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Subcutaneous glucose measurements and glucose regulation (?)

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Sir: Andrea Stoszkova et al. [1] conclude, based on a correlation coefficient of 0.69 comparing subcutaneous glucose values (Guardian RT) and blood glucose values (Central Laboratory) in 15 patients, that subcutaneous devices should not be used in critically ill patients. However, Holzinger et al. [2] in the August issue report a good correlation between subcutaneous and arterial glucose values, even in critically ill patients treated with norepinephrine.

We also evaluated the accuracy and feasibility of a comparable continuous subcutaneous glucose monitoring system (CGMS System Gold, Medtronic Minimed) and found a correlation coefficient of 0.87 with the point-of-care blood gas/glucose analyzer ABL 715 (Radiometer Medical, Copenhagen, Denmark), which we validated in ICU patients previously [3]. We drew 786 arterial blood samples from 60 consecutive ICU patients, of whom 37 patients received vaso-active medication (only norepinephrine) and 13 patients were treated with steroids. Blood glucose ranged from 2.2 to 20.1 mmol/l. In the Clarke error grid (Fig. 1), 85.1% of measurements were in zone A (clinically accurate, leading to correct and safe treatment decisions), 13.2% were in zone B (clinically acceptable), 0.13% were in zone C, and 1.5% were in zone D. Zone D means failure-to-detect (high or low blood glucose) errors, resulting in failure to treat either low or high blood glucose results appropriately. The readings in zone D were found in nine patients, of whom eight were treated with vasopressors. One could argue that—with a correlation coefficient of 0.87 and 98.3% of glucose values in the clinically acceptable zones—rejection of s.c. glucose determination in the ICU seems premature.

On the other hand, looking more precisely at zone D of the Clarke error grid (Fig. 1), a difference of nearly 4 mmol/l in the lower glucose zone (reference 2.8 mmol/l versus s.c. sensor 6.5 mmol/l) observed in one patient could have severe consequences in this individual patient, if this results in an inappropriate rise in insulin dose. Unlike other diagnostic procedures, which usually are interpreted in conjunction with additional findings, a single glucose measurement has direct consequences for treatment, with potentially detrimental effects.

In other words, tight glucose regulation in ICU patients using a subcutaneous device may lead to more severe adverse events than the zone interpretation of the error grid suggests. The fact that we now have safe computerized protocols, which give excellent glucose regulation with a very low chance of hypoglycemic events [4], adds to the feeling that for glucose regulation in critically ill patients only the best point-of-care glucose analyzer and protocol should be used [5]. In an era where the beneficial effect of tight glucose regulation is questioned we cannot afford the introduction of treatment-related morbidity.

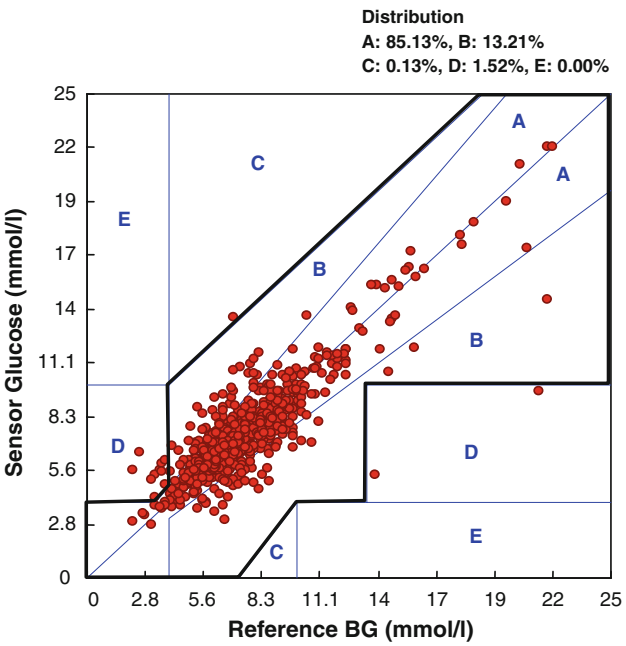

Fig. 1 Clarke error-grid analysis

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