Severe Sepsis: Survive versus Thrive

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Objectives:

● Define Post-Intensive Care Syndrome (PICS) and identify the cognitive, physical and psychological impairments common to survivors of critical illness

● Discuss care interventions that mitigate acute cognitive and physical impairments, specifically the ABCDEF Bundle

● Describe best practices for discharging patients who have survived sepsis

● Identify strategies and resources to support severe sepsis survivors, including their families and caregivers, following hospital discharge
Bad News: Sepsis incidence is rising
Good News: mortality rate from sepsis is declining

In the United States, more than 1.4 million people survive sepsis every year.

sepsis.org
More bad news:

Survival is just the first hurdle....
“You are trying to save my life, but it feels like you are trying to kill me.” - Nancy Andrews
If I had one word to sum up my ICU experience it would be “horror.” -Nancy Andrews
Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders’ conference

*Crit Care Med 2012; 40:502–509*

Dale M. Needham, MD, PhD; Judy Davidson, DNP, RN; Henry Cohen, PharmD; Ramona O. Hopkins, PhD;

**Post Intensive Care Syndrome (PICS)**

- **Family (PICS-F)**
  - Mental Health
    - Anxiety/ASD
    - PTSD
    - Depression
    - Complicated Grief
- **Mental Health**
  - Anxiety/ASD
  - PTSD
  - Depression

- **Survivor (PICS)**
  - Cognitive Impairments
    - Executive Function
    - Memory
    - Attention
    - Visuo-spatial
    - Mental Processing Speed
  - Physical Impairments
    - Pulmonary
    - Neuromuscular
    - Physical Function

SCCM Symposium for Stakeholders
Post-Intensive Care Syndrome
Post-Intensive Care Syndrome (PICS)

New or worsening physical, cognitive, or mental health deficits that persist beyond discharge and can lead to poor functional outcomes

- Symptoms include: extreme fatigue, weakness, muscle and joint pain, insomnia, cognitive dysfunction, anxiety, depression, vivid hallucinations, panic attacks

- Affects up to 50% of sepsis survivors

(Laxton, 2017; sepsis alliance)
Physical Consequences
Physical Consequences

- amputations
- muscle and joint pain
- extreme fatigue
- Decreased respiratory function
  - pulmonary fibrosis
  - respiratory muscle atrophy
- neuromuscular impairment

(Rawal, Yadav, & Kumar, 2017)
ICU-Acquired Weakness

Acute onset of diffuse, symmetric, generalized weakness that develops after critical illness without other plausible cause.

Patients with ICU-weakness have:
- Longer ICU & Hospital stays
- Higher Mortality

Occurs in at least 50% and up to 100% of sepsis or SIRS patients

Herridge, 2003; Koch, 2011
Stevens, et al., 2009; Semmler, 2012
Risk Factors

• Sepsis - ICU-AW in 50% of patients with severe sepsis
• Mechanical ventilation > 1 week
• Multi-organ Failure
• Acute Respiratory Distress Syndrome (ARDS)
• Systemic inflammatory response syndrome (SIRS)
• Hyperglycemia
• Corticosteroids and neuromuscular blocking agents
• Immobility
• Pre-existing weakness

Kress, 2014; Levine, 2008; De Jonghe, 2002
Pathophysiology

Microvascular ischemia?

Sodium channel dysfunction?

Nerve mitochondria injury?

Catabolism?

Immobility?

Truong, et al, 2009
Reproduced from Kress, 2014
Change in Diaphragm Muscle Fibers with MV

Reproduced from Levine, et al. 2008
Long-term effects of ICU Weakness

Up to 65% have functional limitations after discharge from the hospital.

