American Association for the Surgery of Trauma/American College of Surgeons—Committee on Trauma Clinical Consensus-Driven Protocol for glucose management in the post-resuscitation intensive care unit adult trauma patient

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Hyperglycemia is a common response to acute stress. Cytokine dysregulation in the setting of exogenous or endogenous catecholamines can lead to insulin resistance, which alters glucose hemostasis and can lead to hyperglycemia.[1] This response occurs in all patients, but the response and its effects are magnified in the diabetic patient.[1,2] Hyperglycemia is associated with increased risk of infection,[1] deep venous thrombosis,[3] and amputation.[2] In critically ill patients, increased ventilator days, intensive care unit (ICU) length of stay (LOS), hospital LOS, and mortality are also associated with hyperglycemia.[4,5]

Trauma patients are often in a state of systemic shock related to their injuries, and thus at higher risk of hyperglycemia. Early hyperglycemia in trauma patients is associated with poor outcomes including worsening infection and mortality independent of specific injury features.[6,7] Critically ill trauma patients who do not achieve tight glucose control in the first 3 days of admission have higher morbidity and mortality.[4] In addition to hyperglycemia, hypoglycemia is associated with increased risk of inpatient mortality and longer LOS.[8] Even mild hypoglycemia in critically ill patients significantly increases the risk of mortality.[9] Finally, in addition to avoiding hyperglycemia and hypoglycemia, it is important to reduce glucose variability in critically ill patients, since highly variable glucose levels are associated with increased ventilator days, longer ICU/hospital LOS, and increased mortality.[5,10]

Intensive glucose control in critically ill surgical patients was shown to reduce mortality in the landmark 2001 study by Van den Berghe et al.[11] The authors compared intensive versus conventional insulin therapy in critically ill patients in a surgical ICU and demonstrated decreased hospital mortality and morbidity in patients with intensive glucose control (blood glucose [BG], 80–110 mg/dL) versus those with a more conventional goal BG of 180 mg/dL to 200 mg/dL. Their study raised the question of the importance, safety, and feasibility of glucose management in critically ill patients. Their work was replicated[12] and widely adopted[13] until 2009, when the NICE-SUGAR trial was published. This group compared adult ICU patients with glucose maintained at 81 mg/dL to 108 mg/dL versus 144 mg/dL to 180 mg/dL and found that intensive glucose management in fact increased mortality and was associated with a significantly higher rate of hypoglycemia compared with conventional therapy.[14]

Numerous studies have attempted to identify optimal BG ranges for critically ill patients.[15] The heterogeneity of ICU patients complicates the challenge of determining which rules should apply to which patient populations.[4] There is significant variability among trauma ICUs regarding the optimal techniques for managing BG in critically ill trauma patients, including identifying optimal BG ranges, determining appropriate agents to maintain that range, and applying these rules to specialized populations.

RATIONALE, GOALS, AND METHODS

Given the broad variability between trauma centers regarding glucose management in the critically ill trauma patient, we compile here the best available evidence into a clinical protocol, which may be used across multiple settings to standardize care of trauma patients. The goals of this clinical protocol are to ensure that management of hyperglycemia in the trauma patient is based on evidence-based strategies to improve outcomes.

Stakeholders from the American Association for the Surgery of Trauma (AAST) and the American College of Surgeons Committee on Trauma (ACS-COT) established a work group to create this clinical protocol. The work group conducted a literature review to identify prospective and retrospective studies related to hyperglycemia in trauma patients. These studies were reviewed by members of the group, and consensus guidelines were generated based on current literature and expert opinion. This Clinical Protocol has been reviewed and approved by the AAST Board of Managers and the ACS-COT Executive Committee.

The clinical protocol and evidence-based algorithm presented here is based on best available evidence from national and international guidelines (Table 1)[16–20] and the consensus of experts on this panel. However, treatment decisions regarding management should be individualized for each patient and do not exclude other treatment strategies as being within the standard of care. Ultimately, the responsibility to implement treatment decisions rests with the treating physician at bedside in the ICU.

