LEVOTHYROXINE (T4) USE IN DONORS

Organs Transplanted Per Donor:
Various efforts through the national collaboratives and research are being made to close the organ donation and transplantation gap. One of those efforts is to identify physiological opportunities to maximize the gift a donor family is making and to recover as many organs for transplant as possible. The organs evaluated for viability for transplant include the lungs, the heart, the liver, the kidneys, the pancreas and the small intestine.

Brain Death Physiology:
• Brain injury (traumatic or non-traumatic) causes cerebral edema.
• This causes a rise in intracranial pressure and subsequent ischemia, contributing to further cerebral edema.
• Due to the restricted volume of the skull, if the swelling is severe enough, brainstem herniation through the foramen magnum at the base of the skull can occur, leading to brainstem death.
• During herniation and brainstem death a catecholamine storm (aka sympathetic storm) occurs, releasing epinephrine, dopamine, and norepinephrine levels several hundred-fold before eventually returning to baseline. This event can cause significant hemodynamic instability.
• In addition to the catecholamine storm, there is a significant reduction in the hormonal and endocrine system resulting in a loss of thyroid hormones, triiodothyronine (T3) and thyroxine (T4), a decline in serum cortisol, antidiuretic hormone (ADH), and insulin. These changes also contribute to significant hemodynamic instability.
• Hemodynamic instability in a potential donor patient risks complete organ failure, rendering the patient unsuitable for donation.

Thyroid Dysfunction in Brainstem Herniation
• Thyroid hormones have been found to be a contributing factor to an optimally functioning cardiovascular system.
• Thyroid-stimulating hormone (TSH) is secreted by the pituitary as a result of hypothalamus stimulation.
• TSH prompts a release of triiodothyronine (T3) and thyroxine (T4).
• Hypothalamic-pituitary-adrenal axis dysfunction during brain death, results in a depletion of thyroid hormone and cortisol and contributes to cardiovascular instability and organ deterioration.

Treating the Hormonal Loss:
• When hemodynamic instability is difficult to achieve in a herniating or brain dead patient and large amounts of vasopressors are being utilized, the consideration of hormone replacement therapy should be made.
• One of the identified strategies to restore hemodynamic stability and the one adopted by OneLegacy’s donor management protocol includes the use of hormone replacement therapy with T4.
• While T4 and its efficacy in donor management remains a source of discussion and controversy, published studies have demonstrated favorable results and as there is such a shortage of organs for those in need of transplant, opportunities for maximizing the number of organs recovered for transplant is a national goal.

Common T4 Protocol: ** T4 is stable for 24 hours if protected from sunlight.

<table>
<thead>
<tr>
<th>Pre-medicate in rapid succession as follows:</th>
<th>Infusion:</th>
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<tbody>
<tr>
<td>• 1 amp 50% Dextrose in Water</td>
<td>• Levothyroxine 400 mcg / 500 mls Normal Saline</td>
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<tr>
<td>• 2 g Solumedrol IV</td>
<td>• Start infusion at 10 mcg / hr</td>
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<tr>
<td>• 20 units Regular Insulin</td>
<td>• Double infusion rate if no response</td>
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<tr>
<td>• 20 mcg Levothyroxine IV</td>
<td>• Titrare to wean off vasopressors</td>
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24-Hour Referral of all Imminent Brain Death and Cardiac Deaths should be made to
1-800-338-6112