Needs assessment and gap analysis

Diabetes and Obesity

Obesity and diabetes are growing problems in the U.S., particularly among young people. Diabetes is a disease in which the body does not produce or properly use insulin. Insulin is a hormone that is needed to convert sugar, starches and other food into energy needed for daily life. The cause of diabetes continues to be a mystery, although both genetics and environmental factors such as obesity and lack of exercise appear to play roles.

There are 20.8 million children and adults in the United States, or 7% of the population, who have diabetes. While an estimated 14.6 million have been diagnosed with diabetes, unfortunately, 6.2 million people (or nearly one-third) are unaware that they have the disease.

Over the past three decades, the childhood obesity rate has more than doubled for preschool children aged 2-5 years and adolescents aged 12-19 years, and it has more than tripled for children aged 6-11 years. At present, approximately nine million children over 6 years of age are considered obese. Obese children and adolescents are reported to be 12.6 times more likely than non-obese to have high fasting blood insulin levels, a risk factor for type 2 diabetes. The parallel increase of obesity in children and adolescents is reported to be the most significant factor for the rise in Type 2 diabetes.

There has been an explosion of new technologies for treatment of type 1 diabetes in the last 2-3 years, including insulin pumps and continuous glucose monitors, and many practicing pediatric endocrinologists do not have adequate knowledge of the nuances of using such devices. In addition, there have been several manuscripts published on monogenic and neonatal diabetes, but clinicians may not be aware of the appropriate use of screening tests for these conditions or the options for treatment.

New classes of medications are always being added to fight Type 2 Diabetes. Some can lower the amount of glucose produced in the liver, increase the uptake of glucose by the muscles, and decrease the body's resistance to insulin.

Pediatric endocrinologists are increasingly asked to evaluate and treat overweight children. There are many medications that have been studied for childhood obesity and more and more centers are developing bariatric surgery programs for children. Practitioners need to be familiar with the latest data on the use of these therapies.

Hyperlipidemia

Hyperlipidemia is an elevation of lipids (fats) in the bloodstream. These lipids include cholesterol, cholesterol esters (compounds), phospholipids and triglycerides. They're transported in the blood as part of large molecules called lipoproteins.

Hyperlipidemia in children is different from the high cholesterol that adults have which is primarily caused by inherited risk factors and a diet too high in fat. It is also referred to as familial hyperlipidemia because it is passed from parent to child. In a very few cases, given the increasing trend toward obesity among children, it is possible to see cases of hyperlipidemia caused by poor diet. Hyperlipidemia can also be caused in some cases by drugs given to treat non-cardiac conditions.
About 1 in 500 children have the defective gene responsible for hyperlipidemia that causes extremely high cholesterol or high triglycerides, another type of lipid. Those who inherit the defective gene from each parent are at even higher risk for heart problems. It is a rare condition. When managed properly with an appropriate treatment approach, children with hyperlipidemia should be able to avoid major heart problems later in life. For some, diet will be enough, and for others medication will be needed. Children at especially high risk (who have defective genes from each parent) will need specialized care to prevent atherosclerosis.

Furthermore, coincident with the rise in the prevalence of childhood obesity, pediatric endocrinologists are often asked to evaluate and treat lipid disorders, but there is rarely any specific training during fellowship or beyond. Therefore, clinicians need to be familiar with medications available and indications for use in pediatric hypercholesterolemia

**Growth and Puberty**
Fetal growth restriction is associated with an increased risk of developing insulin resistance and type 2 diabetes in adulthood. Regulation of growth is a complex process involving interaction of a wide variety of systems. The growth hormone and insulin like growth factors (GH-IGF) axis plays a vital role in the regulation of growth. Initially considered to be mediators of GH action, insulin like growth factors have been found to be independent endocrine factors influencing a wide array of biological processes.

Biosynthetic human growth hormone (GH) is now used to treat GH deficiency and promote growth in conditions such as Turner syndrome, intrauterine growth restriction, chronic renal failure and idiopathic short stature. The net effect in these conditions is less than in GH deficiency. Vigilance for long-term complications of GH use is essential.

New agents for treatment of common pediatric endocrine conditions, such as recombinant IGF-1 (for short stature) and histrelin (for precocious puberty), have increased the number of options available to clinicians for therapy. However, practitioners need updates on the latest data for such treatments in order to properly use these drugs in practice.

Additionally, it is now more commonly recognized that children who have been treated for cancer or who have sustained traumatic brain injury are at risk for endocrinopathies. However, the precise risk and optimal frequency of screening is not well known to practicing pediatric endocrinologists.

**Childhood osteoporosis**
New techniques are available for the diagnosis of osteoporosis in children, such as quantitative CT (QCT), and differences exist in the reference data between different DXA scanners (the current most popular choice for screening). Thus, practitioners need to be aware of limitations of using DXA, as well as the advantages and disadvantages of newer techniques for assessing bone density in children.
CAH
Congenital Adrenal Hyperplasia (CAH) is caused by a missing enzyme needed for the body to function properly causing overproduction of male hormones. CAH refers to a set of inherited disorders that occurs in both males and females as a result of the excess production of male hormones. The most common type of CAH results from low production of an enzyme of the adrenal gland called 21-hydroxylase. Both classical and non-classical forms are "congenital" which means there is an abnormality in the genes that cause CAH, and people are born with it. The classic form initiates while the baby is still forming in the womb, and its symptoms are present in the newborn, while the non-classical form is often referred to as "late-onset" CAH because it presents later in infancy, or it can even surface in adulthood.

Most forms of congenital adrenal hyperplasia are usually treated by use of medication. Prenatal therapy with a synthetic hormone called dexamethasone throughout pregnancy can allow proper development of the external genitalia in female fetuses. Affected girls are then born with normal external genitalia and do not require corrective surgery.

Hydrocortisone divided into three daily doses has long been the preferred treatment for children with CAH who are still growing. Although adults with CAH can be successfully managed with a single bedtime dose of a long-acting synthetic glucocorticoid, there are concerns that the high potency and long duration of action of these agents could increase the risk of over treatment and consequent growth suppression in children. Despite this potential risk, children with CAH are often treated with long-acting synthetic glucocorticoids. Nonetheless, studies to determine whether children treated with dexamethasone or prednisone can achieve normal growth have reported contradictory findings.

Objectives

- Identify the recent technological advancements in the management of type 1 diabetes.
- Recognize the appropriate use of new technologies in diabetes care.
- Differentiate the options and appropriate use of medications for pediatric obesity.
- Implement strategies in clinical practice for treating pediatric patients who are overweight or obese.
- Determine which patients will benefit from available CAH treatments.
- Integrate the appropriate use of growth hormone for various diagnoses.
- Evaluate which patient will benefit from psychological intervention.
- Recommend screening and management of monogenic/neonatal diabetes.
- Distinguish the appropriate work up for pediatric thyroid nodules.
- Assess endocrine risks in children who have been treated for cancer.
- Incorporate into their professional practice new treatment strategies for various endocrine problems such as hypocalcemia, hypopituitarism, hypocorticolism and short statute found in the pediatric population.
- Define the limitations of using DXA, as well as the advantages and disadvantages of newer techniques for assessing bone density in children.