Schweickert, 2009; Herridge, 2011

- Decreased 6 min. walk test compared to age predicted value at: 1 year (66%), 2 years (68%), 5 years (76%)
  Herridge, 2011

- Reduced levels of activity

- Reduced ability to perform ADL’s and IADL’s
Cognitive Consequences
Cognitive Consequences

50-75% of ICU survivors experience long-term cognitive impairment

800+ Adults with respiratory failure or shock

- 3 months post-discharge:
  - 40% similar to moderate TBI
  - 26% similar to mild Alzheimer's

- 12 months post-discharge
  - 34% similar to moderate TBI
  - 24% similar to mild Alzheimer's

*Cognitive impairment was present across all ages despite pre-morbid health status

*Duration of delirium is a significant risk factor* (Pandharipande et al, 2013)
Cause of Cognitive Impairments

- Delirium
- Hypoxia
- Inflammatory and Coagulopathic derangements (e.g., severe sepsis)
- Toxic effects of sedative and analgesic medications

(ICU delirium.org)
Delirium: “You think I’m crazy”

- A disturbance in attention and awareness
- Develops over a short period of time and fluctuates
- Accompanied by an additional cognitive disturbance

**Three Subtypes**
- **Hypoactive (44-46%)**: Psychomotor slowing, apathy, decreased responsiveness
- **Hyperactive (2-11%)**: Psychomotor agitation, hallucinations, and emotional lability
- **Mixed (53-55%)**: Fluctuates between hypoactive and hyperactive

(American Psychiatric Association, 2013; Herling et al., 2018)
Risk Factors for ICU Delirium

Host Factors

• Age > 65
• Prior depression or dementia

Factors of Acute Illness

• Severe sepsis
• Heart failure/cardiac
• Mechanical ventilation > 7 Days
• Metabolic/electrolyte disturbance
• Alcohol and drug withdrawal
Risk Factors for ICU Delirium

Iatrogenic and Environmental Factors

- Drugs: sedatives (esp. benzodiazepines)
- Uncontrolled, severe pain
- Sleep and sensory deprivation
- Immobility
- LACK OF CONTROL
Pathophysiology

• Imbalances in the neurotransmitters which modulate the control of cognitive function, behavior and mood.
  • derangements in levels of serotonin
  • acetylcholine deficiency
  • dopamine excess

• Anatomic deficits
  • prefrontal and non-dominant posterior parietal regions are implicated by CT/MRI or SPECT scans in delirium

(ICUdelirium.org)
Delirium and Brain Atrophy

(A) 46 year old, no delirium  (B) 42 year old, 12 days of delirium

Gunther, et al. CCM. 2012
Delirium and Cognitive Impairment

• Prevalence rate: 1 in 5 hospital patients, 60-80% of mechanically ventilated patients

• Duration of delirium is important!

• Presence of delirium is associated with delayed hospital discharge, increased risk of death, increased risk of discharge to a nursing home, increased disability, decreased QOL and long-term cognitive impairments following discharge

Psychological Consequences
Psychological Consequences

ICU Survivors:
- 25-33% with depression
- 10-30% with PTSD

2 year prospective study (post-Acute Lung Injury):
- 3 months, 1 in 3 patients w/ PTSD symptoms
- 2 years, 56% of patients survived
  - Of this group, 62% had PTSD symptoms
  - Quality of delirium (how frightening/psychotic) associated with PTSD symptoms

Sepsis was an independent risk factor of stress disorders after critical illness in observational studies

(ICUdelirium.org; Bienvenue et al., 2013; Laxton, 2017; Parker et al., 2015; Schweickert et al., 2009; Prescott & Angus, 2018)
Functional Consequences
Life after Sepsis: Functional Consequences

In an international study of sepsis survivors, 32.4% reported not feeling back to normal at all.

Only 33% of patients living at home prior to contracting sepsis returned to living independently at 6 months post-d/c.

Older sepsis survivors experience an average of 1-2 NEW limitations of their daily activities post an episode of sepsis.

(Huang et al., 2018, Prescott & Angus, 2018; Iwashyna et al, 2010; Yende, et al., 2009)
**Functional Consequences: IADL’s**

**Instrumental Activities of Daily Living (IADLs):** managing housekeeping, cooking, caring for others (children, elders), grocery shopping, using public transportation, managing medications/finances)

- 69% ICU survivors experience new or worsening IADL dependencies after critical illness
- In 75% of studies, IADL dependencies decreased over time but did not return to pre-ICU level

Pre-ICU IADL dependency
- associated with increased risk of post-ICU IADL dependency
- associated with increased risk of early death post-ICU

Post-ICU IADL dependency: positive correlation with delirium and longer duration of mechanical ventilation.

