15. Diabetes Care in the Hospital: *Standards of Medical Care in Diabetes—2019*

American Diabetes Association

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The American Diabetes Association (ADA) "Standards of Medical Care in Diabetes" includes ADA's current clinical practice recommendations and is intended to provide the components of diabetes care, general treatment goals and guidelines, and tools to evaluate quality of care. Members of the ADA Professional Practice Committee, a multidisciplinary expert committee, are responsible for updating the Standards of Care annually, or more frequently as warranted. For a detailed description of ADA standards, statements, and reports, as well as the evidence-grading system for ADA's clinical practice recommendations, please refer to the Standards of Care Introduction. Readers who wish to comment on the Standards of Care are invited to do so at professional.diabetes.org/SOC.

In the hospital, both hyperglycemia and hypoglycemia are associated with adverse outcomes, including death (1,2). Therefore, inpatient goals should include the prevention of both hyperglycemia and hypoglycemia. Hospitals should promote the shortest safe hospital stay and provide an effective transition out of the hospital that prevents acute complications and readmission.

For in-depth review of inpatient hospital practice, consult recent reviews that focus on hospital care for diabetes (3,4).

HOSPITAL CARE DELIVERY STANDARDS

Recommendation

15.1 Perform an A1C on all patients with diabetes or hyperglycemia (blood glucose >140 mg/dL [7.8 mmol/L]) admitted to the hospital if not performed in the prior 3 months. **B**

High-quality hospital care for diabetes requires both hospital care delivery standards, often assured by structured order sets, and quality assurance standards for process improvement. "Best practice" protocols, reviews, and guidelines (2) are inconsistently implemented within hospitals. To correct this, hospitals have established protocols for structured patient care and structured order sets, which include computerized physician order entry (CPOE).

Considerations on Admission

Initial orders should state the type of diabetes (i.e., type 1 or type 2 diabetes) or no previous history of diabetes. Because inpatient insulin use (5) and discharge orders (6) can be more effective if based on an A1C level on admission (7), perform an A1C test on all patients with diabetes or hyperglycemia admitted to the hospital if the test has not been performed in the prior 3 months (8). In addition, diabetes self-management knowledge and behaviors should be assessed on admission and

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diabetes self-management education should be provided, if appropriate. Diabetes self-management education should include appropriate skills needed after discharge, such as taking antihyperglycemic medications, monitoring glucose, and recognizing and treating hypoglycemia (2).

Physician Order Entry

Recommendation

15.2 Insulin should be administered using validated written or computerized protocols that allow for predefined adjustments in the insulin dosage based on glycemic fluctuations. **E**

The National Academy of Medicine recommends CPOE to prevent medication-related errors and to increase efficiency in medication administration (9). A Cochrane review of randomized controlled trials using computerized advice to improve glucose control in the hospital found significant improvement in the percentage of time patients spent in the target glucose range, lower mean blood glucose levels, and no increase in hypoglycemia (10). Thus, where feasible, there should be structured order sets that provide computerized advice for glucose control. Electronic insulin order templates also improve mean glucose levels without increasing hypoglycemia in patients with type 2 diabetes, so structured insulin order sets should be incorporated into the CPOE (11).

Diabetes Care Providers in the Hospital

Recommendation

15.3 When caring for hospitalized patients with diabetes, consider consulting with a specialized diabetes or glucose management team where possible. **E**

Appropriately trained specialists or specialty teams may reduce length of stay, improve glycemic control, and improve outcomes, but studies are few (12,13). A call to action outlined the studies needed to evaluate these outcomes (14). People with diabetes are known to have a higher risk of 30-day readmission following hospitalization. Specialized diabetes teams caring for patients with diabetes during their hospital stay can improve readmission rates and lower cost of care (15,16). Early evidence suggests that virtual glucose management services may be used to improve glycemic outcomes in hospitalized patients and facilitate transition of care after discharge (17). Details of team formation are available from the Joint Commission standards for programs and the Society of Hospital Medicine (18,19).

