Welcome to *Advances in Sepsis: Protecting Patients Throughout the Lifespan*

The audio for today’s conference will be coming through your computer speakers. Please ensure your speakers are turned on and the volume up.

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ACTIVITY DESCRIPTION:
This webinar will discuss sepsis in acute settings, septic shock guidelines for pediatrics, as well as sepsis in post-acute and long-term care settings.

OBJECTIVES:
- Describe infection control techniques that reduce the risk and spread of healthcare- associated infections (HAI).
- Identify unsafe practices that place patients at risk for HAIs.
- Describe best practices for infection control and prevention in daily practice in healthcare settings.
- Apply standards, guidelines, best practices, and established processes related to safe and effective medication use.
Advances in Sepsis: Protecting Patients Throughout the Lifespan

Abbigail Tumpey, MPH, CHES
Associate Director for Communications Science,
Division of Healthcare Quality Promotion

September 13, 2016
Featured Speakers

Anthony Fiore, MD, MPH
Chief, Epidemiology Research And Innovations Branch, CDC’s Division of Healthcare Quality Promotion
- Overview of CDC’s sepsis *Vital Signs* report

Mitchell Levy, MD, MCCM, FCCP
Professor of Medicine and Chief, Division of Critical Care, Pulmonary, and Sleep Medicine, Brown University
- Founding member, Surviving Sepsis Campaign
  - Sepsis in acute care settings

The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
Featured Speakers

Joseph A. Carcillo, MD
Assistant Professor, Department of Critical Care Medicine & Pediatrics, Children’s Hospital of Pittsburg
- Septic shock guidelines for pediatrics

Susan M. Levy, MD, CMD
President, AMDA - The Society for Post-Acute and Long Term Care Medicine
- Sepsis in post-acute and long-term care settings

The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
Before We Get Started…

To submit a question:
• Use the “Chat” window, located on the lower left-hand side of the webinar screen.
• Questions will be addressed at the end of the webinar, as time allows.

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• Please press the “Raise Hand” button, located on the top left-hand side of the screen.

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Anthony Fiore, MD MPH
Chief, Epidemiology Research And Innovations Branch
Division of Healthcare Quality Promotion
Vital Signs report found that:

- Sepsis begins outside of the hospital for nearly 80% of patients.

- 7 in 10 patients with sepsis had recently interacted with healthcare providers or had chronic diseases requiring frequent medical care.

Vital Signs report demonstrates that there are opportunities to better prevent infections and recognize sepsis early to save lives.

- Providers should talk to their patients about infections and sepsis, how infections that can lead to sepsis can be prevented or recognized early, and what to do when an infection is not getting better.
Epidemiology of Sepsis

- **Sepsis most often occurs** in people:
  - Over the age of 65, or infants less than one year of age.
  - With chronic diseases (such as diabetes) or weakened immune systems.

- Sepsis is most often associated with **infections of the lung, urinary tract, skin, or gut.**

- Common germs that cause sepsis are **Staphylococcus aureus, E. coli, and some types of Streptococcus.**

- **Even healthy people can develop sepsis** from an infection, especially if it is not treated properly.
What Can Healthcare Providers do?

Sepsis Prevention

Healthcare providers are key to preventing infections and illnesses that can lead to sepsis.

**EDUCATE** patients and their families about the early symptoms of severe infection and sepsis, and when to seek care for an infection, especially those at higher risk.

**REMINd** patients that taking care of chronic illnesses helps prevent infections.

**ENCOURAGE** infection prevention measures, such as hand hygiene and vaccination against infections.

Sepsis Recognition and Treatment

- **Think sepsis** by knowing sepsis signs and symptoms to identify and treat patients early.
- **Act fast** if sepsis is suspected.
- **Reassess** patient management and antibiotic therapy.

Know the signs and symptoms of sepsis.

- Shivering, fever, or very cold
- Extreme pain or discomfort
- Clay-colored or sweaty skin
- Confusion or disorientation
- Short of breath
- High heart rate

If suspected, get medical care immediately.

**Vital Signs**

SOURCE: CDC Vital Signs, August 2016

http://www.cdc.gov/vitalsigns/sepsis
Thank You

Contact Information

Anthony Fiore, MD, MPH
Branch Chief, Epidemiology Research and Innovations Branch
Division of Healthcare Quality Promotion
Email: abf4@cdc.gov

For more information, please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
Sepsis in Acute Care

Mitchell M. Levy MD, FCCM
Professor of Medicine
Chief, Division of Pulmonary, Sleep, and Critical Care
Warren Alpert Medical School of Brown University
Providence, RI
Disclosures

• None
• Where have we been?
• Where are we now?
• Where are we going?
Where Have We Been?

R Phillip Dellinger MD1; Mitchell M. Levy MD2, Andrew Rhodes MD BS3; Djillali Annane MD4; Herwig Gerlach MD PhD5; Steven M. Opal MD6; Jonathan E. Sevransky MD7; Charles L. Sprung MD8; Ivor S. Douglas MD9; Roman Jaeschke MD10; Tiffany M. Osborn MD MPH11; Mark E. Nunnally MD12; Sean R. Townsend MD13; Konrad Reinhart MD14; Ruth M. Kleinpell PhD RN-CS15; Derek C. Angus MD MPH16, Clifford S. Deutschman MD MS17; Flavia R. Machado MD PhD18, Gordon Dr. Rubenfeld MD19; Steven A. Webb MB BS PhD20; Richard J. Beale MB BS21; Jean-Louis Vincent MD PhD22; Rui Moreno MD PhD23; and the Surviving Sepsis Campaign Guidelines Committee including the Pediatric Subgroup*

Critical Care Med. 2013 Feb;41(2):580-637
Intensive Care Med. 2013 Feb;39(2):165-228
The Impact of Sepsis Performance Measures Data
Surviving Sepsis Campaign: association between performance metrics and outcomes in a 7.5-year study

Surviving Sepsis Campaign: Association Between Performance Metrics and Outcomes in a 7.5-Year Study

Mitchell M. Levy, MD, FCCM\(^1\); Andrew Rhodes, MB BS, MD (Res)\(^2\); Gary S. Phillips, MAS\(^3\); Sean R. Townsend, MD\(^4\); Christa A. Schorr, RN, MSN\(^5\); Richard Beale, MB BS\(^6\); Tiffany Osborn, MD, MPH\(^7\); Stanley Lemeshow, PhD\(^8\); Jean-Daniel Chiche, MD\(^9\); Antonio Artigas MD, PhD\(^10\); R. Phillip Dellinger, MD, FCCM\(^11\)
SSC Final Report of Phase III
7.5 year analysis

Effects:
- Participation
- Duration
- Dose

Levy MM et al; CCM 2015;43:3-12
SSC Mortality: Participation effect

Mortality (Adjusted for severity, geographic region, calendar year)

36.6% to 25.6%
27.3% RRR in mortality
P < 0.001

Levy MM et al; CCM 2015;43:3-12
The adjusted odds of hospital mortality is decreasing 1% per site quarter (p = 0.005).

