Goals and Objectives for sub-specialty training in Pediatric Endocrinology

The field of Pediatric Endocrinology encompasses a broad array of endocrine disorders of infants, children, and adolescents. The intent of the Pediatric Endocrinology fellowship program is to train pediatricians in the prevention, diagnosis, and management of endocrine disorders so as to provide comprehensive, compassionate care for infants, children, and adolescents. Our training program is unique and diverse; though holds to a common goal to provide future academic pediatricians with a foundation to become competent clinicians, researchers, and teachers. To achieve this, our training programs hold to the following objectives:

- To provide the clinical experiences and educational opportunities necessary to build a solid foundation of medical knowledge, critical thinking abilities, literature review, diagnostic acumen and technical skills.

- To provide academic pediatricians the research training and experience to develop careers as physician –scientists.

- To train well-rounded, empathetic clinicians to develop skills in communication and counseling with patients and families.

- To impart to our fellows a sense of responsibility to act as advocates for the health of children and families within our society.

- To expose our fellows to the concept of multi-institutional collaborative research as exemplified by the pediatric endocrinology cooperative groups and encourage them to become active members of the profession's national societies.

- To prepare future pediatric Endocrinologists for the changes taking place within our health care system including managed care, and limitations on resource utilization.

- To create pediatric Endocrinologists able to practice the culturally competent medical care necessary in our increasingly diverse population.

- To teach professionalism by mentorship, validating the critical roles of personal ethics, responsibility, respect, compassion, communication, and self-awareness.

- To provide our training in an environment of respect and support, recognizing that fellowship training is a difficult and challenging time in one's life.
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<u>Core Curriculum</u>

In designing the clinical objectives for training, we had adhered to the criterion of the American Board of Pediatrics for board certification and the American Council of Graduate Medical Education for training in pediatric sub-specialties.

Patient Care: Acquire an understanding and appreciation for the care of infants, children, and adolescents with endocrine disorders. Develop the necessary skills for good patient care.

Objective: Obtain appropriate history and physical exam for patients referred with the following endocrine conditions. Order appropriate laboratory tests and formulate a treatment plan based on the diagnosis.

Goal: Develop skills in endocrine specific areas of the physical exam.

- Short stature, including constitutional delay.
- Disorders of anterior pituitary hormone physiology, including growth hormone deficiency.
- Disorders of posterior pituitary hormone physiology, including diabetes insipidus.
- Disorders of hypothalamic hormonal regulation.
- Disorders of thyroid hormone physiology.
- Diagnosis and management of endocrine neoplasia.
- Disorders of the adrenal gland physiology.
- Disorders of androgen and estrogen metabolism, including adolescent reproductive endocrinology.
- Disorders of sexual differentiation and development.
- Disorders of calcium, phosphorus, and vitamin D metabolism.
- Disorders of parathyroid gland physiology.
- Disorders of fluid and electrolyte balance.
- Disorders of carbohydrate metabolism, including diabetes mellitus and hypoglycemia.
- Disorders of nutrition, including eating disorders

Objectives:

- Demonstrate proper technique in obtaining linear measurements including height, arm span and upper/lower segments.
- Demonstrate how to calculate target heights including mid-parental heights and current height and bone age.
- Demonstrate appropriate Tanner staging of males and females and determination of testicular volume in males using the Prader orchidometer.
- Identify skin findings typical of endocrine disease (i.e. acanthosis nigricans, café au lait pigmentation, etc.)
- Demonstrate proper examination of the thyroid gland.
- Recognize signs associated with hyperlipidemias (i.e. xanthomas, corneal arcus, etc.)

Goal: Understand how to arrange, carry out and interpret diagnostic procedures and stimulation testing important in the evaluation of endocrine disorders.

Objectives:

- Arrange and conduct appropriate ACTH stimulation testing based on suspected diagnosis.
- Demonstrate how to read and interpret a bone age using the Greulich and Pyle atlas in older children and ossification centers in infants/toddlers.
- Know how to organize and conduct GH stimulation testing including the selection of appropriate secretogogues to stimulate GH secretion.

- Demonstrate the use of GnRH agonists in diagnosis of disorders of puberty.
- Order and interpret imaging procedures such as CT scans, MRIs, nuclear medicine tests.
- Know how to safely conduct a water deprivation test to evaluate for diabetes insipidus.
- Know how to arrange for and interpret CGMS testing.

