Myxedema Coma:
A 911 Emergency to Get Patients “Out of the Cold”

March 1, 2007

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University Health Network
Objectives

At the end of this session, you should be able to:

- Identify the common signs and symptoms of myxedema coma
- Explain the mechanism for decompensated hypothyroidism
- Recommend appropriate treatment options for myxedema coma
- Recommend appropriate treatment options for complications associated with myxedema coma
Patient Case
HPI

- **Feb 12, 2007 – TWH ER**
  - Mrs. RH - 87 year old caucasian female
  - Sudden onset of severe weakness and fatigue
    - CNS - confusion, ↓ LOC, visual hallucinations
    - CVS – bradycardia, JVP 5-6 cm
    - Resp – SOB upon minimal exertion
  - 3 week history of SOB with orthopnea and PND
  - 3 week history of recurrent epistaxis requiring cauterization
  - Tx – 2 units of PRBC + furosemide 120 mg IV

- **Feb 13, 2007 – TWH MSICU**
  - Cardiogenic shock and respiratory failure requiring intubation and pacemaker insertion
HPI

- **Allergies**
  - Penicillin

- **Vitals**
  - BP 88/54, HR 35
  - RR 20, O₂Sat 70%
  - T 34.3°C
<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hg</td>
<td>77</td>
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<tr>
<td>WBC</td>
<td>4.4</td>
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<tr>
<td>Plt</td>
<td>343</td>
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<tr>
<td>SCr</td>
<td>203</td>
</tr>
<tr>
<td>CrCl</td>
<td>17</td>
</tr>
<tr>
<td>CK</td>
<td>130</td>
</tr>
<tr>
<td>Tn</td>
<td>0.36</td>
</tr>
<tr>
<td>ALT</td>
<td>131</td>
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<tr>
<td>ALP</td>
<td>398</td>
</tr>
<tr>
<td>ALT</td>
<td>101</td>
</tr>
<tr>
<td>Bili</td>
<td>24</td>
</tr>
<tr>
<td>INR</td>
<td>1.51</td>
</tr>
<tr>
<td>Alb</td>
<td>31</td>
</tr>
<tr>
<td>BG</td>
<td>7.4</td>
</tr>
</tbody>
</table>

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Diagnostic

- **CXR**
  - RLL consolidation

- **ECG**
  - sinus bradycardia
  - QT = 561 ms

- **Urine, MSU**
  - **Enterococcus** > 100 x E6
    - S – ampicillin, nitrofurantoin
    - R – tetracycline
Past Medical History

- **Cardiac**
  - HTN
  - Stable angina
  - AFIB
  - CHF (Grade III LV)

- **Renal**
  - Chronic renal insufficiency

- **Other**
  - Microcytic anemia (x 6 months)
  - Sacral and R leg ulceration (x 4 months)
  - Recurrent epistaxis (x 3 weeks)
  - SOB upon exertion (x 3 weeks)
# Medication History

<table>
<thead>
<tr>
<th>Indication</th>
<th>Medication</th>
</tr>
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<tbody>
<tr>
<td>CAD</td>
<td>ASA 325 mg po OD</td>
</tr>
<tr>
<td>HTN</td>
<td>Clopidogrel 75 mg po OD</td>
</tr>
<tr>
<td>CHF</td>
<td>Metoprolol 50 mg po BID</td>
</tr>
<tr>
<td>AFIB</td>
<td>Ramipril 10 mg po OD</td>
</tr>
<tr>
<td></td>
<td>Furosemide 120 mg po OD</td>
</tr>
<tr>
<td></td>
<td>Nitroglycerin 0.4 mg Spray SL PRN</td>
</tr>
<tr>
<td>Other</td>
<td>Omeprazole 20 mg po OD</td>
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</table>
## Thyroid Profile

<table>
<thead>
<tr>
<th>Marker</th>
<th>Normal</th>
<th>Mrs. RH</th>
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</thead>
<tbody>
<tr>
<td>TSH</td>
<td>0.35 – 4.94</td>
<td>54.75</td>
</tr>
<tr>
<td>T4</td>
<td>9 – 19</td>
<td>6</td>
</tr>
<tr>
<td>T3</td>
<td>2.6 – 5.7</td>
<td>&lt; 1.5</td>
</tr>
</tbody>
</table>

S&Sx consistent with primary hypothyroidism

Diagnosis – Myxedema Coma

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Review of Hypothyroidism and Myxedema Coma
Hypothalamic-Pituitary-Thyroid Axis
Hypothyroidism Classification

