The Epidemiology and Costs of Chronic Critical Illness
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• Mary Catherine Brake
• Peter Bach

• What is Chronic Critical Illness?
• How big is the problem?
• Who are the patients?
• What are their outcomes?
• Can we improve outcomes?

Mechanical Ventilator

Path of Critical Illness

Acute Organ Failure
Leaves ICU alive by 10 days
Chronically Critically Ill
Die within 10 days

Median (IQR) Days of Mechanical Ventilation: 2.7 (1 – 6)
Mechanical Ventilation >21 days: 5 to 10%

Different Patients/Different Behaviors
Randomized trial of 2 sedation regimens for mech vent patients
Project supported by the UNC Program on Health Outcomes
Extreme Burden of Illness

- 85% have symptoms causing quite a bit or very much distress
- 85% have emotional symptoms frequently or almost constantly
- 62% report pain
- 92% report depression and anxiety

Nelson et al. AJRCCM, 2001 (abstract)

Resource Problem

- 7% of Mechanically Ventilated Patients
- 40% of ICU costs
  - 20% of ICU costs consumed after day 7
- Single highest paying DRG in North Carolina

Defining/Identifying CCI

- Ventilator Day
- ICD-9 96.72
- Surgical Literature
- Support
- CMS
- Tracheostomy
- DRG 483
- LTAC Transfer

Long-term (Acute) Care Hospitals

- LTCH/LTAC: Acute hospital with average Medicare LOS > 25 days
  - Vent patients, Nonhealing wounds, Prolonged antibiotics
  - Multidisciplinary approach
  - Specialized vent weaning and rehabilitation services
- LTCH Ideal: Alternative to prolonged acute hospitalization followed by inpatient rehab or skilled nursing facility admission

Incidence

National Inpatient Sample: Discharges for DRG 483, 1997. Estimated n = 88,000

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0 to 21</td>
<td>5,280 (6%)</td>
</tr>
<tr>
<td>Age 22 to 49</td>
<td>17,600 (20%)</td>
</tr>
<tr>
<td>Age 50 to 64</td>
<td>19,360 (22%)</td>
</tr>
<tr>
<td>Age 65 to 74</td>
<td>22,000 (25%)</td>
</tr>
<tr>
<td>Age 75 to 84</td>
<td>19,360 (22%)</td>
</tr>
<tr>
<td>Age 85 or older</td>
<td>4,400 (5%)</td>
</tr>
</tbody>
</table>

Costs

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>LOS (median/mean)</th>
<th>Charges ($1,000) (median/mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-21</td>
<td>30/53</td>
<td>120 (6.6-2,100)</td>
</tr>
<tr>
<td>22-49</td>
<td>30/39</td>
<td>120 (1.2-2,870)</td>
</tr>
<tr>
<td>50-64</td>
<td>32/40</td>
<td>131 (0.07-2,220)</td>
</tr>
<tr>
<td>65-74</td>
<td>32/40</td>
<td>135 (1.9-2,553)</td>
</tr>
<tr>
<td>75-84</td>
<td>32/41</td>
<td>134 (0.3-5,186)</td>
</tr>
<tr>
<td>≥ 85</td>
<td>32/40</td>
<td>120 (0.6-977)</td>
</tr>
</tbody>
</table>

National Inpatient Sample: Discharges for DRG 483, 1997
Epidemiology of CCI in NC

- Cross Sectional study by year over the previous 11 years
- Data source: NC Hospital Discharge Database
- Extracted patients with ICD-9 codes 96.72 and DRG 483
  - ICD-9 97.72: MV >96 hours (PMV)
  - DRG 483: Tracheostomy for diseases other than head and neck disease

Tracheostomy for PMV in NC

Grey Bars: Incidence of Tracheostomy for PMV/100K Residents
Black Line: Tracheostomy for PMV as % of all MV episodes

Prolonged MV Patients in NC

<table>
<thead>
<tr>
<th>Year</th>
<th>PMV/100K residents</th>
<th>% of all MV patients</th>
<th>Chartson Score</th>
<th>Charges per patient $ thousand, adj. 2002</th>
<th>Total Charges, $ million, adj. 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>6.3</td>
<td>4.3%</td>
<td>1.25</td>
<td>198</td>
<td>88</td>
</tr>
<tr>
<td>1997</td>
<td>13.7</td>
<td>6.3%</td>
<td>1.58</td>
<td>159</td>
<td>161</td>
</tr>
<tr>
<td>2003</td>
<td>18.1</td>
<td>7.7%</td>
<td>1.62</td>
<td>163</td>
<td>236</td>
</tr>
</tbody>
</table>

Disposition for PMV in NC

<table>
<thead>
<tr>
<th>Year</th>
<th>LTAC</th>
<th>Hospital</th>
<th>Number</th>
<th>Age</th>
<th>Hospital</th>
<th>One Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>LTAC</td>
<td>Acute</td>
<td>250</td>
<td>60</td>
<td>39.6%</td>
<td>28.6%</td>
</tr>
<tr>
<td>1992</td>
<td>LTAC</td>
<td>Acute</td>
<td>104</td>
<td>66.3</td>
<td>57.7%</td>
<td>38.7%</td>
</tr>
<tr>
<td>1997</td>
<td>LTAC</td>
<td>RWC</td>
<td>1,123</td>
<td>69</td>
<td>71%</td>
<td>37.9%</td>
</tr>
<tr>
<td>1998</td>
<td>LTAC</td>
<td>LTAC</td>
<td>133</td>
<td>71</td>
<td>50%</td>
<td>23%</td>
</tr>
</tbody>
</table>