Quality Assurance Standards

Even the best orders may not be carried out in a way that improves quality, nor are they automatically updated when new evidence arises. To this end, the Joint Commission has an accreditation program for the hospital care of diabetes (18), and the Society of Hospital Medicine has a workbook for program development (19).

GLYCEMIC TARGETS IN HOSPITALIZED PATIENTS

Recommendations

15.4 Insulin therapy should be initiated for treatment of persistent hyperglycemia starting at a threshold ≥180 mg/dL (10.0 mmol/L). Once insulin therapy is started, a target glucose range of 140–180 mg/dL (7.8–10.0 mmol/L) is recommended for the majority of critically ill patients and noncritically ill patients. **A**

15.5 More stringent goals, such as 110–140 mg/dL (6.1–7.8 mmol/L), may be appropriate for selected patients, if this can be achieved without significant hypoglycemia. **C**

Standard Definition of Glucose Abnormalities

Hyperglycemia in hospitalized patients is defined as blood glucose levels >140 mg/dL (7.8 mmol/L) (2,20). Blood glucose levels that are persistently above this level may require alterations in diet or a change in medications that cause hyperglycemia. An admission A1C value ≥6.5% (48 mmol/mol) suggests that diabetes preceded hospitalization (see Section 2 "Classification and Diagnosis of Diabetes") (2,20). Level 1 hypoglycemia in hospitalized patients is defined as a measurable glucose concentration <70 mg/dL (3.9 mmol/L) but ≥54 mg/dL (3.0 mmol/L). Level 2 hypoglycemia (defined as a blood glucose concentration <54 mg/dL [3.0 mmol/L]) is the threshold at which neuroglycopenic symptoms begin to occur and requires immediate action to resolve the hypoglycemic event. Lastly, level 3 hypoglycemia is defined as a severe event characterized by altered mental and/or physical functioning that requires assistance from another person for recovery. See **Table 15.1** for levels of hypoglycemia (21). Hypoglycemia is discussed more fully below.

Moderate Versus Tight Glycemic Control

A meta-analysis of over 26 studies, including the Normoglycemia in Intensive Care Evaluation–Survival Using Glucose Algorithm Regulation (NICE-SUGAR) study, showed increased rates of "severe hypoglycemia" (defined in the analysis as blood glucose <40 mg/dL [2.2 mmol/L]) and mortality in cohorts with tight versus moderate glycemic control (22). Recent randomized controlled studies and meta-analyses in surgical patients have also reported that targeting perioperative blood glucose levels to <180 mg/dL (10-mmol/L) is associated with lower rates of mortality and stroke compared with a target glucose <200 mg/dL (11.1 mmol/L), whereas no significant additional benefit was found with more strict glycemic control (<140 mg/dL [7.8 mmol/L]) (23,24). Insulin therapy should be initiated for treatment of persistent hyperglycemia starting at a threshold ≥180 mg/dL (10.0 mmol/L). Once insulin therapy is started, a target glucose range of 140–180 mg/dL (7.8–10.0 mmol/L) is recommended for the majority of critically ill and noncritically ill patients (2). More stringent goals, such as <140 mg/dL (7.8 mmol/L), may be appropriate for selected patients, as long as this can be achieved without significant hypoglycemia. Conversely, higher glucose ranges may be acceptable in terminally ill patients,

Table 15.1—Levels of hypoglycemia (21)

Level	Glycemic criteria/description
Level 1	Glucose <70 mg/dL (3.9 mmol/L) and glucose ≥54 mg/dL (3.0 mmol/L)
Level 2	Glucose <54 mg/dL (3.0 mmol/L)
Level 3	A severe event characterized by altered mental and/or physical status requiring assistance

in patients with severe comorbidities, and in inpatient care settings where frequent glucose monitoring or close nursing supervision is not feasible.