The longer a site participated, the greater the associated mortality reduction.
# Dose Effect: High vs. Low Compliance

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low resuscitation compliance</th>
<th>High resuscitation compliance</th>
<th>Total</th>
<th>Percent</th>
<th>P-value 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Died</td>
<td>Percent</td>
<td>Total</td>
<td>Died</td>
</tr>
<tr>
<td>Overall</td>
<td>11,609</td>
<td>4,475</td>
<td>38.6</td>
<td>17,861</td>
<td>5,185</td>
</tr>
<tr>
<td>Location of severe sepsis identification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>5,984</td>
<td>1,850</td>
<td>30.9</td>
<td>10,465</td>
<td>2,421</td>
</tr>
<tr>
<td>Ward</td>
<td>3,970</td>
<td>1,800</td>
<td>45.3</td>
<td>5,532</td>
<td>2,032</td>
</tr>
<tr>
<td>ICU</td>
<td>1,655</td>
<td>825</td>
<td>49.8</td>
<td>1,864</td>
<td>732</td>
</tr>
<tr>
<td>Site duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 2 years</td>
<td>4,960</td>
<td>1,896</td>
<td>38.2</td>
<td>3,352</td>
<td>992</td>
</tr>
<tr>
<td>2 to &lt; 3 years</td>
<td>1,611</td>
<td>600</td>
<td>37.2</td>
<td>6,557</td>
<td>1,895</td>
</tr>
<tr>
<td>≥ 3 years</td>
<td>5,038</td>
<td>1,979</td>
<td>39.3</td>
<td>7,952</td>
<td>2,298</td>
</tr>
</tbody>
</table>

Levy MM et al; CCM 2015;43:3-12
Multicenter Implementation of a Severe Sepsis and Septic Shock Treatment Bundle

Screened (n=15,019)
- 2004 (n=1314)
- 2005-2007 (n=4115)
- 2008-2010 (n=9590)

Not Severe Sepsis/Septic Shock (n=10,640)
- 2004 (n=986)
- 2005-2007 (n=2742)
- 2008-2010 (n=6912)

Severe Sepsis/Septic Shock (n=4379)
- 2004 (n=328)
- 2005-2007 (n=1373)
- 2008-2010 (n=2678)

Excluded (n=50)
- Incomplete screening (n=15)
- Age less than 18 or missing (n=36)
  *not mutually exclusive

Study Cohort (n=4329)
- 2004 (n=325)
- 2005-2007 (n=1348)
- 2008-2010 (n=2656)
A. Among all subjects, mortality (circles) decreased while all-or-none total bundle compliance (squares) increased over time. 95% statistical process control limits are represented by dashed lines.

B. Among only subjects with septic shock, mortality (circles) decreased while all-or-none total bundle compliance (squares) increased over time. 95% statistical process control limits are represented by dashed lines.

<table>
<thead>
<tr>
<th>Year</th>
<th>Hospital Mortality</th>
<th>All-or-none total bundle compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>21.2%</td>
<td>4.9%</td>
</tr>
<tr>
<td>2010</td>
<td>8.7%</td>
<td>73.4%</td>
</tr>
</tbody>
</table>
Published Data from SSC: 2006-2015

- All prospective cohort studies
- 60 published reports in peer-reviewed journals
- All demonstrated:
  - Increased compliance
  - Associated decreased mortality

- United States (25)
- Spain (1)
- France (1)
- Germany (1)
- Portugal (1)
- Netherlands (2)
- UK (2)
- China (3)
- Iceland (1)
- Korea (1)
- Pan-Asia (1)
- Latin America (1)
Systematic Review of Sepsis Bundles
Where are We Now?
The Increased Focus on Sepsis

- Sepsis
  - 1,665,000 cases of sepsis diagnosed in US in 2009
  - Principal diagnosis in 2% of all admissions
  - Single most expensive condition treated in the US. ($20.3B in 2011)
  - The inpatient mortality rate from sepsis is 8 times higher than the overall US inpatient mortality rate
Table 2. Ten conditions with the most all-cause, 30-day readmissions for Medicare patients (aged 65 years and older), listed by total number of readmissions in descending order, 2011

<table>
<thead>
<tr>
<th>Principal diagnosis for index hospital stay*</th>
<th>Number of all-cause, 30-day readmissions</th>
<th>Readmissions as a percentage of total Medicare readmissions</th>
<th>Total cost of all-cause, 30-day readmissions (in millions), $</th>
<th>Readmission total cost as a percentage of total costs of Medicare readmissions</th>
<th>Readmission rate (per 100 admissions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure; nonhypertensive</td>
<td>134,500</td>
<td>7.3</td>
<td>1,747</td>
<td>7.3</td>
<td>24.5</td>
</tr>
<tr>
<td>Septicemia (except in labor)</td>
<td>92,900</td>
<td>5.1</td>
<td>1,410</td>
<td>5.9</td>
<td>21.3</td>
</tr>
<tr>
<td>Pneumonia (except that caused by tuberculosis or sexually transmitted disease)</td>
<td>88,800</td>
<td>4.8</td>
<td>1,148</td>
<td>4.8</td>
<td>17.9</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease and bronchiectasis</td>
<td>77,900</td>
<td>4.2</td>
<td>924</td>
<td>3.8</td>
<td>21.5</td>
</tr>
<tr>
<td>Cardiac dysrhythmias</td>
<td>69,400</td>
<td>3.8</td>
<td>835</td>
<td>3.5</td>
<td>16.2</td>
</tr>
<tr>
<td>Urinary tract infections</td>
<td>56,900</td>
<td>3.1</td>
<td>621</td>
<td>2.6</td>
<td>18.1</td>
</tr>
<tr>
<td>Acute and unspecified renal failure</td>
<td>53,500</td>
<td>2.9</td>
<td>683</td>
<td>2.8</td>
<td>21.8</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>51,300</td>
<td>2.8</td>
<td>693</td>
<td>2.9</td>
<td>19.8</td>
</tr>
<tr>
<td>Complication of device; implant or graft</td>
<td>47,200</td>
<td>2.6</td>
<td>742</td>
<td>3.1</td>
<td>19.0</td>
</tr>
<tr>
<td>Acute cerebrovascular disease</td>
<td>45,800</td>
<td>2.5</td>
<td>568</td>
<td>2.4</td>
<td>14.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>718,100</strong></td>
<td><strong>39.1</strong></td>
<td><strong>9,371</strong></td>
<td><strong>39.0</strong></td>
<td><strong>19.6</strong></td>
</tr>
</tbody>
</table>

