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Hyperglycemia management in the critically ill patient with COVID-19

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■ ABSTRACT

Hyperglycemia is common in critically ill patients and is associated with worse outcomes in those admitted to an intensive care unit. Glucose control helps prevent and control infections and their complications. For critically ill patients with COVID-19, management of hyperglycemia must consider caregiver protection and the frequency of monitoring glucose based on patient safety and the use of personal protective equipment. If steroids are used in the management plan, be aware of steroid-induced hyperglycemia. An endocrinology consult may be beneficial to help manage drip rate and frequency of glucose checks.

■ HYPERGLYCEMIA IN THE CRITICALLY ILL

Hyperglycemia is common in critically ill patients and is associated with worse outcomes in those admitted to an intensive care unit (ICU).[1] Causes include insulin resistance[2] and critical illness hyperglycemia (also known as stress-induced hyperglycemia) where changes in hormone levels, especially cortisol and catecholamine, drive the pathophysiology. Hyperglycemia can also occur as a severe complication of diabetes, as in diabetic ketoacidosis and hyperosmolar hyperglycemic state, both of which can be fatal if not managed properly.

Glucose control in the medical ICU has been the subject of multiple trials. It is generally accepted that attempting to maintain tight control (blood glucose of 80–110 mg/dL) rather than more liberal control (ie, 140–180 mg/dL) does not add any benefit, and in fact may harm the patient by causing hypoglycemia and possibly increasing mortality rates.[3,4] For these reasons, a glucose target of 140 to 180 mg/dL is reasonable in most critically ill patients.[5,6]

■ COVID-19 AND HYPERGLYCEMIA

As of this writing (April 9, 2020), the COVID-19 pandemic has infected more than 1.5 million people worldwide and more than 400,000 in the United States, and these numbers are projected to increase.[6] This increase will come with a high death toll, increased morbidity rates, and an expected surge in the number of critically ill patients.

Glucose control is especially important in preventing and, later, in controlling infections and their complications. This was evident in prior viral infection outbreaks like the severe acute respiratory syndrome (SARS), in which the viral culprit was a coronavirus.[7] Data from the current outbreak indicate that diabetes is the second most common comorbidity in patients with COVID-19 and is associated with an increased incidence of acute respiratory distress syndrome and death.[8,9] Data on patients with COVID-19 infection suggest that many have poorly controlled glucose levels. This may stem from high levels of stress, inflammation, lack of adequate protocols for glucose management, and change in diet.[10] Thus, it is vital to understand the implications and challenges of hyperglycemia management.

In addition, the therapeutic approach to COVID-19 continues to evolve. Notably, steroids are being used—in up to 45% of cases in some reports—and especially in patients with severe presentations.[11] Because this may result in steroid-induced hyperglycemia, it will be important to closely monitor glucose levels in critically ill patients and possibly add insulin to therapy.[12]

■ MANAGEMENT CONSIDERATIONS

A key part of managing COVID-19–positive patients is protecting their caregivers. This includes physicians, nurses, nurse assistants, respiratory therapists, and a milieu of other healthcare providers who access patient rooms frequently. Caregivers must practice strict infection control procedures, wear appropriate

personal protective equipment, and use proper donning and doffing techniques. Another consideration is reducing the need to enter the patient's room to administer medications, titrate drips, and change ventilator settings. This is especially important with the expected national shortage of personal protective equipment. With these challenges in mind, there is a clear opportunity to analyze and revisit some of our current practices with an intention to adapt them to meet these unprecedented needs.

In critically ill patients, insulin is still the best glucose-lowering medication. The management of more stable and noncritically ill patients is not within the scope of this commentary. For patients who are not on vasopressors, parenteral nutrition, or high-dose steroids, point-of-care glucose checks can be reduced to every 4 to 6 hours by using subcutaneous insulin instead of intravenous and weight-based dosing.

For patients who otherwise need intravenous insulin but have stable requirements, monitoring can be reduced from every hour to every 2 to 3 hours by bundling the checks together with other nursing activities such as turning and repositioning the patient, measuring input and output, and performing oral care. Caregivers can further reduce the need to enter a patient's room by moving intravenous drips that require frequent titration to the hallway right outside the patient's door. Consideration is also being given to adopting a subcutaneous diabetic ketoacidosis protocol. Having an endocrinologist on consult, even over the phone or virtually, can help with these approaches.

Finally, some consideration can be given to changing how we measure blood glucose levels in the critically ill patient. Checking glucose levels with a meter and test strips requires caregivers to enter a patient's room. There are 2 continuous glucose monitors approved by the US Food and Drug Administration (FDA)—the Optiscanner 5000 and the GlucoScout—for remote glucose monitoring in hospitalized patients, but they are not readily available. The FDA did approve the use of Freestyle Libre for hospitalized patients on April 8, 2020, but not in the critically ill. We hope the technology continues to evolve so that it can be used more routinely in these patients.

■ TAKE-HOME POINTS

The COVID-19 pandemic has driven us to rethink how to best manage our patients while conserving personal protective equipment and protecting caregivers. As more data become available, we will con-tinue to adapt our protocols. For now, we recommend taking the following steps when managing hyperglycemia in the critically ill patient with COVID-19:

- Monitor blood glucose, but when deciding on the frequency of the checks, consider staff and patient safety and use of personal protective equipment. Caregivers should use their clinical judgment as protocols are modified.
- If steroids are being used as part of the management plan, be aware of steroid-induced hyperglycemia.
- Consider managing mild to moderate hyperglycemia with subcutaneous insulin rather than intravenous drip.
- Consider endocrinology consult, even by telemedicine, to help manage changes in drip rate and frequency of glucose checks.

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