Improving Pediatric Sepsis Outcomes

A collaboration of children’s hospitals to prevent severe sepsis and sepsis deaths

March 9, 2016, 9:30 – 10:30 AM
National Co-Chairs

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Quality and Safety in Children’s Health Conference
**Thank You**

**National Expert Advisory Committee**

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<th><em>Leslie Hueschen MD</em></th>
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<tr>
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*Workgroup leader**

**National co-chair**
Infection with Fever
scarlet fever strep throat

Many 1000s of children per year with infection that gets better in a few days but ....
Sepsis is Serious

Sometimes Lethal
By a show of hands, how many of you…

• Joined us for last year’s presentation?

• Have had a serious safety event at your hospital due to failure to recognize sepsis or escalate quickly enough?

• Have had a friend or loved one hospitalized with a serious infection or develop a serious infection while hospitalized?
What is Sepsis?

Infection  Sepsis  Severe Sepsis  Septic Shock

Infection  SIRS  SEPSIS  Severe Shock

Infection  Sepsis³  2+ New Organ Dysfunction (SOFA)  Shock

QUALITY AND SAFETY IN CHILDREN’S HEALTH CONFERENCE
Competing Sepsis Definitions & Objectives

- 2001 expert consensus criteria - adults
- 2006 expert consensus criteria - pediatrics (Goldstein Criteria)
- CMS SEP-1 (Oriented to Surviving Sepsis Campaign)
- CDC surveillance definition for Sepsis is forthcoming
- 2016 SCCM / ES-ICM Sepsis-3 criteria
  - Paradigm shift: Infection + 2 Organ Dysfunction
  - Validated: large adult data sets
  - JAMA, Feb 2016 - Endorsed by 31 societies
  - NOT PEDIATRIC

- No one definition will meet all needs
  - Expect some confusion as new definitions percolate
### Pediatric Sepsis Def. v Adult Sepsis-3

<table>
<thead>
<tr>
<th>Pediatric (Goldstein)</th>
<th>Adults (Sepsis-3)</th>
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<tbody>
<tr>
<td>Infection</td>
<td>Infection</td>
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<tr>
<td>Non-Severe Sepsis</td>
<td>Infection</td>
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<tr>
<td>Severe Sepsis</td>
<td>Sepsis</td>
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<tr>
<td>Septic Shock</td>
<td>Septic Shock</td>
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Regardless of what you call it, Sepsis is a Big Deal!

- ~30,000 children <5 years old world-wide die daily of sepsis / complications
- Most common cause of childhood death in the world
  - More common than cancer
- ~40-80K annual US hospitalizations for severe sepsis
- 2.5-15% hospital mortality
- $2 billion annually in US

Converging Pressures to Engage

- Growing clinical problem
- New data-driven definitions spurring science & QI
- Aligns with CHA Quality Strategic Vision
- Growing # of legislative / state mandates
- CMS mandated metric reporting (adults)
- 2016 update to ACCM / PALS guidelines (soon)
  - 4 Bundles: Recognition, Resuscitation, Stabilization, **Performance**
  *Biggest change: performance bundle (measure compliance)*
IPSO Guiding Principles

• Broad scope
  ▪ Entire sepsis spectrum, not just severe sepsis and septic shock
  ▪ All settings (pre-hospital, ED, all inpatient services, long-term/rehab settings)
  ▪ All relevant disciplines, e.g., infection prevention, pharmacy, respiratory

• Patient-centric focus, not care-setting focus

• Evidence based for efficacy and feasibility of bundles

• Measurement for improvement; perfection not required or appropriate
Patients May Shift Around

Presentation → Inpatient Course → Outcome

No Sepsis

Non-SS (ROS, F&N) [largest n]

Severe Sepsis [medium n]

Septic Shock [smallest n]

Death [smallest n]

Survival + Morbidity [medium n]

Intact Survival [largest n]

PSSC / SSC IPSO

Severe Sepsis

Septic Shock

Non-SS
NEAC Work Group Structure

IPSO Phase 1

Care Setting Work Groups

Functional Work Groups

Cross-cutting Clinical Specialists
(Infection Control/Infectious Disease, Surgery, Pharmacy, Respiratory Therapy)