Goals: Education: Develop the skills to educate and counsel families with chronic endocrine conditions.

Goal & Objective:

Diabetes Education: Develop the knowledge and skills necessary to prepare patients with diabetes and their families to effectively manage diabetes at home.

- Demonstrate proper technique for both subcutaneous and intramuscular injections.
- Demonstrate proper technique for blood glucose monitoring
- Become familiar with the operation of commonly available glucose monitors.
- Understand the operation of commonly available insulin pumps.
- Develop a basic understanding of carbohydrate counting.
- Understand and teach the concepts of low blood sugar treatment and sick day protocols including urine ketone testing.

Medical Knowledge: Understand the scope of established and evolving clinical and basic science knowledge of the endocrine system. Acquire the necessary information regarding the physiology and pathophysiology of endocrine systems to effectively care for infants, children and adolescents with endocrine disorders.

Adrenal Disorders:

Goal: Physiology. Understand the function of the adrenal gland and the HPA axis.

Objectives:

Know the basic enzymes and pathways involved in adrenal steroidogenesis.

Know the neonatal changes in the secretion of glucocorticoids.

Know the normal histology and zonality of the adrenal cortex in the fetus, newborn and the child.

Understand the role of ACTH in the regulation of cortisol synthesis

Understand the role of the renin-angiotensin pathway in the regulation of aldosterone synthesis.

Recognize the clinical implications of diurnal variation of cortisol secretion.

Know the effects of glucocorticoids on carbohydrate and fat metabolism.

Goal: Understand the pathophysiology, diagnosis and treatment of disorders of cortisol deficiency.

Objectives:

Know the causes of adrenal insufficiency including autoimmunity, trauma, genetic disorders, infection, AIDS, ACTH deficiency, iatrogenic (prolonged glucocorticoid treatment).

Know presenting signs, symptoms and laboratory diagnosis of adrenal leukodystrophy.

Understand the genetics and presentation of congenital adrenal hypoplasia due to DAX-1 defect and the association with hypogonadotropic hypogonadism, glycerol kinase deficiency and muscular dystrophy.

Know the enzyme defects and presentations of the various forms of congenital adrenal hyperplasia.

Know the relative potencies of clinically useful glucocorticoids.

Plan replacement therapy for adrenal insufficiency including glucocorticoids and mineralocorticoids.

Plan stress dose steroid treatment in children with adrenal insufficiency.

Understand the treatment of congenital adrenal hyperplasia and long-term implications for under and over treatment with glucocorticoids.

Understand the rational and concerns regarding maternal glucocorticoid treatment in prevention of virilization of an affect female fetus with CAH.

Understand the rational and concerns regarding surgical correction of infants with CAH.

Know the current thoughts regarding prenatal androgen exposure and determination of gender identity. Understand the impact of prenatal androgen exposure on counseling parents regarding sex of rearing and long term outcomes.

Understand the role and limitations of newborn screening in detecting congenital adrenal hyperplasia. Appreciate the role of the Pediatric Endocrinologist in advocating for newborn screening programs.

Understand the implication of adrenal rest tumors in adolescents with CAH

Goal: Understand the pathophysiology, diagnosis and treatment of disorders of glucocorticoid excess.

Objectives:

Know the signs, symptoms and laboratory findings consistent with glucocorticoid excess.

Understand that cortisol excess from excess ACTH may be pituitary mediated, ectopic or a result of ectopic CRH secretion.

Understand that ACTH independent Cushing syndrome may be secondary to a benign or malignant adrenal tumor or from steroid administration including topical, oral, inhaled or injected glucocorticoids.

Understand the pathophysiology of Nelson syndrome.

Know how to differentiate pituitary-dependent from pituitary-independent Cushing syndrome.

Know the various modalities to evaluate and treat (pituitary surgery, radiotherapy, adrenalectomy) pituitary mediated Cushings syndrome including risks and potential for long term cure.

Know the association between multiple functional adrenal nodules and other genetic disorders (McCune Albright Syndrome, Carneys Syndrome).

Goal: Understand the pathophysiology, diagnosis and treatment of disorders of adrenal androgen excess.

Objectives:

Know neonatal changes in adrenal androgen secretion and effect of prematurity on andrenal androgen precursor levels.

