

THYROID DISEASE: HYPO AND HYPERTHYROIDISM



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Overview¹⁻⁴

The thyroid gland plays an important role in regulating tissue metabolism and development. Controlled by thyroid-stimulating hormone (TSH) from the pituitary gland, it is involved in the production of T3 and T4. These hormones regulate protein synthesis by affecting gene transcription and mRNA stabilization. Asymptomatic adults do not require routine thyroid function testing. However, screening should be offered to those with risk factors for thyroid disease or patients who present with non-specific signs and symptoms.

Risk Factors for Thyroid Disease¹⁻⁴

- personal history of autoimmune disease (i.e. Type I Diabetes)
- family history of thyroid disease
- personal history of neck irradiation
- drug therapies (lithium, amiodarone)
- women > 50 years of age
- women in the period of up to 6 months post-partum

Signs & Symptoms¹⁻⁴

Hypothyroidism	Hyperthyroidism
<ul style="list-style-type: none"> • weight gain • hair loss • bradycardia/diastolic hypertension • lethargy • menstrual irregularities (menorrhagia) • cognitive impairment • depression • constipation • goiter • dry skin • cold intolerance 	<ul style="list-style-type: none"> • weight loss • hair loss • palpitations/tachycardia/atrial fibrillation • menstrual irregularities (amenorrhea/oligomenorrhea) • widened pulse pressure • nervousness/tremor/anxiety • proximal muscle weakness • goiter • heat intolerance, diaphoresis, clammy hands • hypertension

Investigations/Diagnostic Tests¹⁻⁴

- TSH is the principle test for evaluating thyroid function
- free T3 (fT3) and free T4 (fT4) are not necessary when screening for hypothyroidism
 - o may measure in suspected hyperthyroidism to confirm diagnosis of thyrotoxicosis (elevated fT3 and normal fT4)
 - o may measure to rule out TSH-producing pituitary adenoma (elevated TSH, fT3, fT4)
- a thyroid ultrasound should be done if the physical exam suggests nodularity
- thyroid uptake scan should be done to differentiate causes of a hyperthyroid state

Causes of Hypothyroidism¹⁻⁴

Primary	<ul style="list-style-type: none"> • chronic autoimmune thyroiditis (Hashimoto's) • transient <ul style="list-style-type: none"> o painless thyroiditis o postpartum thyroiditis o subtotal thyroidectomy o following treatment of Graves' by thyroidectomy o subacute thyroiditis • infiltrative <ul style="list-style-type: none"> o fibrous thyroiditis o sarcoidosis • medications • iatrogenic <ul style="list-style-type: none"> o thyroidectomy o radioactive iodine treatment
Secondary	<ul style="list-style-type: none"> • pituitary lesion causing TSH deficiency • hypothalamic lesion causing TRH deficiency

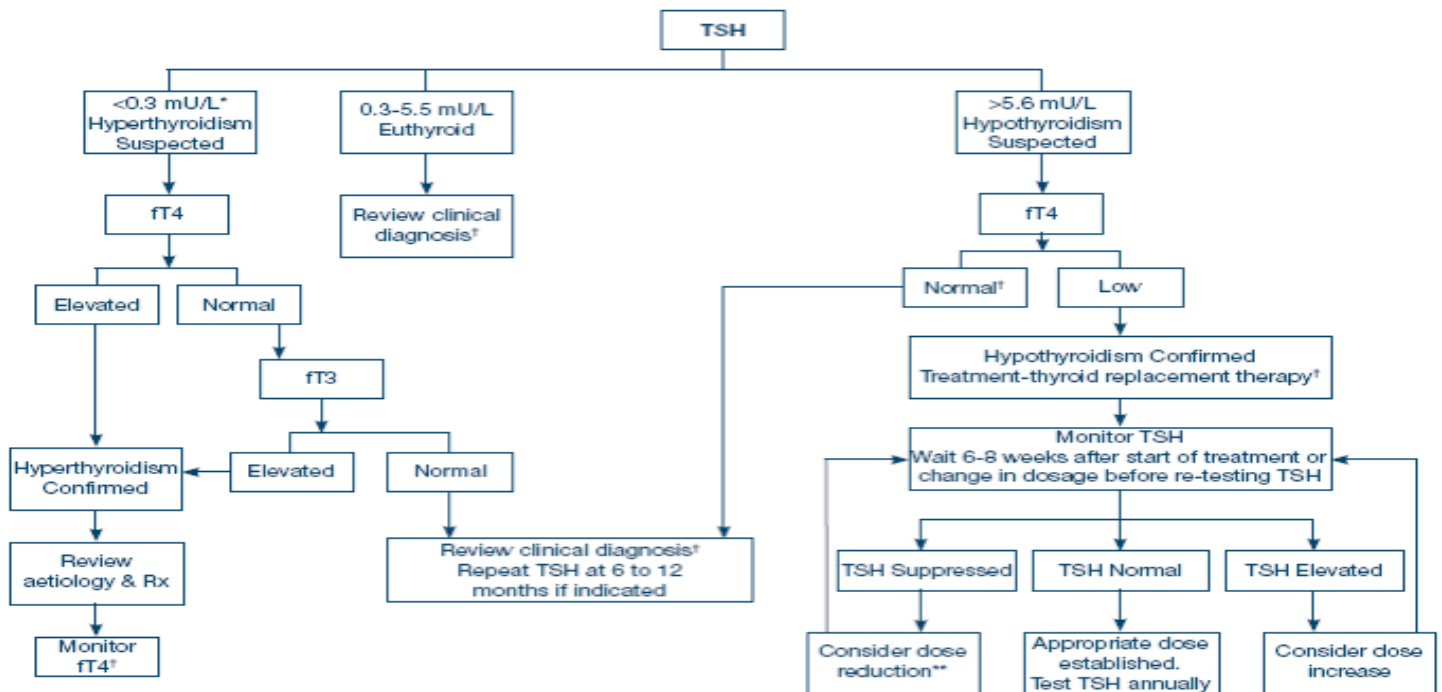
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Causes of Hyperthyroidism¹⁻⁴