Clinical judgment combined with ongoing assessment of the patient's clinical status, including changes in the trajectory of glucose measures, illness severity, nutritional status, or concomitant medications that might affect glucose levels (e.g., glucocorticoids), should be incorporated into the day-to-day decisions regarding insulin dosing (2).

BEDSIDE BLOOD GLUCOSE MONITORING

Indications

In the patient who is eating meals, glucose monitoring should be performed before meals. In the patient who is not eating, glucose monitoring is advised every 4–6 h (2). More frequent blood glucose testing ranging from every 30 min to every 2 h is required for patients receiving intravenous insulin. Observational studies have shown that safety standards should be established for blood glucose monitoring that prohibit the sharing of fingerstick lancing devices, lancets, and needles (25).

Point-of-Care Meters

Point-of-care (POC) meters have limitations for measuring blood glucose. Although the U.S. Food and Drug Administration (FDA) has standards for blood glucose meters used by lay persons, there have been questions about the appropriateness of these criteria, especially in the hospital and for lower blood glucose readings (26). Significant discrepancies between capillary, venous, and arterial plasma samples have been observed in patients with low or high hemoglobin concentrations and with hypoperfusion. Any glucose result that does not correlate with the patient's clinical status should be confirmed through conventional laboratory glucose tests. The FDA established a separate category for POC glucose meters for use in health care settings and has released guidance on in-hospital use with stricter standards (27). Before choosing a device for in-hospital use, consider the device's approval status and accuracy.

Continuous Glucose Monitoring

Real-time continuous glucose monitoring (CGM) provides frequent measurements of interstitial glucose levels, as well as direction and magnitude of glucose trends, which may have an advantage over POC glucose testing in detecting and reducing the incidence of hypoglycemia in the hospital setting (28,29). Several inpatient studies have shown that CGM use did not improve glucose control but detected a greater number of hypoglycemic events than POC testing (30,31). However, a recent review has recommended against using CGM in adults in a hospital setting until more safety and efficacy data become available (30). For more information on CGM, see Section 7 "Diabetes Technology."

ANTIHYPERGLYCEMIC AGENTS IN HOSPITALIZED PATIENTS

Recommendations

15.6 Basal insulin or a basal plus bolus correction insulin regimen is the preferred treatment for noncritically ill hospitalized patients with poor oral intake or those who are taking nothing by mouth. An insulin regimen with basal, prandial, and correction components is the preferred treatment for noncritically ill hospitalized patients with good nutritional intake. **A**

15.7 Sole use of sliding scale insulin in the inpatient hospital setting is strongly discouraged. **A**

In most instances in the hospital setting, insulin is the preferred treatment for hyperglycemia (2). However, in certain circumstances, it may be appropriate to continue home regimens including oral antihyperglycemic medications (32). If oral medications are held in the hospital, there should be a protocol for resuming them 1–2 days before discharge. Insulin pens are the subject of an FDA warning because of potential blood-borne diseases, and care should be taken to follow the label insert "For single patient use only" (33). Recent reports, however, have indicated that the inpatient use of insulin pens appears to be safe and may be associated with improved nurse satisfaction compared with the use of insulin vials and syringes (34–36).

Insulin Therapy

Critical Care Setting

In the critical care setting, continuous intravenous insulin infusion has been shown to be the best method for achieving glycemic targets. Intravenous insulin infusions should be administered based on validated written or computerized protocols that allow for predefined adjustments in the infusion rate, accounting for glycemic fluctuations and insulin dose (2).

Noncritical Care Setting

Outside of critical care units, scheduled insulin regimens are recommended to manage hyperglycemia in patients with diabetes. Regimens using insulin analogs and human insulin result in similar glycemic control in the hospital setting (37).

