Long-term mortality

Hannah Wunsch, MD MSc
Herbert Irving Assistant Professor
Anesthesiology & Epidemiology

Department of Anesthesiology, College of Physicians & Surgeons
Department of Epidemiology, Mailman School of Public Health
Columbia University
What do we know?
ICU team
A shifting target

ICU
HOSPITAL
POST-HOSPITAL
Mortality curve becomes parallel to control

Mortality curve is never parallel to control
“After controlling for the effect of hospital admission, admission to ICU has minimal independent effect on mortality after discharge”

Adjusted hazard ratio: 1.21; 95% CI: 1.17, 1.27
Figure 1. Three-Year Follow-up of Intensive Care Unit (ICU) Survivors and Their Matched Hospital and General Population Controls

Log-rank $\chi^2 = 5621.3; P < .001$
Really...

- All about sub-groups
  - Age
  - Severity of illness
  - Diagnosis
  - Interventions
  - Type of surgery
Mechanically ventilated

Three-Year Outcomes for Medicare Beneficiaries Who Survive Intensive Care

Hannah Wunsch, MD, MSc
Carmen Guerra, MPH
Amber E. Barnato, MD, MPH, MS
Derek C. Angus, MD, MPH
Guohua Li, MD, DrPH
Walter T. Linde-Zwirble

Context Although hospital mortality has decreased over time in the United States for patients who receive intensive care, little is known about subsequent outcomes for those discharged alive.

Objective To assess 3-year outcomes for Medicare beneficiaries who survive intensive care.

Design, Setting, and Patients A matched, retrospective cohort study was conducted using a 5% sample of Medicare beneficiaries older than 65 years. A random half

Mechanical ventilation

Cumulative Survival

Log-rank $\chi^2 = 1032.5; P < .001$

Controls
- General
- Hospital

ICU survivors receiving mechanical ventilation

Follow-up, mo

0 6 12 18 24 30 36

0.2 0.4 0.6 0.8 1.0

0% 58%
1 year survival ARDS (US)

Survival 69.5% at 1 month, 55.7% at 6 months, no change at 12 months

Excludes sepsis patients/anyone requiring vasopressors

Angus et al AJRCCM 2001
6 mos = 9 deaths

12 mos = 3 deaths
Sepsis and age

No. at risk:

<table>
<thead>
<tr>
<th>Age</th>
<th>18-44, y</th>
<th>45-64, y</th>
<th>65-84, y</th>
<th>85+, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 18-44, y</td>
<td>848</td>
<td>333</td>
<td>186</td>
<td>125</td>
</tr>
<tr>
<td>Age 45-64, y</td>
<td>2,167</td>
<td>758</td>
<td>409</td>
<td>216</td>
</tr>
<tr>
<td>Age 65-84, y</td>
<td>9,802</td>
<td>2,851</td>
<td>1,563</td>
<td>893</td>
</tr>
<tr>
<td>Age 85+, y</td>
<td>3,202</td>
<td>659</td>
<td>329</td>
<td>186</td>
</tr>
</tbody>
</table>
Where people go - US

Most do not go home

US ICU patients with MV

Kahn et al JAMA 2010
Mortality after hospital discharge

Patients by ventilation status

Ventilation status
- No mechanical ventilation
- Originating hospital only
- Originating hospital and long-term acute care facility

Survival, %

Log-rank test, $P < .001$

Survival Time, d

Kahn et al JAMA 2010
Majority of mortality occurring in first 6 mos – 1 yr

Control cohorts

ICU survivors
The future...

Why?
Problems among survivors

- ICU weakness (and other physical ailments)
  - Ventilator dependence
- Cognitive impairment
  - Dementia
- Mental health problems
  - Depression
  - Post-traumatic stress disorder
  - Anxiety
- Financial strain
- Caregiver strain
Contributing to mortality

- Continuation of the acute problem
- New disabilities
- Old disabilities
- New frailty
- Old frailty
- New comorbidities
- Old comorbidities
- Genetic predisposition
Inflammatory markers at hospital discharge

Yende et al AJRCCM 2008
Influence of Comorbid Conditions on Long-Term Mortality After Pneumonia in Older People

