Respiratory Management Strategies for Potential Organ Donors

Kayla Grout, RRT
UVM Medical Center
I have no financial interests or relationships to disclose.
Vermont Drug Poisoning Deaths by County (2002-2014)

Vermont's 2014 age adjusted rate of drug poisoning deaths is the same as the U.S. average at approximately 14.7 per 100,000 Vermonters.
Some Statistics for Vermont…

Opioid abuse treatment is **increasing**.
Emergency Department visits for heroin are **increasing**.

Some Statistics for Vermont…

**Rate of emergency department visits**
related to opioids per 10,000 Vermonters by type of opioid

- **Heroin**
  - 2012: 0.6
  - 2013: 1.4
  - 2014: 2.1

- **Prescription**
  - 2012: 1.2
  - 2013: 1.5
  - 2014: 1.3

Source: Vermont Early Aberration Reporting System

University of Vermont Medical Center
Fatalities involving heroin are increasing.

Source: Vermont Office of the Chief Medical Examiner
In 2015…

- 17,844 people misused a pain reliever
- 8,600 opioid dependent people treated
- 403 community naloxone reversals
- 2013-76 accidental opioid deaths
- 1,375 EMS overdose calls
- 204 ED discharges

Vermont Department of Health
Objectives

- Limiting lung and organ injury
- Optimal ventilator management
- Understanding the steps to procurement from a respiratory standpoint
Types of Organ Donation

- Donation after brain death
- Donation after cardiac death
Brain Death
UVMMC Policy on Neurological Brain Death

DEFINITION: Irreversible cessation of all functions of the entire brain, including the brainstem.

PURPOSE: To provide consistent and adequate documentation of the diagnosis of Death by Neurological Criteria.

POLICY: In order to ensure consistent and adequate documentation of Death by Neurological Criteria, the Diagnosis of Death by Neurological Criteria Navigator in PRISM (see Appendix C) must be filled out, dated, timed, and signed by the two doctors-attending physicians or designees (defined as residents or fellows on that clinical service). One physician will be board-certified in critical care (Surgical, Medical, Anesthesiology, Neurologic or Pediatric) and the second physician will be a team of Neurology, Neurosurgery, Critical Care. Two independent exams are required. Both physicians completing the exams must document in the navigators that they have examined the patient with the complete data and time and acquire a separate document the exam (see Appendix).

PROCEDURE:

1. Notification
   Prior to the completion of a determination of Death by Neurological Criteria, the attending physicians or designees shall make reasonable efforts to notify the patient’s next of kin or other person closest to the patient that such a determination is to be completed. Such efforts shall be recorded in the patient’s medical record.

2. Prerequisites (Adults and children (from newborns to children 18 years of age))
   The criteria for Death by Neurological Criteria include (a) spontaneous muscle movements or evidence of pursuit or versions or disturbances in the absence of vestibular reflexes, (b) sleep coma with unresponsiveness to any spoken pain stimuli administered above the level of the spinal cord, absence of brain stem reflexes (the poplar response to light, (c) absence of corneal reflexes, absence of corneal or spastic responses to hand tapping and calcaneal testing (downs with ROE 233 degrees from horizontal), (d) gag on deep hypoglossal stimulation and no cough reflex to endotracheal suctioning and a positive apnea test, limit movements, either spontaneous or in response to external disturbances, (e) the heart rate is considered to be reflective and originating from an intact brain that can be identified and measured using high-fidelity cardiac monitoring equipment and (f) an arterial blood pressure greater than 60 mmHg for at least 10 minutes.

3. Clinical Criteria (Adults and children (from newborns to children 18 years of age))
   The clinical criteria for the determination of Death by Neurological Criteria include the presence of spontaneous muscle movements, the absence of brain stem reflexes, the absence of corneal reflexes, the absence of corneal or spastic responses to hand tapping and calcaneal testing (downs with ROE 233 degrees from horizontal), the gag reflex on deep hypoglossal stimulation and no cough reflex to endotracheal suctioning and a positive apnea test, limit movements, either spontaneous or in response to external disturbances, (e) the heart rate is considered to be reflective and originating from an intact brain that can be identified and measured using high-fidelity cardiac monitoring equipment and (f) an arterial blood pressure greater than 60 mmHg for at least 10 minutes.

