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SCIENTIFIC LETTER

Blood glucose monitoring in intensive care. Results of a survey☆

Monitorización de la glucemia en cuidados intensivos. Resultados de una encuesta

Dear Sir,

Critical patients suffer intense stress, developing a response characterized by hypermetabolism, hyperdynamic circulation and hyperglycemia. Stress hyperglycemia manifests in situations of acute injury or disease as a result of insulin resistance and glucose intolerance, and appears on a transient basis in the context of critical illness.[1] In addition to the development of stress hyperglycemia, diabetic patients account for an important proportion of admissions to the Intensive Care Unit (ICU). The prevalence of hyperglycemia is close to 50% in septic patients[2] and individuals with acute coronary syndrome,[3] and approximately 40% in patients with acute cerebrovascular accident (ACVA).[4]

The control of blood glucose is a fundamental element of management in the ICU, with recommended values of <180 mg/dl and, if possible, close to 150 mg/dl.[5] Many clinical trials have examined the influence of blood glucose control upon mortality.[6] However, less evidence is available on the ideal method for measuring blood glucose (laboratory testing, blood gas analyzer or glucometer) and the samples that should be used. The *Surviving sepsis* guide recommends arterial blood sampling for the determination of blood glucose, regardless of whether glucometers or blood gas analyzers are used, and advises caution in interpreting the results obtained from capillary blood samples.[7] Despite these recommendations, the use of glucometers and capillary blood is widespread in the ICU, due to their immediateness and the need for smaller amounts of blood.

The present survey-based study describes the way in which the measurement of blood glucose is conducted in ICUs in Andalusia (Spain).

A survey was designed, involving six questions addressing the type of sample used, the blood glucose measurement technique (glucometer, blood gas analyzer or laboratory testing), ICU type/specialization, number of ICU beds and number of hospital beds. The questionnaire was distributed among the safety references of the patients of all the hospital centers of the Andalusian public healthcare system that have an ICU (37 hospitals), through the Strategy for Patient Safety of the Andalusian Public Healthcare System (*Estrategia para la Seguridad del Paciente del Sistema Sanitario Público de Andalucía* [ESSPA]). A total of 32 hospital centers (86.4%) corresponding to different healthcare levels answered the survey.

The results of the survey are reported in Table 1. There was a predominance of polyvalent ICUs (13.42%). All hospital levels were represented in the study sample. Thirteen hospitals (40.6%) had over 500 beds. In turn, 10 ICUs had over 25 beds (high complexity hospital centers). Capillary blood samples remained the most widely used samples. Thirteen hospitals (40.6%) only used capillary blood samples, while 14 hospitals (43.75%) used capillary blood samples together with arterial and venous blood samples for glucose testing. Glucometers were widely employed. Specifically, 12 centers (37.5%) exclusively used these devices for the control of blood glucose, and glucometers formed part of the protocols implemented in another 15 centers (46.9%). Only four hospitals (12.5%) used arterial blood samples and measurement with blood gas analyzers in all their blood glucose determinations.

The results of our study evidence a lack of uniformity of blood glucose determinations in the ICU. A review of the literature yielded one survey of similar characteristics.[8] The study in question analyzed the responses of 72 specialists in intensive care. Fifty-one percent of those surveyed claimed to use glucometers for measuring blood glucose, and although the type of blood sample used was not specified, the high percentage use of glucometers suggests the probable utilization of capillary blood samples. In our study the incidence of glucometer use was clearly higher, exceeding 80%. Of note was the null use (0%) of laboratory testing for glucose measurement in the aforementioned study, which coincides with our own findings (blood samples being sent to the laboratory in only 2.6% of the cases).

We feel the results of the survey to be representative of the global ICUs in Andalusia for two reasons: the high response rate obtained (87%) and the distribution of the centers that answered the questionnaire. Although the latter was anonymous, an inductive analysis of the responses (number of ICU and hospital beds, type of ICU) allowed us to conclude that the sample effectively represented first,

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Table 1 Results of the survey.

Type of ICU	*n* = 31	%
Cardiac	4	12.9
Neurotrauma	1	3.25
Other	2	6.45
Polyvalent	13	41.9
Polyvalent, cardiac	2	6.45
Polyvalent, other	1	3.25
Polyvalent, surgical, cardiac	2	6.45
Polyvalent, surgical, neurotrauma	2	6.45
Polyvalent, surgical, neurotrauma, cardiac	2	6.45
Polyvalent, surgical, other	2	6.45
ICU beds	***n* = 32**	**%**
<10	10	31.2
11–25	12	37.5
26–50	7	21.9
>50	3	9.4
Type of sample used	***n* = 32**	**%**
Arterial	4	12.5
Capillary	13	40.6
Venous	1	3.1
Capillary and venous	4	12.5
Capillary and arterial	4	12.5
Capillary, arterial and venous	6	18.8
Measurement technique	***n* = 32**	**%**
Glucometer	12	37.5
Glucometer and laboratory testing	2	6.25
Glucometer and blood gas analyzer	7	21.8
Glucometer, blood gas analyzer and laboratory testing	6	18.8
Blood gas analyzer	5	15.6

second and third levels hospitals, and both polyvalent and specialized ICUs.

In conclusion, there is great variability in the monitoring of blood glucose in the ICUs regarding both the type of sample used and the measurement device employed. The degree of compliance with the recommendations of the *Surviving sepsis* guide referred to the blood glucose samples and measurement techniques is low. Efforts are required to homogenize the measurement of blood glucose in the ICU.

The recommendations for authors and ethical responsibilities have been considered in developing this article.

The authors have no conflicts of interest in relation to this study, and the article has not been submitted for publication in any other journal.

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