POST-ICU SYNDROME

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OBJECTIVES:
Participants should be better able to:

1. To define the current key problems that survivors from ICU face;

2. To outline current state of the art in interventions to improve survivors;

3. To introduce the notion that future work should consider resilience, coping, and post-traumatic growth.
Dr. Iwashyna has declared no conflicts of interest related to the content of his presentation.

Three Unfinished Revolutions in ICU: Resuscitation, Palliation, Survivorship

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I have no relevant financial conflicts of interest to disclose

What happens afterwards for survivors of critical illness?
-1- Sepsis versus Non-hospitalized

Absolute Increase in Late Mortality:

(a) None (it is an acute problem)
(b) 1 in 10 die
(c) 1 in 5 die
(d) 1 in 2 die

*Late mortality = mortality in the 31 days – 2 years post-sepsis
-1- Sepsis versus Non-hospitalized

Absolute Increase in Late Mortality:

a. None (it is an acute problem)

b. 1 in 10 die

c. 1 in 5 die

d. 1 in 2 die

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days in a Healthcare Facility (Mean)</td>
<td>24</td>
<td>32</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Days in a Healthcare Facility (Median)</td>
<td>7</td>
<td>16</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>% of Days Alive in Healthcare Facility (Mean)</td>
<td>7%</td>
<td>25%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>% of Days Alive in Healthcare Facility (Median)</td>
<td>2%</td>
<td>10%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Figure 2: Use and mortality for 1,063 matched survivors in the 2 years surrounding severe sepsis and nonsepsis hospitalizations. This figure displays the daily location of 1,063 matched survivors of severe sepsis and nonsepsis hospitalizations in the 1 year before (A and C) and 1 year after hospitalization (B and D). The index admission is not included. The year prior ends at the day before hospitalization; the year after begins the day after hospital discharge. Patients are depicted as being at home (blue), admitted to a healthcare facility (red), or dead (black).
-1- Sepsis versus Non-hospitalized

Adjusted Odds Ratio for Late* Mortality:

3.5 \ (p < 0.001)

Absolute Increase in Late Mortality:

22% \ (40.4\% \text{ v} 18.3\%)

*Late mortality = mortality in the 31 days – 2 years post-sepsis

-2- Sepsis versus Infected, but No Acute Organ Dysfunction

Adjusted Odds Ratio for Late* Mortality:

1.6 \ (p < 0.001)

Absolute Increase in Late Mortality:

10%

*Late mortality = mortality in the 31 days – 2 years post-sepsis
How much greater is the risk of cognitive impairment among sepsis survivors?

(a) None (it is an acute problem)
(b) 2-fold
(c) 3-fold
(d) 4-fold
**Figure 2. Cognitive Impairment Among Survivors of Severe Sepsis at Each Survey Time Point**

![Graph showing cognitive impairment among survivors of severe sepsis at each survey time point.](image)

Error bars indicate 95% confidence intervals (CI); IQR, interquartile range.

**Interpretive Example:** Compared with stable rates before severe sepsis, the prevalence of moderate to severe cognitive impairment increased from 6.1% (95% CI, 4.2%-8.0%) before severe sepsis to 16.7% (95% CI, 13.8%-19.7%) at the first survey after severe sepsis ($p<.001$ by $\chi^2$ test; Table 2).

**Table 2. Severe Sepsis and Moderate to Severe Cognitive Impairment Among Survivors**

<table>
<thead>
<tr>
<th>Effect of sepsis</th>
<th>Odds Ratio (95% Confidence Interval)</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before sepsis</td>
<td>1.35 (1.11-1.66)</td>
<td>.002</td>
</tr>
<tr>
<td>Effect of sepsis</td>
<td>3.34 (1.53-7.25)</td>
<td>.002</td>
</tr>
<tr>
<td>After sepsis</td>
<td>1.68 (1.28-2.21)</td>
<td>.001</td>
</tr>
</tbody>
</table>

(Iwashyna et al. 2010 JAMA 304:1787)

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**Figure 3. Functional Trajectories by Baseline Functioning**

![Graph showing functional trajectories by baseline functioning.](image)

**Table 3 (Excerpt): Number of Newly Acquired Disabilities, after regression controls**

<table>
<thead>
<tr>
<th>Pre-Sepsis Disability</th>
<th>Effect of Sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe</td>
<td>0.04 ($p=0.93$)</td>
</tr>
<tr>
<td>Mild/Moderate</td>
<td>1.50 ($p=.001$)</td>
</tr>
<tr>
<td>None</td>
<td>1.57 ($p=.001$)</td>
</tr>
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(Iwashyna et al. 2010 JAMA 304:1787)
Figure 3. Functional Trajectories by Baseline Functioning

Table 3 (Excerpt):
Number of Newly Acquired Disabilities, after regression controls

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The unadjusted mean number of functional limitations of surviving cohort members is shown. Error bars indicate 95% confidence intervals.
58 yo self-employed builder presents to Glasgow Royal Infirmary with gall stone pancreatitis. 19 day ICU stay, including 3 days vent.