* Clinical Classifications Software (CCS) label
Where is Sepsis Diagnosed in Acute Care Settings?
Outcomes of the Surviving Sepsis Campaign in intensive care units in the USA and Europe: a prospective cohort study


<table>
<thead>
<tr>
<th></th>
<th>USA</th>
<th>Europe</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>18766 (74.0%)</td>
<td>6609 (26.0%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency department</td>
<td>12218 (65.1%)</td>
<td>2159 (32.7%)</td>
<td></td>
</tr>
<tr>
<td>Ward</td>
<td>4763 (25.4%)</td>
<td>3405 (51.5%)</td>
<td></td>
</tr>
<tr>
<td>ICU</td>
<td>1785 (9.5%)</td>
<td>1045 (15.8%)</td>
<td></td>
</tr>
</tbody>
</table>
Outcomes of the Surviving Sepsis Campaign in intensive care units in the USA and Europe: a prospective cohort study


<table>
<thead>
<tr>
<th></th>
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<th>Europe</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Count</strong></td>
<td>18,766 (74.0%)</td>
<td>6,609 (26.0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Hospital mortality if origin is emergency department</strong></td>
<td>3,008 (24.6%)</td>
<td>736 (34.1%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Hospital mortality if origin is ward</strong></td>
<td>1,661 (34.9%)</td>
<td>1,481 (43.5%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Hospital mortality if origin is ICU</strong></td>
<td>644 (36.1%)</td>
<td>502 (48.0%)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
The odds of mortality decrease 4% per month (OR = 0.96, 95% CI: 0.94 – 0.98, p-value = 0.002)

The odds of ICU admission decrease 3% per month (OR = 0.97, 95% CI: 0.95 – 0.99, p-value = 0.004)
Compliance with 3 hr Bundle Over Time

The odds of compliance with the 3-hour bundle increase 9% per month (OR = 1.09, 95% CI: 1.07 – 1.12, p-value < 0.001)
Sepsis: Where are We Going?
Where are we Going?

• Increased attention to sepsis:
  – Public
  – Governments

• Are we Doing enough?
An Infection, Unnoticed, Turns Unstoppable

For a moment, an emergency room doctor stepped away from the serum of people working on Rory Staunton, 12, and spoke to his mother, who was watching through the glass of the intensive care unit. "I want to go home," she said. "I want to be normal again."

By JIM DWYER
Published: July 11, 2012 | 1659 Comments
New York State Regulation: Mandated Reporting

- Amendments to existing hospital regulations
- Apply to acute care hospitals only
- Required hospitals to:
  - implement a sepsis protocol
  - train staff in its use
  - report data to the NYS DOH (adherence and RA mortality)
- Reporting began April 2014
- Data Analysis: Nov 2016
Figure 5. Three- and Six-Hour Bundle Adherence Percentages in New York State (4 Qtr YTD).

Three-Hour Bundle Adherence

- 25th Percentile Benchmark
- 75th Percentile Benchmark
- Your Hospital
- All Hospitals

Six-Hour Bundle Adherence

- 25th Percentile Benchmark
- 75th Percentile Benchmark
- Your Hospital
- All Hospitals
SEP-1: First National Core Measure on Sepsis Care
SEP-1

TO BE COMPLETED WITHIN 3 HOURS OF TIME OF PRESENTATION †:

1. Measure lactate level
2. Obtain blood cultures prior to administration of antibiotics
3. Administer broad spectrum antibiotics
4. Administer 30ml/kg crystalloid for hypotension or lactate ≥4mmol/L

† “time of presentation” is defined as the time of earliest chart annotation consistent with all elements severe sepsis or septic shock ascertained through chart review.
5. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65mmHg

6. In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥4 mmol/L, re-assess volume status and tissue perfusion and document findings according to table 1.

7. Re-measure lactate if initial lactate elevated.
TABLE 1
DOCUMENT REASSESSMENT OF VOLUME STATUS AND TISSUE PERFUSION WITH:

- **Either**
  - Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner including vital signs, cardiopulmonary, capillary refill, pulse and skin findings

- **Or two of the following:**
  - Measure CVP
  - Measure ScvO2
  - Bedside cardiovascular ultrasound
  - Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge
So, Where are We Now?

• Published studies demonstrate wide practice variation
  – Poor compliance with known quality indicators
  – Clinicians benefit from being reminded
  – There is benefit from standardization

• It is feasible to use data to audit and change clinical behavior
  – Performance metrics can change clinical practice

• Increased compliance with performance metrics is associated with improved survival
So, Where are We Now?

