



# Pharmacy Friday

Brief pearls related to acute care pharmacology and evidence-based medicine

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- <https://sites.google.com/presby.edu/pharmacy-friday>



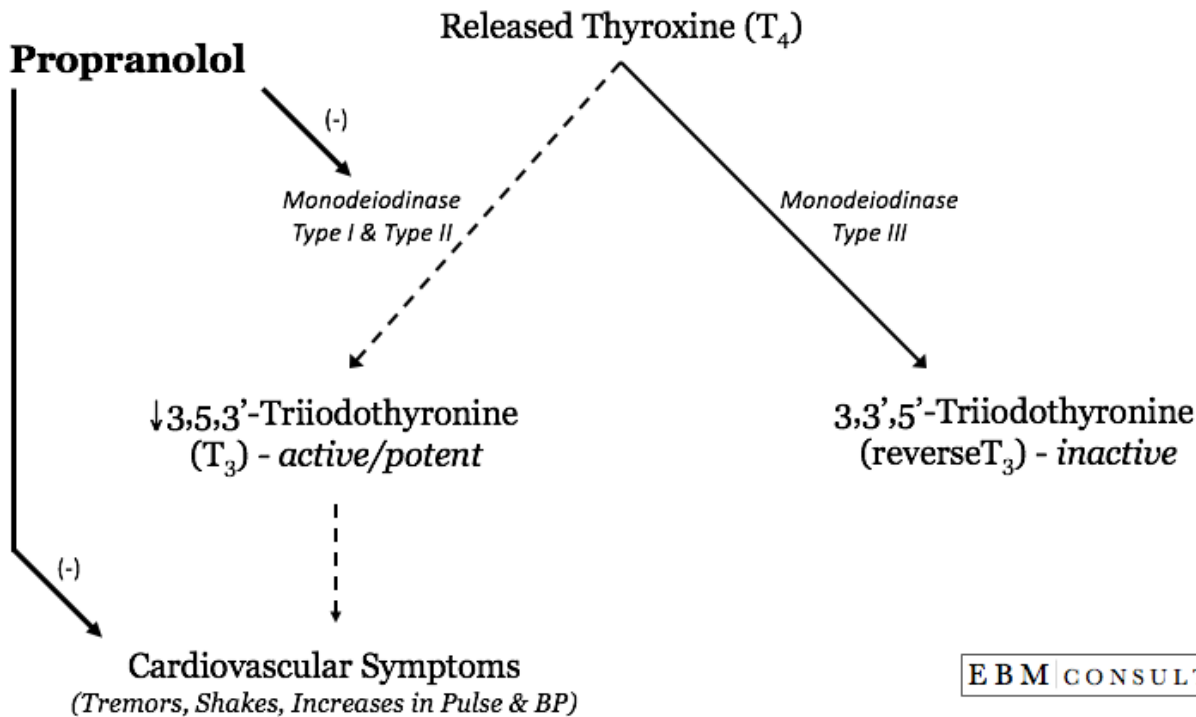
## Pharmacologic Management of Thyroid Storm

### Introduction

1. Thyroid storm, also known as thyroid crisis, is an rare form thyrotoxicosis in an extreme fashion
2. The mortality that has been published has ranged from 20-100%, especially if prompt treatment isn't initiated
3. Thyroid storm often occurs in people with Graves disease who have stopped medication or whose underlying condition is undiagnosed
4. The pathophysiology is characterized by adrenergic hyperactivity either by increased release of thyroid hormones (with or without increased synthesis) or increased receptor sensitivity.
5. Precipitants of Thyroid Storm include Infection, trauma, surgery, DKA, withdrawal of anti-thyroid medication, or radioactive iodine therapy
6. Diagnosis can be difficult due to the disease mimicking other disease states such as withdrawal syndromes and sepsis

### Pharmacology

Properties	Propranolol/ Esmolol	Methimazole/ Propylthiouracel (PTU)	SSKI	Hydrocortisone
<b>Dose</b>	Propranolol: IV 0.5-1 mg over 10 min or PO: 60-80 mg q4h  Esmolol IV: 500 mcg/kg bolus then 50-200 mcg/kg/min infusion	Methimazole 60-80 mg in divided dose  PTU: 500-1000 mg load then 250 mg q4h	5 drops PO q6h	IV: 300 mg load then 100 mg q8h
<b>Administration</b>	Propranolol IV: via slow IV push ~10 min  Esmolol: Bolus and continuous infusion	PO	Place drops in water or juice with administration delayed for at least one hour after initiation of methimazole or PTU therapy	Via IV push
<b>Formulation</b>	Propranolol: PO/IV  Esmolol: IV	PO	PO	IV/PO
<b>Adverse Effects</b>	Bradycardia, hypotension	PTU: black box warning for severe and/or life-threatening hepatotoxicity issued by FDA in 2010 Methimazole: not preferred in pregnancy	If not given after thionamide can serve as a substrate for thyroid hormone synthesis and exacerbate thyroid storm	Further hyperglycemia
<b>Where is this located at GHS</b>	Propranolol: Inpatient Pharmacy  Esmolol: ED zone 2+3, and detention Pyxis	Methimazole: ED Chest Pyxis  PTU: inpatient Pharmacy	Inpatient Pharmacy	ED Chest Pyxis
<b>Comments</b>	Propranolol is only beta blocker that has been documented to inhibit peripheral conversion of T4 to T3  Propranolol is preferred but may be difficult to access in an emergency, Esmolol may be good alt until propranol sent from MIP	Pregnancy considerations: PTU is generally preferred over MMI	Iodine solutions are not interchangeable  If contraindication to giving iodine (for example, hypersensitivity to iodine), an alternative like lithium 300mg q8h can be used	Can use dexamethasone 4mg q6h as alternative



Drug	Purpose
<b>Iodide: Lugol solution, Potassium Iodine (SSKI), and lithium</b>	Used to prevent the release of pre-formed thyroid hormone from the thyroid gland
<b>Thioureas: Methimazole/Propylthiouracel (PTU)</b>	Inhibit thyroid peroxidase, an enzyme involved in the production of T3 and T4 through the iodination of tyrosine residues on thyroglobulin
<b>Beta Blocker: Propranolol and Esmolol</b>	Blocks β-adrenergic receptors to allow for effective treatment of systemic effects, such as tremor, tachycardia, agitation, fever, diaphoresis, psychosis  Propranolol also blocker peripheral conversion of T4→T3
<b>Steroids: Hydrocortisone and Dexamethasone</b>	Inhibition of peripheral conversion of T4 to T3 and treat relative adrenal insufficiency.

- There is very limited evidence for the use of these agents that are limited to case reports and data dating back to 1970s-90. A great review article is Thyroid emergencies written by Joanna Klubo-Gwiezdzinska in the references below.
- However, these drugs are recommended in the 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and other causes of Thyrotoxicosis.

### References

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