

1.11 DIABETES MELLITUS

Introduction

Diabetes mellitus, a disorder of glucose homeostasis, is increasing in incidence and prevalence in pediatrics. Although there has been a significant rise in the incidence of type 2 diabetes, particularly among adolescents in high-risk ethnic groups, type 1 diabetes is still the most common form of diabetes in the pediatric and adolescent populations. The increase in obesity in the general population and the propensity of adolescents with type 2 diabetes to develop ketosis has resulted in phenotypic overlap in the pediatric patient presenting with a new diagnosis. In addition to the medical complications associated with these chronic conditions, both forms of diabetes have profound social and emotional impacts on the child. Pediatric hospitalists frequently encounter both children with new-onset diabetes and children previously diagnosed who may require hospitalization because of a diabetes related complication, an unrelated condition, or an elective procedure. Pediatric hospitalists are often positioned to provide both immediate care for children with diabetes as well as to coordinate care across multiple specialties when indicated.

Knowledge

Pediatric hospitalists should be able to:

- Compare and contrast the epidemiology and pathophysiology of type 1 and type 2 diabetes, attending to differences in family history, impairment of glucose regulation, and occurrence of ketoacidosis.
- Discuss the potential short and long-term complications of poor glucose control, including end-organ damage, and describe methods to assess for these complications.
- Describe common comorbidities and polyendocrinopathies associated with type 1 and type 2 diabetes.
- Describe the role of obesity in metabolic syndrome and type 2 diabetes.
- List other common causes of hyperglycemia, such as stress, drug, or steroid-induced hyperglycemia and indicate when insulin administration is needed.
- Explain the critical role of glucose homeostasis for patients admitted for reasons unrelated to their diagnosis of diabetes.
- List and interpret the laboratory tests, including islet autoantibodies and hemoglobin A1c, used to classify diabetes type and assess glycemic control.
- List the type and appropriate timing of screening tests for complications and co-morbidities of both type 1 and type 2 diabetes.
- Describe the different formulations of insulin and the different systems for insulin delivery and glucose monitoring.
- Describe the expected patterns of post-prandial glucose excursion in patients with diabetes and identify when a change in management is needed based on these patterns.
- Compare and contrast the role of nutrition in the management of type 1 versus type 2 diabetes.
- Review the principles of carbohydrate counting.
- Compare and contrast glucose monitoring, dietary recom-

mendations, insulin dosing, and glucose targets between populations (such as type 1, type 2, cystic fibrosis related diabetes, and others).

- Define diabetic ketoacidosis (DKA) and describe its initial management, attending to fluid delivery, electrolyte and acid-base monitoring, mental status assessments, and appropriate patient placement based on local context.
- Discuss potential complications that may result from treatment of diabetes and DKA, including hypoglycemia and electrolyte imbalances.
- Summarize the approach toward management and education after stabilization of DKA.
- Describe criteria for hospital discharge, including specific measures of clinical improvement, education for patients and the family/caregivers, and establishment of a coordinated longitudinal care plan.

Skills

Pediatric hospitalists should be able to:

- Diagnose diabetes and its complications by efficiently performing a history and physical examination, determining if the patient meets diagnostic criteria.
- Identify and treat underlying causes of increased insulin demand that may lead to DKA in the patient with known diabetes.
- Order appropriate diagnostic testing for patients with new onset diabetes, diabetes exacerbations, or secondary causes of hyperglycemia.
- Order insulin doses and delivery systems (such as intravenous infusion, subcutaneous injection, and others) and other classes of drugs used in the treatment of diabetes.
- Identify and manage both hyperglycemia and hypoglycemia with attention to complications that may arise during treatment.
- Identify changes in clinical status related to severe acidosis and fluid and electrolyte disturbances and promptly initiate appropriate actions, including transfer to a higher level of care when indicated.
- Obtain prompt consultation with an endocrinologist or other subspecialist as appropriate.
- Utilize available support services, such as a certified diabetes educator, social worker, child life specialist, registered dietitian, and others, to ensure a comprehensive approach to management.
- Coordinate care and education for patients and the family/caregivers with other healthcare providers.
- Coordinate care with subspecialists and the primary care provider and arrange an appropriate transition plan for hospital discharge.

Attitudes

Pediatric hospitalists should be able to:

- Realize the importance of effective communication and culturally responsive care when creating a diabetes management plan, maintaining awareness of the unique needs of various groups.

- Recognize that acute and chronic psychosocial factors that impact the ability of patients and the family/caregivers to manage diabetes appropriately.
- Recognize the importance of the multidisciplinary team approach in the management of diabetes in children, including involvement of the primary care provider, endocrinologist, diabetes educator, dietitian, social worker, psychologist, child life specialist, and school representative.
- Acknowledge the value of collaboration with subspecialists and the primary care provider to ensure coordinated longitudinal care for children with diabetes.
- Maintain awareness of local populations and their risk factors for diabetes.

Systems Organization and Improvement

In order to improve efficiency and quality within their organizations, pediatric hospitalists should:

- Lead, coordinate, or participate in the development and implementation of cost-effective, safe, evidence-based care pathways to standardize the evaluation and management

for hospitalized children with diabetes.

- Work with hospital administration, hospital staff, subspecialists, and community organizations to effect system-wide processes to improve the transition of care from hospital to the ambulatory setting.
- Lead, coordinate, or participate in system-wide processes within the hospital to promote therapeutic safety and vigilance in the use of hypoglycemic agents.
- Lead, coordinate, or participate in educational events to promote awareness of and familiarity with national guidelines for management strategies, new therapeutic and pharmacologic agents, and the use of medical devices to improve and monitor glucose homeostasis.

References

1. American Diabetes Association. Children and Adolescents: Standards of Medical Care in Diabetes - 2019. *Diabetes Care*.2019;42(Supplement 1):S148-S164. <https://doi.org/10.2337/dc19-S013>.
2. Rosenbloom AL. The management of diabetic ketoacidosis in children. *Diabetes Ther*. 2010;1(2):103-120. <https://doi.org/10.1007/s13300-010-0008-2>.