Interventions

Data & Analytics

Education

Family Engagement

Research

Co-Chairs  CHA  WG Leads

Steering Committee (n=21 people from 18 institutions)
Foundational to IPSO: AAP PSSC

• Has built upon the significant prior work
  • CHA Rapid Cycle Collaborative
    ▪ 2012-2013
    ▪ 15 hospitals
  • Pediatric Septic Shock Collaborative
    ▪ 2013-2016
    ▪ 25 hospitals (ED Focused)
Pediatric Septic Shock Collaborative

Initial Clinical Assessment Compliance

Time to First Fluid Bolus (wi 20 min)

Fluid within First Hour (2 or 3 boluses)

Timely Antibiotic Administration (1 hr)

IMPROVEMENT

OPPORTUNITY
Phase II: Mortality Outcomes

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

Severe Sepsis (smaller n)

- 30 day mortality: 11% → 3% (p<0.03)

All Sepsis (larger n)

- 30 days mortality: 2% → 2%
PSSC Phase III - Success Stories

Cincinnati Children’s Dr. Holly Depinet

Best Practice Alert – built in the EMR

5 months with no sepsis-related deterioration!!!

Frequency of BPA firing, per 100 ED patients

Median: < 2 patients/day
% Mortality of septic patients admitted to PICU pre- and post-shock protocol

- PICU Mortality
- PICU Sepsis Mortality
- PICU Sepsis Mortality w/ inotropes
Global Aims -- IPSO

Decrease mortality from Severe Sepsis\(^G\) by 75% in US Pediatric Acute Care Settings from a baseline of ~10\(^A\) to 2.5% by 12/2017

Decrease the incidence of hospital-onset Severe Sepsis\(^G\) in US Pediatric Acute Care Settings by 75% from ~2\(^B\) to 0.5% by 12/2017

Estimated figures for ballpark draft (will replace with baseline data from collaborative)

\(^A\) Crude estimate based on 2014 PCCM publications and prior CHA sepsis data.

\(^B\) Very crude interpolation from pediatric epidemiologic data and pooled nosocomial infection data.

\(^G\) 2006 Goldstein Peds Definition (analogous to Sepsis-3 criteria for “Sepsis” and “Septic Shock”)
KDD Conceptualization – High Level

Reduce Severe Sepsis Mortality

Prevention of Hospital-Onset Severe Sepsis

Sensitive & timely recognition

Appropriate diagnostic evaluation

Appropriate, timely, & effective resuscitation & stabilization

Appropriate & timely de-escalation of care and initiation of rehabilitative care

Engage patients & families

Measure & Optimize Performance

Novel Approach

Like PSSC & Surviving Sepsis Campaign, but will include all inpatient settings

- ED
- Gen Care
- PHO
- PICU

*This is QI, not Patient Safety.
Natural/logical extension for SPS’s HAI prevention.

Aligns w/ PALS 2016

*This is QI, not Patient Safety. Natural/logical extension for SPS’s HAI prevention.
Reduce Severe Sepsis Mortality

Prevention of Hospital-Onset Severe Sepsis

- Sensitive & timely recognition of non-severe sepsis
- Appropriate, timely, & effective antibiotics
- Engage patients & families
- Measure & Optimize Performance

Scope of this work more limited (large n):
- Infections at risk for progressing to Severe Sepsis (e.g. Rule Out Sepsis, F&N)
- Inpatient or planned admission (ED)
- Orders for new IV Antibiotics & Blood Culture
- Metrics: time to antibiotics; appropriateness of antibiotics
KDD Conceptualization – By Key Driver

Reduce Severe Sepsis Mortality

Sensitive & timely recognition

- Use screening process/trigger tool (1st screen)
- Initiate continuous cardiorespiratory monitoring
- Perform structured clinical assessment (2nd screen)
- Conduct team huddles/plan further diagnostic and therapeutic interventions
PEdiATRiC SEPTic shOK COLLAbOATIVE SEPTic shOK 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:

- Hyperthermia (Table 2) _____________ °C
- Hypotension (Table 2) ______________ mmHg
- Tachycardia (Table 2) ______________ bpm
- Tachypnea (Table 2) _______________ bpm
- Capillary refill abnormality (Table 3)
- Pulse abnormality (Table 3)
- Skin abnormality (Table 3)

Is patient hypotensive?