(Hopkins, et al., 2017)
Functional Consequences

- Reduction in employment
  - At enrollment:
    - 88% employed FT
    - 12% employed PT
  - At 3 months follow up:
    - 58% were unemployed
    - 34% employed FT
    - 8% employed PT
    - 62% reported reduced employment
  - 12 months follow up
    - 47% unemployed
    - 45% employed FT
    - 7% employed PT
    - 70% reduction in employment

Only 43% of previously employed patients returned to work within 1 year following septic shock

(Norman et al., 2016, Poulsen, Moller, & Perner, 2009)
PICS-F: Caregiver Burden

6 months after ICU d/c:
- 15-24% with anxiety
- 4.7-36.4% with depression
- 35-57% with PTSD

Additional Areas of Burden:
- loss of employment
- financial burden
- lifestyle interference

*Low health-related quality of life

*(Van Beusekom, Bakhshi-Raiez, et al. 2016)*
Vicious Circle

**Figure 1.** Relationship between ICU-acquired delirium and weakness in a patient with sepsis.

Vasilevskis, 2010
Acute Care Management: Animate to Liberate
Teamwork Evidenced by Coordination of Evidence-Based Interventions:

**ABCDEF Bundle**

- A. Assess, Prevent and Manage Pain
- B. Both SAT and SBT
- C. Choice of Analgesia and Sedation
- D. Delirium: Assess, Prevent and Manage
- E. Early Mobility and Exercise
- F. Family Engagement and Empowerment
Assess, prevent and manage pain

Both spontaneous awakening and spontaneous breathing trials

Choice of analgesia and sedation
Delirium: assess, prevent and manage

PAD guidelines recommend adult ICU patients be monitored for delirium at least once per shift.

Tools:
- CAM-ICU (Confusion Assessment Method)
- The Intensive Care Delirium Screening Checklist (ICDSC)
STEP 2

DELIRIUM ASSESSMENT

1. Acute Change or Fluctuating Course of Mental Status:
   - Is there an acute change from mental status baseline? OR
   - Has the patient’s mental status fluctuated during the past 24 hours?

   NO → CAM-ICU negative NO DELIRIUM

   YES →

2. Inattention:
   - “Squeeze my hand when I say the letter ‘A’.”
     Read the following sequence of letters: S A V E A H A A R T
     ERRORS: No squeeze with ‘A’ & Squeeze on letter other than ‘A’
   - If unable to complete Letters → Pictures

   0 - 2 Errors → CAM-ICU negative NO DELIRIUM

   > 2 Errors →

3. Altered Level of Consciousness
   - Current RASS level (think back to sedation assessment in Step 1)
   - RASS = zero → CAM-ICU positive DELIRIUM Present

4. Disorganized Thinking:
   1. Will a stone float on water?
   2. Are there fish in the sea?
   3. Does one pound weigh more than two?
   4. Can you use a hammer to pound a nail?

   Command: “Hold up this many fingers” (Hold up 2 fingers)

   OR “Now do the same thing with the other hand” (Do not demonstrate)
   OR “Add one more finger” (If patient unable to move both arms)

   > 1 Error → CAM-ICU negative NO DELIRIUM

   0 - 1 Error →

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Management of Delirium

- Repeated reorientation of patients
- Provisions of cognitively stimulating activities for the patients multiple times a day
- A nonpharmacological sleep protocol
- Early mobilization activities
- Early Engagement in self-care
- Timely removal of catheters and physical restraints
- Use of eye glasses and magnifying lenses, hearing aids and earwax disimpaction
- Early correction of dehydration
- Use of a scheduled pain management protocol
- Minimization of unnecessary noise/stimuli
- Avoid Benzodiazepines when possible
We recommend performing early mobility of adult ICU patients whenever feasible to decrease the incidence of delirium.

Schweikert, 2009; Needham, 2010; Barr, 2013
Early mobility and exercise

bed bicycle

hydraulic-assist platform walker

Wii
Lack of early mobility was associated with readmission or death in the first year following ICU discharge.