EVIDENCE BASE: BRIEF SUMMARY

Controversies in the Literature

Optimal BG Range for Critically Ill Trauma Patients

There is little high-quality evidence that establishes the optimal BG range in critically ill trauma patients. Several societies have compiled available evidence to provide practice guidelines for certain populations (see Table 1).[16–20] One of these—a Clinical Practice Guideline (CPG) developed by the Society of

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TABLE 1. National and International Guidelines for Glycemic Control in Adult ICU Patients

Society	Guidelines	Citation
Society of Critical Care Medicine	Guidelines for the use of an insulin infusion for the management of hyperglycemia in critically ill patients	Jacobi et al. 2012[16]
Society of Hospital Medicine	The Glycemic Control Implementation Guidelines, 2nd Ed.	Maynard et al. 2015[17]
American Diabetes Association	Diabetes Care in the Hospital: *Standards of Medical Care in Diabetes-2021*	American Diabetes Association 2021[18]
American College of Physicians	Use of intensive insulin therapy for the management of glycemic control in hospitalized patients	Qaseem et al. 2011[19]
Society of Thoracic Surgeons	Guidelines for blood glucose management during adult cardiac surgery	Lazar et al. 2009[20]

Critical Care Medicine (SCCM) recommends initiation of insulin therapy if BG is 150 mg/dL or greater to maintain BG < 150 mg/dL generally and BG < 180 mg/dL absolutely, using a protocol that achieves a low rate of hypoglycemia (defined as BG ≤ 70 mg/dL) to achieve lower rates of infection and shorter ICU stays. They note that hypoglycemia and even brief severe hypoglycemia (BG < 40 mg/dL) may be independently associated with mortality, with risk increasing the more often this occurs. With a very low level of evidence, they note that the quality of an insulin protocol should be evaluated by quantifying the percentages of BG checks within range and the frequency of hypoglycemic events.[16] Recent guidelines by the American Diabetic Association support a treatment threshold of greater than 180 mg/dL with treatment range of 140 mg/dL to 180 mg/dL in most critically ill patients.[18] These guidelines also acknowledge that certain populations (e.g., critically ill postsurgical patients and cardiac surgery patients) may benefit from lower range of 110 mg/dL to 140 mg/dL based upon a lower level of supporting evidence.

Measuring BG

Blood glucose may be measured by arterial, venous, or fingerstick blood, but there can be significant variability in these measurements, and several factors common in critically ill patients increase the degree of this variability. BG measurements from central venous blood may be higher than arterial blood samples due to infusion of dextrose-containing fluids. On the other hand, fingerstick blood may estimate lower BG values than arterial, particularly in patients with elevated lactate and poor capillary refill, or patient on vasoactive agents or insulin infusions. Therefore, hypoglycemia measured by fingerstick whole blood or hyperglycemia measured by central venous blood may be erroneous and should be confirmed by arterial blood sampling if there is clinical question of appropriateness of treatment. These differences can be significant and vary based on several patient-related factors, but even in patients without hemodynamic failure, 10% of patients have a difference of 16 mg/dL or greater between arterial and fingerstick measurements, and 10% of patients have a difference of 44 mg/dL or greater between arterial and central venous measurements.[21] The SCCM task force CPG recommends, with a moderate level of evidence, the use of arterial or venous BG measurements instead of fingerstick for patients in shock, on vasopressors, with severe peripheral edema, or on prolonged insulin infusion.