Know adrenal androgen synthesis pathway and how and where excess adrenal androgens are converted to testosterone and DHT.

Understand the role of ACTH in adrenal androgen synthesis.

Understand the role of adrenal androgens in development of pubic and axillary hair.

Know the pathophysiology of adrenal androgen excess in classic and late onset forms of CAH.

Know the differential diagnosis and evaluation of premature adrenarche.

Know the long term outcome of idiopathic premature adrenarche.

Goal: Understand the pathophysiology, diagnosis and treatment of other disorders of the adrenal gland.

Objectives:

Know that the adrenal cortex synthesizes minimal amounts of estrone and estradiol and that most adrenal estrogens are due to peripheral conversion of adrenal androgens.

Know the clinical implication of estrogen or estrogen receptor defects.

Know the clinical and lab findings in addition to treatment of feminizing adrenal tumors.

Know the enzyme pathway and adrenal zone involved in synthesis of aldosterone.

Know the differential diagnosis, evaluation and treatment of hypoaldosteronism/psuedohypoaldosteronism.

Understand how to differentiate between mineralocorticoid deficiency and mineralocorticoid unresponsiveness.

Understand the pathophysiology of mineralocorticoid and “apparent” mineralocorticoid excess.

Know the molecular mechanism behind glucocorticoid suppressible hyperaldosteronism.

Know the clinical presentation, diagnosis, and treatment of disorders associated with excessive production of catecholamines and catecholamine metabolites.

Know the association of pheochromocytoma with MEN IIa, IIb, and Von Hippel-Lindau syndrome.

Bone and Mineral Metabolism

Goal: Physiology. Understand the role of calcium regulating hormones in normal bone and mineral metabolism

Objectives:

Know the actions and interactions of PTH and 1,25 OH Vitamin D on the kidney, bone and intestine. Understand how these hormones alter calcium and phosphorus levels.

Understand the difference between ionized and total calcium and effects of binding proteins on total calcium.

Know the effects of medications on the renal handling of calcium (thiazide diuretics, furosemide, glucocorticoids).

Understand the role of magnesium in PTH action and secretion.

Understand the various assays that measure PTH and Vitamin D and the limitations and advantages of these assays.

Goal: Diagnose and manage PTH related abnormalities

Objectives:

Differentiate between hypoparathyroidism and psuedohypoparathyroidism.

Know how to treat hypocalcemia from hypoparathyroidism and psuedohypoparathyroidism.

Be aware of other endocrinopathies associated with Albrights Hereditary Osteodystrophy.

Be aware of the polyglandular syndromes associated with hypoparathyroidism (APS1, Schmidt's syndrome).

Know the differential diagnosis of hyperparathyroidism and be aware of and when to screen for associated disorders (MEN I, MEN II).

Goal: Diagnose and manage disorders of Vitamin D

Objectives:

Recognize the populations at risk for Vitamin D deficiency.

Recognize that nutritional Vitamin D deficiency is associated with rickets and may also cause hypocalcemia and/or failure to thrive.

Know that anticonvulsant therapy and gastrointestinal disorders can lead to Vitamin D deficiency.

Understand the pathophysiology of secondary hyperparathyroidism which accompanies renal insufficiency or vitamin D deficiency.

Know that deficiencies in 1 alpha-hydroxylase (Vit D dependent rickets type 1) and vitamin D receptors (Vit D resistant rickets) exist and how to recognize these conditions.

Goal: Diagnose and manage disorders of calcium and phosphorus

Objectives:

Know causes of early and late neonatal hypocalcemia including genetic and "acquired" forms of hypoparathyroidism, DiGeorge Syndrome, hypomagnesemia, infant of diabetic mother, increased phosphate intake, etc.

Know how maternal hypercalcemia can cause neonatal hypocalcemia.

Know appropriate therapies for individual causes of hypocalcemia.

Identify causes of hypercalcemia (i.e. Williams syndrome, Benign familial hypocalcuria hypercalcemia, hyperparathyroidism, malignancy).

Know how to treat symptomatic hypercalcemia and be aware of long term risks of hypercalcemia.

Recognize that most common cause of hypophosphatemia is renal phosphate wasting (Hypophosphatemic rickets).

Goal: Diagnose and manage disorders of bone

Objectives:

Know how to diagnose the genetic disorders of osteopenia in children (Juvenile osteoporosis, Osteogenesis imperfecta).

