

In Brief

On any given day, from 25 to 50% of all hospitalized patients meet criteria for a diagnosis of diabetes, prediabetes, or hyperglycemia. It is essential for all health care providers, including diabetes clinicians, to examine current processes to ensure the delivery of the highest quality care, with a focus on glucose control, improved outcomes, and patient safety from admission through discharge.

Addressing Glycemic Targets from Diagnosis to Discharge

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Diabetes, an ever-increasing nationwide epidemic, affects > 29 million Americans, with 21 million people diagnosed and another 8.1 million undiagnosed.¹ Of the 12.3% of the adult population with diabetes, the Centers for Disease Control and Prevention (CDC) estimates that one in four is unaware that they are living with diabetes.²

Increasing obesity rates have greatly contributed to the increase in the incidence of type 2 diabetes. This underpins the prediction that, unless significant lifestyle changes are undertaken, one in three Americans will have diabetes by 2050.¹ The children of today face the startling prediction that they will be the first generation to have shorter lifespans than their parents. These frightening calculations are based on the increasing rate of obesity and its contribution to the increasing number of type 2 diabetes diagnoses in young people.³

The more recent official classification of prediabetes has been used to create and implement new interventional treatment options for as many as 86 million additional Americans, many of whom also remain undiagnosed. These combined glucose abnormalities have led to increasing numbers of hospitalized patients in need of glucose management and coordination of additional resource allocations.¹

Diabetes Care in the Hospital

Diabetes is a common diagnosis; it was listed as either a primary or secondary

diagnosis in > 5.3 million hospital discharges in 2010.¹ In the largest review of hospital glucose data,⁴ 126 U.S. hospitals reported on 12 million glucose readings. Hyperglycemia (defined as blood glucose > 180 mg/dl) was reported in 45% of all blood glucose readings performed in the intensive care unit (ICU) and in 31% of all blood glucose readings taken outside of the ICU.⁴

In a study of hospital patient-days that defined hyperglycemia as > 180 mg/dl and hypoglycemia as < 70 mg/dl, hyperglycemia with or without a diagnosis of diabetes was noted to be present in 32.3% of all patient-days in critically ill and 32% of all patient-days in noncritically ill patients. Hypoglycemia, most often experienced in diagnosed patients treated with antidiabetic agents, was reported to have occurred in 6.7% of all patient-days in critically ill and in 5.7% of all patient-days in noncritically ill patients.⁵

More often than not, patients with diabetes or prediabetes are hospitalized for comorbid conditions that may involve critical care, extensive testing, infection control, and perhaps surgery. These cases are often complicated by the need to put additional resources toward the task of maintaining patients' glycemic targets. Specific targets have been developed to ensure improved outcomes across multiple complicating diagnoses. Hospitalized patients with hyperglycemia require special attention from various system-wide caregivers. A review of data

confirms the need for increased diligence focused on early identification and documentation of diabetes, along with mobilization of additional strategies aimed at preventing or delaying the short-term and subsequent long-term complications of the disease.⁴

Recognizing Hyperglycemia in Hospitalized Patients

Identifying and treating inpatients who present with hyperglycemia with or without diabetes is an important component of efforts to improve patient outcomes.⁴ Risks for poor outcomes may be greater in patients with no diagnosis of diabetes than in those with known diabetes when delayed treatment is the norm. A missed opportunity to recognize undiagnosed diabetes in a patient whose blood has already been drawn for laboratory testing is an omission of consequence.

The A1C test, now accepted as an additional diagnostic tool, is a relatively easy and inexpensive laboratory test. The small cost of this test becomes insignificant when compared to the adverse clinical consequences and much greater costs of unrecognized diabetes and poor glycemic control in the hospital setting.