Continuous glucose monitoring is a newer technologic advance that offers benefits over traditional serial blood glucose monitoring in the inpatient setting. Sensors measure glucose in the interstitial compartment to correlate with plasma blood glucose levels. Benefits include avoidance of hypoglycemia, decreasing nursing workload, and potential for alerts for hypoglycemia and hyperglycemia. Disadvantages include device costs, lag time between plasma and interstitial glucose values, training, and lack of high-quality studies on the benefits compared with point of care testing.[22]

Bolus Versus Infusion Insulin Administration

Glycemic variability may be lower in patients receiving insulin infusions rather than bolus insulin dosing and this variability may be deleterious to patient outcomes. To quantify this variability, Ali et al.[23] calculated a measure they called the glycemic lability index (GLI) (the squared difference between BG values over time between them) and found that increased GLI was associated with higher in-hospital mortality, with higher mortality risk in euglycemic than in hyperglycemic patients. In practice, insulin infusion rather than insulin bolus dosing in a prospective randomized study of vascular surgery patients reduced postoperative death, myocardial infarction, and congestive heart failure.[24] The theory behind these findings is that fluctuating glucose levels may trigger increased oxidative stresses and worsen patient outcomes.[25] Insulin infusion, then, which may limit glycemic variability, is preferred to bolus insulin administration in critically ill patients. In settings and for patient populations in which insulin infusion is not feasible; however, bolus dosing is appropriate if care is taken to minimize glycemic variability.

PROPOSED PROTOCOL

Initial Assessment

Figure 1 demonstrates our recommendations for the initial assessment of BG levels in critically ill trauma patients. Patients admitted to the ICU after trauma should be initially assessed to determine their BG. Blood glucose may be obtained using either arterial or venous blood sampling or by finger-stick measurement. Patients who are hypoglycemic should be treated with exogenous dextrose administration (either IV or PO). Patients who are hyperglycemic should be treated with exogenous insulin. The degree of hyperglycemia determines the administration route and dosing of insulin.

In patients with risk factors for insulin resistance and insulin dependent diabetes, an augmented insulin sliding scale (Table 2) may be utilized to reach the target BG range; in patients without these risk factors, a lower dose sliding scale regimen may be used. Critically ill patients with a history of diabetes should have a

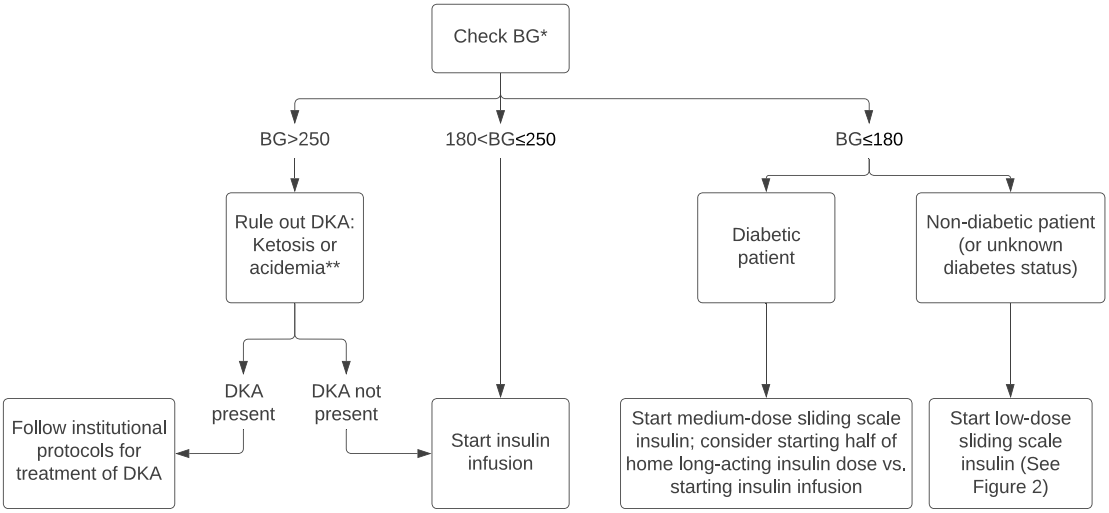

Figure 1. Initial assessment of BG and insulin requirements (SAMPLE). Sample algorithm summarizing the process by which BG may be initially assessed and initial insulin requirements established in critically ill trauma patients. BG values in mg/dL. *Arterial or venous blood test (preferred) or finger stick. **Ketosis = 2+ or moderate urinary ketones OR serum beta-hydroxybutyrate > 2 mmol/L; acidemia = pH ≤ 7.3 or serum bicarbonate ≤ 18 meq/L. Note: In patients with creatinine clearance ≤ 50 mL/min, insulin clearance will be affected—close monitoring of BG levels is recommended. BG, blood glucose; DKA, diabetic ketoacidosis.