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

NO  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  Does physician assessment concur with triage assessment?

YES  Continue routine triage process.

NO  Continue routine care.

<table>
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<tr>
<th>Table 1. High Risk Conditions</th>
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<tbody>
<tr>
<td>Malignancy</td>
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<tr>
<td>Asplenia (including SCD)</td>
</tr>
<tr>
<td>Bone marrow transplant</td>
</tr>
<tr>
<td>Central or indwelling line/catheter</td>
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<td>Solid organ transplant</td>
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<tr>
<td>Severe MR/CP</td>
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<tr>
<td>Immunodeficiency, immunocompromise or immunosuppression</td>
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<tr>
<th>Table 2. Vital Signs (PALS)</th>
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<tr>
<td>Age</td>
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<td>0 d - 1 m</td>
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<tr>
<td>≥ 1 m - 3 m</td>
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<tr>
<td>≥ 3 m - 1 y</td>
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<td>≥ 1 y - 2 y</td>
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<td>≥ 2 y - 4 y</td>
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<tr>
<td>≥ 4 y - 6 y</td>
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<td>≥ 6 y - 10 y</td>
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<tr>
<td>≥ 10 y - 13 y</td>
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<td>≥ 13 y</td>
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<th>Table 3. Exam Abnormalities</th>
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<tr>
<td>Pupils (central vs. peripheral)</td>
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<tr>
<td>Decreased or weak</td>
</tr>
<tr>
<td>Capillary refill (central vs. peripheral)</td>
</tr>
<tr>
<td>Skin</td>
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<tr>
<td>Mental status</td>
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Reduce Severe Sepsis Mortality

KDD Conceptualization – By Key Driver

Appropriate diagnostic evaluation

• Use an order set for laboratory and imaging studies

• ID potential site / cause of infection / need for source control

• Characterize organ dysfunction
KDD Conceptualization – By Key Driver

Reduce Severe Sepsis Mortality

Appropriate, timely, & effective resuscitation & stabilization

ALL CARE AREAS
  • Use an order set for initial management
  • Provide supplemental oxygen, escalate respiratory support
  • Establish vascular access
  • Initiate fluid resuscitation (<30 min)
  • Initiate antibiotics (<60 min)
  • Appropriate initiation of inotropes for fluid-refractory shock or fluid overload (<60 min)
  • Initiate Hydrocortisone for catechol resistant shock
  • Transition to higher level of care if indicated
  • Monitor UO
  • Measure Hgb, define transfusion criteria

Partial List Due To Length
KDD Conceptualization – By Key Driver

Reduce Severe Sepsis Mortality

Appropriate, timely, & effective resuscitation & stabilization

HEME-ONC
- Confirm proper Antibiotics for immunocompromised pts
- Review immunosuppressive therapy
- Monitor patient VS & response to Rx

PICU
- Establish hemodynamic targets
- Use standardized indications for CVC
- Maintain mixed venous saturation >70%
- Monitor end organ function
- Start appropriate nutritional support (<24h)
KDD Conceptualization – By Key Driver

Reduce Severe Sepsis Mortality

Appropriate & timely de-escalation of care; Initiation of rehabilitation care

- Discontinue or wean treatment no longer indicated
- Review antibiotics daily; discontinue based on cultures / labs
- Remove invasive devices no longer required
- Assess for delirium or withdrawal, sedation and pain med. needs
- Assess rehabilitation needs
KDD Conceptualization – By Key Driver

**Reduce Severe Sepsis Mortality**

- Inform, support, engage families early and ongoing care
- Include families in planning and implementation teams
- Use storytelling to increase awareness and commitment
- Debrief with family members after a sepsis event for learning
- Create or engage PFE resources
- Family activation of a rapid response team
- Ensure common understanding of PFE across the organization