LTAC: Survival and Place of Residence over one year

Carson et al. AJRCCM 159:1568, 1999

Survival for Chronic Critical Illness

Carson et al. AJRCCM 159:1568, 1999
Days since LTAC Admission

High risk: Age >74 or Age > 64 and poor prior function
Low risk: Age <65 or Age <75 and good prior function

Carson et al. AJRCCM 159:1568, 1999

Functional Outcomes

<table>
<thead>
<tr>
<th>Type</th>
<th>N</th>
<th>Functionally Independent - 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>245</td>
<td>3%</td>
</tr>
<tr>
<td>LTAC</td>
<td>133</td>
<td>8%</td>
</tr>
<tr>
<td>ECFs</td>
<td>97</td>
<td>12%</td>
</tr>
</tbody>
</table>

Outcomes of PMV in the Acute Hospital

- Prospective Cohort – 300 patients at UNC requiring MV > 21 days after acute illness
  - January 2002 to April 2005
  - 50 patients each from Duke and ECU
- One-year survival, functional status, HRQL and Perceived QOL
- Prediction model for one-year survival
- Risk factors for poor functional status

Interim Analysis

- 148 patients consecutively enrolled from Jan 2002 to July 2003
- 97 consented for detailed 1-year follow-up
  - 9 lost to follow-up
- 51 enrolled for hospital outcomes and 1-year survival by Death Index
  - 19 hospital survivors
- One-year survival known for 82% currently

Demographics

<table>
<thead>
<tr>
<th></th>
<th>UNC Cohort</th>
<th>NC Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (IQR)</td>
<td>57 (42, 67)</td>
<td>62 (48, 72)</td>
</tr>
<tr>
<td>Male</td>
<td>62%</td>
<td>56%</td>
</tr>
<tr>
<td>Caucasian</td>
<td>62%</td>
<td>53%</td>
</tr>
<tr>
<td>African American</td>
<td>31%</td>
<td>21%</td>
</tr>
<tr>
<td>Charlson Score, mean (SD)</td>
<td>2.5 (2.2)</td>
<td>1.62 (1.67)</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>88%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Patient Characteristics - UNC

- APACHE II, mean (SD) 20 (7.3)
- Congestive Heart Failure 13%
- Chronic Lung Disease 27%
- Renal Failure 29%
- Diabetes 20%
- BMI, mean (SD) 29.7 (8.1)
### Patient Characteristics - UNC

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Residence</td>
<td>94%</td>
</tr>
<tr>
<td>Needed assist with ADLs</td>
<td>19%</td>
</tr>
<tr>
<td>Advanced Directive</td>
<td>16%</td>
</tr>
<tr>
<td>Did not graduate from HS</td>
<td>33%</td>
</tr>
<tr>
<td>Income &lt; $30,000</td>
<td>64%</td>
</tr>
<tr>
<td>Faith Very Important</td>
<td>67%</td>
</tr>
</tbody>
</table>

### Mortality - UNC

- **Hospital Mortality**: 37%
- **Detail Group, n=97**: 24%
- **No Detail Group, n=51**: 63%
- **One-Year Mortality, n=119**: 60%
- **Estimated, n=148**: 55%

### Died After Discharge

- **Age < 65**: 24%
- **Age > 65**: 26%

### Resources

- **Liberated from Ventilator**: 62%
- **Ventilator Days, median (IQR)**: 35 (27, 51)
- **ICU Days, median (IQR)**: 36 (28, 51)
- **Hospital Days, median (IQR)**: 51 (36, 72)
Disposition for Survivors

- Home Independent: 1%
- Home with Assistance: 10%
- Inpatient Rehab: 33%
- LTAC: 10%
- Skilled Nursing Facility: 8%
- Other: 1%

High Risk Group One-year Mortality

<table>
<thead>
<tr>
<th>Location</th>
<th>One-year Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago LTAC</td>
<td>84%</td>
</tr>
<tr>
<td>Age &gt;64, 92% medical patients, n=87</td>
<td></td>
</tr>
<tr>
<td>UNC Cohort</td>
<td>77%</td>
</tr>
<tr>
<td>Age &gt;64, medical patients, n=17</td>
<td></td>
</tr>
</tbody>
</table>

Improving Outcomes

Early Tracheostomy

<table>
<thead>
<tr>
<th>Days from admission until Tracheostomy</th>
<th>OR [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 - 14</td>
<td>1.56 [1.09, 2.24]</td>
</tr>
<tr>
<td>15 - 21</td>
<td>2.04 [1.38, 3.0]</td>
</tr>
<tr>
<td>&gt;21</td>
<td>3.0 [2.05, 4.40]</td>
</tr>
</tbody>
</table>

Adjusting for age, gender, Charlson Score, trauma

Location of LCTH in 2003

Source: Online survey, Certification and Reporting System from CMS
Summary

- The incidence and costs of Chronic Critical Illness are increasing.
- Long-term outcomes are poor, especially for the elderly
  - More work is pending for patient-centered outcomes
- Long-term outcomes and costs can be improved
  - Improving acute care to avoid chronic critical illness
  - Targeting the post-discharge period

CMS Radar

Medicare reimburses 80% of LTCH Discharges
Spent $398 million in 1993 - $2.6 billion in 2003