glycated hemoglobin A1c (HbA1c) checked if not measured in the last 3 months. Patients with red cell transfusion during admission may have a reduced HbA1c concentration, with a greater discrepancy observed in patients with large transfusion volumes.[26] If there is any question about a patient's baseline insulin resistance, err on the side of undertreating hyperglycemia and titrating insulin doses upward according to patient response.

Special Populations

Brain Injury

Appropriate glucose control is critical in patients with traumatic brain injury (TBI). This includes traumatic injury but also trauma patients with ischemic stroke and intracranial hemorrhage. Avoiding secondary brain injury following a primary insult leads to the best outcomes in brain-injured patients. Jacobi et al.[16] provide recommendations for glucose control in brain-injured patients. Based on limited evidence, they recommend that patients with TBI have insulin therapy administered if BG ≥ 150 mg/dL to maintain BG < 150 mg/dL generally and BG < 180 mg/dL absolutely. Further, they note that relative hypoglycemia (e.g., BG < 100 mg/dL) should be avoided if at all possible to optimize neurologic outcomes. A recent meta-analysis of randomized trials comparing intensive to standard glucose control in TBI patients found no difference in mortality between the two groups. Though the study noted better neurologic outcomes with intensive glucose control, there was a strong association between intensive control and hypoglycemia. The authors noted that while hyperglycemia and hypoglycemia both appear to be deleterious in TBI, there may be promise in tight glucose control in TBI patients if hypoglycemia can be avoided.[27]

TABLE 2. Sliding Scale Subcutaneous Insulin Dosing (SAMPLE)

BG (mg/dL)	Low	Medium	High
151–200	1	2	3
201–250	2	4	6
251–300	3	6	9
301–350	4	8	12
351–400	5	10	15
>400	6	12	18

Cardiac Injury

Adequate glucose control in cardiac surgery patients may reduce the chance of highly morbid sternal wound infections. In cardiac patients, glycemic control (e.g., BG < 180 mg/dL) reduces mortality, morbidity, incidence of wound infections, and hospital LOS..[20] Based on very low level evidence, Jacobi et al.[16] recommend that the upper threshold for glucose control be tightened, aiming for BG < 150 mg/dL instead of BG < 180 mg/dL to reduce the chance of deep sternal wound infection. The Society of Thoracic Surgeons practice guidelines recommend using insulin infusions to maintain BG < 180 mg/dL in ICU patients and BG < 150 mg/dL in more critically ill ICU patients (e.g. those on a ventilator for 3 days or longer or patients who require inotropes, intra-aortic balloon pumps, left ventricular assist device support, anti-arrhythmic medications, or renal replacement) regardless of diabetic status.[20] These recommendations are applicable to critically ill trauma patients who have had cardiac surgery.

Thermal Injury

Glucose control in burn patients is also critical to reduce morbidity and mortality. Burn patients with diabetes have longer LOS per percent total body surface area (TBSA), and higher rates of amputation.[2] In a retrospective study in a burn ICU, patients who achieved "tight glucose control" (BG < 150 mg/dL) had decreased episodes of sepsis than those who did not.[28] The risk for infection and sepsis in the burn population and its associated morbidity and mortality would suggest that BG target <150 mg/dL would be preferential to reduce infectious complications.

