**Thyroid Disorders in Pediatrics**

Thyroid Gland Embryology– Lateral lobes form from the 4th pharyngeal pouch and migrate from the lingual region to the base of the neck by 12 weeks gestation

* Thyroid Hormone Physiology:
	+ Major hormones released by the thyroid gland include Thyroxine (T4) and Triiodiothyroine (T3)
	+ T3 plays the pivotal role in affecting physiology, principally binding to the thyroid hormone receptor
	+ T4 is the predominant circulating form
* Pertinent History and Exam Findings:
	+ **Overproduction of Thyroid Hormone**:
		- History: Anxiety, mood swings, behavioral problems, inability to concentrate, sleep disturbances, palpitations, heat-intolerance, fatigue, muscle weakness, tremors, increased appetite, diarrhea, weight loss
		- Physical Exam: Accelerated linear growth, tachycardia, hypertensive, tongue fasciculation, firm enlarged goiter +/- bruit, tremors, prominent stare, lid lag, proptosis, proximal muscle weakness, hyper-reflexive,
	+ **Underproduction of Thyroid Hormone**:
		- History: Slow growth, constipation, fatigue, weakness, cold intolerance, heavy or irregular menses
		- Exam Findings: pale or dry skin, thin/brittle hair or nails
			* infants: macroglossia, open posterior fontanel with wide sutures, icterus, hoarse cry
* Work Up:
	+ Initial Screening Labs:
		- **Concern for Overproduction**: TSH, Free T4 (FT4), Total T3, Thyroid Stimulating Immunoglobulin (TSI), Thyroid Receptor Antibody (TRAb), CBC with differential, CMP
		- **Concern for Underproduction**: TSH, FT4, Thyroid Peroxidase (TPO) Antibody, Thyroglobulin (TG) Antibody
* Interpretation of Laboratory Findings:
	+ **Overproduction**: Elevated FT4, Elevated Total T3, Suppressed TSH, Positive TSI and/or TRAb
		- AST, ALT, White blood cell count and ESR may be elevated
	+ **Underproduction:**
		- Primary: Low FT4, Elevated TSH, Positive TPO and/or TG Antibody
		- Central: Low FT4, Low/normal TSH
* Thyroid Disorders:
	+ **Hyperthyroidism:**
		- Neonatal Graves’ disease
		- TSH receptor activating mutations
		- Graves’ disease
		- Thyrotoxic phase of thyroiditis
		- Surreptitious ingestion of levothyroxine
		- TSH-dependent hyperthyroidism including pituitary TSH-secreting tumors
		- Resistance to thyroid hormone
		- Toxic multinodular goiter
		- Solitary thyroid nodule
		- Intrinsic activating mutation of the TSH receptor (Leclere’s disease)
	+ **Hypothyroidism:**
		- Secondary Hypothyroidism: CNS process (tumor, cranial irradiation), drugs (steroids)
		- Primary:
			* Congenital Hypothyroidism Thyroid dyshormonogenesis, thyroid agenesis, ectopic thyroid gland, maternal anti-thyroid medication use, or autoantibody transferChronic lymphocytic thyroiditis (“Hashimoto’s thyroiditis”
			* Euthyroid Sick Syndrome/ Non-thyroidal Illness
			* Subacute thyroiditis / Other thyroiditis
			* Drug induced hypothyroidism: thioamides, lithium, amiodarone, excessive iodine exposure
			* Iodine deficiency
			* Infiltrative or storage disorders of thyroid gland
			* Iatrogenic hypothyroidism: post-irradiation; thyroidectomy