The use of subcutaneous rapid- or short-acting insulin before meals or every 4–6 h if no meals are given or if the patient is receiving continuous enteral/parenteral nutrition is indicated to correct hyperglycemia (2). Basal insulin or a basal plus bolus correction insulin regimen is the preferred treatment for noncritically ill hospitalized patients with poor oral intake or those who are taking nothing by mouth (NPO). An insulin regimen with basal, prandial, and correction components is the preferred treatment for noncritically ill hospitalized patients with good nutritional intake.

If the patient is eating, insulin injections should align with meals. In such instances, POC glucose testing should be performed immediately before meals. If oral intake is poor, a safer procedure is to administer the rapid-acting insulin immediately after the patient eats or to count the carbohydrates and cover the amount ingested (37).

A randomized controlled trial has shown that basal-bolus treatment improved glycemic control and reduced hospital complications compared with sliding scale insulin in general surgery patients with type 2 diabetes (38). Prolonged sole use of sliding scale insulin in the inpatient hospital setting is strongly discouraged (2,14).

While there is evidence for using premixed insulin formulations in the outpatient setting (39), a recent inpatient study of 70/30 NPH/regular insulin versus basal-bolus therapy showed comparable glycemic control but significantly increased hypoglycemia in the group receiving premixed insulin (40). Therefore, premixed insulin regimens are not routinely recommended for in-hospital use.

Type 1 Diabetes

For patients with type 1 diabetes, dosing insulin based solely on premeal glucose levels does not account for basal insulin requirements or caloric intake, increasing both hypoglycemia and hyperglycemia risks. Typically, basal insulin dosing schemes are based on body weight, with some evidence that patients with renal insufficiency should be treated with lower doses (41). An insulin regimen with basal and correction components is necessary for all hospitalized patients with type 1 diabetes, with the addition of prandial insulin if the patient is eating.

Transitioning Intravenous to Subcutaneous Insulin

When discontinuing intravenous insulin, a transition protocol is associated with less morbidity and lower costs of care (42) and is therefore recommended. A patient with type 1 or type 2 diabetes being transitioned to outpatient subcutaneous insulin should receive subcutaneous basal insulin 2–4 h before the intravenous insulin is discontinued. Converting to basal insulin at 60–80% of the daily infusion dose has been shown to be effective (2,42,43). For patients continuing regimens with concentrated insulin (U-200, U-300, or U-500) in the inpatient setting, it is important to ensure the correct dosing by utilizing an individual pen and cartridge for each patient, meticulous pharmacist supervision of the dose administered, or other means (44,45).

Noninsulin Therapies

The safety and efficacy of noninsulin antihyperglycemic therapies in the hospital setting is an area of active research. A few recent randomized pilot trials in general medicine and surgery patients reported that a dipeptidyl peptidase 4 inhibitor alone or in combination with basal insulin was well tolerated and resulted in similar glucose control and frequency of hypoglycemia compared with a basal-bolus regimen (46–48). However, an FDA bulletin states that providers should consider discontinuing saxagliptin and alogliptin in people who develop heart failure (49). A review of antihyperglycemic medications concluded that glucagon-like peptide 1 receptor agonists show promise in the inpatient setting (50); however, proof of safety and efficacy awaits the results of randomized controlled trials (51). Moreover, the gastrointestinal symptoms associated with the glucagon-like peptide 1 receptor agonists may be problematic in the inpatient setting.

Regarding the sodium–glucose transporter 2 (SGLT2) inhibitors, the FDA includes warnings about diabetic ketoacidosis (DKA) and urosepsis (52), urinary tract infections, and kidney injury (53) on the drug labels. A recent review suggested SGLT2 inhibitors be avoided in severe illness, when ketone bodies are present, and during prolonged fasting and surgical procedures (3). Until safety and effectiveness are established, SGLT2 inhibitors cannot be recommended for routine in-hospital use.