Know the characteristics of the more common forms of osteochondrodystrophies.

Know the techniques and limitations of methods to assess bone mineral density in children.

Know the primary therapies for treatment of low bone mass in children and when bisphosphonates should be considered.

Carbohydrate Metabolism

Goal: Physiology. Understand the integrated hormone effects on carbohydrate metabolism

Objectives:

Know sources of glucose and basic enzyme systems that regulate storage, oxidation and production of glucose.

Know the effect of insulin and counter regulatory hormones on carbohydrate, fat and protein metabolism.

Know the criteria for normal blood glucose concentrations in infants, children and adults.

Understand the basic physiology of insulin production and action including glucose-mediated regulation of insulin release and insulin action at the insulin receptor.

Goal: Diabetes Mellitus. Diagnose and manage diabetes mellitus.

Objectives:

Differentiate Type I, Type II, MODY, Neonatal and Mitochondrial forms of diabetes on the basis of findings from the clinical history, physical examination, and laboratory tests.

Formulate appropriate treatment regimens for patients based on type of diabetes, including the use of oral medications, insulin, diet, exercise, etc.

Know the pathophysiology of Type 1 diabetes including the role of HLA and genetics in determining risk and the role of autoimmunity.

Recognize immediate life-threatening complications associated with the diagnosis and treatment of diabetic ketoacidosis and steps for initial treatment and stabilization. Recognize when intensive care as indicated.

Develop appropriate treatment plan for patients with diabetic ketoacidosis including use of insulin drips, appropriate fluids, monitoring of laboratory studies, etc.

Develop strategies for treatment of Type 1 diabetes based on stages of development, abilities of care takers, etc.

Participate in and obtain the necessary skills to educate families in the procedures and practices needed to effectively care for their children with diabetes. Be able to independently educate patients/families with new onset diabetes in the “survival skills” necessary to safely manage diabetes at home.

Identify autoimmune diseases associated with Type 1 diabetes and develop a strategy for when and how to screen for these diseases.

Identify the short term and long term complications associated with diabetes and develop a strategy for when and how to screen for these complications.

Identify the risk factors for developing type 2 diabetes and provide a strategy for routine screening of those at elevated risk.

Recognize the co-morbid conditions associated with type 2 diabetes (i.e. Obesity, hypertension, hyperlipidemia, PCOS, NASH, etc.) and their treatment.

Know other conditions associated with type 2 diabetes (i.e. Down's syndrome, Prader-Willi syndrome, hypothalamic obesity syndrome, etc.).

Know drugs associated with inducing hyperglycemia (i.e. prednisone, aspariginase)

Identify and participate in community resources available to children and adolescents with diabetes.

Goal: Hypoglycemia. Diagnose and Manage Hypoglycemia

Objectives:

Differentiate between hormonal and metabolic causes of hypoglycemia.

Understand the concept of the "critical sample" in diagnosing causes of hypoglycemia. Include both urine and blood studies in critical sample.

Know the history, physical exam, and laboratory testing for hormone deficiencies that can present with hypoglycemia.

Understand overutilization vs. underproduction of glucose in the pathophysiology of hypoglycemia.

Identify the factors on history, physical exam and preliminary laboratory studies that increase the likelihood of hyperinsulinemia in the neonate.

Know the various causes of hyperinsulinemia, how to differentiate between them and how to treat based on the diagnosis.

Growth

Goal: Understand the basic patterns of normal growth and how growth is evaluated in children

Objectives:

Know the origin of commonly used growth charts and their limitations.

Know the relationship of age to upper/lower segment ratios.

Know how growth velocity differs in infancy, childhood and adolescence.

Know the effect of normal early and normal late puberty on expected patterns of growth.

Understand the concept of skeletal age an the effect of nutrition, hormonal and genetic factors on skeletal age.

Know the limitations of growth predictions using bone age.

Goal: Growth Hormone/IGF-I: Understand the normal physiology of growth hormone and IGF-I.

Objectives:

Know the hormones involved in normal growth and relative importance in fetal, infant, childhood and adolescent development.

Know the effects of sex steroids on linear growth, body composition, and bone maturation including effect on epiphyseal closure.

Understand the clinical and physiological importance of pulsatile secretion of GH.

