

# Hyperthyroid crisis (Thyrotoxic storm)

*Synonyms: thyrotoxic crisis, thyroid storm, hyperthyroid storm*

Hyperthyroid crisis, or thyrotoxic storm, is an extreme manifestation of [thyrotoxicosis](#) due to overproduction of thyroid hormones.

Although hyperthyroid crisis usually occurs in patients already known to have hyperthyroidism, it may be the first presentation of hyperthyroidism.

Early recognition and aggressive treatment are essential. Hyperthyroid crisis can occur in patients with a toxic adenoma or multinodular toxic goitre but is more often seen in patients with Graves' disease.

## Epidemiology

Hyperthyroid crisis is rare. It has an incidence of 0.2 cases per 100,000 population and approximately 1-2% of patients with hyperthyroidism progress to a hyperthyroid crisis<sup>[1]</sup>.

## Presentation

The diagnosis of hyperthyroid crisis is clinical - a combination of patient presentation and laboratory values confirming hyperthyroidism<sup>[2]</sup>. The presentation of hyperthyroid crisis can be varied and, therefore, difficult to diagnose, especially in a trauma patient who is likely to be tachycardic and may also have altered mental status<sup>[3]</sup>.

Hyperthyroid crisis classically occurs in patients with underlying Graves' disease or toxic multinodular goitre. Often, there is sudden onset of severe hyperthyroidism with<sup>[4]</sup>:

- Hyperpyrexia (over 41°C), dehydration.

- Heart rate greater than 140 beats per minute (with or without [atrial fibrillation](#) or other arrhythmias), [hypotension](#), atrial dysrhythmias, [congestive heart failure](#).
- Nausea, jaundice, vomiting, diarrhoea, abdominal pain.
- Confusion, agitation, [delirium](#), psychosis<sup>[5]</sup>, seizures or coma.

Cocaine intoxication and hyperthyroid crisis lead to clinical pictures with overlapping signs, including hyperpyrexia, tachycardia, and central nervous system disturbances<sup>[2]</sup>.

## Precipitants

Hyperthyroid crisis is most often seen in a thyrotoxic patient with intercurrent illness, trauma or emergency surgery.

Common precipitants include<sup>[6]</sup>:

- Infection or other acute illness.
- Withdrawal of or non-compliance with antithyroid medication.
- Recent trauma, including surgical stress.
- [Myocardial infarction](#) or [stroke](#).
- [Diabetic ketoacidosis](#), [hyperosmolar coma](#) or [hypoglycaemia](#).
- Following childbirth.
- [Pulmonary embolism](#).
- Drugs: radio-iodine, amiodarone, radiographic contrast media.
- Overdose of thyroid hormone tablets.
- Vigorous palpation of the thyroid gland in hyperthyroid patients.
- Recent thyroid surgery.

## Investigations

- Investigations for any underlying precipitant – eg, infection screen.

- TFTs: elevated T3 and T4 levels, elevated T3 uptake, suppressed TSH levels.
- Indications of decompensation of homeostasis – eg, renal dysfunction, elevated creatine kinase, electrolyte imbalance (due to dehydration), anaemia, thrombocytopenia, raised white cell count, abnormal LFTs (raised levels of transaminases, lactate dehydrogenase, alkaline phosphatase and bilirubin), hypercalcaemia, hyperglycaemia.
- ECG.
- CXR.
- Arterial blood gases and pH.

**NB:** the degree to which the thyroid hormone levels are elevated does not determine the presence or absence of hyperthyroid crisis<sup>[2]</sup>.

## Management

Once a thyroid crisis is suspected, emergency treatment should be initiated even before the arrival of TFTs.

There are four components to the therapy of thyroid storm<sup>[7]</sup>:

- Treatment directed at thyroid hormone synthesis and secretion by the thyroid gland.
  - Antithyroid treatment:
    - Carbimazole or propylthiouracil orally. However, anti-thyroidal therapy is sometimes limited due to rare and serious side-effects or failure to control disease progression<sup>[8]</sup>.
    - After four hours, give Lugol's solution (aqueous iodine oral solution). Iodine should typically be administered after thionamide therapy has been started to prevent stimulation of new hormone synthesis<sup>[2]</sup>.
    - Beta-blockers (initially IV propranolol 5 mg, then orally) unless contra-indicated (eg, asthma - but heart failure is not a contra-indication). Diltiazem can be used if propranolol is contra-indicated.
    - Hydrocortisone administration is also recommended. It treats possible relative adrenal insufficiency while also decreasing T4 to T3 conversion<sup>[9]</sup>.
    - Patients who fail medical therapy should be treated with therapeutic plasma exchange or thyroidectomy<sup>[8]</sup> <sup>[10]</sup>.
- Addressing the distribution, content, and action of the thyroid hormones already in the peripheral circulation.
- Determining the precipitating cause of storm when possible eg infection, and ensuring that there is no ongoing contribution to the exacerbation of the thyrotoxicosis.

- Supportive and symptomatic therapy for the systemic decompensation present.
  - Resuscitation: oxygen, intravenous (IV) access and give 0.9% saline infusion (adjust IV fluids as necessary, ideally guided by central venous pressure) and nasogastric tube if there is vomiting.
  - For severe agitation, sedate with chlorpromazine.
  - Keep cool with tepid sponging and with paracetamol. Avoid aspirin which can increase T4 levels<sup>[1]</sup>.

Addressing all four components of treatment provides the best opportunity to avoid a fatal outcome. Further thyroid management will depend on the progress of each individual patient and must be under the care of an endocrinologist.

Patients who fail medical therapy should be treated with therapeutic plasma exchange or thyroidectomy<sup>[4]</sup> <sup>[8]</sup>. Thyroidectomy has been attempted with mixed results for the rare patient who does not respond to medical treatment, who continues to have elevated thyroid function tests and/or symptoms<sup>[7]</sup>.

## Prognosis

- Untreated hyperthyroid crisis is usually fatal due to hyperthermia, cardiac arrhythmias, multi-organ failure<sup>[11]</sup>, and sepsis<sup>[6]</sup>.
- Even with early diagnosis and targeted treatment, the mortality rate of hyperthyroid crisis ranges from 10-30%<sup>[4]</sup>.
- It has a fatality rate of 50-90% if left untreated<sup>[12]</sup>.

## Prevention

Identification and prevention or early treatment of precipitating factors.

---

## Further reading

- [Snyder S, Joseph M](#); The Perfect Storm: A Case of Ischemic Stroke in the Setting of Thyroid Storm. Cureus. 2020 May 6;12(5):e7992. doi: 10.7759/cureus.7992.

**Disclaimer:** This article is for information only and should not be used for the diagnosis or treatment of medical conditions. Egton Medical Information Systems Limited has used all reasonable care in compiling the information but makes no warranty as to its accuracy. Consult a doctor or other healthcare professional for diagnosis and treatment of medical conditions. For details see our [conditions](#).

Authored by:	Peer Reviewed by: Dr Colin Tidy, MRCP	
Originally Published: 20/11/2023	Next review date: 28/07/2020	Document ID: doc_2292

View this article online at: [patient.info/doctor/hyperthyroid-crisis-thyrotoxic-storm](https://patient.info/doctor/hyperthyroid-crisis-thyrotoxic-storm)

Discuss Hyperthyroid crisis (Thyrotoxic storm) and find more trusted resources at [Patient](#).



To find out more visit [www.patientaccess.com](https://www.patientaccess.com)  
or download the app



Follow us

