

**DIABETES MELLITUS**

Diabetes mellitus is a disease characterized by abnormal insulin production or disordered glucose metabolism and is a co-morbid condition of many hospitalized patients. Diabetic ketoacidosis (DKA) and hyperglycemia hyperosmolar state (HHS) are extreme presentations of diabetes mellitus that require hospitalization. There were 577,000 hospital discharges for diabetes mellitus in 2002, according to the American Heart Association. The prevalence of physician-diagnosed diabetes mellitus was 13.9 million or 6.7 percent of the United States population. Another 5.9 million Americans are believed to have undiagnosed diabetes mellitus. The Healthcare Cost and Utilization Project (HCUP) reports an average length-of-stay of 4.1 days and mean charges of \$11,761 per patient for the Diagnosis Related Group (DRG) for Diabetes Mellitus. The estimated economic cost of diabetes in 2002 was \$132 billion, of which \$92 billion was direct medical costs. Hospitalists care for diabetic patients and optimize glycemic control in the hospital setting. They stabilize and treat DKA and HHS. The inpatient setting provides an opportunity to institute therapies to slow disease progression, prevent disease complications, and provide diabetic education to improve quality of life and limit complications leading to readmission. Hospitalists use evidence based approaches to optimize care and lead multidisciplinary teams to develop institutional guidelines or care pathways to optimize glycemic control.

**KNOWLEDGE**

*Hospitalists should be able to:*

- Define diabetes mellitus and explain the pathophysiologic processes that can lead to hyperglycemia, DKA and HHS.
- Describe the impact of hyperglycemia on immune function and wound healing.
- Describe the effect of DKA and HHS on intravascular volume status, electrolytes and acid-base balance.
- Describe the clinical presentation and laboratory findings of DKA and HHS.
- Describe the indicated tests to evaluate and diagnose DKA and HHS.
- Explain physiologic stressors and medications that adversely impact glycemic control.
- Explain the precipitating factors of DKA and HHS.
- Identify the goals of glycemic control in hospitalized patients in various settings, including critically ill and surgical patients, and cite supporting evidence.
- Explain indications, contraindications and mechanisms of action of pharmacologic agents used to treat diabetes mellitus.
- Explain the rationale of strict glycemic control and its effects on morbidity and mortality in hospitalized patients.
- Recognize factors that indicate severity of disease in patients with DKA or HHS.
- Explain goals for hospital discharge, including specific measures of clinical stability for safe care transition.

**SKILLS**

*Hospitalists should be able to:*

- Elicit a thorough and relevant history, and review the medical record to identify symptoms suggestive of acute co-morbid illness that can impact glycemic control.
- Estimate the level of outpatient glycemic control, adherence to medication regimen, and social influences that may impact glycemic control.
- Perform a comprehensive physical examination to identify possible precipitants of hyperglycemia, DKA or HHS.
- Identify precipitating factors for DKA and HHS, including infection, myocardial ischemia, and adherence to medication regimen.
- Select and interpret indicated studies in patients suspected of having DKA or HHS, including electrolytes, beta-hydroxybutyrate, urinalysis, venous pH, and electrocardiogram.
- Recognize the indications for managing DKA and HHS in an intensive care unit.
- Select appropriate insulin therapies, initiate fluid resuscitation, and manage the electrolyte disturbances caused by DKA and HHS.
- Adjust medications to achieve optimal glycemic control and minimize side effects.

- Assess caloric and nutritional needs and order appropriate diabetic diet.
- Recognize and address neuropathic pain.
- Anticipate and manage the presence of ongoing metabolic derangements associated with DKA and HHS.
- Develop an individualized diabetic regimen to achieve optimal glycemic control and prevent the development of complications from diabetes mellitus, including during the perioperative period.

## ATTITUDES

*Hospitalists should be able to:*

- Communicate with patients and families to explain the history and prognosis of diabetes mellitus.
- Communicate with patients and families to explain potential long-term complications of diabetes mellitus and prevention strategies, including foot and eye care.
- Communicate with patients and families to explain goals of care plan, discharge instructions and management after release from the hospital.
- Communicate with patients and families to explain the importance of and factors affecting glycemic control, such as adherence to medical regimens and self-monitoring, following dietary and exercise recommendations, and complying with routine follow-up appointments.
- Communicate with patients and families to explain the potential side effects or adverse interactions of diabetes medications, including hypoglycemia.
- Recognize indications for early specialty consultation, which may include endocrinology and nutrition.
- Employ a multidisciplinary approach, which may include nursing, nutrition and social services and a diabetes educator, to the care of patients with diabetes that begins at admission and continues through all care transitions.
- Document treatment plan and discharge instructions, and communicate with the outpatient clinician responsible for follow-up, including the need for continued nutrition and diabetic counseling.
- Facilitate discharge planning early in the admission process.
- Recommend appropriate post-discharge care, which may include endocrinology, ophthalmology, and podiatry.
- Utilize evidence based recommendation in the treatment of inpatients with diabetes mellitus.

## SYSTEM ORGANIZATION AND IMPROVEMENT

*To improve efficiency and quality within their organizations, Hospitalists should:*

- Implement systems to ensure hospital-wide adherence to national standards (American Diabetes Association and others), and document those measures as specified by recognized organizations.
- Lead, coordinate or participate in efforts to develop guidelines and protocols that standardize assessment and aggressive treatment of DKA and HHS.
- Lead, coordinate or participate in efforts to develop guidelines and/or protocols to optimize glycemic control in hospitalized patients, including intensive regimens in critically ill medical and surgical patients.
- Lead, coordinate or participate in multidisciplinary teams, which may include nursing, nutrition and endocrinology, to promote quality and cost-effective diabetes management.