(1) Primary Hypothyroidism
- Disorder of the thyroid gland
  - ↓ production of T3 and T4
  - E.g. Hashimoto’s disease, iodine deficiency

(2) Central Hypothyroidism
- Disorder of the pituitary gland, hypothalamus, or hypothalamic-pituitary portal circulation
  - ↓ stimulation of a normal thyroid gland by TSH
    - ↓ thyroid hormone

  - (a) Secondary Hypothyroidism
    - Disorder of the pituitary gland to release TSH
      - e.g. Sheehan's syndrome, pituitary adenomas

  - (b) Tertiary Hypothyroidism
    - Disorder of the hypothalamus to release TRH

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Hypothyroidism Classification

- **Primary Hypothyroidism**
- **Secondary Hypothyroidism**
- **Tertiary Hypothyroidism**
Review of T4, T3, Reverse T3 (rT3)

- T4 is deiodinated to form either T3 or rT3
  - T3 is active form
    - 4-5x more potent than T4
    - Short half life (~24 h)
  - rT3 is non-active form

- >99% of T4 and T3 is bound in the blood
  - 75% - Thyroid binding globulin (TBG)
  - 15-20% - Thyroid binding prealbumin (TBPA)
  - 5-10% - Albumin
Hypothyroid Presentation

- **Signs and symptoms**
  - Dry, pale, cool skin
  - Sparse, coarse hair
  - Deep hoarse voice
  - Fatigue
  - Peri-orbital edema
  - Macroglossia
  - Non-pitting edema of hands/feet
  - Delayed deep tendon reflexes
  - Cold intolerance

Source: http://www.netterimages.com
Physiological Effects

- **Calorigenesis**
  - ↓ basal metabolic rate
  - ↓ $O_2$ consumption
  - ↓ thermogenesis

- **Compensated Hypothyroidism**
  - Peripheral vasoconstriction to redirect blood towards central organs to maintain normal body temperature

References:
Physiological Effects

Cardiovascular

- α- and β-adrenergic imbalance
  - Reduction in expression of β-adrenergic receptors
- Result?
  - Diminished β receptor responsiveness
    - ↓ heart rate, ↓ stroke volume, ↓ cardiac output
  - Unopposed α receptor responsiveness
    - Vasoconstrictive, hypertensive response to catecholamines
      - Peripheral vasoconstriction
      - Diastolic hypertension
      - Decreased blood volume (up to 20%)
- Other
  - Prolonged QT interval
  - Ventricular enlargement

Physiological Effects

Respiratory Function

- ↓ ventilatory drive to hypoxia and hypercarbia
  - Alveolar hypoventilation
  - CO$_2$ retention and narcosis
  - Coma
- Exacerbating factors?
  - Sedatives
  - Pneumonia
  - Obstructive sleep apnea
  - Myxedematosus swelling of upper airway

<table>
<thead>
<tr>
<th>Alteration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug clearance</td>
<td>↓ Risk of drug toxicity</td>
</tr>
<tr>
<td>ADH level</td>
<td>↑ Risk of hyponatremia</td>
</tr>
<tr>
<td>Water clearance</td>
<td>↓ Risk of hyponatremia</td>
</tr>
<tr>
<td>Gluconeogenesis Glycogenolysis</td>
<td>↓ Risk of hypoglycemia</td>
</tr>
<tr>
<td>Cortisol clearance</td>
<td>↓ Thyroid hormone replacement can contribute to cortisol insufficiency</td>
</tr>
<tr>
<td>RBC</td>
<td>↓ Anemia with Hct 30-35% common</td>
</tr>
<tr>
<td>WBC</td>
<td>N or ↓ Rarely &gt; 10 000</td>
</tr>
<tr>
<td>CK</td>
<td>↑ Can be mistaken for myocardial infarction</td>
</tr>
</tbody>
</table>
Decompensated Hypothyroidism

- Decompensation occurs when homeostatic mechanisms are disrupted by a precipitating factor.

- Progressive dysfunction can result in myxedema coma.
Myxedema Coma

- Most severe expression of hypothyroidism
  - First reported in 1879 in London, England
    - Rare – only 300 cases have been reported to date!

- Life-threatening condition
  - Historically, mortality = 60-70%
  - With current treatment advances, mortality = 15-20%

- “Myxedema coma” is a misnomer
  - Neither myxedema or coma are prerequisites for diagnosis

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What is Myxedema?