HYPOGLYCEMIA

Recommendations

15.8 A hypoglycemia management protocol should be adopted and implemented by each hospital or hospital system. A plan for preventing and treating hypoglycemia should be established for each patient. Episodes of hypoglycemia in the hospital should be documented in the medical record and tracked. **E**

15.9 The treatment regimen should be reviewed and changed as necessary to prevent further hypoglycemia when a blood glucose value of <70 mg/dL (3.9 mmol/L) is documented. **C**

Patients with or without diabetes may experience hypoglycemia in the hospital setting. While hypoglycemia is associated with increased mortality (54), hypoglycemia may be a marker of underlying disease rather than the cause of increased mortality. However, until it is proven not to be causal, it is prudent to avoid hypoglycemia. Despite the preventable nature of many inpatient episodes of hypoglycemia, institutions are more likely to have nursing protocols for hypoglycemia treatment than for its prevention when both are needed.

A hypoglycemia prevention and management protocol should be adopted and implemented by each hospital or hospital system. There should be a standardized hospital-wide, nurse-initiated hypoglycemia treatment protocol to immediately address blood glucose levels of <70 mg/dL (3.9 mmol/L), as well as individualized plans for preventing and treating hypoglycemia for each patient. An American Diabetes Association (ADA) consensus report suggested that a patient's overall treatment regimen be reviewed when a blood glucose value of <70 mg/dL (3.9 mmol/L) is identified because such readings often predict imminent level 3 hypoglycemia (2).

Episodes of hypoglycemia in the hospital should be documented in the medical record and tracked (2).

Triggering Events

Iatrogenic hypoglycemia triggers may include sudden reduction of corticosteroid dose, reduced oral intake, emesis, new NPO status, inappropriate timing of short- or rapid-acting insulin in relation to meals, reduced infusion rate of intravenous dextrose, unexpected interruption of oral, enteral, or parenteral feedings, and altered ability of the patient to report symptoms (3).

Predictors of Hypoglycemia

In one study, 84% of patients with an episode of "severe hypoglycemia" (defined as <40 mg/dL [2.2 mmol/L]) had a prior episode of hypoglycemia (<70 mg/dL [3.9 mmol/L]) during the same admission (55). In another study of hypoglycemic episodes (defined as <50 mg/dL [2.8 mmol/L]), 78% of patients were using basal insulin, with the incidence of hypoglycemia peaking between midnight and 6 A.M. Despite recognition of hypoglycemia, 75% of patients did not have their dose of basal insulin changed before the next insulin administration (56).

Prevention

Common preventable sources of iatrogenic hypoglycemia are improper prescribing of hypoglycemic medications, inappropriate management of the first episode of hypoglycemia, and nutrition–insulin mismatch, often related to an unexpected interruption of nutrition. Studies of "bundled" preventative therapies including proactive surveillance of glycemic outliers and an interdisciplinary data-driven approach to glycemic management showed that hypoglycemic episodes in the hospital could be prevented. Compared with baseline, two such studies found that hypoglycemic events fell by 56% to 80% (57,58). The Joint Commission recommends that all hypoglycemic episodes be evaluated for a root

cause and the episodes be aggregated and reviewed to address systemic issues.

MEDICAL NUTRITION THERAPY IN THE HOSPITAL

The goals of medical nutrition therapy in the hospital are to provide adequate calories to meet metabolic demands, optimize glycemic control, address personal food preferences, and facilitate creation of a discharge plan. The ADA does not endorse any single meal plan or specified percentages of macronutrients. Current nutrition recommendations advise individualization based on treatment goals, physiological parameters, and medication use. Consistent carbohydrate meal plans are preferred by many hospitals as they facilitate matching the prandial insulin dose to the amount of carbohydrate consumed (59). Regarding enteral nutritional therapy, diabetes-specific formulas appear to be superior to standard formulas in controlling postprandial glucose, A1C, and the insulin response (60).