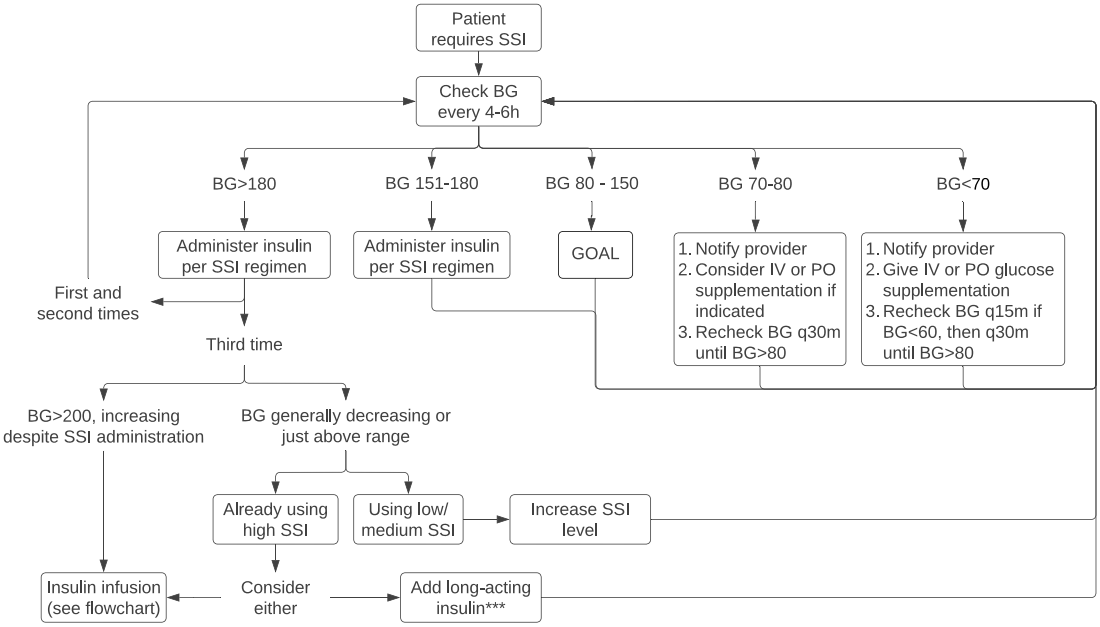

Figure 2. Administration of sliding scale subcutaneous insulin (SAMPLE). For patients for whom initial assessments recommend starting subcutaneous sliding scale insulin, this figure provides a sample algorithm demonstrating how to continue that insulin titration in critically ill trauma patients. BG values in mg/dL. ***Calculate 24-hour insulin requirement and add intermediate- or long-acting subcutaneous insulin at 40% of daily dose; increase as needed. Note: For patients with traumatic brain injury, initiate hypoglycemia management for BG < 100 to prevent hypoglycemia. IV, intravenous; PO, oral.

Diabetic Patients

Preinjury glycemic control may play a role in risk of hypoglycemia, hyperglycemia, and mortality in hospitalized critically ill patients. Patients with poorly controlled diabetes, as measured by HbA1c, have increased mortality with lower BG targets.[29,30] Furthermore, lower mortality is observed with BG targets ≥180 mg/dL in patients with HbA1c levels ≥8.0%.[31] A recent randomized control trial evaluated an individualized glycemic target based on HbA1c versus a conventional target of BG ≤ 180 mg/dL in both diabetic and nondiabetic patients.[32] Although mortality and glycemic control were similar in both groups, post hoc analysis showed a higher mortality in nondiabetic patients with lower HbA1c and lower individualized targets of 129 mg/dL (118–138 mg/dL). In summary, a more personalized approach for BG targets depending on admission HbA1c may be warranted in patients with higher HbA1c values, as they may benefit from higher glucose targets.[31]