Know the common secretogogues used to stimulate GH secretion (i.e. l-DOPA, clonidine, glucogon, arginine, propranolol)

Understand the effect of hypoglycemia on GH release.

Know the primary binding proteins for circulating GH.

Understand the role of GH in stimulating IGF-I production.

Know the direct and indirect physiologic effects and functions of GH.

Know the effects and functions of IGF-I on growth and carbohydrate metabolism.

Know the difference between IGF-I and IGF-II and their roles in growth and development.

Know the primary binding proteins for IGF-I and that the major circulating form is the terniary complex including IGFBP-3 and ALS.

Know the age dependent changes in IGF-I.

Know that low plasma IGF-1 levels are consistent but not diagnostic of GH deficiency and that low normal levels of IGF-1 do not rule out GH deficiency.

Recognize the effect of fasting and/or malnutrition on GH and IGF-I levels.

Goal: Disorders of Growth: Diagnose and manage disorders of growth.

Objectives:

Differentiate between general causes of growth failure including hormonal, SGA/IUGR, chronic disease, genetic, constitutional growth delay and familial short stature.

Know the criteria and clinical presentation that identifies a child with Constitutional Delay of Growth and Puberty.

Know the hormones disorders that can lead to short stature.

Know the causes of GH deficiency.

Know the advantages and disadvantages of using various secretogogues used to stimulate GH secretion including their risks and side effects.

Know the risks and benefits of GH replacement therapy.

Understand the effect of GH therapy on need for thyroid hormone replacement.

Know the molecular basis and treatment for growth hormone insensitivity syndrome (Laron syndrome).

Know the effect of hypothyroidism on growth.

Know the effect of excess glucocorticoids on growth.

Understand the implication of SGA/IUGR on long term growth potential.

Recognize the risks associated with SGA/IUGR on the risk for early adrenarch, PCOS, obesity and type 2 diabetes later in life.

Know the role of GH treatment in SGA infants including when to consider treatment and appropriate dosing of GH.

Know the clinical features and causes of Russell-Silver Syndrome.

Know the major genetic causes of short stature.

Know how to recognize and evaluate for skeletal dysplasias.

Know how to diagnose, treat and manage Turners syndrome.

Understand the need to evaluate girls with new diagnosis of Turners syndrome for heart and kidney defects.

Understand the current approaches to treatment and controversies in the GH treatment of non growth hormone deficient syndromes (i.e. Turners syndrome, chronic renal failure, SGA, Idiopathic Short Stature).

Recognize that children with Prader-Willi Syndrome have hypothalamic dysfunction that includes GH deficiency.

Understand the risks and benefits of GH treatment in Prader-Willi syndrome.

Understand the current concerns with sudden death in Prader-Willi syndrome including PWS children treated with GH.

Recognize the common overgrowth and tall stature syndromes including cerebral gigantism, Weavers syndrome, Klinefelter syndrome, Marfan syndrome and homocystinuria.

Know the appropriate therapy and indications for hormonal treatment of familial tall stature.

Lipids

Goal: Understand the physiology and pathophysiology of disorders of lipids.

Objectives:

Know that chylomicrons, VLDL, LDL and HDL are the major varieties of lipoproteins in plasma.

Know the effect of diet on triglycerides and cholesterol.

Know that LDL is the most atherogenic and HDL is the most protective lipoprotein.

Be able to distinguish the major types of hyperlipidemias.

Know the current recommendations for treatment of hypercholesterolemia in children and adolescents.

Obesity

Goals: Understand the pathophysiology and management of Obesity.

Objectives:

Know the physiology and normal regulation of weight and energy homeostasis.

Know the basic peripheral hormones and central neuropeptides that regulate weight.

Know the major adipocytokines (leptin, adiponectin, resistin, etc.)and their physiologic roles

Differentiate between hormonal, syndromic and “idiopathic” obesity.

Understand that normal linear growth velocity is atypical for hormonal and syndromic forms of obesity.

Know that obesity can be associated with hypothalamic lesions and how to differentiate from common “idiopathic” obesity.

Know the obesity related syndromes including Prader-Willi syndrome, Bardet-Biedl, Albrights Hereditary Osteodystrophy, Alstroms, etc.

Know the common complications of obesity (i.e. NASH, sleep apnea, hypertension, glucose intolerance, etc.) and the importance of screening for complications.