Hyperglycemia is directly related to hospitalized patients' average length of stay. Even when a diabetes diagnosis has been made, patients with diabetes typically remain hospitalized an average of 1 day longer and have double the related costs of patients without diabetes.⁴ Seizing the opportunity hospitalization affords to diagnose and treat hyperglycemia and diabetes is key to improving patient care. In addition, the importance of providing this population with education on survival skills and lifestyle changes, along with the tools needed to help avoid unnecessary readmissions, cannot be overstated.

Guidelines and Monitoring of Inpatient Care in the Acute Care Setting

Reports from clinical trials have caused experts to reevaluate glucose targets for hospitalized patients. Despite differing viewpoints generated by various studies, most experts have concluded that hyperglycemia in hospitalized patients cannot be ignored and have agreed that specific assessment and individualized management guidelines are crucial to improving patient outcomes.⁶

The American Diabetes Association (ADA) and the American Association of Clinical Endocrinologists (AACE) joined together to publish a consensus statement providing guidelines for the attainment of inpatient glucose targets.⁴ In the most general terms, both organizations agree that hospitalized patients should have glucose levels maintained at < 180 mg/dl. It is important to note that glycemic targets have recently been adjusted to avoid potential patient harm. Specifically, regarding hypoglycemia in the intensive care setting, target values were increased based on a lack of scientific proof that lower values decrease morbidity and mortality. Also of importance, the previously recommended lower glucose targets for critical care units were proven in some studies to increase rates of hypoglycemia, which could prove disastrous.⁴

Definitions of Glucose Abnormalities in the Hospital Setting

Hyperglycemia in the hospital has been defined as any blood glucose level > 140 mg/dl. Levels that are significantly and persistently higher than this require additional evaluation and treatment. An A1C value > 6.5% in a previously undiagnosed patient suggests that diabetes preceded the admission. An A1C > 9% suggests an urgent need for evaluation, intervention, and new treatment strategies. Hypoglycemia is defined as a blood glucose level < 70 mg/dl.⁷

Glucose Considerations in Critical and Noncritical Care

In 2013, AACE developed an algorithm addressing multiple factors across patient populations for achieving A1C goals for patients with or without concurrent illnesses.⁷ For those without concurrent illnesses or high risk for hypoglycemia, this algorithm recommends an A1C target of ≤ 6.5%.

The 2014 ADA standards of care⁸ also made recommendations for specific populations regarding diabetes care and glucose control in the hospital setting. ADA's suggested goals for inpatient blood glucose management include:

- All patients with diabetes who are admitted to the hospital should have their diabetes clearly identified in the medical record
- All patients with diabetes should have an order for blood glucose

monitoring, with results available to all members of the health care team

- Blood glucose targets should include:
 - For critically ill patients, insulin therapy should be initiated for treatment of persistent hyperglycemia starting at a threshold no greater than 180 mg/dl. Once insulin therapy is started, a glucose range of 140–180 mg/dl is recommended for the majority of critically ill patients. More stringent goals, such as 110–140 mg/dl, may be appropriate for selected patients, as long as they can be achieved without significant hypoglycemia.
 - For noncritically ill patients, there is no clear evidence for specific blood glucose goals. For patients treated with insulin, targets of < 140 mg/dl premeal and < 180 mg/dl random are reasonable, provided they can be safely achieved. More stringent targets may be appropriate in stable patients with previous tight glycemic control. Less stringent targets may be appropriate in those with severe comorbidities.⁸

The 2014 ADA guidelines further state that scheduled subcutaneous insulin with basal, nutritional, and correction components should be given as the preferred method of maintaining glucose control in noncritically ill patients. These guidelines, as well as the recommendations from AACE, specifically caution clinicians to avoid the use of sliding-scale insulin (SSI) without background (basal) insulin also being given.^{7,8} SSI is noted to be a reactive approach to the treatment of glucose values by administering insulin, usually before meals and at bedtime, using preselected insulin doses matched to predetermined glucose ranges.⁹