When the nutritional issues in the hospital are complex, a registered dietitian, knowledgeable and skilled in medical nutrition therapy, can serve as an individual inpatient team member. That person should be responsible for integrating information about the patient's clinical condition, meal planning, and lifestyle habits and for establishing realistic treatment goals after discharge. Orders should also indicate that the meal delivery and nutritional insulin coverage should be coordinated, as their variability often creates the possibility of hyperglycemic and hypoglycemic events.

SELF-MANAGEMENT IN THE HOSPITAL

Diabetes self-management in the hospital may be appropriate for select youth and adult patients (61,62). Candidates include patients who successfully conduct self-management of diabetes at home, have the cognitive and physical skills needed to successfully self-administer insulin, and perform self-monitoring of blood glucose. In addition, they should have adequate oral intake, be proficient in carbohydrate estimation, use multiple daily insulin injections or continuous subcutaneous insulin infusion (CSII), have stable insulin requirements, and understand sick-day management. If self-management is to be used, a protocol should include a requirement that the patient, nursing staff, and physician agree that patient self-management is appropriate. If CSII is to be used, hospital policy and procedures delineating guidelines for CSII therapy, including the changing of infusion sites, are advised (63).

STANDARDS FOR SPECIAL SITUATIONS

Enteral/Parenteral Feedings

For patients receiving enteral or parenteral feedings who require insulin, insulin should be divided into basal, prandial, and correctional components. This is particularly important for people with type 1 diabetes to ensure that they continue to receive basal insulin even if the feedings are discontinued. One may use the patient's preadmission basal insulin dose or a percentage of the total daily dose of insulin when the patient is being fed (usually 30–50% of the total daily dose of insulin) to estimate basal insulin requirements. However, if no basal insulin was used, consider using 5 units of NPH/detemir insulin subcutaneously every 12 h or 10 units of insulin glargine every 24 h (64). For patients receiving continuous tube feedings, the total daily nutritional component may be calculated as 1 unit of insulin for every 10–15 g carbohydrate per day or as a percentage of the total daily dose of insulin when the patient is being fed (usually 50–70% of the total daily dose of insulin). Correctional insulin should also be administered subcutaneously every 6 h using human regular insulin or every 4 h using a rapid-acting insulin such as lispro, aspart, or glulisine. For patients receiving enteral bolus feedings, approximately 1 unit of regular human insulin or rapid-acting insulin per 10–15 g carbohydrate should be given subcutaneously before each feeding.

Correctional insulin coverage should be added as needed before each feeding. For patients receiving continuous peripheral or central parenteral nutrition, human regular insulin may be added to the solution, particularly if $>$20 units of correctional insulin have been required in the past 24 h. A starting dose of 1 unit of human regular insulin for every 10 g dextrose has been recommended (65), to be adjusted daily in the solution. Correctional insulin should be administered subcutaneously. For full enteral/parenteral feeding guidance, the reader is encouraged to consult review articles detailing this topic (2,66).

Glucocorticoid Therapy

Glucocorticoid type and duration of action must be considered in determining insulin treatment regimens. Once-a-day, short-acting glucocorticoids such as prednisone peak in about 4–8 h (67), so coverage with intermediate-acting (NPH) insulin may be sufficient. For long-acting glucocorticoids such as dexamethasone or multidose or continuous glucocorticoid use, long-acting insulin may be used (32,66). For higher doses of glucocorticoids, increasing doses of prandial and correctional insulin may be needed in addition to basal insulin (68). Whatever orders are started, adjustments based on anticipated changes in glucocorticoid dosing and POC glucose test results are critical.

Perioperative Care

Many standards for perioperative care lack a robust evidence base. However, the following approach (69) may be considered:

1. Target glucose range for the perioperative period should be 80–180 mg/dL (4.4–10.0 mmol/L).
2. Perform a preoperative risk assessment for patients at high risk for ischemic heart disease and those with autonomic neuropathy or renal failure.
3. Withhold metformin the day of surgery.
4. Withhold any other oral hypoglycemic agents the morning of surgery or procedure and give half of NPH dose or 60–80% doses of long-acting analog or pump basal insulin.
5. Monitor blood glucose at least every 4–6 h while NPO and dose with short- or rapid-acting insulin as needed.