Primary	<ul style="list-style-type: none"> • autoimmune <ul style="list-style-type: none"> ◦ Graves' disease ◦ Hashimoto's (Hashitoxicosis - rare) • toxic multinodular goiter • toxic adenoma • exogenous thyroid hormone intake • postpartum thyroiditis • neoplastic (usually metastatic thyroid cancer - very rare) • drug-induced (amiodarone)
Secondary	<ul style="list-style-type: none"> • TSH-producing pituitary adenoma
Other	<ul style="list-style-type: none"> • gestational hyperthyroidism (seen with hyperemesis gravidarum) • trophoblastic disease

Diagnosis Algorithm¹

Algorithm for diagnosing and monitoring thyroid disease in patients with an intact hypothalamic-pituitary-thyroid axis (does not apply to patients with Euthyroid Sick Syndrome or Subclinical Thyroid Disease).



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Management & Monitoring^{1,2,4}

	Treatment	Additional Comments	Monitoring
Hypothyroidism	Levothyroxine (LT4)	<ul style="list-style-type: none"> - usually start at 50mcg daily and increase incrementally - start children and elderly at 25mcg daily - take on empty stomach to improve absorption 	<ul style="list-style-type: none"> - check TSH* 6 weeks after initiation and change in dose or clinical status - check annually once normalized
Hyperthyroidism	Antithyroid Meds: - propylthiouracil (PTU) - methimazole	<ul style="list-style-type: none"> - initiate at 100mg TID for hyperthyroidism; higher dosages required for thyrotoxicosis - maintenance dose usually 50-150mg/day - initiate at 15-60mg divided TID for 4-6 weeks and then re-evaluate; dose should be reduced by 1/3 once T4 or T3 have returned to normal. - maintenance dose is 5-15mg daily or divided TID - cutis aplasia in early pregnancy (therefore avoid in T1)**both may cause vasculitis, hepatitis (PTU > methimazole), agranulocytosis 	<ul style="list-style-type: none"> - recheck TSH* after 6-12 weeks, as pituitary secretion may be suppressed for several months - thyroid status may be assessed using fT4- CBC not routinely done, only if signs and symptoms of agranulocytosis
	Radioactive Iodine (RAI)	<ul style="list-style-type: none"> - one -time pill which is usually curative; some may require second dose - patient required to follow radioactive precautions for one week after administration - usually become hypothyroid in the long-term, can worsen Grave's orbitopathy (especially in smokers) - cannot use in pregnancy, should not be pregnant for 6-12 months after tx 	
	Thyroidectomy	<ul style="list-style-type: none"> - curative - invasive and requires life-long levothyroxine replacement - rare complications of hypoparathyroidism and recurrent laryngeal nerve damage 	
	Beta-blocker	<ul style="list-style-type: none"> - needed for short-term treatment of symptoms until the above treatments take effect - usually initiate atenolol 25-50mg od, or propranolol 20-40 mg BID-QID depends on severity of symptoms 	

*TSH is only useful if the hypothalamic-pituitary-thyroid axis is intact. Otherwise, measurement of fT4 is preferred to assess adequate replacement.

Subclinical Thyroid Disease^{1,2,5}

- in subclinical hypothyroid disease with elevated TSH and normal fT4
 - o TSH levels should be monitored annually in untreated patients
 - o treatment is recommended if:
 - TSH > 10mU/L
 - TSH above reference range but < 10mU/L and any of the following:
 - goitre
 - strong family history of autoimmune disease
 - pregnancy
 - elevated thyroid peroxidase (TPO) antibodies
- in subclinical hyperthyroidism with suppressed TSH levels and normal fT4 (less common)
 - o TSH levels should be monitored every 6-12 month
 - o treatment recommended if patients have atrial fibrillation and/or osteoporosis

Thyroid Disease in Pregnancy^{1,2,5,6}

- maternal hypothyroidism is associated with decreased IQ in newborns
- TSH screening is indicated in all women with a goitre or strong family history of thyroid disease who are planning pregnancy or who are in early pregnancy
- TSH may be suppressed as a normal finding in pregnancy; hyperthyroidism may be ruled out with a normal fT4
- TSH should be targeted to 0.5-2.5mU/L in the first trimester and 0.5-3.0mU/L in the second and third trimesters
- levothyroxine requirements may increase 50% during pregnancy
- post-pregnancy, most women need a reduction in levothyroxine dose
 - o screening for post-partum thyroiditis should be done at 3 and 6 months in women an increased risk (positive anti-TPO antibodies)

References can be found online at http://www.dfcu.utoronto.ca/programs/postgraduateprograme/One_Pager_Project_References.htm