Lung Transplantation at Vanderbilt University Medical Center
A Decade of Transitions
**Challenge aka PROBLEM**

<table>
<thead>
<tr>
<th>Date</th>
<th>30 Day Survival</th>
<th>Expected</th>
<th>One Year</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2002</td>
<td>0.76</td>
<td>90.17%</td>
<td>0.65</td>
<td>72.98%</td>
</tr>
<tr>
<td>January 2003</td>
<td>0.71</td>
<td>88.75%</td>
<td>0.61</td>
<td>74.88%</td>
</tr>
<tr>
<td>July 2003</td>
<td>0.73</td>
<td>89.63%</td>
<td>0.55</td>
<td>72.11%</td>
</tr>
<tr>
<td>January 2004</td>
<td>0.71</td>
<td>90.41%</td>
<td>0.52</td>
<td>74.97%</td>
</tr>
<tr>
<td>July 2004</td>
<td>0.77</td>
<td>92.44%</td>
<td>0.57</td>
<td>76.73%</td>
</tr>
</tbody>
</table>

Within systems....Processes are designed to achieve exactly the results that they achieve.
Quality Improvement - Approach

• Eliminate inappropriate variation
  – PROCESS

• Document and measure improvements
  – OUTCOMES
Defining the Process - Daunting

- Intake – Data acquisition, standard indications, contraindications
- Assessment – Physiological testing, social evaluations
- ***Risk/Benefit Definition
  - Modifiable factors – nutrition, rehab, management of chronic disease
  - Fixed factors – Co-morbidities – age, diabetes, heart disease, GI, prior surgery
- Listing - Primary lung disease
- Transplantation
  - Donor selection criteria – literature review (?high risk/age), infection concerns
  - Recipient operation
- Intraoperative – Immunosuppression, CPB, Ischemic time, Bronchial anastomosis, chest closure
- ICU Recovery
  - Vent management, Bleeding control, PGD Management (ECMO), Infection management (ID)
- **protocols**
- Floor Recovery
  - Tube management, Medicine education, Bronchoscopy, PT, social/disposition
- Post-care
  - Early recognition/intervention with Δs
- Immunosuppression
- Infection suppression
PSDA Cycles

- Biannual retreats
  - RULE: The determination of patient candidacy for transplantation will be determined on analysis of risk/benefit profile.
- Patient profile
  - Literature review
- System care
- “Does patient meet our criteria?”
  - Remove bias
- Weekly selection meetings
Defining the Process - Changes

- Intake – Demographic and other data acquisition, standard indications, contraindications
- Risk Assessment – Physiological testing, social evaluations
  - ** Risk/Benefit Definition **
    - Modifiable factors – nutrition, rehab, management of chronic disease
    - Fixed factors – Co-morbidities – age, diabetes, heart disease, GI, prior surgery
- Listing - Primary lung disease
- Transplantation
  - Donor selection criteria – literature review (?high risk/age), infection concerns
  - Recipient operation
- Intraop – Immunosuppression, CPB, Ischemic time, Bronchial anastomosis, chest closure
- ICU Recovery
  - Protocols for Ventilator, Bleeding control, PGD Mgt (ECMO), Infection mgt (ID)
- Floor Recovery
  - Tube management, Medicine education, Bronchoscopy, PT, social/disposition
- Post-hospital care with early recognition and intervention for changes
  - Immunosuppression and Infection suppression
Protocol initiation

- Ventilator management post transplantation
- Donor ventilator management
Improvements

• Primary goal of survival – SRTR data
• Secondary Benefits
  – Length of Stay
  – Median Wait Time
  – Cost
• Patient collectively had higher LAS (sicker)
• Institutional credibility – Model for other improvements?
One Year Survival 2003 - 2013
### Vanderbilt Lung Transplant

**July, 2012 – June, 2013**

**Mortality Observed / Expected**

<table>
<thead>
<tr>
<th>Relative Performance</th>
<th>Denom (Cases)</th>
<th>Obs/Exp Ratio</th>
<th>UHC Median</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Quarter</td>
<td>7</td>
<td>0.00</td>
<td>0.00</td>
<td>10/40</td>
</tr>
<tr>
<td>Recent Year</td>
<td>20</td>
<td>0.00</td>
<td>0.52</td>
<td>6/41 *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cases (denom.)</th>
<th>Current Quarter</th>
<th>Last Quarter</th>
<th>Recent Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Deaths</td>
<td>7</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Expected Deaths</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Observed Mortality (%)</td>
<td>0.40</td>
<td>0.31</td>
<td>1.07</td>
</tr>
<tr>
<td>Expected Mortality (%)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Observed/Mortality (%)</td>
<td>5.68</td>
<td>5.24</td>
<td>5.36</td>
</tr>
</tbody>
</table>