- Skin and tissue disorder usually caused by severe prolonged hypothyroidism

- Accumulation of hyaluronic acid and chondroitin sulfate in the dermis
  - Mechanism unknown

- Presentation
  - Skin thickening
  - Swelling of lips, subcutaneous tissue
  - Dry, yellow skin
  - Puffiness around eyes

Source: http://meded.ucsd.edu

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What is Myxedema?
Clinical Presentation

- Signs and symptoms of myxedema coma
  - Altered mental status
  - Hypothermia
  - Hypoventilation
  - Bradycardia
  - Hypotension
  - Hyponatremia
  - Hypoglycemia
  - Associated infection

  → Hallmark signs

- Progression dysfunction of the cardiovascular, respiratory and central nervous systems
  - E.g. lethargy → stupor → coma
Precipitating Factors

- Infection / sepsis
- Cold exposure
- Congestive heart failure
  - Lung disease
  - Stroke
  - Gastrointestinal bleeding
  - Trauma
  - Hypoglycemia

- Drugs
  - Anesthetics
  - Sedatives
  - Narcotics
  - Tranquilizers
  - Beta blockers
  - Diuretics
    - Amiodarone
    - Lithium
    - Phenytoin
    - Rifampin

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Risk Factors

- **Elderly**
  - Majority $\geq 60$ years of age

- **Female**
  - 80% of cases

- **Winter**
  - 90% of cases
  - Lowers threshold for vulnerability because increased thyroid hormone requirement to maintain adequate body temperature

- Prior history of hypothyroidism (or related causes)

Diagnosis

- Myxedema coma is caused by primary hypothyroidism in >95% of cases
  - ↓ T4 and ↑↑↑ TSH

- Differentiate from central hypothyroidism
  - ↓ T3, ↓ T4, ↓ or ↔ TSH

- Differentiate from severe non-thyroidal systemic illness (sick euthyroid syndrome)
  - ↓ T3, ↓ T4, ↓ or ↔ TSH
Diagnosis

- Other laboratory abnormalities that support the diagnosis:
  - ↑ CK
  - ↓ Na
  - Hypoglycemia
  - Anemia
  - ↓ WBC
General Treatment Principles

- Early recognition and rapid treatment
  - “When in doubt, treat”

- Resuscitate and stabilize patient within 24 – 48h

- Empiric thyroid hormone therapy
- Empiric glucocorticoid therapy
- Empiric antibiotic therapy
- Supportive care

Three major strategies
- T4 (levothyroxine) alone
- T3 (liothyronine) alone
- T4/T3 combination

Challenge is achieving fine balance between:
- Urgent replacement of thyroid hormone
- Complications of supraphysiological levels of thyroid hormone

Be more cautious with elderly patients especially those with underlying cardiac disease
Therapy with T4

Advantages
- Metabolism of $^{131}$I-labelled T4 allows for estimation of required dose
- T4’s peripheral conversion requirement and tight binding to thyroxine-binding globulin cause slow, gradual release of T3

Significance?
- Overtreatment is less likely compared to T3
  - High dose can be used to replenish body pool of T4 (500 µg)
- More predictable onset and duration of action
  - Elimination half-life ($t_{1/2}$) = 7 d

Therapy with T4

Advantages

- Gradual conversion to T3 minimizes risk of adverse cardiac effects associated with sudden changes in T3
  - Organ response to thyroid hormone replacement occurs sequentially rather than in parallel
    - Cardiovascular system regains its response to adrenergic stimulation before it regains its full capacity to perform work
    - Excessive thyroid hormone levels poses risk of overstimulating the cardiovascular system

- High doses do not appear to cause any detectable adverse effects when administered to sick euthyroid patients

Therapy with T4

Disadvantages

- Conversion of T4 → T3 is reduced in critically ill patients and hypothyroid state
  - Impaired 5’deiodinase activity
  - Increased conversion to reverse T3 (inactive)
T4 Regimen

- 300 – 500 µg IV x 24 h then
  - 50 – 100 µg IV od until PO meds tolerated

- Consider dose reductions for elderly patients (especially if known history of cardiac disease)
Case Reports with T4

Retrospective review by Arlot et al

- 2 patients treated with intravenous T4
  - Pt 1: 1000 µg IV (load) + 500 µg IV (on day 6,12)
  - Pt 2: 1000 µg IV (load) + 100 µg PO od (day 9)

- 5 patients treated with oral T4
  - Pt 4-5: 500 µg PO (load) + 100 µg PO od (day 2)
Case Reports: Arlot et al

In IV group,
- T4 and T3 peaked within 3 h
- Levels fell to hypothyroid range after 24 h
- Good clinical response within 24-72 h
- One died of myocardial infarction on day 15

In PO group,
- T4 and T3 increased slowly
- Levels remained in hypothyroid range
- Good clinical response within 24-72 h
- One died of septicemia on day 9
Conclusions?