4. Determination of Death by Neurological Criteria
   The diagnosis of Death by Neurological Criteria is made by the attending neurologist or neurosurgeon, if the patient is unconscious and unresponsive to all stimuli, including the ability to follow commands, the absence of spontaneous movements, the absence of brain stem reflexes, the absence of corneal reflexes, the absence of corneal or spastic responses to hand tapping and calcaneal testing (downs with ROE 233 degrees from horizontal), the gag reflex on deep hypoglossal stimulation and no cough reflex to endotracheal suctioning and a positive apnea test, limit movements, either spontaneous or in response to external disturbances, (e) the heart rate is considered to be reflective and originating from an intact brain that can be identified and measured using high-fidelity cardiac monitoring equipment and (f) an arterial blood pressure greater than 60 mmHg for at least 10 minutes.

The Formal Apnea Testing
Testing for apnea is outlined in the American Academy of Neurology (AAN) practice guidelines for performing apnea test (3) and is as follows:

1. Patients will receive oxygen support aimed at maintaining arterial oxygen saturation at the discretion of the attending physician as and as close to the patient as possible throughout the procedure. Please reference Respiratory Apnea Test Procedure (Appendix B).
2. Arterial blood gas samples or end tidal carbon dioxide measurements are taken for analysis before ventilator support is administered and then intermittently to determine ventilator support required.
3. In case of severe hypotension the blood pressure and end tidal CO2 should be monitored closely.
4. A physician will observe for effective respiratory movements during the apnea test (typically 5-10 minutes). Blood pressure, oxygen saturation, and heart rate are monitored during the procedure. Familiarity with apnea testing to help them understand the concept of Death by Neurological Criteria.
5. A positive apnea test (i.e., supporting the diagnosis of Death by Neurological Criteria) is one in which there is no observable effective respiratory movements in the setting of a PaCO2 of 60 mmHg or greater than 20 mmHg increase above the baseline measured value.
6. In patients who develop severe hypotension during the apnea testing period, vasopressors (e.g., dopamine, norepinephrine, or levophed) may be used to support SBP >100 mmHg. If a patient remains hemodynamically unstable despite vasopressor support, the apnea test should be stopped. At this time, it is up to the discretion of the physician whether a confirmatory test is required to finalize the clinical diagnosis of Death by Neurological Criteria. Alternatively, the apnea test can be attempted again 10 minutes later.

6. The results of the apnea test shall be documented in the Death by Neurological Criteria Navigator in PRISM.

The period of observation recommended between the two clinical exams to determine Death by Neurological Criteria varies depending on the patient's age:

- 40 to 50 years: 1.5 hours
- 50 to 60 years: 1.0 hour
- 60 to 70 years: 0.5 hour
- 70 to 80 years: 0.25 hour
- 80 to 90 years: 0.1 hour

ANCILLARY TESTS

Death by Neurological Criteria is a clinical diagnosis and an ancillary test is not mandatory. However, an ancillary test is necessary in patients in whom specific components of clinical testing cannot be reliably performed or evaluated. The following conditions may interfere with the clinical diagnosis of Death by Neurological Criteria, such that the diagnosis cannot be made with certainty on clinical grounds alone:

1. Severe facial trauma that precludes assessment of brainstem function.
2. Pre-existing sleep disturbances or other conditions that interfere with the accuracy of the clinical assessment.
3. Levels of substances, medications thought to be interfering with clinical exam, including but not limited to sedatives, hypnotics, anxiolytics, antipsychotics, anticonvulsants, or neurovascular blocking drugs. (A cerebral blood flow scan—Cerebral blood flow scan or Contrast or venous angiography—is necessary in this case).
4. Presence of severe electrolyte imbalance, severe acidosis, or the presence of neuromuscular disorders.