Using the A1C in the Acute Care Setting

The A1C test is useful both for diagnostic purposes and for assessing recent glycemic control (over the past 60–90 days). The A1C criterion for diagnosing diabetes, according to the ADA, is a value ≥ 6.5%. For those already diagnosed with diabetes, the ADA suggests that a reasonable goal for nonpregnant adults would

be $\leq 7\%$. Providers may suggest more stringent A1C goals (such as $< 6.5\%$) for some patients, if they can be achieved without hypoglycemia or other adverse effects. On the other hand, less stringent A1C goals (such as $< 8\%$) may be appropriate for patients with advanced cardiovascular complications and those with a history of severe hypoglycemia, comorbid conditions, limited life expectancy, or longstanding diabetes, in which the general recommended goal is difficult to achieve. According to the ADA, prediabetes is determined by an A1C between 5.7 and 6.4%.⁸

During hospitalization, A1C can be used to:

- Diagnose diabetes in the inpatient setting
- Assess patients' recent glycemic management (within the past 60–90 days)
- Guide hospital care and management
- Assist with discharge planning, which includes safe transition to the next care provider
- Motivate patients to reach a better level of control
- Provide a safe and effective guide for assessing diabetes therapy after discharge⁷

Hospitalization presents an opportunity to address both longstanding and new educational deficits. This task is complicated by increased challenges related to the severe and often critical nature of the medical conditions leading to hospitalization. At admission, a diabetes education assessment based on the patient's knowledge of survival skills should be completed to identify and prioritize individual educational needs.

In addition to learning basic survival skills before discharge, it is essential for patients to understand how to interpret their A1C values and also the importance of sharing this information with their next care provider in the outpatient setting. Self-care education is a key component of the ADA standards of care⁸ and is important for improved glycemic control, diabetes prevention, avoidance or delay of short- and long-term complications, and prevention of avoidable readmissions.

Discharge planning should begin on the day of admission with a thorough assessment of patients' overall understanding of diabetes. This initial diabetes education assessment

should include determining whether patients understand their disease and checking their ability to perform self-management tasks. It is important to remember that diabetes discharge planning often takes on a multidisciplinary focus and is an essential part of the overall discharge plan.

Joint Commission certification standards for advanced inpatient diabetes care require an A1C on admission if results from a test performed within the past 60 days cannot be documented. These standards also require and stress the importance of giving patients their A1C test results in writing at discharge. This process increases the likelihood of continuity of care from the inpatient to the outpatient settings.

After discharge, it is crucial for the next care provider to receive not only the A1C value, but also a summary of the hospitalization, including history, physical findings, and laboratory and other test results.⁷ A copy of the educational assessment and educational plan and information regarding the patient's knowledge and ability to master survival skills is also important to share in follow-up, both for patients who are newly diagnosed and for those with an established diabetes diagnosis.

It is also crucial for glycemic control to be addressed in preparation for discharge by the prescribing physician. It is appropriate to discharge patients with an A1C $< 7\%$ on their home medications. For those who are admitted with an elevated A1C, adding another oral agent or basal insulin at discharge is recommended. For those with an A1C $> 10\%$, which is considered poor control, a basal-bolus insulin regimen is recommended for continuation at home.⁹ Patients who are hospitalized often are not treated by their primary care provider (PCP), so it is extremely important to communicate and confirm a follow-up appointment with the PCP before discharge.¹⁰

It is important for all health care professionals (HCPs) to have a clear understanding of the discharge disposition. The final transition of care occurs when patients are discharged to home and then seen by their PCP on the first follow-up clinic visit. Being able to provide the latest A1C result to the PCP helps to ensure better assessment of patients' status.¹¹

The High Cost of Diabetes Care

A 2012 analysis found that one in every five health care dollars was spent on the medical care of people with diabetes, and half of that was attributed to diabetes care specifically.¹² The most recent available data show diabetes care expenditures to be \$274 billion annually, with 43% of that, or \$174 billion, spent directly on hospital care. The cost of hospitalization for patients with diabetes is reported to be 2.3 times greater than the cost of care for the age-matched population without diabetes.¹ Focusing on glucose management during hospitalization is more than a cost-saving tactical necessity; it is crucial to increasing and protecting patient safety.

