It is difficult to overstate the importance of diabetes mellitus in terms of public health in the United States. Although the subject of this article is emergencies in diabetes mellitus (ie, diabetic ketoacidosis [DKA], hyperglycemic hyperosmolar nonketotic syndrome, hypoglycemia, acute coronary syndrome and soft-tissue infections), physicians need to keep in mind that long-term complications of diabetes mellitus are equally important. These long-term complications include disorders of lipid metabolism, the microvasculature, and the cardiac, visual, renal and nervous systems.
40% in the mid-1900s to approximately 5% today. However, cerebral edema, a relatively rare complication of DKA that is encountered most often in adolescents, still carries a high mortality rate, between 21% and 25%.

Hyperglycemic hyperosmolar syndrome
Hyperglycemic hyperosmolar nonketotic syndrome (also known as hyperglycemic hyperosmolar nonketotic coma) is a syndrome that occurs mainly in patients with type 2 diabetes mellitus (T2DM). Precipitating causes of this syndrome are similar to causes of DKA, as are some of the symptoms (eg, hyperglycemia, dehydration). However, because patients with hyperglycemic hyperosmolar nonketotic syndrome usually produce sufficient insulin, ketoacidosis is not a prominent feature of the syndrome.

Diabetic ketoacidosis
Diabetic ketoacidosis, which occurs mainly in patients with type 1 diabetes mellitus (T1DM), is a syndrome in which a paucity of insulin and an excess of glucagon combine to produce a deranged metabolic state characterized by hyperglycemia, metabolic acidosis, dehydration and electrolyte imbalance.

Most commonly, DKA results from patient noncompliance with insulin regimens, particularly among adolescent patients. Diabetic ketoacidosis may also be the initial presentation in an individual who has newly diagnosed diabetes mellitus, though concurrent illness or physical or emotional stress may represent the underlying cause in such a case.

Symptoms of patients with DKA are attributed most frequently to the effects of dehydration, which are often profound, and also to metabolic acidosis. Fluid losses resulting from osmotic diuresis lead to tachycardia, hypotension and confusion. Frank shock may ensue if intervention is delayed. Ketoacidosis leads to vomiting and electrolyte disturbances, as well as to a depressed mental state, which further exacerbates the patient’s symptoms.

The treatment of patients with DKA is based on two fundamental principles: replacement of intravascular volume with isotonic fluid and cessation of ketosis via insulin administration. Nevertheless, in all but the mildest cases, intensive care is required because of the rapid changes in glucose level, fluid balance, and electrolyte level (particularly that of potassium) that take place during therapy. With intensive care and meticulous monitoring, most patients with DKA completely recover. Mortality has been reduced from a rate of almost 40% in the mid-1900s to approximately 5% today. However, cerebral edema, a relatively rare complication of DKA that is encountered most often in adolescents, still carries a high mortality rate, between 21% and 25%.
Patients in the early stages of hyperglycemic hyperosmolar nonketotic syndrome who report only increased thirst and urination without complicating features can typically be treated on an outpatient basis. Patients who are in the later stages of the syndrome may present with profound dehydration, often accompanied by a depressed mental state, confusion, or even frank coma. Such patients should be treated in an inpatient setting and often require intensive care to effectively manage the hyperosmolar state.2

Hypoglycemia
Several metabolic factors may precipitate a decrease in blood sugar levels in patients with diabetes mellitus. Given the current goal of precise control of glucose levels, such decreases may lead to symptomatic hypoglycemia. Patients with T1DM are more likely to experience hypoglycemic events than are those with T2DM, because patients with T1DM have inadequate counterregulatory hormonal responses, involving epinephrine and glucagon. Patients with symptomatic hypoglycemia may experience or present with conditions ranging from tachycardia and diaphoresis to confusion, syncope and frank coma.2

Hypoglycemia may be caused by skipping meals, by an acute illness, by misuse of diabetic medications, or by use of concurrent medications. For example, β-blockers may contribute to hypoglycemia through inhibition of both glycogenolysis and pancreatic release of glucagon. In addition, β-blockers may mask the tachycardic response normally associated with hypoglycemia.2