Pregnant Patients

The physiologic changes associated with pregnancy have important implications in the glycemic management of critically ill pregnant trauma patients. In these patients, the optimal BG range is narrower than in non-pregnant patients. Early gestational maternal hyperglycemia is associated with spontaneous abortion and congenital malformations, while macrosomia and fetal hyperinsulinemia are noted later in pregnancy. The American College of Obstetricians and Gynecologists recommends a target glucose range less than 140 mg/dL in pregnant patients, and a range of 70 mg/dL to 110 mg/dL for patients in labor.[33]

Notably, insulin requirements in patients with known diabetes (Type 1, Type 2, and gestational). during the first and early second (Weeks 10–14) trimesters are slightly lower than pre-pregnancy baseline, but rise to three or more times baseline as gestation continues, peaking just before term delivery.[33] Finally, pregnant patients who require basal insulin have historically been dosed with intermediate-acting neutral protamine Hagedorn (NPH) insulin in preference to insulin detemir or glargine. However, there is increasing evidence that insulin detemir (pregnancy category B) may be used in pregnant patients.[17]

Administration of Subcutaneous Insulin

In trauma patients admitted to the ICU, we recommend that all patients have some level of ongoing surveillance of their blood sugar until there is clear demonstration that exogenous insulin is not needed. In patients who have not received any supplemental insulin for 72 hours while tolerating a regular diet or goal enteral feeds, BG checks may be discontinued. However, BG checks should be resumed in the setting of clinical deterioration or new administration of glucose-rich infusions (e.g., dextrose-containing fluids), medications (e.g., total parenteral nutrition [TPN]), or diet with increased carbohydrate or sugar load.

TABLE 3. Initial Bolus Doses and Infusion Rates for Patients Starting Insulin Infusion (SAMPLE)

BG (mg/dL)	Bolus (units)	Infusion Rate (units/hour)
180–200	0	2
201–250	2	3
251–300	3	4
301–350	4	6
350–400	5	8
>400	6	10

TABLE 4. Adjustment Dosing of Insulin Infusion (SAMPLE)

BG (mg/dL)	Additional Details	Action
<50		–Stop infusion and notify provider
		–Give 1 ampule D50 (25 g) or 45 g oral carbohydrate gel or 12 oz juice
		–Recheck BG and repeat dextrose administration every 15 min until BG > 60, then every 30 min until BG > 80, then resume hourly checks
		–If BG > 160, restart infusion at 50% prior rate
50–70		–Stop infusion and notify provider
		–Give ½ ampule D50 (12.5 g) or 15 g oral carbohydrate gel or 4 oz juice
		–Recheck BG and repeat dextrose administration every 30 min until BG > 80, then resume hourly checks
		–If BG > 160, restart infusion at 50% prior rate
71–99	Rapid decline (BG dropped >25)	–Stop infusion
		–Recheck BG every 30 min until BG > 80 × 2 then resume hourly checks
		–If BG > 160, restart insulin at 50% prior rate
	No rapid decline	–Change infusion rate to 50% prior rate
100–139	Rapid decline (BG dropped >25)	–Change infusion rate to 50% prior rate
		–Recheck BG in 30 min
	No rapid decline	–Change infusion rate to 75% prior rate
		–Recheck BG in 1 h
	BG increasing	–No rate change, recheck BG in 1 h
140–180	Rapid decline (BG dropped >50)	–Recheck BG in 30 min
	No rapid decline	–No rate change, recheck BG in 1 h*
>180	Rapid decline (BG dropped >50)	–No rate change, recheck BG in 1 h
	No rapid decline	–Bolus with current infusion rate and
		–Increase insulin infusion to 125% of prior rate
		–Recheck BG in 1 h

*If BG falls in this box on two consecutive checks, may change to BG checks every 2 h.