At discharge:
- Could do < 2.5 mets of exercise
- Grip strength less than half of normal
- NGT with enteral feeding
- 2 months later, he and his wife had not returned to work
- Felt abandoned by care team, no idea where to turn for help
Impact of Acute Illness

- Muscle Strength
- Hypoperfusion
- Delirium
- Altered Thirst + Nutrition

↓

- Inflammation
- Altered Thirst + Nutrition
- Delirium

↑

- Altered Thirst + Nutrition
- Inflammation

↓

- Plasma Volume
- Ventilation Barriers
- "Tether"
- Rx Diet
- Social Isolation
- Sedating Medications

- Dehydration
- Malnutrition
- Hypoxemia
- Deconditioning
- Syncope
- Fall

adapted from / inspired by M.C. Creditor (1993) Annals of Internal Medicine

++ ++ +

- Delirium
- Weakness
- Cognitive Impairment
- Psychological Problems
- New or Exacerbated Organ Dysfunctions

Increased Mortality Risk
Inability to Return to Social Roles
Caregiving Burdens
Recurrent Healthcare Needs

adapted from / inspired by M.C. Creditor (1993) Annals of Internal Medicine
Enduring Long-Term Morbidity Impact of Acute Illness

Hazards of Bed Rest and Hospitalization

- Immobilization
- Malnutrition
- Dehydration
- Hypoxemia
- Delirium
- Sedating Medications

Muscle Strength
Hypoperfusion
Delirium
Increased Mortality Risk
Inability to Return to Social Roles
Recurrent Healthcare Needs
Caregiving Burdens

Inflammation
Altered Thirst + Nutrition
Social Isolation
Psychological Problems

New or Exacerbated Organ Dysfunctions

Weakness
Cognitive Impairment

Increased Mortality Risk
Inability to Return to Social Roles
Recurrent Healthcare Needs
Caregiving Burdens

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If you had to pick just one problem to target, what would it be:

(a) Mortality risk  
(b) Loss of social roles  
(c) Recurrent healthcare needs  
(d) Caregiving burdens

- Mortality risk: 7%  
- Loss of social roles: 29%  
- Recurrent healthcare needs: 45%  
- Caregiving burdens: 18%
But this is not the first hard problem that has been confronted by clinicians who care for the critically ill.
First Unfinished Revolution

1970s: The Birth of ICM and the Rise of Resuscitation

A well organized approach can save the very sick

a better way of thinking + a better way of doing
The Resuscitation Revolution was thus *both*
the rise of a more coherent way to understand shock, in particular
about heart / lung / vasculature / inflammation interactions
*and also*
the development of the multidisciplinary coherent (often closed) ICU
that could learn to promptly put that understanding into practice.

### A Controlled Trial to Improve Care for Seriously Ill Hospitalized Patients

The Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT)

#### Markers of Bad Deaths

<table>
<thead>
<tr>
<th></th>
<th>0%</th>
<th>20%</th>
<th>40%</th>
<th>60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians knew patients did not...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late DNR orders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deaths after &gt;10 ICU days</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate to Severe Pain</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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**Diagram:**

- **Median Predicted Days Until DNR was Written**
- **DNR Agreement, %**
- **Median Days in ICU, Coma, or Receiving Mechanical Ventilation**
- **Moderate to Severe Pain, %**
- **Resource Use, $ Thousands**

**Legend:**

- Intervention Group
- Control Group
Second Unfinished Revolution

1990s: Owning End-of-Life Care

A well organized approach can give a good death to those we cannot save

A better way of thinking + A better way of doing

The Palliation Revolution was thus both

the understanding that we could care for patients we could not cure

and also

the development of the multidisciplinary approaches to family meetings and symptom relief to implement that understanding.

A better way of thinking + A better way of doing
Improving the lives of survivors is—like shock and end-of-life care—a hard problem.

That’s what Google Images comes up with for “Gordian Knot”. I think survivorship may do for us what it did for Alexander.

Third Unfinished Revolution

2010s: Beyond Life and Death: Surviving and Thriving

A well organized approach can help those who survive critical illness live full new lives.
Third Unfinished Revolution

2010s: Beyond Life and Death: Surviving and Thriving

*A well organized approach can help those who survive critical illness live full new lives*

---

Survivorship research provides us a way to think about the complex interactions between physiology, psychology, and social environment.

We have not yet found a best way to implement that understanding.

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A better way of thinking + a better way of doing
4 Credible Choices

Option 1: Focus on prevention, particularly mobilization & delirium prevention.