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**Graph:**

- **LunTx**
- **Mortality Rate (%)**
  - Observed
  - Expected

**Legend:**

- Observed
- Expected
Length of Hospital Stay - Days
# Vanderbilt Lung Transplant


Length of Stay Observed / Expected

<table>
<thead>
<tr>
<th>Recent Year UHC Top-10 Mortality O/E in Lung Transplant</th>
<th>Mort O/E</th>
<th>Cases</th>
<th>LOS O/E</th>
<th>Readmit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>VANDERBILT</td>
<td>0.00</td>
<td>41</td>
<td>1.10</td>
<td>25.00</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>40</td>
<td>0.77</td>
<td>21.05</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>30</td>
<td>1.14</td>
<td>18.52</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>27</td>
<td>1.39</td>
<td>16.00</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>21</td>
<td>0.63</td>
<td>38.89</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>20</td>
<td>0.57</td>
<td>29.41</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>17</td>
<td>1.20</td>
<td>62.50</td>
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<tr>
<td></td>
<td>0.00</td>
<td>16</td>
<td>1.54</td>
<td>50.00</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>15</td>
<td>0.64</td>
<td>25.00</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>14</td>
<td>0.64</td>
<td>69.23</td>
</tr>
</tbody>
</table>
The Transplant Numbers

2007 2008 2009 2010 2011 2012 2013
Patient Survival for Lung Transplant Recipients 1/1/2008-6/30/2010

Source: U.S. Scientific Registry of Transplant Recipients - released June 2011

1 month, 95.84% (USA)
1 month, 94.87% (VUMC)
1 year, 94.87% (VUMC)
1 year, 84.17% (USA)

U.S. National data
VUMC Lung Transplant Program
Proof of concept – Quality improves cost
Year 2006 vs 2011  Unadjusted for inflation.
Opportunity

• Center of Excellence Designation – Additional Insurance Groups
  – Maintenance
  – Requires 20 per year – Inflection point of centers SRTR data
• Institutional credibility – collective effort across disciplines for ongoing care improvements and increasing vestment in efforts
• Donor Access
  – 2/3 of available TN donor organs
  – 2/3 no listed match – trend of increasing assessments
  – 1/3 quality (Discussion with surgeon and pulmonologist)
Time frame to restore an underperforming system: 5-7 Years.

1. Supporting change with data/measurements
2. Developing a change
3. Testing a change
4. Implementing a change
5. Spreading improvements.
6. The human side of change.

** Creating standard processes to replace chaotic and wasteful activity is the fundamental source of improvement.
Human Side of Change

Pulmonary Medicine
  Mark Steele, Ivan Robbins, James Loyd, Lisa Lancaster

Thoracic Surgery
  Eric Lambright, Eric Grogan, Jon Nesbitt, Bill Putnam

Nurse Practitioners
  Haley Hoy, Laura Roberts, Jean Barnes, Jennifer Crichton

Anesthesia/Critical Care

Infectious Disease
  Stephen Dummer, Geraldine Miller

Support by Administrators, Coordinators, Case Managers, Psychology.
  OR Team, Pharmacy
Dr. Eric K. Lambright
Surgical Director, Vanderbilt Lung Transplant Program

Dr. Mark Steele
Medical Director, Vanderbilt Lung Transplant Program

Dear Drs. Lambright and Steele,

My wife, [redacted], received a double lung transplant at Vanderbilt on March 25th, 2009. Today is [redacted] 65th birthday and she is in good health. The marking of a 65th birthday has a range of meanings to many Americans (old age onset, Medicare eligibility, Social Security options, etc.), but for [redacted] and I'm sure many lung transplant recipients, it marks a pure gift from God enabled by the care and competencies of incredible medical practitioners such as yourselves and your teams. Thank you.

While one never knows exactly what tomorrow may bring, [redacted] and I do know she would have passed from this earth within weeks or even days had she not received your lifesaving surgery and follow-up care. I suppose that your days and indeed your lives are filled with the highest of highs and the lowest of professional lows, so please know how much we appreciate your total and complete dedication to patient wellness. You have enabled our gift from God and we are eternally grateful. Thank you again and have a happy and productive New Year!