Know the currently accepted treatment approaches and their risks and benefits.

Understand that diet, exercise and lifestyle change are the initial approaches to obesity treatment

Pituitaryhypothalamus

Goal: Physiology. Understand the development and function of the hypothalamus and pituitary.

Objectives:

Know the role of transcription factors in hypothalamic pituitary development including Pit-1 and PROP1.

Understand how the hypothalamus regulates the secretion of pituitary hormones.

Know the physiologic effects and functions of each of the anterior and posterior pituitary hormones.

Goal: Hypopituitarism: Diagnose and manage disorders of pituitary hormone deficiency

Objectives:

Recognize clinical characteristics of patients with septo-optic dysplasia and the likelihood of hypothalamic pituitary dysfunction.

Recognize the association of midline defects with hypopituitarism.

Recognize that head trauma, CNS tumors, infiltrative diseases and CNS infections can result in hypopituitarism.

Understand the time and dose-dependent effects of ionizing radiation on the function of the hypothalamus and pituitary.

Recognize the physical signs and symptoms associated with hypopituitarism in neonates and older children and how they indicate specific hormone defects.

Understand how to replace pituitary hormone deficiencies in hypopituitary infants and children.

Know the clinical signs and symptoms of hypothalamic and pituitary tumors including adenomas, optic gliomas, craniopharyngiomas, etc.

Demonstrate the appropriate pre-, peri- and postoperative management of patients with hypothalamic and/or pituitary tumors.

Know how to diagnose and manage the endocrine requirements of hypopituitary patients during health and during surgery, trauma and severe illnesses.

Know the clinical presentation of isolate ACTH deficiency and Allgroves syndrome (triple A syndrome).

Goal: Pituitary hormone excess: Diagnose and manage disorders of pituitary hormone excess.

Objectives:

Know the clinical features of hyperfunctioning pituitary tumors including excess GH, prolactin, ACTH.

Differentiate elevated prolactin between prolactinomas and other causes of hyperprolactinemia.

Understand the role of surgery versus dopamine agonist therapy in the treatment of prolactinomas.

Understand the clinical usefulness of long acting analogues of somatostatin in treatment of GH excess.

Goal: Vasopressin: Diagnose and manage disorders of ADH deficiency and excess.

Objectives:

Understand the relative roles of blood volume and osmolality in the regulation of ADH secretion.

Know the site of synthesis and release of ADH.

Know the site and mechanism of action of ADH.

Recognize signs and symptoms of diabetes insipidus.

Know the causes of diabetes insipidus including central and nephrogenic.

Understand the clinical usefulness of water deprivation testing in the evaluation of diabetes insipidus.

Know the characteristic phases of vasopressin release and deficiency after surgical manipulation or trauma to the median eminence or pituitary stalk.

Know the effect of glucocorticoid deficiency or replacement therapy on ADH requirements.

Know how to treat diabetes insipidus in infants and children

Differentiate SIADH from other conditions that result in low serum osmolality.

Know how to treat SIADH.

Understand the difference between SIADH and cerebral salt wasting and how the treatment approaches differ.

Reproductive Endocrine System

Goals: Physiology. Understand the function of the reproductive system including the hypothalamic gonadal axis.

Objectives:

Know the basic regulation of FSH and LH release including the role of GnRH.

Know the relative roles of pituitary and placental gonadotropins in sexual differentiation.

Know the pattern of gonadotropin and sex steroid levels from birth through adolescence including the “minipuberty of infancy”.

Know the feedback effects of the major sex steroids and inhibin on the release of gonadotropins.

Understand the different roles of FSH and LH on steroidogenesis in testes and ovaries.

Understand the sex steroid pattern in the normal menstrual cycle.

Understand the structure of the gonadotropin receptors and the cAMP dependent intracellular messenger system.

Understand the different cell types in ovaries and testes and their physiologic functions.

Know the enzymes involved in steroidogenesis in the ovaries and testes.

Understand the genetic regulation and embryology of development of internal and external genitalia in males and females.

Understand the origin and role of MIF in development of internal genitalia.

Goal: Pathophysiology: Understand normal puberty and how to diagnose and treat disorders of puberty.

Objectives:

Know the normal mean and range of the onset of puberty and major pubertal landmarks.

Differentiate between isolated gonadotropin deficiency and constitutional growth delay.