Sachin Yende, MD, MS,* Derek C. Angus, MD, MPH,* Ibrahim Sultan Ali, MD,† Grant Somes, PhD,‡ Anne B. Newman, MD, MPH,* Douglas Bauer, MD,§ Melissa Garcia, MPH,* Tamara B. Harris, MD, MS,* and Stephen B. Kritchevsky, PhD,** for the Health ABC Study

Table 3. Reasons for Rehospitalization for Participants with Initial Hospitalization Due to Community-Acquired Pneumonia

<table>
<thead>
<tr>
<th>Reason</th>
<th>Hospitalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community-acquired pneumonia</td>
<td>18</td>
</tr>
<tr>
<td>Exacerbation of chronic obstructive lung disease</td>
<td>13</td>
</tr>
<tr>
<td>Coronary artery disease and myocardial infarction</td>
<td>14</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>11</td>
</tr>
<tr>
<td>Cancer</td>
<td>5</td>
</tr>
<tr>
<td>Fracture</td>
<td>4</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td>2</td>
</tr>
<tr>
<td>Others</td>
<td>78</td>
</tr>
</tbody>
</table>
Failed to wean
Mortality in the following year
64% of deaths due to cause identical, or attributable to cause of critical illness

After 2 years, no deaths attributable to original critical illness

**Cause of death after critical illness**

S. RIDLEY AND J. PURDIE

**Table 1.** The distribution of ITU admission diagnoses and cause of death in 158 patients for whom death certificates were available.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Trauma</th>
<th>Respiratory failure</th>
<th>Cancer</th>
<th>Poisoning</th>
<th>Arrest</th>
<th>Neuro</th>
<th>CVS</th>
<th>GIT</th>
<th>MISCEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>12</td>
<td>5</td>
<td>1</td>
<td></td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Postoperative (not cancer)</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postoperative (cancer surgery)</td>
<td>2</td>
<td>20</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poisoning</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac arrest (arrest)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Neurological (neuro)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular (CVS)</td>
<td>5</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Gastrointestinal (GIT)</td>
<td>7</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Miscellaneous (MISCEL)</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
We don’t (usually) cure cancer in the ICU

Table 4. Proportion of deaths related to cancer, by admission type

<table>
<thead>
<tr>
<th>Admission type</th>
<th>Relationship*</th>
<th>No. of deaths</th>
<th>Cancer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective cardiac surgery</td>
<td>Related</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Not related</td>
<td>21</td>
<td>13 (61.9%)</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>39</td>
<td>13 (34.2%)</td>
</tr>
<tr>
<td>Elective non-cardiac surgery</td>
<td>Related</td>
<td>28</td>
<td>24 (85.7%)</td>
</tr>
<tr>
<td></td>
<td>Not related</td>
<td>14</td>
<td>4 (28.6%)</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>42</td>
<td>28 (66.7%)</td>
</tr>
<tr>
<td>Acute admission from OR</td>
<td>Related</td>
<td>26</td>
<td>20 (76.9%)</td>
</tr>
<tr>
<td></td>
<td>Not related</td>
<td>17</td>
<td>1 (5.9%)</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>43</td>
<td>21 (48.8%)</td>
</tr>
<tr>
<td>Other acute admission</td>
<td>Related</td>
<td>52</td>
<td>14 (26.9%)</td>
</tr>
<tr>
<td></td>
<td>Not related</td>
<td>17</td>
<td>6 (35.3%)</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>69</td>
<td>20 (29.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>Related</td>
<td>124</td>
<td>58 (46.8%)</td>
</tr>
<tr>
<td></td>
<td>Not related</td>
<td>69</td>
<td>24 (34.8%)</td>
</tr>
<tr>
<td>Total overall</td>
<td>All</td>
<td>193</td>
<td>82 (42.5%)</td>
</tr>
</tbody>
</table>
1 week on the ventilator, COPD, pneumonia, sepsis
“Doc, is he gonna be ok?”
Depends what you mean by “ok”
Possible definitions

What does it mean to do ok?

- Go home and be exactly the same
- Be able to eventually take care of himself
- Survive to hospital discharge – get to daughter’s wedding
Survival curve with hospice

Christakis, *NEJM* 1996
Conclusions

- Long-term mortality remains high
  - Sub-group specific
  - Majority of mortality occurs in the first six months
  - Still poor prognostication and communication

- We are beginning to understand morbidity, but not yet its full relationship to mortality

- Lower mortality may not always be better
Thank you