Figure 2 highlights the indications for exogenous subcutaneous insulin based on BG measurements. Table 2 provides a sample sliding scale insulin (SSI) for the administration of subcutaneous regular insulin. In patients for whom SSI is not bringing BG rapidly into range, consider insulin infusion or administering intermediate- or long-acting exogenous insulin. Patients at high risk for deterioration or with tenuous clinical status are preferentially treated with infusion. Patients with BG not significantly out of range or with stabilizing clinical parameters may be treated with additional longer-acting insulin preparations, keeping in mind the longer duration of action of these medications in the setting of subsequent unexpected clinical deterioration.

Administration of Insulin Infusion

Institutions should adopt insulin protocols based on available resources and expertise to achieve target BG control and minimize hypoglycemia. Protocols for insulin infusions should account for the following scenarios:

- Discontinuation or adjustments in TPN or total enteral nutrition (TEN)—insulin infusion rates will need to be adjusted and more frequent BG monitoring should be performed to avoid hypoglycemia or hyperglycemia.
- Increased insulin requirements in patients with risk factors for insulin resistance such as high acuity, sepsis, or steroid usage.
- Many medications including antibiotics are given in dextrose, which will temporarily increase BG.
- The addition of prandial insulin—consider not increasing insulin infusion for 2 hours after eating but record BG values during this time.
- Parameters for transitioning off continuous insulin infusion therapy.
- Consideration for endocrine consult if insulin rate >20 units per hour.

Detailed guide on designing and implementing insulin infusion protocols and orders can be found in the Society of Hospital Medicine's glycemic control implementation guide.[17] We provide here one example of an insulin infusion protocol with initiation, monitoring, and titration parameters. Table 3 provides initial insulin bolus dosing and infusion rates based on the patient's starting BG. Ongoing monitoring of the patient's BG is critical, with careful titration of the insulin infusion to maintain BG within the acceptable range. In the proposed protocol, if the patient's BG has been in range (e.g., 110–150 mg/dL) for three consecutive checks, BG may be checked every 2 hours. If the patient's BG is being checked every 2 hours and is in range for three consecutive checks, BG may be checked every 4 hours. Hourly BG monitoring should resume if there is any change in the rate of insulin infusion, if the patient's clinical status changes (e.g., clinical deterioration, need for operative intervention), or if pressors, renal replacement therapy, nutritional support, steroids, etc. are started or stopped.

Table 4 provides details regarding adjustments that should be made to the insulin infusion rate based on ongoing BG measurements. Of note, hypoglycemia initiates administration of

exogenous dextrose and both hypoglycemia and rapid decline of BG initiates closer monitoring of BG until the BG stabilizes.

Administration of Insulin in TPN

Insulin should only be included in TPN for patients with stable glucose requirements. If the patient becomes hypoglycemic while receiving TPN with insulin, consideration should be given to either discontinuing the TPN (to halt the ongoing administration of exogenous insulin) or continuing TPN while adding an additional dextrose source. Special adjustments should be made for patients who have type 1 diabetes, who should be maintained on an insulin infusion until they can be safely transitioned to basal insulin (e.g., insulin pump, intermediate- or long-acting insulin). Involvement of local expertise in this patient population is recommended for optimizing this transition.[17,18]

Transition to Subcutaneous Regimens

Discontinuation of the insulin infusion and transition to exogenous (or no) insulin may be attempted once the following conditions are met: 1) patient's clinical status has stabilized, 2) critical illness has resolved/no further need for volume resuscitation/vasopressors, (3) nutrition is being administered consistently without planned interruption, and (4) BG has been stable for the past 24 hours to 48 hours and in the target range for the last 4 hours to 6 hours.[34] Safe discontinuation of an insulin infusion should avoid rebound hyperglycemia as well as hypoglycemia.

