

Chapter 51

Approach to Hypothyroidism in the ICU



51.1 Introduction

Myxedema coma is a rare but life-threatening complication of severe, often long-standing untreated hypothyroidism. It occurs when adaptive mechanisms—such as peripheral vasoconstriction and reduced blood volume—begin to fail. These adaptations can be overwhelmed by precipitating events such as infections or cold exposure, pushing the patient into a critical state requiring immediate intensive care. Early recognition and intervention are crucial, as mortality rates range from 20% to 60% even with advanced ICU support. This chapter provides a detailed, stepwise approach to managing myxedema coma in the ICU, covering initial recognition, diagnostic steps, critical care interventions, hormone replacement therapy, and strategies for addressing precipitating factors [1, 2]. [Ref: Algorithm 51.1].

51.2 Initial Assessment and Recognition

51.2.1 Identification of Symptoms and Signs

Early recognition of myxedema coma is vital due to its subtle presentation and high mortality. Common signs include altered mental status (from confusion to coma), hypothermia, bradycardia, hypotension, and hypoventilation. Importantly, myxedema coma often presents in older adults and during winter months, as cold exposure can exacerbate hypothermia in patients with diminished thermoregulation. A critical red flag is the absence of the mild diastolic hypertension that usually accompanies severe hypothyroidism; its absence may signal impending myxedema coma.

51.2.2 History Taking

A thorough history is essential, with attention to known hypothyroidism, previous thyroid surgery, or use of medications like lithium and amiodarone, which may contribute to thyroid dysfunction. Recognizing a history of hypothyroidism is critical, as it can direct clinicians to consider this rare but severe diagnosis early.

51.3 Confirming Diagnosis

51.3.1 Laboratory Investigations

Diagnosis relies on serum-free T4 (FT4) and TSH levels. Typically, TSH is elevated in primary hypothyroidism with low FT4. However, TSH can be low or normal in cases of central hypothyroidism or nonthyroidal illness syndrome, complicating diagnosis and highlighting the need for comprehensive testing. Additional laboratory assessments should include tests for anemia, hyponatremia, hypoglycemia, and elevated creatine kinase—common metabolic abnormalities in myxedema coma. Accurate temperature measurement is critical, as automatic thermometers may fail to register the hypothermia typically seen in these patients.

51.4 Immediate Management (Supportive Care)

51.4.1 Respiratory and Cardiovascular Complications

Given the high risk of hypoventilation due to respiratory depression, early intubation and mechanical ventilation are recommended to prevent hypercapnic respiratory failure. Mechanical support stabilizes oxygenation while allowing clinicians to focus on underlying management. In managing hypothermia, active rewarming should be avoided, as peripheral warming may lead to vasodilation and subsequent hypotension. If rewarming is needed, consider central methods like warmed IV fluids, but exercise caution.

51.4.2 Hemodynamic Support

Hypotension, commonly seen in myxedema coma, often results from decreased cardiac output and systemic vascular resistance. Initial management includes cautious fluid resuscitation, but vasopressors may be required if hypotension persists despite

adequate fluid support. Careful titration is essential to avoid fluid overload in these patients.

51.5 Hormonal Replacement Therapy

51.5.1 Thyroid Hormone Replacement

The cornerstone of treatment is thyroid hormone replacement, with IV T4 (levothyroxine) preferred for initial administration due to potential gastrointestinal absorption issues. Updated guidelines suggest an initial IV T4 dose of 300–500 µg, followed by daily maintenance at 1.6 µg/kg. If there is no clinical improvement within 24 hours, IV T3 (liothyronine) may be considered, though it should be used cautiously—especially in patients with cardiovascular comorbidities—as high doses may precipitate arrhythmias or myocardial ischemia. A conservative regimen of 10–25 µg IV T3 every 8 hours is recommended, with adjustments based on patient response and cardiovascular risk.

51.5.2 Glucocorticoid Administration

Concurrent adrenal insufficiency is a risk in severe hypothyroidism, as increased metabolic demands from thyroid hormone therapy may precipitate adrenal crisis. IV hydrocortisone (100 mg every 8 hours) is recommended to stabilize the adrenal axis during the acute phase. This prevents adrenal suppression while metabolic rates are restored.

51.6 Monitoring and Addressing Complications

51.6.1 Electrolyte and Glucose Management

Hyponatremia is a frequent complication and can typically be managed with fluid restriction. For severe cases, cautious administration of hypertonic saline may be necessary. In cases resistant to standard management, conivaptan, a vasopressin antagonist, may be considered, although evidence for its use in myxedema coma remains limited. Hypoglycemia, due to impaired gluconeogenesis, should be managed with IV dextrose to maintain stable glucose levels. Continuous monitoring of electrolytes, glucose, and thyroid hormone levels is essential to tailor treatment and monitor response as the patient stabilizes.