Option 3: Set up your own Post-ICU Clinic.

Option 4: Integrate with Primary Care.

Option 5: Multi-modal attack particularly with Peer Support.

A conventional scholarly talk should probably end with that previous slide.
4 Credible Choices

Option 1: Focus on prevention, particularly mobilization & delirium prevention.

Option 3: Set up your own Post-ICU Clinic.

Option 4: Integrate with Primary Care.

Option 5: Multi-modal attack particularly with Peer Support.

These are mostly harm mitigation strategies
Can we be more ambitious?

Excellence is not merely the absence of failure.
And, yes, of course there is Batman. But while his trauma motivated his greatness, the success of his psychological adjustment seems less clear.
58 yo self-employed builder presents to Glasgow Royal Infirmary with gall stone pancreatitis. 19 day ICU stay, including 3 days vent.

At 6-months:
• Feeding himself, NGT removed
• Driving independently
• Doing ongoing exercises, no longer needed walker
• Both he and his wife were back at work fulltime

What fraction of all survivors of In-Hospital Cardiac Arrest report significant growth as a result of their cardiac arrest?

(a) None
(b) 1 in 10
(c) 1 in 5
(d) 1 in 3
What fraction of all survivors of In-Hospital Cardiac Arrest report significant growth as a result of their cardiac arrest?

a. None
b. 1 in 10
c. 1 in 5
d. 1 in 3
Who are these patients? What can we learn from them and their care providers?

Three Unfinished Revolutions In My Lifetime

1970s: The Birth of ICM and the Rise of Resuscitation
A well organized approach can save the very sick

1990s: Owning End-of-Life Care
A well organized approach can give a good death to those we cannot save

2010s: Beyond Life and Death: Surviving and Thriving
A well organized approach can help those who survive critical illness live full new lives
I suspect we are on the cusp of a big leap forward in ICU care.

Making this leap will require an interplay of bedside reasoning, deep empathy with our patients, and new ways of doing things.

We need both hard thinking and a playful willingness to invent new forms of care.

I look forward to learning how to do this with you.

For copies of my slides, or to continue the conversation, please email me at
tiwashyn @ umich . edu

or
tweet @iwashyna

Thank you for sharing NAMDRC with me
2004 Interview with Gordon Bernard

Q: Is there a residue in sepsis survivors who have had multi-organ failures or dysfunctions?

A: Most people return to normal or near-normal lives even if they have had severe organ failures… Most surviving patients come back to being normal.

Top 5 Unhelpful ICU Clinician Responses to Every Problem Ever

1. “That’s not what we do”
2. “I can solve this myself”
3. “I only do things clinically for which there is good evidence”
4. “There is no multi-center RCT evidence, so I’m going to do whatever I want”
5. “We just need to buy this new equipment”
<table>
<thead>
<tr>
<th>Table 1.—Content, Recipient, and Timing of Phase II SUPPORT Intervention*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
</tr>
<tr>
<td>Feedback of phase I results, benchmarking information, describing phase I mode of patient/physician interaction</td>
</tr>
<tr>
<td>Prognostic information</td>
</tr>
<tr>
<td>Survival time estimates for up to 6 mo</td>
</tr>
<tr>
<td>Prognostic information</td>
</tr>
<tr>
<td>Prognosis for outcome for CPRI if needed</td>
</tr>
<tr>
<td>Prognosis for outcome for CPRI if needed</td>
</tr>
<tr>
<td>Survival estimates, enhanced by physician</td>
</tr>
<tr>
<td>Prognosis, probability of severe disability, at 2 mo</td>
</tr>
<tr>
<td>Interview information</td>
</tr>
<tr>
<td>Patient and surrogate report of prognosis, preferences about CPR, advance directives, quality of life, information desired, and pain</td>
</tr>
<tr>
<td>Interview on knowledge of preferences</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Nurse involvement</td>
</tr>
<tr>
<td>Explaining prognostic estimates and interview reports</td>
</tr>
<tr>
<td>Enhancing understanding of likely outcomes/preferences</td>
</tr>
<tr>
<td>Electing and documenting preferences/advance directives</td>
</tr>
<tr>
<td>Assessing pain and enabling treatment</td>
</tr>
<tr>
<td>Vicariously patient/family preferences and values</td>
</tr>
<tr>
<td>Convening meetings, negotiating preferences</td>
</tr>
<tr>
<td>Encouraging planning for future disabilities</td>
</tr>
</tbody>
</table>

*SUPPORT indicates Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments; CPRI, cardiopulmonary resuscitation; and ICU, intensive care unit. **Physician interview on day 10 was for evaluation, not part of the intervention.

SUPPORT Principal Investigators (1995) JAMA 274:1591