The rates of morbidity and mortality for this population are more than two times higher than for the general population, representing a real, ongoing, and untold price paid by people with this disease.¹² Hospital death rates for the acute occurrence of undiagnosed diabetes or emergencies associated with acute complications such as diabetic ketoacidosis (DKA), hyperosmolar coma, and episodic hypoglycemia emphasize the need for increased focus on glucose management, not only throughout the daily life of these patients, but also, specifically, throughout the course of their hospital care.

Addressing glucose management throughout the health care continuum and avoiding emergent and complicating events makes sense regardless of who ultimately pays the bill. When dollars are assigned to the effects of not diagnosing, treating, and educating this population before, during, and after hospitalization, we can appreciate more completely the costs of these missed opportunities for improved patient care.

Penalties for Glycemia-Related Health Care–Acquired Conditions

Starting in fiscal year 2015, Medicare is scheduled to reduce payments for all diagnosis-related groups by 1% to hospitals with top-quartile health care–acquired condition (HAC) rates.¹³ Some of these conditions are tied directly to diabetes management, including manifestations of poor glycemic control such as DKA and hypoglycemia. Other HAC categories are indirectly tied to diabetes, including falls and trauma, surgical site infections, and pressure ulcers, all

of which can increase the likelihood of negative outcomes during diabetes patients' course of care. Considering the issues of patient safety, quality of care, HACs, coexisting core measure disease states,¹⁴ readmission rates, and patient satisfaction that affect the care of this high-risk population, it becomes apparent that a heightened focus on and system-wide evaluation of inpatient diabetes care is warranted.

Controlling Postoperative Glucose in Cardiac Surgery Patients

According to the American Heart Association, patients with diabetes are two to four times more likely to have heart disease.³ For hyperglycemic patients who undergo bypass surgery for heart disease, the Joint Commission, in a renewed effort to ensure improved outcomes, has defined glucose goals that must be attained at specific points in the course of hospital care. Hospitals not reaching these goals will face potential financial penalties.

Under the Joint Commission Surgical Care Improvement Project (SCIP) guidelines for care of coronary artery bypass graft (CABG) patients, hospitals also face the possibility of public censure for poor glycemic control and the real and significant possibility of financial penalties and nonpayment by Medicare for patients with blood glucose levels falling outside of the glucose targets.¹⁵ This situation demonstrates that patient outcomes and financial goals are increasingly aligned in support of patients reaching and maintaining established glucose targets. A payment structure based on expected glucose targets brings the need for improved diabetes care to the attention of most hospital administrators in a very concrete manner.

In January 2014, multiple revisions were made to the SCIP standards. The collection timeframe for evaluating blood glucose levels was changed to 18–24 hours after anesthesia end time. The blood glucose target of ≤ 200 mg/dl was changed to a goal of ≤ 180 mg/dl.¹⁵ These glycemic levels are monitored closely and reported monthly or quarterly in an effort to improve outcomes. This close monitoring is more than warranted given that morbidity and mortality rates have been reported to be more than double when blood glucose levels are not controlled within specific targeted goals.³ Achieving

glucose targets is recognized as a top priority and quality measure in support of patient safety.