Know the causes and treatment of pituitary gonadotropin deficiency.

Know the clinical features and patterns of inheritance associated with Kallmann syndrome.

Know the causes and treatment of primary gonadal failure in boys and girls.

Know the differential diagnosis of primary amenorrhea.

Know the incidence and chromosomal etiology of Turner syndrome.

Understand the incidence of primary gonadal failure in Turners syndrome.

Know the risk for malignant change in gonads of patients with Turner syndrome and a Y chromosome in their karyotype.

Know how to initiate puberty in girls with Turner syndrome and the effect of estrogen on growth potential.

Know the clinical presentation, incidence and chromosomal etiology of Klinefelter syndrome.

Understand the pros and cons of treatment of Klinefelter syndrome with testosterone.

Know how to differentiate between gonadotropin dependent and independent forms of precocious puberty.

Know the relative incidence of intracranial lesions in boys and girls leading to central precocious puberty.

Know the non-endocrine manifestations of the McCune Albright Syndrome.

Know the use of synthetic GnRH agonists in the treatment of precocious puberty.

Distinguish between premature thelarche and precocious puberty in girls.

Know how to evaluate and counsel boys with pubertal gynecomastia.

Know that prepubertal gynecomastia may represent an estrogen producing adrenal or testicular tumor but in many cases is idiopathic.

Goal: Intersex: Diagnose and manage infants and children with disorders of genital development

Objectives:

Know the causes of ambiguous genitalia in infants with XX, XY or mosaic karyotypes.

Recognize and differentiate the enzymatic blocks affecting testosterone or dihydrotestosterone synthesis.

Understand the presentation and inheritance pattern of androgen insensitivity syndrome.

Know how to differentiate gonadal dysgenesis from other forms of undervirilization.

Know that micropenis may result from testicular insufficiency or hypopituitarism.

Know how to treat micropenis in infants.

Distinguish between CAH and other forms of virilization in XX infants.

Understand the differences in the terms gender role, gender identity and sex or rearing.

Understand the current issues and controversies in sex of rearing assignments in intersex patients.

Understand the current issues and controversies in surgical procedures in intersex patients.

Goal: Polycystic Ovarian Syndrome/Hyperandrogenism: Understand the pathophysiology and treatment of PCOS and hyperandrogenism.

Objectives:

Know the presentation and variability of laboratory/imaging studies in adolescent girls with PCOS.

Know the association between insulin resistance, obesity and PCOS.

Understand that not all girls with PCOS are obese.

Know how to evaluate and treat hirsutism in girls.

Know the current approaches to treatment of hyperandrogenism and PCOS.

Thyroid Hormones

Goal: Physiology: Understand normal thyroid physiology

Objectives:

Know the embryology of thyroid gland formation and timing of the hypothalamic pitiuitary thyroidal function in the fetus.

Understand the biochemistry and physiology of thyroid hormone production including the role of iodide.

Be aware of changes in thyroid hormone concentrations in the neonatal period and first weeks of life.

Understand the importance of thyroid hormone in normal growth and development and the critical role it plays in brain maturation and function.

Be aware of the impact of premature birth on the changing concentrations of thyroid hormone in the neonate.

Be aware of the impact of severe illness on thyroid hormone concentrations.

Know the major serum binding proteins for thyroid hormone.

Know how to perform a thyroid exam and distinguish between normal and abnormal thyroid exam.

Goal: Diagnose and manage hypothyroidism

Objectives:

Know how to diagnose and treat congenital and acquired hypothyroidism.

Understand the role and limitations of newborn screening in detecting congenital hypothyroidism. Appreciate the role of the Pediatric Endocrinologist in advocating for newborn screening programs.

Know the incidence, recurrence risk and general cause of most common forms of congenital hypothyroidism.

Know the effect of TBG deficiency on the newborn screen results and understand the genetics of TBG deficiency and excess.

Know the effect of maternal passage of antibodies, antithyroid drugs, and use of iodine topically in hypothyroidism in the neonate.

Be aware of defects associated with inherited forms of hypothyroidism in the neonate (Pendred's Syndrome-sensorineural hearing loss, Albrights Hereditary Osteodystrophy-gonadotropin def, GH def, etc.).

Be aware of clinical presentation and typical laboratory findings including types of antibodies present in autoimmune hypothyroidism.