- Oral route allows for more gradual increase of T4 levels without significant delay (> 36 h) in onset of clinical response.

- Peripheral conversion of T4 to T3 allows for gradual delivery to organ systems.
Case Reports with T4

- Prospective case series by Holvey et al
  - Seven patients treated with intravenous T4
    - 300-500 µg IV to correct thyroid hormone deficit
  - All patients exhibited:
    - No evidence of cardiac complications related to acute treatment with T4
      - Note that 2 patients had significant history of CAD
    - Improvement in vital signs within 6-12 h
    - Return to consciousness within 36 h
    - Ability to return home

Case Reports with T4

- Prospective case series by Rodriguez et al.
  - Eleven patients treated with intravenous T4
    - 6 patients received 500 µg IV then 100 µg IV od
    - 5 patients received 100 µg IV od
  - High dose T4 group had lower mortality rate than low dose T4 group
    - 16.7% vs. 60% (NS)

Conclusions on T4

- High dose T4 (po/iv) appears to be a reasonable option for acute treatment
  - 85% (17 of 20) survival rate
  - No significant cardiac complications attributable to T4 treatment
Therapy with T3

Advantages

- Rapid onset of action
  - No deiodination is required for bioactivity

- Animal studies show that T3 cross the BBB more readily and rapidly than T4


Treatment with T3

Disadvantages

- Use of T3 has risk of overcorrection and abrupt cyclical changes in metabolic status
  - Risk of cardiovascular complications and relapse
  - Elimination half life \((t_{1/2}) = 24\ h\)

- Hylander et al. found that average daily dose \(\geq 76\ \mu g\) is associated with fatal outcome
  - T3 levels were 1.9x higher in non-survivors compared to survivors \((p < 0.05)\)


T3 Regimen

- 10 – 20 µg IV then
  - 10 µg IV q4h x 24 h then
    - 10 µg q6h until patient regains consciousness and can take oral T4

- Consider dose reductions for elderly patients (especially if known history of cardiac disease)
Case Reports with T3

- Case reports between 1911-1961 showed that survival rates were higher in patients treated with T3 compared to T4

![Bar chart showing survival rates for T3 and T4 treatment]

Survival (%)

- T3: 14/31 (45%)
- T4: 4/20 (20%)

Case Reports with T3

- All non-surviving patients in the T4 group had received inadequate doses of T4
  - 75% of surviving patients had received high dose T4

- All surviving patients in the T3 group had received high doses of T3 (i.e. 50-200 µg load)

- 47% of non-surviving patients had received high dose T3 and died despite an initial response

Case Reports with T3

- Prospective case series by Pereira et al
  - Pt 1 and 2 - T3 12.5 µg NG q6h
  - Pt 3 - T3 12.5 µg NG q6h x 6 days then
    - T3 50 µg IV q24h x 7 days then
    - T4 100 µg IV until PO meds tolerated
  - All patients survived without cardiac complications

- Serum T3 levels failed to rise despite NG treatment in Pt 3
  - T4 therapy corrected T4 levels, but did not increase T3 levels
    - Reverse T3 rose proportionately to administered T4 levels

- Consciousness was regained after 3-7 days of treatment

Case Reports with T3

Case report by McCulloch et al

- Patient treated with single dose of 2.5 µg NG
  - Within 30 min,
    - Increase in O₂ consumption (80 → 100 L/min/m²)
    - Increase in heart rate (62 → 80 bpm)
    - Increase in cardiac output (3.4 → 4.2 L/min/m²)
- Patient recovered without any cardiac complications
- Dose increased gradually over 10 days to 10 µg NG od then switched to T4 0.1 mg PO od
- Results suggest that there is a risk of precipitating myocardial ischemia with larger doses of T3
Conclusion on T3

- Low dose T3 (po/iv) appears to be a reasonable option in acute treatment

- Conflicting evidence regarding the safety of high dose T3
## Comparison of T4 and T3