Readmission Concerns

The recently enacted Medicare payment penalty for excessive 30-day readmission rates puts increasing emphasis on the necessity of paying close attention to inpatient glucose levels and to patients' ability to self-manage their diabetes after discharge. HCPs who work with diabetes patients realize that patients with uncontrolled diabetes and those who are uneducated about self-management will be at a higher risk for repeat admissions.¹⁶ Medicare readmission penalties do not directly target the diagnosis of diabetes. However, the conditions being monitored, including heart attack, heart failure, pneumonia, and CABG procedures, are known to affect diabetes patients at disproportionately higher rates. According to the CDC, patients who have diabetes are most likely to die from heart disease and three times as likely to die from pneumonia or influenza as patients without diabetes.¹⁶

Although efforts to manage care of patients with diabetes from admission through discharge are often associated with increased resource allocation and costs, these efforts can be considered worthwhile in terms of preventing in-hospital complications and readmissions and, ultimately, improving the quality of care. Hospitals that include discharge and outpatient transition planning as a routine part of inpatient care may achieve a decrease in readmission rates.¹⁶

Refocusing on Glycemic Targets

Although patients with diabetes comprise a large percentage of a hospital's daily patient population, diabetes has not always been the primary focus of attention for most facilities, nor is it specifically addressed as a disease process in the Joint Commission's Core Measures, which identify specific diseases that receive increased attention upon admission.¹⁴ However, those who care for patients with diabetes note that diabetes is often a complicating factor within the set of Core Measure disease processes that are being monitored closely by hospital systems accredited by the Joint Commission. To those at the bedside, it is apparent that patients with diabetes move across various Core Measure

populations, including those admitted for acute myocardial infarction, heart failure, CABG, and pneumonia. With the addition of glucose concerns and possible complicating factors, diabetes often complicates the course of care for patients with those Core Measure conditions. Within those closely scrutinized conditions, more successful outcomes, along with greater reductions in lengths of stay, reduced resource utilization, and increased cost savings, are recognized as being closely tied to the identification and control of hyperglycemia in all patients within the hospital setting.¹²

With the implementation of the Affordable Care Act, payment for improved outcomes is on schedule to become more often the norm than the exception.¹⁷ Given new data, reporting systems, and potential penalties for not maintaining expected glucose control, hospitals are paying more attention to the business of diabetes care. Current glucose management recommendations provide the rationale and new, system-wide monitoring opportunities to support an increased focus on diabetes by hospital officials and administrators, perhaps including areas in which glucose management was previously overlooked.

Review of Guidelines and Standards of Care

The ADA's annually updated standards of care⁸ help guide HCPs in their attempts to provide the best diabetes care while maximizing patient safety. The Joint Commission certification for advanced inpatient diabetes care requirements provide direction for in-hospital evaluation and coordination of quality initiatives to be carried out by multidisciplinary teams across hospital departments.¹¹

Diabetes clinicians are most likely to be aware of the ADA standards of care and are usually the most qualified individuals to assist in quality improvement efforts. Multidisciplinary teams are encouraged to focus on system-wide quality improvement issues.¹¹ Most hospitals' diabetes committees address protocol development, teaching exercises, and the role of multiple departments in coordinating and evaluating various factors to enhance, validate, and improve inpatient glucose management. Physicians should be reminded to conduct a complete medical evaluation of patients to 1) diagnose and

classify diabetes; 2) document diabetes complications; 3) review previous treatment, risk factors, and glucose control in those with known diabetes; 4) formulate a treatment plan; and 5) provide a basis for continuity of care.⁵

Patients benefit when hospitals focus on maintaining glucose targets for inpatients and utilize A1C results to empower patients and guide therapy during and after hospitalization. When hyperglycemia management is championed from admission through discharge, patients are more likely to experience improved outcomes and increased patient satisfaction, and hospitals are more likely to achieve substantial cost savings.⁹

It has been 21 years since the diabetes community was able to announce that “metabolic control matters.”¹⁸ The ongoing challenge has been to address patients’ needs in real time by mobilizing multidisciplinary teams of specially trained professionals to evaluate and intervene in patients’ current disease processes as each patient presents for care. For a variety of reasons, the current focus in the care of hospitalized patients with diabetes, from admission to discharge and beyond, needs to be, “Metabolic control *must* matter.”

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Additional Readings

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