)	2 (5.1)	1
Liver disease	2 (22.2)	2 (5.1)	.15
Renal failure	3 (33.3)	9 (23.1)	.67
Oncologic disease	2 (22.2)	9 (23.1)	1
Immunodeficiency	2 (22.2)	1 (2.6)	.08
Charlson ≥ 3	8 (88.9)	29 (74.4)	.66

IQR: interquartile range.

1.65 ng/L (IQR, 0.21–11.36); and median glucose was 141 mg/dL (IQR, 100–168).

The types of infection causing sepsis are shown in Figure 1. Frequently used antibiotics included ceftriaxone (22.4%) and meropenem (18.9%). Vasopressors were administered to 5.6% of patients, oxygen therapy to 61.6%, and IV fluids to 93.6% (most commonly 1–2 L of saline in 35.5%). Patients were admitted to internal medicine (37.7%), geriatrics (22.9%), and intensive care (12.5%).

Hyperglycemia occurred in 37.5% of patients (n = 48), yet was not documented in the medical record in 83.3%. Characteristics of this subgroup are presented in Table 2. A total of 81% did not receive treatment for hyperglycemia. Among the 18.8% who were treated (n = 9), 55.6% received long-acting insulin alone. Mortality rate was 33.3% in patients who received hyperglycemia treatment versus 41% in those who did not; differences were not statistically significant (OR, 0.72; 95% CI, 0.16–3.3; *P* = .671).

In the multivariable model adjusted for Charlson index ≥ 3, age, and respiratory infection, treatment was associated with a lower probability of mortality (OR, 0.56; 95% CI, 0.09–3.27), though results were not statistically significant (*P* = .52).

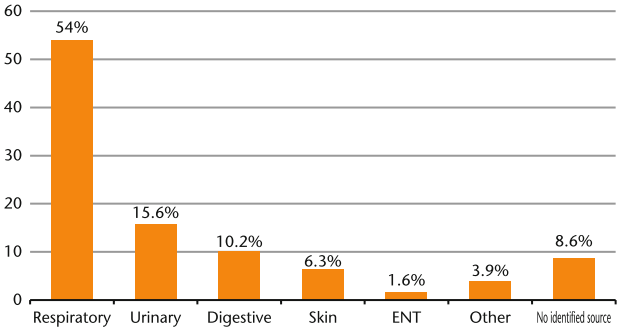

Figure 1. Types of infections.

Discussion

To our knowledge, this is the first study to describe hyperglycemia management within the ED Sepsis Code framework, using a sample exceeding 100 patients. The most notable finding is that, despite hyperglycemia being recognized as a marker of poor prognosis in hospitalized patients—and despite its high prevalence in acutely ill, unstable patients (nearly 40% of our cohort)—it was treated in fewer than 20% of cases. Moreover, when treatment was initiated, long-acting insulin was the most widely used therapy, despite it not being indicated for this acute complication.[6] This may reflect underrecognition of hyperglycemia, as suggested by the near absence of diagnostic documentation—an issue noted in previous studies.[7] It may also reflect prioritization of other urgent interventions by ED physicians, such as early antibiotic administration, IV fluid resuscitation, or vasopressor use.

Patients who received some form of hyperglycemia treatment had lower mortality compared with those who did not, although statistical significance was not reached—likely due to sample size limitations and the small number treated for hyperglycemia.

This study has limitations. First, its retrospective design carries inherent constraints. Second, missing information in electronic records may have introduced bias. Third, the small sample size may limit statistical significance. Fourth, the timing of therapeutic interventions—which may influence mortality—was not explored in depth. Nonetheless, all patients were managed under the Sepsis Code protocol, which standardizes recommended interventions and likely reduced treatment variability. Despite these limitations, this is the first study to address this issue and raises the possibility that treating hyperglycemia may have a clinical impact in this patient population.

ARTICLE INFORMATION

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