51.7 Identification and Treatment of Precipitating Factors

Myxedema coma often results from an acute precipitating event in an already hypothyroid patient. Recognizing and addressing these precipitating factors is crucial:

- **Infection:** The most common precipitating factor, infection, may not present with fever due to hypothermia. Empiric broad-spectrum antibiotics should be initiated until infection is ruled out.
- **Other Triggers:** Besides infection, other triggers include cold exposure, trauma, stroke, gastrointestinal bleeding, and certain medications (e.g., sedatives and tranquilizers), which depress respiratory function further. These should be managed or avoided as part of the overall treatment plan.

51.8 Follow-Up and Transition

51.8.1 *Transition to Oral Therapy*

Once the patient is alert, stable, and able to tolerate oral intake, transitioning from IV to oral thyroid hormone therapy is essential for ongoing management. Oral levothyroxine can be initiated with careful dose titration based on thyroid hormone levels and the patient's clinical response. Gradual increase in oral doses helps to avoid excessive fluctuations in hormone levels during recovery.

51.8.2 *Tapering of Glucocorticoids*

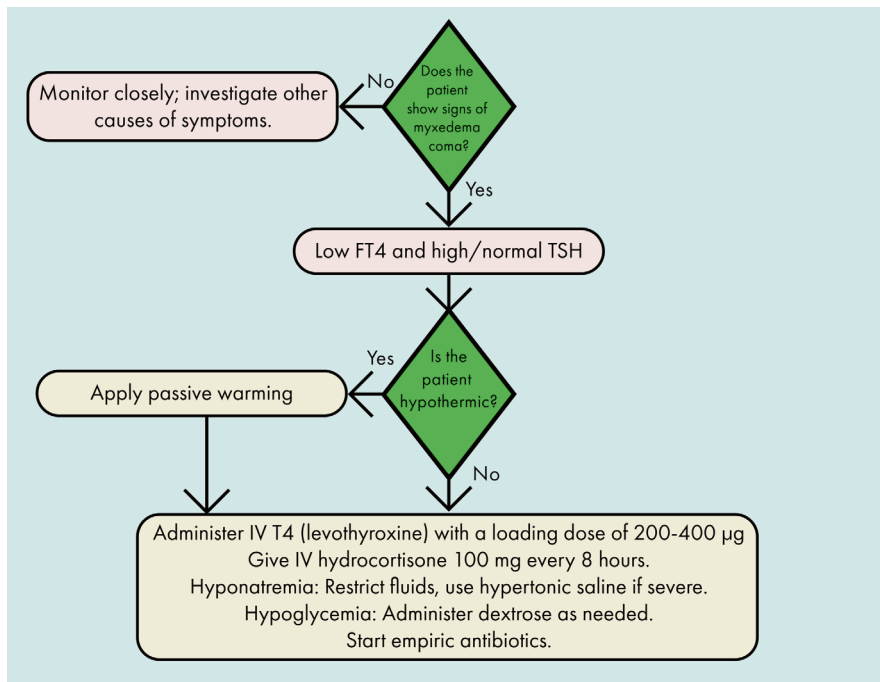
When the patient stabilizes, glucocorticoid support can be gradually tapered to minimize the risk of adrenal suppression. Monitoring adrenal function as glucocorticoids are withdrawn ensures that the patient's adrenal axis remains intact, supporting a smooth transition out of critical care.

51.9 Conclusion

Managing myxedema coma or severe hypothyroidism in the ICU requires a structured approach, integrating early recognition with targeted thyroid hormone replacement and supportive care. Addressing precipitating factors is equally critical, as these often exacerbate the hypothyroid crisis. Practitioners should balance the need for adequate hormone replacement with caution to avoid excessive cardiovascular stress. Through careful titration of IV T4, selective use of T3, and adrenal support

with glucocorticoids, clinicians can optimize care in this life-threatening condition. Early and aggressive intervention, along with a systematic transition to long-term therapy, are central to improving outcomes in myxedema coma management.

Algorithm 51.1: Approach to hypothyroidism in the ICU



Bibliography

1. Jonklaas J, Bianco AC, Bauer AJ, Burman KD, Cappola AR, Celi FS, et al. Guidelines for the treatment of hypothyroidism: prepared by the american thyroid association task force on thyroid hormone replacement. *Thyroid*. 2014;24(12):1670–751.
2. Persani L, Brabant G, Dattani M, Bonomi M, Feldt-Rasmussen U, Fliers E, et al. 2018 European thyroid association (ETA) guidelines on the diagnosis and Management of Central Hypothyroidism. *Eur Thyroid J*. 2018;7(5):225–37.

Part V

Trauma