- Patients with severe sepsis or septic shock on the medical wards have a higher rate of mortality than their counterparts identified in the ER, likely due to delays in recognition and treatment.
  - Action is required
- It's possible to institute nursing driven, every-shift screening on the medical wards
- Early identification and management on the wards is associated with improved survival
Conclusions: Managing Sepsis in Acute Care

• Early identification
  – Use lactate to risk assess
• Aggressive source control
• Blood cultures
• Rapid administration of appropriate antibiotics
• Early, aggressive resuscitation
  – Utilize some monitoring technique as target
Thank You
Pediatric Sepsis Guidelines

Centers for Disease Control and Prevention Webinar
Dr. Joseph A. Carcillo M.D.
University of Pittsburgh with some slides provided by CHA-AAP IPSO Initiative
Infection with Fever

scarlet fever strep throat

Many 1000s of children per year with infection that gets better in a few days but ....
DO NOT FORGET THE POWER OF EDUCATING CHILDREN AND PARENTS

Definition – 2000 years ago

- Hippocrates:
  - Breakdown of living tissues: „pepsi“ and „sepsi“

- Celsus:
  - Rubor - Peripheral vasodilatation
  - Dolor - Altered mental status
  - Calor - Fever, hypothermia
  - Tumor - Oedema

- Galen:
  - Functio Iesa

SEPSIS
DO NOT FORGET THE POWER OF EDUCATING CHILDREN AND PARENTS

Prolonged Capillary Refill Time

Painful Legs
Sepsis is Serious

Sometimes Lethal
DON’T FORGET THE POWER OF EDUCATING CHILDREN PARENTS COACHES FIRST LINE CAREGIVERS
Antibiotics are the CURE!

Pathogens Doubling Time is less than 30 minutes!

SO WHY WAIT????????????????

GIVE ANTIBIOTICS
Figure 1. Previously unpublished pilot data for the relationship of time to antimicrobial and mortality in septic shock among emergency department (ED) patients (n = 192). In this pilot analysis, the index time represents the first documented hypotension in ED, but does not include pre-ED arrival data. The subsequent full study (4) utilized pre-ED data whenever available inclusive of ambulance and nursing home records. CATSS = Cooperative Antimicrobial Therapy of Septic Shock.
FIGURE 1. Time to correct parenteral antibiotic initiation and clinical outcomes for all study subjects (n = 45) and those without acute comorbidities (n = 23). For the cohort as a whole, longer time to correct parenteral antibiotic initiation was not significantly associated with duration of mechanical ventilation (A), though it was significantly associated with longer durations of ICU (B) and hospital (C) lengths of stay by simple linear regression. In children without acute comorbidities, longer time to correct antibiotic initiation was significantly associated with longer durations of mechanical ventilation (D), ICU (E), and hospital (F) lengths of stay by simple linear regression. Children with complex chronic conditions are identified by solid symbols.

Timing of Correct Parenteral Antibiotic Initiation and Outcomes From Severe Bacterial Community-acquired Pneumonia in Children. Muszynski, Jennifer; Knatz, Nina; Sargel, Cheryl; Fernandez, Soledad; Marquardt, David; Hall, Mark

DOI: 10.1097/INF.0b013e3181ff64ec
Delayed Antimicrobial Therapy Increases Mortality and Organ Dysfunction Duration in Pediatric Sepsis

<table>
<thead>
<tr>
<th>Time to Initial Antimicrobial Administration</th>
<th>≤ 3 Hr</th>
<th>&gt; 3 Hr</th>
<th>Unadjusted p</th>
<th>Adjusted p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vasoactive-free days</td>
<td>26 (24–28)</td>
<td>26 (23–28)</td>
<td>0.28</td>
<td>0.054</td>
</tr>
<tr>
<td>Ventilator-free days</td>
<td>21 (7–28)</td>
<td>18 (2–25)</td>
<td>0.08</td>
<td>0.11</td>
</tr>
<tr>
<td>Organ failure-free days</td>
<td>20 (6–26)</td>
<td>16 (1–23)</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>PICU length of stay, days</td>
<td>8 (3–19)</td>
<td>10 (5–17)</td>
<td>0.42</td>
<td>0.58</td>
</tr>
</tbody>
</table>

*Adjusted for Pediatric Index of Mortality-2 score.
Figure 1. Pediatric intensive care unit empiric antibiotic pathway including risk factors for infection due to healthcare-associated bacteria. 

- Hospitalization > 48 hours
- Current/Recent antibiotic
- Immunosuppression
- Hospitalization within past month
- History of antibiotic-resistant infection

Any Risk Factor for Resistant Organisms?

- Chronic Lung Disease
- Congenital Heart Disease
- Resident of chronic care facility
- Indwelling central venous line
- History of prematurity (if pt < 2 y)

Low Risk Antibiotics
1. Vancomycin
2. Cefotaxime
3. Other agents as clinically indicated

High Risk Antibiotics
1. Vancomycin
2. Dicyclam anti-Pseudomonal β-lactam
3. Cycled aminoglycoside
4. Other agents as clinically indicated

---

Annals ATS, 2014

Published in: Todd J. Karsies; Cheryl L. Sargel; David J. Marquardt; Nadeem Khan; Mark W. Hall; *Annals ATS* 11, 1569-1575.
DOI: 10.1513/AnnalsATS.201408-389OC
Copyright © 2014 by the American Thoracic Society
Recognition Trigger Tools and Emergency Department Sepsis Initiatives
**PEDIATRIC SEPTIC SHOCK COLLABORATIVE**

**SEPTIC SHOCK IDENTIFICATION TOOL**

**Patient presents to the ED with concern for infection and/or temperature abnormality (in the ED or within 4 hrs of presentation)?**

NO → Exclude from shock triage tool. Continue routine triage process.

YES → Continue assessment at triage

General assessment: Is patient critically ill?

YES → Transfer patient to a resuscitation room and immediately alert physician/resuscitation team

NO → Continue shock triage tool

- Obtain a full set of vital signs including blood pressure and temperature
- Perform a brief history and physical exam assessing mental status, skin, pulses, and capillary refill/perfusion
- Is the patient a high-risk patient? (see Table 1)

**Septic Shock Checklist**

- Temperature abnormality (Table 2)
- Hypotension (Table 2)
- Tachycardia (Table 2)
- Tachypnea (Table 2)
- Capillary refill abnormality (Table 3)
- Mental status abnormality (Table 3)
- Pulse abnormality (Table 3)
- Skin abnormality (Table 3)

Is patient hypotensive?

NO → Continue routine triage process

YES → Initiate/continue the Septic Shock protocol/pathway using the Septic Shock Order Set, and mobilize resources

Does patient meet 3 or more of the 8 clinical criteria, or does high-risk patient meet 2 or more of the 8 clinical criteria?