Once clinical examinations by two physicians indicate Death by Neurological Criteria, and an ancillary test is not performed, then a confirmatory test such as EEG, electrocorticographic, MEG, or other imaging studies should be performed. The EEG will be recorded according to guidelines developed by the American Electroencephalographic Society.
Irreversible cessation of all functions of the brain and brainstem

• Criteria for brain death:
  – Unresponsive to noxious stimuli
  – No pupillary reflexes
  – Absence of corneal reflexes
  – No gag or cough
  – Absence of ocular response
  – No spontaneous muscle movements or evidence of posturing or shivering

• Testing:
  – Apnea testing
  – Ancillary testing
Testing Methods

- To make sure there are no reversible causes

- Apnea testing
  - To prove there’s no respiratory drive or effort

- Ancillary testing
  - To prove there’s no electrical activity to the brain/brainstem
Apnea Testing

- Baseline ABG
  - Goal PCO2 levels approximately 40 mmHg
- Place patient on flow inflating bag, with manometer
  - Achieve a PEEP of 10 cmH2O
  - 5-10 minutes, observe for respiratory effort, watch vital signs
- Second ABG before placing back on ventilatory support

POSITIVE apnea test:
- No observable respiratory effort
- Increase in PCO2 by 20 mmHg, or >60 mmHg total
Ancillary Testing

• Electroencephalogram (EEG)
  – Detects electrical activity in the brain

• Radioisotope imaging, four-vessel angiography
  – Studies blood flow and vessels in the brain and brainstem
Risks Associated with Brain Death

- Neurogenic pulmonary edema
- Immunologic and inflammatory responses
  - SIRS
  - ARDS
After brain death, lungs are at risk for the development of lung injury due to neurogenic pulmonary edema (NPE).
Risks Associated with Brain Death, cont.

• Brain death can also induce immunologic and inflammatory responses.
  – Can trigger systemic inflammatory response syndrome (SIRS)
    • Associated with the release of cytokines
  – SIRS can stimulate neutrophilic infiltration in the lungs
    • ARDS
Cardiac Death
Donation After Cardiac Death

• Occurs after the cessation of circulatory and respiratory function
  – NOT cardiac function
  – EKG, Doppler study, indwelling arterial line may be used to assess for the absence of circulation
Transplant Criteria
Donation Teams Have High Standards...

<table>
<thead>
<tr>
<th>Table 1 Ideal lung donor criteria (1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20-45</td>
</tr>
<tr>
<td>PaO₂:FiO₂</td>
<td>&gt;350</td>
</tr>
<tr>
<td>Smoking history</td>
<td>None</td>
</tr>
<tr>
<td>Chest X-ray</td>
<td>Clear</td>
</tr>
<tr>
<td>Ventilation days</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Microbiology</td>
<td>Gram stain negative</td>
</tr>
<tr>
<td>Bronchoscopy</td>
<td>Clear</td>
</tr>
<tr>
<td>Ischemic time</td>
<td>&lt;4 hours</td>
</tr>
</tbody>
</table>
A Soft NO (AKA Extended Criteria)

- Advanced donor age (>55 years old)
- Significant smoking history
- Chest trauma
- Evidence of aspiration or sepsis
- Abnormal chest radiography
- Cytomegalovirus (CMV)
- Diabetes
- Malignancy
  - Low grade skin cancer, cervical cancer
- Pulmonary edema or contusions, vascular thrombosis
The Hard NO

- HIV/AIDS*
- Systemic viral infections
  - Measles, rabies, adenovirus, West Nile, hepatitis B antigen positivity, hepatitis C, etc.
- Gram-negative bacteremia
  - Infection caused by hard to treat bacteria (often multi-drug resistant)
- Mycobacterial infections of the chest
  - Tuberculosis

*HOPE Act, which allows HIV+ donors to donate liver and kidneys to HIV+ recipients. Lung donation is not included in this.

https://optn.transplant.hrsa.gov/learn/professional-education/hope-act/
So where do we come in???
Lung Management

• Initial evaluation/interventions
• Secondary evaluation/interventions
• Tertiary evaluation/interventions
Initial Evaluation/Interventions

- Physical exam
- Current and past medical history
- Chest X-ray, chest CT
- ABG (repeat Q4-Q6)
- Volume assessment (I&O’s)
- Ventilator management
Ventilation Strategies