We recommend the administration of a long-acting or intermediate-acting insulin 2 hours prior to the discontinuation of the insulin infusion. Long-acting insulin (e.g., detemir, glargine) is typically preferred to intermediate-acting (e.g., NPH) because it leads to fewer fluctuations in BG. Moreover, the use of a basal/bolus regimen is preferred to the use of a reactive SSI, which is associated with decreased hyperglycemia but not increased hypoglycemia.[35]

To determine the appropriate regimen, calculate the total daily dose of insulin (TDD) by multiplying the prior 6 hours of insulin administration by four to estimate the patient's 24-hour insulin requirement. When first transitioning from infusion to subcutaneous regimens, the dose administered should be approximately 80% of this 24-hour requirement, adjusting for the patient's clinical situation, age, weight, renal function, current dextrose infusion, dietary intake, or steroid use and titrating as needed.[17,36,37]

The patient's dietary intake will affect insulin dosing. If the patient is not able to eat or is eating <50% of meals, 50% of the TDD should be administered as subcutaneous basal insulin and additional insulin should be held. If the patient is eating ≥50% of meals or is on TEN, 50% of the TDD should be administered as longer-acting basal insulin and 50% as shorter-acting nutritional insulin dosing divided evenly between meals or TEN boluses. If the TEN is continuous, nutritional insulin should be dosed in equally spaced intervals over the 24-hour period. If the patient is on TPN, 50% to 100% of the basal dose should be added to the TPN and no basal dose given.[17]

Finally, in addition to the above, patients being transitioned from an insulin infusion to a subcutaneous regimen should also be started on an SSI. Many patients may be safely started on a medium-dose SSI, but consider low-dose SSI for insulin-sensitive patients (e.g., frail elderly, patients with type 1 diabetes, renal failure, low body mass index (BMI), or insulin naïve) or a high-dose SSI for insulin-resistant patients (e.g., patients with type 2 diabetes or who are obese, on high dose steroids, or have high insulin infusion requirements).

Example Case

For example, a patient eating >50% of meals/TEN receiving 15 μ of insulin in the 6 hours prior to infusion discontinuation has a TDD of 60 μ and could be started on 48 μ of insulin per day divided into 24 μ long-acting insulin (dosed once a day or in two divided doses) and 24u short-acting insulin (dosed as 8 μ with meals or 6u q6h if on continuous TEN). The patient should also be started on an SSI. If the same patient needed to be NPO for surgery, continue the long-acting insulin and SSI and hold the short-acting insulin. If there is a concern for periprocedural hypoglycemia (e.g., long procedure, low BG, inability to restart feeds post-procedure), the long-acting dose may be reduced by 20% to 30% the night before but otherwise may be given as the full dose. Regardless, BG should be checked regularly throughout the procedure and dextrose-containing infusions started if the patient becomes hypoglycemic.

LIMITATIONS

As discussed above, given lack of high-quality evidence for the specific nuances of BG management in critically ill trauma patients, we provide the above consensus-driven protocol as a general and practical protocol for use in trauma ICUs. We take into consideration the existing literature on the subject, recognizing that there are differences in blood glucose management based on hospital and regional variation. Our goal is not to provide a definitive recommendation for BG management but rather a framework based on the best-available evidence for trauma centers seeking to standardize their BG management in critically ill trauma patients.

CONCLUSION

In the last 20 years, the pendulum has swung significantly on BG management in ICU patients. From minimal active management of BG to intensive therapies to achieve BG in a narrow range to liberalization of that range, the literature continues to refine optimal ranges for and management of BG in critically ill trauma patients. While there remain several controversies in glucose management, there is general agreement that euglycemia is preferable to hyperglycemia and hypoglycemia. Both have been shown to worsen morbidity and mortality. This AAST-COT protocol aims to minimize periods of excessive hypoglycemia and hyperglycemia. In the absence of high-quality evidence dictating the nuances of glucose management, this protocol provides a foundation on which to base BG management protocols in critically ill trauma patients.

AUTHORSHIP

All authors participated in literature review, drafting of article content, and development of the clinical protocol and algorithm. C.L.J., D.A.S., and G.T.T. worked on writing of the article. All authors participated in critical review, article revision, and approval of the final draft for publication.

DISCLOSURE

The authors declare no funding or conflicts of interest.

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