YES → Identify the patient as meeting septic shock triage criteria, transfer to a room immediately and alert physician

NO → Continue routine triage process

Does physician assessment concur with triage assessment?

YES → Continue triage process

NO → Continue routine care

---

**Table 1. High Risk Conditions**

- Malignancy
- Asplenia (including SCD)
- Bone marrow transplant
- Central or indwelling line/catheter
- Solid organ transplant
- Severe MR/ICP
- Immunodeficiency, immunocompromise or immunosuppression

**Table 2. Vital Signs (PALS)**

<table>
<thead>
<tr>
<th>Age</th>
<th>Heart Rate</th>
<th>Resp Rate</th>
<th>Systolic BP</th>
<th>Temp (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 1 m</td>
<td>&gt; 205</td>
<td>&gt; 60</td>
<td>&lt; 60</td>
<td>&lt; 36 or &gt; 36</td>
</tr>
<tr>
<td>1 m – 3 m</td>
<td>&gt; 205</td>
<td>&gt; 60</td>
<td>&lt; 70</td>
<td>&lt; 36 or &gt; 36</td>
</tr>
<tr>
<td>&gt; 3 m – 1 y</td>
<td>&gt; 150</td>
<td>&gt; 80</td>
<td>&gt; 70</td>
<td>&gt; 36 or &gt; 38.5</td>
</tr>
<tr>
<td>&gt; 1 y – 2 y</td>
<td>&gt; 140</td>
<td>&gt; 40</td>
<td>&lt; 70 + (age in yr x 2)</td>
<td>&gt; 36 or &gt; 38.5</td>
</tr>
<tr>
<td>&gt; 2 y – 4 y</td>
<td>&gt; 140</td>
<td>&gt; 40</td>
<td>&lt; 70 + (age in yr x 2)</td>
<td>&gt; 36 or &gt; 38.5</td>
</tr>
<tr>
<td>&gt; 4 y – 6 y</td>
<td>&gt; 140</td>
<td>&gt; 34</td>
<td>&lt; 70 + (age in yr x 2)</td>
<td>&gt; 36 or &gt; 38.5</td>
</tr>
<tr>
<td>&gt; 6 y – 10 y</td>
<td>&gt; 140</td>
<td>&gt; 30</td>
<td>&lt; 70 + (age in yr x 2)</td>
<td>&gt; 36 or &gt; 38.5</td>
</tr>
<tr>
<td>&gt; 10 y – 13 y</td>
<td>&gt; 100</td>
<td>&gt; 40</td>
<td>&lt; 60</td>
<td>&lt; 36 or &gt; 38.5</td>
</tr>
<tr>
<td>&gt; 13 y</td>
<td>&gt; 100</td>
<td>&gt; 16</td>
<td>&lt; 60</td>
<td>&lt; 36 or &gt; 38.5</td>
</tr>
</tbody>
</table>

**Table 3. Exam Abnormalities**

- **Pulses** (central vs. peripheral):
  - Cold Shock: Decreased or weak
  - Warm Shock: Bounding

- **Capillary refill** (central vs. peripheral):
  - Cold Shock: ≥ 3 sec
  - Warm Shock: Flash (< 1 sec)

- **Skin**:
  - Cold Shock: Mottled, cool
  - Warm Shock: Flushed, red, erythema (other than face)
  - Non-specific: Petechiae below the nipple, any purpura

- **Mental status**:
  - Cold Shock: Decreased, irritability, confusion, inappropriate crying or drowsiness, poor interaction with parents, lethargy, diminished arousability, obtunded
Early care of a child presenting in septic shock.

0-5 min
Recognize decreased mental status and perfusion
Maintain airway and establish access according to PALS guidelines

Push 20 mL/kg isotonic saline or colloid boluses up
to and over 60 mL/kg
Correct hypoglycemia and hypocalcemia

15 min
Fluid responsive
Observe
Fluid refractory shock
Establish central venous access, begin dopamine
therapy, and establish arterial monitoring

Fluid refractory dopamine-resistant shock
Titratedepinephrine for cold shock,
Norepinephrine for warm shock

Joe Brierley, and Mark J. Peters Pediatrics
2008;122:752-759

©2008 by American Academy of Pediatrics
A, Statistical process control charts of time to first bolus for children identified at triage.

Mortality reduction from 4% to 2.4% at TCH

Andrea T. Cruz et al. Pediatrics 2011;127:e758-e766

©2011 by American Academy of Pediatrics
**Multivariate analyses of risk factors for the development of AKI**