- Protective lung/low tidal volume
- Optimal PEEP and oxygenation
- Low plateau and inspiratory pressure
- Respiratory rate
- Closed circuit suction
Low Tidal Volume

• Tidal volumes of 6-8 ml/kg of ideal body weight (IBW)
  – Reduces risk of acute respiratory distress syndrome (ARDS)
  – Reduces risk of lung injury

  – Two randomized groups:
    • Conventional ventilation (CV) 10-12 ml/kg IBW, 59 patients
    • Lung protective ventilation (LPV) 6-8 ml/kg IBW, 59 patients

Vent Parameters

- PEEP 5-10 cmH2O
- Titrate FiO2
  - SpO2 >95%
  - PaO2 >90 mmHg
- Diuretics if chest X-ray shows pulmonary edema
- Transfuse blood cells as needed

- Hypoxemia needs to be treated aggressively to prevent injury to other organs
**Vent Parameters**

- **PIP and plateau pressures**
  - Maintain below 30 cmH2O
  - Reduce lung injury
  - If unable to obtain plateau pressure, peak pressures may be used

- **Respiratory Rate**
  - Adjust accordingly
  - Maintain PCO2 35 mmHg-45 mmHg
  - Maintain pH 7.35-7.45
Closed Circuit Suction

- Maintains sterile catheter
- Helps to maintain recruitment by not disconnecting ventilator circuit
Lung Management

- Initial evaluation/interventions
- Secondary evaluation/interventions
- Tertiary evaluation/interventions
Secondary Evaluation/Interventions

- Central line access
- Arterial line placement
- Bronchoscopy
- Sputum culture
- Thermoregulation
- Bronchodilators/corticosteroids
- Pulmonary toilet
- Antibiotic therapy
Bronchodilators/Steroids

Bronchodilators—may be given to patients with pulmonary history for the management of bronchospasm.

Steroids—given prior to organ retrieval to optimize the donor lungs, and also as a treatment for the inflammatory response that can occur with brain death.

Airway Clearance and Hyperinflation

• Prevent atelectasis
  – Intrapulmonary Percussive Ventilation (IPV)
  – Chest physiotherapy (CPT)
  – Cough Assist

• Mobilize and remove secretions
  – IPV
  – CPT
  – Cough Assist
  – Suctioning
  – Vest
**Airway Clearance and Hyperinflation Modalities**

**IPV**
- Small microbursts of air travel down the airways, promoting recruitment and providing airway clearance
- Primary modality used at UVMMC

**Vest**
- Full vest or partial wrap that provides high frequency oscillations on the chest wall
- Used for airway clearance
Airway Clearance and Hyperinflation Modalities

Cough Assist
- Provides artificial cough
- Uses positive and negative pressures
- Helps with hyperinflation and secretion removal

Suctioning
- Removes secretions
- Inline suction helps to reduce de-recruitment caused by disconnecting circuit
Antibiotics can be administered to protect the organs being donated.

For lung donors, regimen is designed to cover MRSA and gram-negative pathogens often found in lower respiratory tract colonizations.

Continue until procurement.
Ventilator Associated Events (VAE)

• Groups all the conditions that result in a significant and sustained deterioration in oxygenation.
  – Defined as a greater than 20% increase daily in FiO2
  – Or an increase of at least 3 cmH2O daily in PEEP

• Infectious conditions and noninfectious conditions may fulfill this definition.
Preventing Ventilator Associated Events (VAE)

- Elevated head of bed
- Frequent oral care (Q2)
- Hand hygiene
- Adequate endotracheal tube cuff pressures
- Lung-protective ventilator strategies
Lung Management

- Initial evaluation/interventions
- Secondary evaluation/interventions
- Tertiary evaluation/interventions
Tertiary Evaluation/Interventions

- FiO2 challenge
- PEEP recruitment
- Pulmonary edema management
FiO2 Challenge (UVMMC Policy)

**Lung Donor Candidate**
- Confirm Brain Death and Review exclusion criteria
- Initiate protective lung strategy:
  - $V_t = 6 - 8 \text{ mL/kg IBW}$
  - PEEP $8 - 10 \text{ cm H}_2\text{O}$
  - FiO2 $1.0$