Several factors influence the treatment of patients with hypoglycemia. Many patients choose to treat themselves with glucose-containing solids or liquids without seeking professional medical care. In many cases, physicians may deem it desirable to instruct patients in the recognition and self-management of milder episodes of hypoglycemia. Patients who are more symptomatic may need intravenous dextrose to reverse the effects of hypoglycemia. Those patients who become hypoglycemic from concurrent illnesses may prove to be profoundly ill and/or septic and, thus, will require hospitalization. Patients requiring hospitalization for hypoglycemia may also include those with T2DM who are using long-acting sulfonylureas. Such patients are prone to have rebound hypoglycemia after initial correction of their serum glucose levels.8

Acute coronary syndrome
The acute coronary syndrome, ranging from acute myocardial ischemia to myocardial infarction, is a common complication of diabetes mellitus. Mortality rates from myocardial infarction among patients with diabetes mellitus are as much as double those of patients without diabetes mellitus.2 However, because of the effects of ischemic neuropathy associated with diabetes mellitus, patients’ perceptions of pain may be reduced—so much so that pain normally associated with acute coronary syndrome may be completely absent. This phenomenon is known as silent myocardial infarction.

Most patients with diabetes mellitus who have coronary artery ischemia will manifest symptoms, including shortness of breath, nausea and/or vomiting, abdominal discomfort, or a general feeling of weakness or malaise.9 Therefore, physicians must maintain a high index of suspicion for acute coronary syndrome when caring for patients with diabetes mellitus who complain of symptoms that may not be immediately referable to coronary artery ischemia. If the physician believes that the presentation could be that of active ischemia, the patient should be referred or transported to the nearest emergency department for monitoring and further testing.

Soft-tissue infections
Soft-tissue infections—commonly occurring in, but not limited to, tissues of the foot—are a much-feared complication among patients who have diabetes mellitus. Such infections can
lead to limb-threatening and life-threatening complications. Infections associated with diabetes mellitus can be classified as mild, moderate, or severe, the latter category representing threats to life and limb. The following severe complications of a wound infection should be considered medical emergencies in individuals with diabetes mellitus, necessitating immediate hospitalization and multidisciplinary treatment:

- rapidly progressive or deep-tissue infection
- tissue necrosis or gangrene
- systemic toxicity or metabolic instability
- evidence of limb ischemia

Patients with the complication of osteomyelitis also merit hospitalization, though this condition is less of an immediate threat than the previously mentioned complications. In addition, hospitalization should be considered for patients with diabetes mellitus and soft-tissue infections who are unable to care for themselves.

A particularly serious soft-tissue infection encountered in patients with diabetes mellitus is necrotizing fasciitis. Pathogens causing this potentially lethal infection include group A β-hemolytic Streptococcus, Escherichia coli, Bacteroides fragilis, and Clostridia species. Necrotizing fasciitis originates in the soft tissues and then spreads rapidly along fascial planes. A patient may present with severely painful edema and erythema of the involved body part, and the physician caring for the patient may observe the disease progress in a matter of hours to the development of bullae and palpable crepitus. The extremities or the abdominal wall represent possible areas of origin of necrotizing fasciitis. In its most dramatic form, necrotizing fasciitis affects the perineum and is known as Fournier's gangrene.

Patients with necrotizing fasciitis mandate immediate surgical consultation for extensive debridement, as well as immediate treatment with antibiotics against gram-positive, gram-negative, and anaerobic species. Unfortunately, even when these measures are promptly undertaken, mortality among these patients is high.

**Final notes**

Diabetes mellitus has profound effects on the well-being of patients. Many of these effects are chronic or insidious. However, a number of acute effects constitute true medical emergencies for patients with diabetes mellitus. These emergencies include diabetic ketoacidosis, hyperglycemic hyperosmolar nonketotic syndrome, hypoglycemia, acute coronary syndrome and soft-tissue infections. Physicians must recognize these medical emergencies and institute rapid treatment measures in order to restore their patients’ health and to limit morbidity and mortality.

**References**


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