<table>
<thead>
<tr>
<th>Variables</th>
<th>aOR (95% CI)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock protocol</td>
<td>0.27 (0.13-0.56)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PELOD</td>
<td>1.08 (1.03-1.12)</td>
<td>.002</td>
</tr>
<tr>
<td>Age</td>
<td>1.01 (0.96-1.07)</td>
<td>.47</td>
</tr>
<tr>
<td>Sex</td>
<td>0.99 (0.54-1.84)</td>
<td>.99</td>
</tr>
</tbody>
</table>
Ventura, Andrea; Shieh, Huei; Bousso, Albert; Goes, Patricia; Fernandes, Iracema; de Souza, Daniela; Paulo, Rodrigo; Chagas, Fabiana; Gilio, Alfredo. Double-Blind Prospective Randomized Controlled Trial of Dopamine Versus Epinephrine as First-Line Vasoactive Drugs in Pediatric Septic Shock. Critical Care Medicine. 43(11):2292-2302, November 2015.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>Before Randomization</th>
<th>6 Hr After Randomization</th>
<th>At the End of Resuscitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate (beats/min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dopamine</td>
<td>159±25 (108-204)</td>
<td>154±23 (96-206)</td>
<td>145±27 (98-207)</td>
<td>142±26 (81-201)</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>149±31 (75-205)</td>
<td>143±28 (74-190)</td>
<td>142±25 (81-188)</td>
<td>140±23 (86-185)</td>
</tr>
<tr>
<td>p</td>
<td>0.047*</td>
<td>0.02*</td>
<td>0.50*</td>
<td>0.67*</td>
</tr>
<tr>
<td>Systolic blood pressure (mm Hg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dopamine</td>
<td>85±22 (40-135)</td>
<td>85±18 (43-144)</td>
<td>92±19 (55-161)</td>
<td>96±18 (63-143)</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>87±19 (56-143)</td>
<td>80±15 (62-120)</td>
<td>99±17 (52-150)</td>
<td>104±19 (63-169)</td>
</tr>
<tr>
<td>p</td>
<td>0.59*</td>
<td>0.13*</td>
<td>0.03b</td>
<td>0.01b</td>
</tr>
<tr>
<td>Shock index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dopamine</td>
<td>1.9±0.6 (1-4.3)</td>
<td>1.9±0.6 (0.9-3.6)</td>
<td>1.7±0.6 (0.9-3.4)</td>
<td>1.5±0.4 (0.7-2.6)</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>1.7±0.5 (0.7-3)</td>
<td>1.8±0.6 (0.7-4.5)</td>
<td>1.5±0.4 (0.6-2.4)</td>
<td>1.3±0.4 (0.6-2.9)</td>
</tr>
<tr>
<td>p</td>
<td>0.12*</td>
<td>0.87*</td>
<td>0.02*</td>
<td>0.07*</td>
</tr>
<tr>
<td>Mean arterial pressure and central venous pressure (cm H2O)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dopamine</td>
<td>47±10 (33-50)</td>
<td>54±13 (35-75)</td>
<td>55±14 (25-87)</td>
<td>57±11 (26-79)</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>49±19 (35-77)</td>
<td>53±10 (35-77)</td>
<td>66±10 (46-88)</td>
<td>68±13 (41-93)</td>
</tr>
<tr>
<td>p</td>
<td>0.99*</td>
<td>0.86*</td>
<td>0.003*</td>
<td>0.007*</td>
</tr>
<tr>
<td>$\Delta_{O_2}$ (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dopamine</td>
<td>72±6 (58-81)</td>
<td>67±8 (54-80)</td>
<td>74±10 (38-91)</td>
<td>76±8 (42-83)</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>67±3 (64-74)</td>
<td>65±8 (50-80)</td>
<td>77±5 (64-89)</td>
<td>70±5 (69-83)</td>
</tr>
<tr>
<td>p</td>
<td>0.24*</td>
<td>0.70*</td>
<td>0.31*</td>
<td>0.18*</td>
</tr>
</tbody>
</table>

$\Delta_{O_2}$ = central venous oxygen saturation.

*Student's t test.
**Mann-Whitney test.

All values are expressed as mean ± 10 (min).
THE TEAM APPROACH
Five time points evaluated for adherence from 2006 PALS algorithm.
Percent adherence to 5 algorithm time points and median time to intervention (with goal time displayed). *Error bars represent IQRs for median times.

Raina Paul et al. Pediatrics 2012;130:e273-e280

©2012 by American Academy of Pediatrics
Ishikawa fishbone diagram for fluid delivery.

©2014 by American Academy of Pediatrics

Raina Paul et al. Pediatrics 2014;133:e1358-e1366
Statistical process control charts for outcome measures.

Mortality 4% to 1.7%

©2014 by American Academy of Pediatrics

Raina Paul et al. Pediatrics 2014;133:e1358-e1366
THE INSTITUTIONAL APPROACH
Pediatric Septic Shock Collaborative

Initial Clinical Assessment Compliance
P1. Initial clinical assessment compliance

- 46% → 59% → 60% → 69%
  - 23 percentage point improvement

Fluid within First Hour (2 or 3 boluses)
P2B. Fluid bolus administration - 1st hour

- 50% → 66% → 57% → 58%
  - 8 percentage point improvement

Time to First Fluid Bolus (wi 20 min)
P2A. Fluid bolus administration - 1st bolus

- 38% → 47% → 48% → 46%
  - 8 percentage point improvement

Timely Antibiotic Administration (1 hr)
P3. Timely antibiotic administration

- 56% → 57% → 67% → 56%
  - No improvement

IMPROVEMENT

OPPORTUNITY
Severe Sepsis / Septic Shock

Severe Sepsis 30 day mortality: 11% → 3% (p<0.03)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Q3 - 2012</th>
<th>Q4 - 2012</th>
<th>Q1 - 2013</th>
<th>Q2 - 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 days</td>
<td>4%</td>
<td>9%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>30 days</td>
<td>11%</td>
<td>12%</td>
<td>7%</td>
<td>5%</td>
<td>3%</td>
</tr>
</tbody>
</table>
ON ADVOCACY, GOVERNOR CUOMO, AND THE CENTERS FOR DISEASE CONTROL AND PREVENTION
RESULTS OF ALL LABORATORY TESTS MUST NOW BE DISCUSSED WITH PARENTS BEFORE A CHILD IS SENT HOME FROM EMERGENCY DEPARTMENT OR THE HOSPITAL

ALL HOSPITALS MUST NOW HAVE PROTOCOLS/POLICY FOR SEPSIS RECOGNITION AND MANAGEMENT

CHANGING THE WORLD
NY first U.S. state to enact Rory’s Regulations
SEPSIS IS A MEDICAL EMERGENCY!

HOSPITAL STANDARDS FOR SEPSIS SHOULD BE AS STRINGENT AS FOR STROKE, ACUTE MYOCARDIAL INFARCTION, STATUS EPILEPTICUS, TRAUMA, STATUS ASTHMATICUS, AND DIABETIC KETOACIDOSIS
Recognition Bundle Example

• Screen patient for septic shock
• Clinician assessment within 15 minutes for any patient who screens positive
• Initiate Resuscitation Bundle within 15 minutes for patient identified by the trigger tool whom the assessing clinician confirms suspicion of septic shock
**Pediatric Septic Shock Collaborative**

**Septic Shock Identification Tool**

- Patient presents to the ED with concern for infection/infection or temperature abnormality (in the ED or within 4 hrs of presentation)?
  - NO: Exclude from shock triage tool. Continue routine triage process.
  - YES: Continue assessment at triage.

**General assessment:**
- Is patient critically ill?
  - YES: Transfer patient to a resuscitation room and immediately alert physician/resuscitation team.
  - NO: Continue shock triage tool.