**Engage patients & families**
Reduce Severe Sepsis Mortality

Measure & Optimize Performance

- Develop / implement comprehensive multi-professional education
- Align with 2016 ACCM / PALS performance bundle
- IPSO:
  - All-share/All-learn QI Collaborative Model (qualitative/quantitative)
  - Aggregate Data (large n, better power, faster learning)
  - Site Reports (local context, inform targeted interventions)
Replacing concept of a single “Time Zero”

- Time of physiological sepsis (retrospective)
- Time of provider recognition/response
- Time of antibiotic administration
- Time of IV fluids (if hemodynamic compromise)

Different “deltas” that reflect different problems
Anticipated high-level metrics

• **Outcome:**
  • Mortality from Severe Sepsis
  • Incidence of hospital-onset Severe Sepsis

• **Care Process:**
  • Screening – trigger tool
  • Antibiotics (timing, appropriateness)
  • Fluids (timing)
  • Vasoactive agents
  • Treatment de-escalation

• **Other Processes:** Education, Patient/family engagement
Data collection and submission

• Customized web-based data portal
  • Patient-level data
  • Parsimonious data elements

• Flexible approaches to gathering/submitting data
  • Paper audit and manual data entry
  • Data import (e.g., REDCap data collection forms)
  • Import from EMR
Strategic Partnerships

Section on Emergency Medicine of AAP (AAP SOEM)
- Pediatric Septic Shock Collaborative led by Charles Macias (IPSO Co-Chair)
- Data submission ends in early 2016

Centers for Disease Control (CDC)
- Ongoing conversation with CHA

Society for Critical Care Medicine (SCCM)
- 2016 update to PALS / guidelines for severe sepsis.
- Dr. Carcillo chairs SCCM guidelines committee, currently serves on IPSO Interventions workgroup of NEAC

Children’s Hospital Association of Texas (CHAT)
- Launching sepsis collaborative for member hospitals in 2016 – will align with IPSO
Why Join the IPSO Collaborative – 6 Benefits

1. Reduce sepsis mortality and hospital-onset severe sepsis
2. Aggregate data with other members to quickly detect trends
3. Reduce costs by sharing infrastructure & avoiding development costs
4. All-Share, All-Learn collaborative model to accelerate change
5. Speak as a community of children’s hospitals focused on developing industry standards for identifying, treating and preventing sepsis
6. MOC-4 Opportunity for PEM, PCCM, PHO, Hospitalists, PID, etc.
Collaborative services

• Flexible data collection matched to hospital’s technology preference
• Monthly site performance reporting and aggregate analysis/reporting/benchmarking
• Two face-to-face workshops/year
• Monthly webinars for data interpretation, training, and team presentations
• Interventions Training
Collaborative services (cont.)

• Team coaching
• Access to collaborative data assets for analysis, research and publication
• QI methodology training
• Access to secure collaborative discussion board
• Share experiences and learn from peers
Timeline (subject to change!)

2Q2016
Pilot begins

4Q2016
Process improvement trends

2017
New hospitals enroll

Late 2017
Outcome improvement trends
Participation Steps

Commit ➔ Mobilize ➔ Implement ➔ Measure ➔ Collaborate

Hospital leader commitment

Hospital wide

Two-three year engagement

Fee
Participation Steps

Commit → Mobilize → Implement → Measure → Collaborate

- Build Hospital-Wide Partnership
- Engage Family Advisors
- Develop Teams
- Assess Resources and Readiness
- Map Processes and Changes
- Plan Implementation
- Train Teams
Participation Steps

Commit ➔ Mobilize ➔ Implement ➔ Measure ➔ Collaborate

Phase I Care Settings

90 aims and tests of change
Participation Steps

Commit ➔ Mobilize ➔ Implement ➔ Measure ➔ Collaborate

- Collect data
- Submit data
- Review monthly reports
Participation Steps

Commit ➔ Mobilize ➔ Implement ➔ Measure ➔ Collaborate

- Exchange what works
- Virtual meetings
- Workshops
- Online discussion

QUALITY AND SAFETY IN CHILDREN’S HEALTH CONFERENCE
Thank you for attending – Questions?

• Presentations:

  www.childrenshospitals.org

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