**P/F Ratio < 300 mm Hg**
- Perform recruitment maneuver for 2 hours:
  - VCV: $V_t = 6 - 8 \text{ mL/kg IBW} + \text{PEEP} 15 \text{ cm H}_2\text{O}$ OR
  - PCV: $P_c = 10 - 15 \text{ cm H}_2\text{O} + \text{PEEP} 15 \text{ cm H}_2\text{O}$
  - Keep Pressure Limit $< 30 \text{ cm H}_2\text{O}$ in either mode
- Return to pre-recruitment settings:
  - P/F Ratio < 300 mm Hg
  - Reject as lung donor

**P/F Ratio ≥ 300 mm Hg**
- Continue ventilation with:
  - $V_t = 6 - 8 \text{ mL/kg IBW}$
  - PEEP $8 - 10 \text{ cm H}_2\text{O}$
  - Decrease FiO2 as low as possible to keep SpO2 $92 - 95$
- Prepare for further assessment of suitability for lung donation
Successful FiO2 Challenge

- Normalize ABG
- FiO2 to 100%, PEEP 5 cmH2O for 30 minutes
  - Draw ABG, PaO2 in healthy lungs >300 mmHg
- Drop FiO2 to 40% for 30 minutes
  - Redraw second ABG, PaO2 >120 mmHg
- Prepare for further evaluation
FiO2 Challenge

Lung Donor Candidate
- Confirm Brain Death and Review exclusion criteria
- Initiate protective lung strategy:
  \( V_T \ 6 - 8 \text{ mL/kg IBW} + \text{PEEP } 8 - 10 \text{ cm H}_2\text{O} + \text{FiO}_2 \ 1.0 \)

P/F Ratio < 300 mm Hg
- Perform recruitment maneuver for 2 hours:
  - VCV: \( V_T \ 6 - 8 \text{ mL/kg IBW} + \text{PEEP } 15 \text{ cm H}_2\text{O} \) OR
  - PCV: \( P_C \ 10 - 15 \text{ cm H}_2\text{O} + \text{PEEP } 15 \text{ cm H}_2\text{O} \)
  - Keep Pressure Limit < 30 cm H2O in either mode
- Return to pre-recruitment settings:
  - P/F Ratio < 300 mm Hg
    - Reject as lung donor
- P/F Ratio ≥ 300 mm Hg
  - Continue ventilation with:
    - \( V_T \ 6 - 8 \text{ mL/kg IBW} \)
    - PEEP 8 - 10 cm H2O
    - Decrease FiO2 as low as possible to keep SpO2 92 - 95%
    - Prepare for further assessment of suitability for lung donation

Return to pre-recruitment settings:
- P/F Ratio ≥ 300 mm Hg
  - Continue ventilation with:
    - \( V_T \ 6 - 8 \text{ mL/kg IBW} \)
    - PEEP 8 - 10 cm H2O
    - Decrease FiO2 as low as possible to keep SpO2 92 - 95%
    - Prepare for further assessment of suitability for lung donation
Unsuccessful FiO2 Challenge

• If PaO2 is not greater than 300 mmHg on 100%, perform recruitment maneuvers for 2 hours, then return to pre-recruitment settings and attempt challenge again.
  – If PaO2 still <300 mmHg, reject as donor lungs.
On the Horizon
Airway Pressure Release Ventilation (APRV)

- A mode of ventilation that can be used in potential donors to improve hypoxemia, control PIPs, recruit alveoli
- Uses higher, controlled PIP and prolonged inspiratory phase
  - Similar to inverse ratio ventilation, but does not have a closed expiratory valve
  - Helps to keep lungs recruited
APRV vs. Volume Ventilation Waveforms

APRV

Traditional Ventilation
• For spontaneously breathing patients, APRV allows them to breath above the set pressure.
  – Promotes recruitment of posterior lung segments
• APRV can also be used in brain dead patients who are not triggering breaths to help manage neurogenic pulmonary edema.
APRV

Low Tidal Volume Ventilation

APRV
Case Study

• 27 y.o. male (day 1)
• CC: asystole, cardiac arrest
  – Found unresponsive and pulseless in car
  – Unknown down time (at least 30 minutes)
• ROSC obtained in ED
Case Study