---

- Obtain a full set of vital signs including blood pressure and temperature.
- Perform a brief history and physical exam assessing mental status, skin, pulses, and capillary refill/perfusion.
- Is the patient a high-risk patient? (see Table 1)

**Septic Shock Checklist**
- Temperature abnormality (Table 2) $^\circ$C
- Hypotension (Table 2) __________ mmHg
- Tachycardia (Table 2) __________ bpm
- Tachypnea (Table 2) __________ bpm
- Capillary refill abnormality (Table 3) __________ mm/sec
- Mental status abnormality (Table 3) __________
- Pulse abnormality (Table 3) __________
- Skin abnormality (Table 3) __________

---

- Is patient hypotensive?
  - NO: Continue routine triage process.
  - YES: Initiate/continue the Septic Shock protocol/pathway using the Septic Shock Order Set, and mobilize resources.

**Does patient meet 3 or more of the 8 clinical criteria, OR does high-risk patient meet 2 or more of the 8 clinical criteria?**
- YES: Continue routine triage process.
- NO: Identify the patient as meeting septic shock triage criteria, transfer to a room immediately and alert physician.

**Does physician assessment concur with triage assessment?**
- YES: Continue routine care.
- NO: Continue assessment at triage.

---

**Table 1: High Risk Conditions**
- Malignancy
- Asplenia (including SCD)
- Bone marrow transplant
- Central or indwelling line/catheter
- Solid organ transplant
- Severe MR/ICP
- Immunodeficiency, immunocompromise or immunosuppression

**Table 2: Vital Signs (PALS)**

| Age          | HR Rate | RR Rate | Systolic BP | Temp $(^\circ \text{C})$
|--------------|---------|---------|-------------|-----------------
| 0 d – 1 m    | > 205   | > 60    | < 60        | <36 or >38.5   |
| 1 m – 3 m    | > 205   | > 60    | < 70        | <36 or >38.5   |
| 3 m – 1 r    | > 150   | > 60    | < 70        | <36 or >38.5   |
| ≥ 1 y - 2 y  | > 190   | > 40    | < 70 + (age in yr * 2) | <36 or >38.5   |
| ≥ 2 y - 4 y  | > 140   | > 40    | < 70 + (age in yr * 2) | <36 or >38.5   |
| ≥ 4 y - 8 y  | > 140   | > 34    | < 70 + (age in yr * 2) | <36 or >38.5   |
| ≥ 8 y - 10 y | > 140   | > 30    | < 70 + (age in yr * 2) | <36 or >38.5   |
| ≥ 10 y - 13 y| > 100   | > 30    | < 60        | <36 or >38.5   |
| > 13 y       | > 100   | > 16    | < 60        | <36 or >38.5   |

**Table 3: Exam Abnormalities**

<table>
<thead>
<tr>
<th>Pulses (central vs. peripheral)</th>
<th>Cold Shock</th>
<th>Warm Shock</th>
<th>Non-specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased or weak</td>
<td>Bounding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capillary refill (central vs. peripheral)</th>
<th>Cold Shock</th>
<th>Warm Shock</th>
<th>Non-specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 3 sec</td>
<td>Flash (=1 sec)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skin</th>
<th>Cold Shock</th>
<th>Warm Shock</th>
<th>Non-specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mottled, cool</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mental status</th>
<th>Cold Shock</th>
<th>Warm Shock</th>
<th>Non-specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased, irritability, confusion, inappropriate crying or drowsiness, poor interaction with parents, lethargy, dimished arousability, obtundated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Resuscitation Bundle

• Attain IV/IO access within 5 minutes
• Appropriate fluid resuscitation begun within 30 minutes
• Initiation of broad spectrum antibiotics within 60 minutes
• Begin peripheral (adrenaline) or central inotrope infusion therapy for fluid refractory shock within 60 minutes.
Five time points evaluated for adherence from 2006 PALS algorithm.

Raina Paul et al. Pediatrics 2012;130:e273-e280

©2012 by American Academy of Pediatrics
Stabilization Bundle Example

• Use multimodal monitoring to optimize fluid, hormonal, and cardiovascular therapies to attain hemodynamic goals.
• Confirm administration of appropriate antimicrobial therapy and source control
Performance Bundle Example

• Measure adherence to Trigger, Resuscitation, and Stabilization Bundles
• Perform root cause analysis to identify barriers to adherence
• Provide an action plan to address identified barriers
Improving Pediatric Sepsis Outcomes
A collaboration of children’s hospitals to prevent severe sepsis and sepsis deaths
Prior work is foundational to IPSO

• CHA Rapid Cycle Collaborative
  ▪ 2012-2013
  ▪ 15 hospitals

• Pediatric Septic Shock Collaborative
  ▪ 2013-2016
  ▪ 25 hospitals (ED Focused)
Collaborative Timeline

2Q2016 Collaborative Begins

1Q2017 Process Improvement Trends

Late 2017 Outcome Improvement Trends

2020 Reduce Mortality and Hospital-onset Severe Sepsis by 75%
Sepsis in the Post-acute and Long Term Care World

Susan M. Levy, MD, CMD,
President
AMDA The Society for Post-acute and Long Term Care Medicine
www.paltc.org
Susan M. Levy, MD Disclosures

- CMS consultant
- VHQC consultant
- CMO Linked Senior
- Five Star Physician services
- Legal Case reviews
Sepsis: Definition

• Life-threatening organ dysfunction caused by a dysregulated host response to infection

2016 Society of Critical Care Medicine and the European Society of Critical Care Medicine
Sepsis and Aging

• Higher incidence
• Greater severity
• Greater mortality
Risk Factors for Sepsis in the Elderly

- Multiple co-morbidities
- Pre-morbid functional status (frailty)
- Medications (steroids, antibiotics)
- Instrumentation/procedures
- Recurrent hospitalization (exposure)
- Endocrine disorders
- “Normal” aging changes
  - Immune senescence
  - Host defenses
Post-Acute and Long-Term Care Continuum

Diagram showing the various stages of care including LTACH, Home, IRF, AL, SNF, and HOSPITAL.
Sepsis in the Nursing Home: Population

• Over 15,000 facilities
• 1.4 million beds
• Short stay vs. long stay populations
• Younger vs. older population
Sepsis in Nursing Homes: Common Sources of Infection