<table>
<thead>
<tr>
<th></th>
<th>T4</th>
<th>T3</th>
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</thead>
<tbody>
<tr>
<td><strong>Onset</strong></td>
<td>Up to 1 week</td>
<td>Within 24 hours</td>
</tr>
<tr>
<td><strong>(Consciousness)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Onset</strong></td>
<td>8 – 14 h</td>
<td>2 – 3 h</td>
</tr>
<tr>
<td><strong>(Temperature and O2 consumption)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>t₁/₂</strong></td>
<td>7 d</td>
<td>1 d</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
<td>IV and PO</td>
<td>PO</td>
</tr>
<tr>
<td><strong>In Canada</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Comparative Efficacy</strong></td>
<td>???</td>
<td>???</td>
</tr>
<tr>
<td><strong>Comparative Safety</strong></td>
<td>Decreased relative risk of cardiac complications?</td>
<td>Increased relative risk of cardiac complications?</td>
</tr>
</tbody>
</table>
Therapy with T4/T3 Mix

- Wartofsky advocates combination therapy
  - T4 - 4 µg/kg LBW (200-300 µg) IV x 24h then
    - 100 µg IV x 24h then
      - 50 µg PO/IV q24
  - T3 - 10 µg T3 IV q8-12h until maintenance
    oral T4 dose is tolerated

- Physiologic rationale
  - Improved safety and efficacy?
Conclusions

- Good evidence to support one of the above replacement strategies in terms of efficacy or safety does not exist.

- No controlled trials comparing strategies to each other or various dosing regimens.

- Most experts advocate the use of intravenous T4 alone.
Glucorticoid Therapy

- Empiric therapy is advocated in case of concomitant adrenal insufficiency to prevent adrenal crisis
  - Myxedema coma can also be caused by pituitary or hypothalamic disease
  - Ridgeway et al found that cortisol response to stress is blunted in severe hypothyroidism
  - Thyroid hormone therapy may increase cortisol clearance

- Tx: Hydrocortisone 50-100 mg IV q6-8h

- Monitoring
  - Discontinue if baseline cortisol consistent with stress response
  - If needed, ACTH stimulation test can be administered

Antibiotic Therapy

- **Infection present in 35% of cases**
  - Pneumonia or urosepsis is most common

- **Usual signs of infection are absent**
  - Fever, diaphoresis, tachycardia

- **Since hypothermia is the rule, presence of a “normal” temperature is clue of underlying infection and/or sepsis**

- **Empiric therapy with broad spectrum antibiotics is recommended until organism is identified**

Hypotension

Recall hypertension is expected in patients with uncomplicated chronic hypothyroidism

Hypotension indicates:

- Bleeding
  - GI bleed
- Functional loss of blood volume
  - Pooling of blood secondary to sepsis
  - Iatrogenic vasodilation due to external warming
  - Overuse of diuretics

Hypotension and Vasopressors

- Volume resuscitation with whole blood is preferred
  - Why?
    - Restores blood volume
    - Increases O$_2$-carrying capacity
  - Alternative? Crystalloids

- If possible, avoid vasopressors and inotropes
  - Exacerbate or precipitate cardiac arrhythmias (especially when combined with thyroid hormone replacement)
  - Treatment often fails to achieve desired effect
    - Recall α- and β-adrenergic imbalance
    - Recall reduced blood volume

Hypotension and Hyponatremia

Dilemma!
- Need to administer fluids for hypotension
- Need to restrict fluids for hyponatremia

Treatment strategies?
- Isotonic saline to replace majority, but not all, of daily fluid losses
- Hypertonic 3% saline (50-100 mL) followed by furosemide bolus (40-120 mg) to promote diuresis

Treatment of Hypothermia

- Recall peripheral vasoconstriction is one mechanism of compensation for hypothermia.

- Exercise caution with re-warming:
  - Rapid warming can cause peripheral vasodilation and increase O$_2$ consumption:
    - Result? cardiovascular collapse
    - eg. external warming blankets
  - Passive re-warming is recommended:
    - eg. conventional blankets
Predictors of Fatal Outcome

- Advanced age
- Body temperature < 34°C
- Hypothermia non-responsive after 3 day
- Bradycardia < 44 bpm
- Sepsis
- Myocardial infarction
- Hypotension
- Treatment with T3?