- **Initial Evaluation:**
  - Hx known drug abuse (cocaine)
  - Intubation and arterial line placement in ED
    - Briefly on vasopressors after intubation
  - CT head: cerebral edema, diffuse anoxic injury
  - Neuro exam (in ED):
    - Overbreathing vent
    - NO cough/gag
    - Pupils fixed and dilated
    - No response to noxious stimuli
  - Initial ABG in ED, immediately following intubation:
    7.19/51/481/21/-9, FiO2 100%
  - Initial vent settings: 520 (8 cc/kg), RR 22, PEEP 5, FiO2 100%
• **Secondary evaluation** (day 2):
  – A-line placed in ED
  – Central line placed in ICU
  – Second ABG (in ICU): 7.43/27/240/18/-5, 50% FiO2
  – Targeted Temperature: 36 C
  – Corrected electrolyte abnormalities
  – NO sedation on board
  – Labs Q6
  – Neuro exam in ICU:
    • NOT following commands
    • No movements or w/d to noxious stim
    • Pupils fixed and dilated
    • No corneal reflexes
    • No gag/cough
    • No deep tendon reflexes
**Case Study**

- **EEG (day 2):** 26 minutes in duration
  - Reading: abnormal, depressed EEG. No activity shown in study.

- **Bronchoscopy (day 3):**
  - Left lung: normal in appearance, secretions noted in LLL
  - Right lung: mildly erythematous w/ thick white secretions
    - Sputum culture sent

- **Apnea test:**
  - Initial ABG: 7.43/42/505/29/+3, 100% FiO2
  - Follow-up ABG: 7.14/89/80/33/-2

  **POSITIVE APNEA TEST**
• **Tertiary evaluation:**
  – Vent changes/management (day 3):
    • Vt to 550 ml from 520 ml
    • PEEP to 8 cmH20, from 5 cmH20
    • IPV Q4
    • Cuff pressure between 20 mmHg-30 mmHg
    • ABG PRN
  – FiO2 challenge:
    • FiO2 100%: 7.49/34/459/26
    • FiO2 40%: 7.48/36/201/26
    – **SUCCESSFUL FIO2 CHALLENGE**
Case Study

- Day 4: to OR at 01:00
  - Donation by brain death
  - Organ placement: heart, both lungs (some adhesions noted on left lower lobe), both kidneys, liver, iliac artery and veins
    - Spleen and lymph nodes taken for tissue typing
• Initial vent settings quickly reversed respiratory acidosis
• Appropriate vent settings in the ICU based on the patient’s IBW prevented further injury to the lungs and other organs
• Airway clearance/hyperinflation kept the lungs recruited and clear of secretions
  – Doing this prophylactically can increase the rate of donation
• Open communication with the teams at every step of the process helps to achieve the overall goal
  – HEALTHY, DONATABLE ORGANS
## UVMMC Statistics

### Organ Disposition Summary Report

**NYAP - Center for Donation and Transplant**

**01/01/2013 - 01/01/2018**

<table>
<thead>
<tr>
<th>Organ List</th>
<th>Recovered</th>
<th>Transplanted</th>
<th>Research</th>
<th>Discarded</th>
<th>Recovered for HV</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>16</td>
<td>15</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intestine</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kidney</td>
<td>91</td>
<td>75</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Liver Split</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Liver Whole</td>
<td>36</td>
<td>33</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lung</td>
<td>19</td>
<td>13</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pancreas</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>174</strong></td>
<td><strong>147</strong></td>
<td><strong>10</strong></td>
<td><strong>17</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

### Summary Grid

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organ Donors</strong></td>
<td>47</td>
</tr>
<tr>
<td><strong>Recovered Per Donor</strong></td>
<td>3.7</td>
</tr>
<tr>
<td><strong>Transplanted Per Donor</strong></td>
<td>3.1</td>
</tr>
<tr>
<td><strong>% Discard of Recovered</strong></td>
<td>9.8%</td>
</tr>
<tr>
<td><strong>% Research of Recovered</strong></td>
<td>5.7%</td>
</tr>
</tbody>
</table>
Questions?