Know the effects of hypothyroidism on puberty and growth including the "overlap syndrome".

Differentiate between centrally mediated hypopituitary hypothyroidism and primary hypothyroidism.

Know which drugs (iodides, lithium, amiodarone) interfere with thyroid function.

Know that some chromosomal disorders (i.e. Turners, Downs) predispose to the development of autoimmune endocrine diseases including hypothyroidism.

Goal: Diagnose and manage hyperthyroidism

Objectives:

Know how to diagnose and treat congenital and acquired forms of hyperthyroidism.

Understand the mechanism of neonatal Graves disease in relation to maternal thyroid disease.

Know the clinical presentation, course and management of neonatal Graves disease.

Understand the medical management of Graves disease and advantages/disadvantages of potential treatments (antithyroid drugs, radioactive iodine, surgery).

Know side effects of antithyroid drugs.

Know the natural course of Graves disease and long term outcome.

Be aware of other forms of hyperthyroidism including "hot nodule", McCune Albright syndrome, TSH receptor mutations.

Differentiate hyperthyroidism from generalized thyroid hormone resistance and partial thyroid hormone resistance.

Goal: Diagnose and manage other disorders of the thyroid gland.

Objectives:

Know how to evaluate and treat the “euthyroid” goiter.

Differentiate between acute and subacute thyroiditis.

Know how to evaluate a single thyroid nodule that presents in childhood and understand the implications for thyroid carcinoma.

Recognize the relationship of medullary carcinoma to other endocrine neoplasia syndromes (MEN IIA and MEN IIB)

Know current recommendations for treatment of thyroid carcinoma in childhood.

Molecular Biology/Statistics/Research Methods

Goal: Obtain the knowledge and skills necessary to conduct basic science and clinically based research in Pediatric Endocrinology

Objectives:

Know the basics of Protein, DNA and RNA biochemistry including structure and function.

Understand the fundamentals of gene function and regulation

Know the basic classes of hormones and hormone receptors.

Understand the basics of signal transduction.

Recognize the difference in the principles and methods involved in the various hormone assays (RIA, ELISA, IRMA, ICMA, etc.)

Know how a bioassay differs from other methods of assaying hormones.

Understand how to design and conduct a basic science research project.

Understand the federal guidelines for the use of human subjects in a research project.

Understand how to design and conduct a well-controlled clinical study.

Know basic statistical terms including mean, mode, median, standard deviation, standard error, etc.

Utilize appropriate statistical tests to analyze data sets.

Use a power analysis to determine appropriate sample size for a study.

Practice-Based Learning and Improvement

Objectives:

Identify personal learning needs, systematically organize relevant information resources for future reference, and plan for continuing acquisition of knowledge and skills.

Demonstrate knowledge, skills and attitudes needed for continuous self-assessment and improvement.

Use available evidence to investigate, evaluate and improve the care of patients with endocrine disorders.

Interpersonal Skills and Communication Skills

Objectives:

Demonstrate an ability to teach and communicate information effectively to audiences of varying backgrounds (i.e. lay public, medical students, residents/fellows, Pediatric Endocrinology colleagues).

Function effectively as part of an interdisciplinary team member in both the inpatient and outpatient setting.

Develop an understanding and empathy for patients with chronic endocrine diseases.

Develop the communication skills to quickly assess, assist patients and triage as necessary phone calls received while on call.

Professionalism

Objectives:

Demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles and sensitivity to diversity.

Provide emotional, social and culturally sensitive support to patients and families with endocrine disorders.

Participate in community programs that enhance the lives of our patients.

Become familiar with the ethical and medicolegal considerations of care of infants with intersex conditions.

Understand issues related to patient confidentiality.

Systems-Based Practice

Objectives:

Understand how to practice high-quality fiscally responsible health care.

Function effectively as part of an interdisciplinary team.

Understand how to properly document and code for billing purposes using ICD9 and CPT coding.

Understand continuing educational responsibilities.

Understand and participate in the administrative responsibilities of the Pediatric Endocrine Division, Pediatric Department and the University.

Scholarly Activities

Objectives:

Prepare and present an abstract at a regional or national meeting

Understand the steps for career development in an academic setting.

Prepare a Scholarly work product (i.e. advocacy project, first author paper, extramural grant application, etc.)