Morris, 2011
Family engagement and empowerment

- Actively involve patients and families in daily rounds and decision-making
- Instruct family in carryover activities such as reorientation, ADL assist, ROM, exercises
- Providing both physical comfort and emotional support to patient and families
● “Getting to Know Me” information sheet about patient

● ICU delirium handout

● Encourage family to care for themselves
  ○ eat, sleep, exercise
ICU Diary

• Reduced incidence of new cases of PTSD in patients (5% vs 13%) following critical illness 3 months post discharge

• Reduced rates of PTSD symptoms in both patients and relatives 12 months following critical illness
  ○ Avoidance symptoms reduced
  ○ Intrusive symptoms reduced

• Reduced instances of depression and anxiety in patients who had received ICU Diary intervention

Jones, et al., 2010; Garrouste-Orgeas et al., 2012; Knowles & Terrier, 2009
Caring for Critically Ill Patients with the ABCDEF Bundle
Results of the ICU Liberation Collaborative in Over 15,000 Adults

- Decreased
  - use of mechanical ventilation
  - coma
  - delirium
  - ICU readmissions
  - discharge to facility

- Increased
  - restraint-free care
  - increased survival
Management upon Discharge
Follow up with a Provider

- Screen for functional, cognitive, physical, and psychosocial deficits for survivors of sepsis
- Screen caregivers/family members for psychosocial deficits
- Refer to outpatient providers:
  - **cognitive deficits**: neuropsychiatry, OT, SLP
  - **psychosocial deficits**: SW, psychiatry, counseling
  - **physical/functional deficits**: PT, OT
  - **swallowing deficits**: SLP
- Multidisciplinary clinics for post-ICU care
Education and Advocacy Resources

- ICU delirium.org
  - access to research articles, evidence-based guidelines, educational handouts, patient testimonials
- Sepsis.org
  - letter to providers [https://www.sepsis.org/explaining-post-sepsis-issues-to-others/](https://www.sepsis.org/explaining-post-sepsis-issues-to-others/)
- Society of Critical Care Medicine
  - great resource for patients and families [https://www.sccm.org/myicucare/thrive](https://www.sccm.org/myicucare/thrive)
  - resource for providers [https://www.sccm.org/ICULiberation/Home](https://www.sccm.org/ICULiberation/Home)
In Summary...

- Physical, cognitive and psychological impairments can be long-lasting and significantly decrease the quality of life and function of a survivor of critical illness and sepsis.

- ICU-acquired weakness and delirium are significant and prevalent complications of critical illness.

- A bundle of processes, the ABCDEF bundle, implemented early in an ICU stay, is protective and preventive – an essential part of reducing pain, agitation, delirium and weakness.

- There are evidence-based resources available to survivors and family members of sepsis and PICS that can be used to optimize post-discharge function.
People do not ‘have’ diseases, which are really descriptive mechanisms created by contemporary medicine. People have stories, and the stories are narratives of their lives, their relationships, and the way they experience an illness.

- Arthur Kleinman, *The Illness Narratives*
REFERENCES


• Gunther, M. L., Morandi, A., Krauskopf, E., Pandharipande, P., Girard, T. D., Jackson, J. C., ... VISIONS Investigation, VISualizing Icu SurvivOrs Neuroradiological Sequelae. (2012). The association between brain volumes, delirium duration, and cognitive outcomes in intensive care unit survivors: the VISIONS cohort magnetic resonance imaging study*. *Critical Care Medicine, 40*(7), 2022–2032. [http://doi.org/10.1097/CCM.0b013e318250acc0](http://doi.org/10.1097/CCM.0b013e318250acc0)


• Sepsis alliance (sepsis.org)


**WEBSITES**

• artsandsciencesofdelirium.wordpress.com
• icudelirium.org
• iculiberation.org
• nancyandrews.net
• sccm.org
• sepsisalliance.org
This is my story...
Forgot to ask.... I know you wanted him diuresed, but with his metabolic acidosis, kidneys, liver et al.... How about some fluid?

no fluid. drive fast.
**Result**

*Collection and time columns refer to when the test was done.*

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Waking up in the ICU
Returning Home
Post-Intensive Care Syndrome (PICS)
Be a FLU FIGHTER
GET YOUR FLU SHOT!