A review found that perioperative glycemic control tighter than 80–180 mg/dL (4.4–10.0 mmol/L) did not improve outcomes and was associated with more hypoglycemia (70); therefore, in general, tighter glycemic targets are not advised. A recent study reported that, compared with the usual insulin dose, on average an approximate 25% reduction in the insulin dose given the evening before surgery was more likely to achieve perioperative blood glucose

levels in the target range with decreased risk for hypoglycemia (71).

In noncardiac general surgery patients, basal insulin plus premeal short- or rapid-acting insulin (basal-bolus) coverage has been associated with improved glycemic control and lower rates of perioperative complications compared with the traditional sliding scale regimen (short- or rapid-acting insulin coverage only with no basal insulin dosing) (38,72).

Diabetic Ketoacidosis and Hyperosmolar Hyperglycemic State

There is considerable variability in the presentation of DKA and hyperosmolar hyperglycemic state, ranging from euglycemia or mild hyperglycemia and acidosis to severe hyperglycemia, dehydration, and coma; therefore, treatment individualization based on a careful clinical and laboratory assessment is needed (73–76).

Management goals include restoration of circulatory volume and tissue perfusion, resolution of hyperglycemia, and correction of electrolyte imbalance and ketosis. It is also important to treat any correctable underlying cause of DKA such as sepsis.

In critically ill and mentally obtunded patients with DKA or hyperosmolar hyperglycemic state, continuous intravenous insulin is the standard of care. Successful transition of patients from intravenous to subcutaneous insulin requires administration of basal insulin 2–4 h prior to the intravenous insulin being stopped to prevent recurrence of ketoacidosis and rebound hyperglycemia (76). There is no significant difference in outcomes for intravenous human regular insulin versus subcutaneous rapid-acting analogs when combined with aggressive fluid management for treating mild or moderate DKA (77). Patients with uncomplicated DKA may sometimes be treated with subcutaneous insulin in the emergency department or step-down units (78), an approach that may be safer and more cost-effective than treatment with intravenous insulin (79). If subcutaneous administration is used, it is important to provide adequate fluid replacement, nurse training, frequent bedside testing, infection treatment if warranted, and appropriate follow-up to avoid recurrent DKA. Several studies have shown that the use of bicarbonate in patients with DKA made no difference in resolution of acidosis or time to discharge, and its use is generally not recommended (80). For further information regarding treatment, refer to recent in-depth reviews (3).

TRANSITION FROM THE ACUTE CARE SETTING

Recommendation

15.10 There should be a structured discharge plan tailored to the individual patient with diabetes. **B**

A structured discharge plan tailored to the individual patient may reduce length of hospital stay and readmission rates and increase patient satisfaction (81). Therefore, there should be a structured discharge plan tailored to each patient. Discharge planning should begin at admission and be updated as patient needs change.

Transition from the acute care setting is a risky time for all patients. Inpatients may be discharged to varied settings, including home (with or without visiting nurse services), assisted living, rehabilitation, or skilled nursing facilities. For the patient who is discharged to home or to assisted living, the optimal program will need to consider diabetes type and severity, effects of the patient's illness on blood glucose levels, and the patient's capacities and preferences. See Section 12 "Older Adults" for more information.

An outpatient follow-up visit with the primary care provider, endocrinologist, or diabetes educator within 1 month of discharge is advised for all patients having hyperglycemia in the hospital. If glycemic medications are changed or glucose control is not optimal at discharge, an earlier appointment (in 1–2 weeks) is preferred, and frequent contact may be needed to avoid hyperglycemia and hypoglycemia. A recently described discharge algorithm for glycemic medication adjustment based on admission A1C found that use of the algorithm to guide treatment decisions resulted in significant improvements in the average A1C after discharge (6). Therefore, if an A1C from the prior 3 months is unavailable, measuring the A1C in all patients with diabetes or hyperglycemia admitted to the hospital is recommended.