- Genitourinary
- Pulmonary
- Skin and Soft Tissue
- Gastrointestinal
Sepsis in Nursing Homes: Barriers to Recognition

• Classic signs and symptoms may be absent, blunted, or have a non-infectious cause
  • Fever
  • Altered mental status
  • Elevated respiratory rate
  • Elevated heart rate
• Access to diagnostic testing and turn around times
• Frequent colonization
• Staff education and training in early signs and symptoms
• Lack of on site practitioners
• Advance Care Planning (goals of therapy unclear)
Sepsis: Advance Care Planning

- Pneumonia may well be called the friend of the aged. Taken off by it in an acute, short, not often painful illness, the old man escapes those ‘cold gradations of decay’ so distressing to himself and his friends.  
  *Sir William Osler (1898)*

- **INFECTION AND SEPSIS ARE NOT UNCOMMON TERMINAL EVENTS AT THE END OF LIFE**
Sepsis in Nursing Homes: Key Interventions

• Infection prevention
  • Immunizations (resident, visitors, staff)
  • Handwashing and other appropriate precautions
  • Environmental cleaning

• Early recognition tools/triggers
  • qSOFA as a trigger
  • Need to Know
  • INTERACT

• Early empiric treatment when the risk is high
• Access to oral and parenteral antibiotics
• Antibiotic stewardship
qSOFA

- Developed as an adjunct to the SOFA score
- “quick” SOFA score
- SOFA = Sequential (sepsis-related) Organ Failure Assessment used in ICUs
- qSOFA helps identify patients with early sepsis OUTSIDE the ICU
qsOFA

Hypotension
Systolic BP
<100 mmHg

Altered
Mental
Status

Tachypnea
RR >22/Min

Score of 22 Criteria Suggests a Greater Risk of a Poor Outcome
Multiple Initiatives in Nursing Homes

- Reducing Sepsis
- Antibiotic Stewardship
- Readmission Reduction
MEDICARE NURSING HOME RESIDENT HOSPITALIZATION RATES MERIT ADDITIONAL MONITORING
Nursing home residents went to hospitals most commonly for septicemia, pneumonia, and congestive heart failure.

Medicare nursing home residents went to hospitals for a wide range of conditions—236 of the possible 285 primary diagnosis categories described in the HCUP CCS. The primary diagnosis describes the most significant medical condition found during an inpatient admission. The 15 most frequent CCS diagnosis categories accounted for 60.9 percent of all resident hospitalizations (see Table 1).

Table 1: Primary Diagnoses on Claims of All Hospitalized Medicare Nursing Home Residents in FY 2011

<table>
<thead>
<tr>
<th>CCS Primary Diagnosis Category</th>
<th>Percentage of Hospitalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fifteen Most Frequent CCS Categories</strong></td>
<td>60.9%</td>
</tr>
<tr>
<td>Septicemia</td>
<td>13.4%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>7.0%</td>
</tr>
<tr>
<td>Congestive heart failure, nonhypertensive</td>
<td>5.8%</td>
</tr>
<tr>
<td>Urinary tract infections</td>
<td>5.3%</td>
</tr>
<tr>
<td>Aspiration pneumonitis, food/vomitus</td>
<td>4.0%</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>3.9%</td>
</tr>
<tr>
<td>Complication of device, implant, or graft</td>
<td>3.3%</td>
</tr>
<tr>
<td>Respiratory failure, insufficiency, or arrest</td>
<td>2.7%</td>
</tr>
<tr>
<td>Gastrointestinal hemorrhage</td>
<td>2.4%</td>
</tr>
<tr>
<td>Complications of surgical procedures or medical care</td>
<td>2.4%</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease (COPD) and bronchiectasis</td>
<td>2.4%</td>
</tr>
<tr>
<td>Delirium, dementia, and amnestic and other cognitive disorders</td>
<td>2.2%</td>
</tr>
<tr>
<td>Acute cerebrovascular disease</td>
<td>2.1%</td>
</tr>
<tr>
<td>Fluid and electrolyte disorders</td>
<td>2.0%</td>
</tr>
<tr>
<td>Fracture of neck of femur (hip)</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Remaining 221 CCS Categories on Nursing Home Claims</strong></td>
<td>39.1%</td>
</tr>
<tr>
<td><strong>All CCS Diagnosis Categories on Nursing Home Claims</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: OIG analysis of data on FY 2011 hospitalizations of nursing home residents.
Sepsis: Causes of Re-admissions

Why Post-Acute and Long-Term Care Patients May be at Higher Risk for Re-Hospitalizations


• Possible Underlying Causes

  • Sleep deprivation
  • Malnutrition
  • Pain
  • Emotional stress
  • Physical deconditioning
  • Multiple medications
Antibiotic Stewardship in Nursing Homes

4.1 MILLION
Americans are admitted to or reside in nursing homes during a year.

UP TO 70%
of nursing home residents received antibiotics during a year.

UP TO 75%
of antibiotics are prescribed incorrectly.

CDC recommends 7 CORE ELEMENTS for antibiotic stewardship in nursing homes:
- Leadership Commitment
- Accountability
- Drug Expertise
- Action
- Tracking
- Reporting
- Education

*Incorrectly = prescribing the wrong drug, dose, duration or reason
1. NICHS County Report 2013
Reducing Sepsis in Nursing Homes: Role of the Medical Director and Practitioners

• Medical Director (CMD-Certified Medical Director)
  • Policies and procedures (incorporate best practices)
  • Oversight of the medical staff (monitor performance)
  • Clinical champion/QAPI (Quality Assurance and Performance Improvement)

• Practitioners
  • Physicians, nurse practitioners, physicians assistants
  • Site specific education and training in nursing home care
  • Need to know when they are called
Summary

• Sepsis is difficult to recognize and to manage in PA/LTC
• Sepsis is a common cause for hospitalization of nursing home residents and is expensive
• It is important to recognize and appropriately treat the common infections that can lead to sepsis and tools are available
• Many of the current infection related initiatives have similar goals
• We need to engage our medical directors and practitioners in these initiatives
THANK YOU

Susan M. Levy, MD, CMD
susan@susanlevymd.com