Mortality and Hypothermia

Response to therapy and survival correlates with degree of hypothermia
(Based on all 76 reported cases in the world between 1911-1961)

Pharmacy Care Plan

**DRP**
- Mrs. HR is experiencing signs and symptoms of myxedema coma and requires appropriate thyroid hormone replacement therapy

**Clinical Outcome**
- Resolve urgent endocrine deficit and prevent complications of myxedema coma

**Pharmacotherapeutic Outcome**
- Provide optimal thyroid hormone replacement therapy at the right dose, frequency and duration while minimizing cardiac complications

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## Pharmacotherapeutic Endpoints

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Degree of Change</th>
<th>Time Frame</th>
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</thead>
<tbody>
<tr>
<td>Hypothermia</td>
<td>Resolution</td>
<td>24 – 48 h</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>Improvement</td>
<td>24 h</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Keep MAP &gt; 65</td>
<td>24 h</td>
</tr>
<tr>
<td>TSH</td>
<td>Normalize</td>
<td>24 – 48 h</td>
</tr>
<tr>
<td>T4</td>
<td>Normalize</td>
<td>24 – 48 h</td>
</tr>
<tr>
<td>T3</td>
<td>Normalize</td>
<td>Within 7 days</td>
</tr>
<tr>
<td>LOC</td>
<td>Increased Complete recovery</td>
<td>24 – 48 h, 7 days</td>
</tr>
</tbody>
</table>
Therapeutic Alternatives

As discussed:
- Intravenous T4 alone
- Intravenous T3 alone
- T4 / T3 combination

Patient considerations
- Elderly patient
- History of cardiac disease
- Prolonged QT
- Elevated CK and Tn on admission
## Therapeutic Plan

<table>
<thead>
<tr>
<th>Indication</th>
<th>Drug Therapy</th>
</tr>
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<tbody>
<tr>
<td>Myxedema Coma</td>
<td>Levothyroxine (T4) 250 µg IV over 24 h then 125 µg IV q24h</td>
</tr>
<tr>
<td>Enterococcus (Urine)</td>
<td>Ampicillin 1 g IV q6h</td>
</tr>
<tr>
<td>Empiric Tx</td>
<td>Ceftriaxone 1 g IV q24h</td>
</tr>
<tr>
<td></td>
<td>Hydrocortisone 50 mg IV q6h</td>
</tr>
<tr>
<td>Bradycardia / Hypotension</td>
<td>Dobutamine 4 µg/kg/min IV</td>
</tr>
<tr>
<td></td>
<td>Levaphed 0.48 µg/kg/min IV</td>
</tr>
<tr>
<td>Post MI</td>
<td>ASA 80 mg NG od</td>
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<tr>
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<td>Clopidogrel 75 mg ng od</td>
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</table>

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## Therapeutic Endpoints

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Degree of Change</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC</td>
<td>Improvement Complete recovery</td>
<td>24 – 36 h</td>
</tr>
<tr>
<td>Cardiac Complications (MI or arrhythmia)</td>
<td>Prevent</td>
<td>Throughout</td>
</tr>
<tr>
<td>Renal Dysfunction</td>
<td>Prevent further progression</td>
<td>Throughout</td>
</tr>
</tbody>
</table>
Assessment of Clinical Efficacy

- Within 24 h of receiving IV T4,
  - ↑ LOC
    - GCS 6 → GCS 11, SAS 3 → 4
  - ↑ HR
    - 60 → 85 bpm
  - ↑ respiratory capacity
    - PC 16, PEEP 10 → PS 10, PEEP 8
  - ↑ body temperature
    - 32.0 – 37.7°C
## Assessment of Clinical Efficacy

<table>
<thead>
<tr>
<th></th>
<th>Normal Range</th>
<th>Feb 12</th>
<th>Feb 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH (mIU/L)</td>
<td>0.35-4.94</td>
<td>54.75</td>
<td>6.64</td>
</tr>
<tr>
<td>Free T4 (pmol/L)</td>
<td>9 - 19</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Free T3 (pmol/L)</td>
<td>2.6 – 5.7</td>
<td>&lt; 1.5</td>
<td>&lt; 1.5</td>
</tr>
</tbody>
</table>
What happened to Mrs. RH?

- Body temperature began to decline

- Significant cardiac ischemia after 3 days of thyroid replacement
  - CK 133, Tn 7.65

- Potential causes and contributing factors?
  - High dose IV T4 therapy
  - Use of vasopressors
  - Pre-existing CAD

- Family decided to withdraw therapy
Key Points

- Myxedema coma is a severe presentation of hypothyroidism
- Treatment needs to be initiated promptly in an intensive care unit setting
- Thyroid hormone therapy is critical to survival
- Adjunctive measures may be essential
  - fluids, antibiotics, corticosteroids
Questions?