Clear communication with outpatient providers either directly or via hospital discharge summaries facilitates safe transitions to outpatient care. Providing information regarding the cause of hyperglycemia (or the plan for determining the cause), related complications and comorbidities, and recommended treatments can assist outpatient providers as they assume ongoing care.

The Agency for Healthcare Research and Quality (AHRQ) recommends that, at a minimum, discharge plans include the following (82):

Medication Reconciliation

- The patient's medications must be cross-checked to ensure that no chronic medications were stopped and to ensure the safety of new prescriptions.
- Prescriptions for new or changed medication should be filled and reviewed with the patient and family at or before discharge.

Structured Discharge Communication

- Information on medication changes, pending tests and studies, and follow-up needs must be accurately and promptly communicated to outpatient physicians.
- Discharge summaries should be transmitted to the primary care provider as soon as possible after discharge.
- Appointment-keeping behavior is enhanced when the inpatient team schedules outpatient medical follow-up prior to discharge.

It is recommended that the following areas of knowledge be reviewed and addressed prior to hospital discharge:

- Identification of the health care provider who will provide diabetes care after discharge.
- Level of understanding related to the diabetes diagnosis, self-monitoring of blood glucose, home blood glucose goals, and when to call the provider.
- Definition, recognition, treatment, and prevention of hyperglycemia and hypoglycemia.
- Information on making healthy food choices at home and referral to an outpatient registered dietitian nutritionist to guide individualization of meal plan, if needed.
- If relevant, when and how to take blood glucose–lowering medications, including insulin administration.

- Sick-day management.
- Proper use and disposal of needles and syringes.

It is important that patients be provided with appropriate durable medical equipment, medications, supplies (e.g., blood glucose test strips), and prescriptions along with appropriate education at the time of discharge in order to avoid a potentially dangerous hiatus in care.

PREVENTING ADMISSIONS AND READMISSIONS

Preventing Hypoglycemic Admissions in Older Adults

Insulin-treated patients 80 years of age or older are more than twice as likely to visit the emergency department and nearly five times as likely to be admitted for insulin-related hypoglycemia than those 45–64 years of age (83). However, older adults with type 2 diabetes in long-term care facilities taking either oral antihyperglycemic agents or basal insulin have similar glycemic control (84), suggesting that oral therapy may be used in place of insulin to lower the risk of hypoglycemia for some patients. In addition, many older adults with diabetes are overtreated (85), with half of those maintaining an A1C <7% (53 mmol/mol) being treated with insulin or a sulfonylurea, which are associated with hypoglycemia. To further lower the risk of hypoglycemia-related admissions in older adults, providers may, on an individual basis, relax A1C targets to 8% (64 mmol/mol) or 8.5% (69 mmol/mol) in patients with shortened life expectancies and significant comorbidities (refer to Section 12 "Older Adults" for detailed criteria).

Preventing Readmissions

In patients with diabetes, the hospital readmission rate is between 14 and 20% (86). Risk factors for readmission include lower socioeconomic status, certain racial/ethnic minority groups, comorbidities, urgent admission, and recent prior hospitalization (86). Of interest, 30% of patients with two or more hospital stays account for over 50% of hospitalizations and their accompanying hospital costs (87). While there is no standard to prevent readmissions, several successful strategies have been reported, including an intervention program targeting ketosis-prone patients with type 1 diabetes (88), initiating insulin treatment in patients with admission A1C >9% (75 mmol/mol) (89), and a transitional care model (90). For people with diabetic kidney disease, patient-centered medical home collaboratives may decrease risk-adjusted readmission rates (91).

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