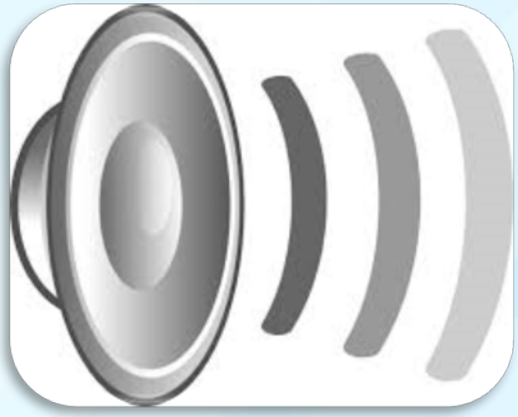
Welcome to *Advances in Sepsis: Protecting Patients Throughout the Lifespan*

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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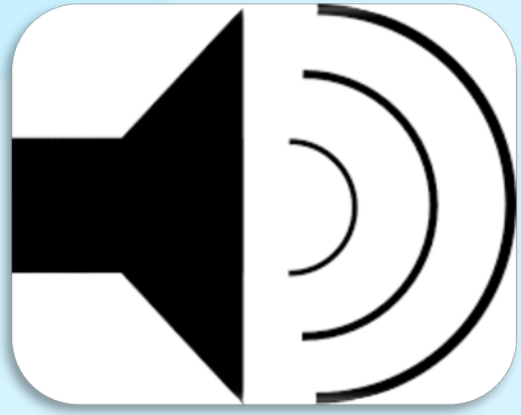

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Continuing Education Information

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.

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

The Society For Post-Acute And Long-Term Care Medicine™

Society of Critical Care Medicine
The Intensive Care Professionals

Children's Hospital Association

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.

To ask for help:

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

To hear the audio:

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Making Health Care Safer

Think sepsis. Time matters.

CDC Vitalsigns™

Anthony Fiore, MD MPH

Chief, Epidemiology Research And Innovations Branch

Division of Healthcare Quality Promotion

CDC *Vital Signs* Report

- ***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.

Thank You

Contact Information

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Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

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

Surviving Sepsis Campaign

The Warren Alpert Medical School of Brown University Department of Medicine

Disclosures

- None

Sepsis

- Where have we been?
- Where are we now?
- Where are we going?

Where Have We Been?

Special Articles

Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012

R Phillip Delllinger MD[1]; Mitchell M. Levy MD[2], Andrew Rhodes MD BS[3]; Djillali Annane MD[4]; Herwig Gerlach MD PhD[5]; Steven M. Opal MD[6]; Jonathan E. Sevransky MD[7]; Charles L. Sprung MD[8]; Ivor S. Douglas MD[9]; Roman Jaeschke MD[10]; Tiffany M. Osborn MD MPH[11]; Mark E. Nunnally MD[12]; Sean R. Townsend MD[13]; Konrad Reinhart MD[14]; Ruth M. Kleinpell PhD RN-CS[15]; Derek C. Angus MD MPH[16], Clifford S. Deutschman MD MS[17]; Flavia R. Machado MD PhD[18], Gordon Dr. Rubenfeld MD[19]; Steven A. Webb MB BS PhD[20]; Richard J. Beale MB BS[21]; Jean-Louis Vincent MD PhD[22]; Rui Moreno MD PhD[23]; 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

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The Impact of Sepsis Performance Measures

Data

Surviving Sepsis Campaign

The Warren Alpert Medical School of Brown University Department of Medicine

Intensive Care Med
DOI 10.1007/s00134-014-3496-0

ORIGINAL

Mitchell M. Levy
Andrew Rhodes
Gary S. Phillips
Sean R. Townsend
Christa A. Schorr
Richard Beale
Tiffany Osborn
Stanley Lemeshow
Jean-Daniel Chiche
Antonio Artigas
R. Phillip Dellinger

Surviving Sepsis Campaign: association between performance metrics and outcomes in a 7.5-year study

Critical Care Medicine

www.ccmjournal.org

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

Surviving Sepsis Campaign

Levy MM et al; CCM 2015;43:3-12

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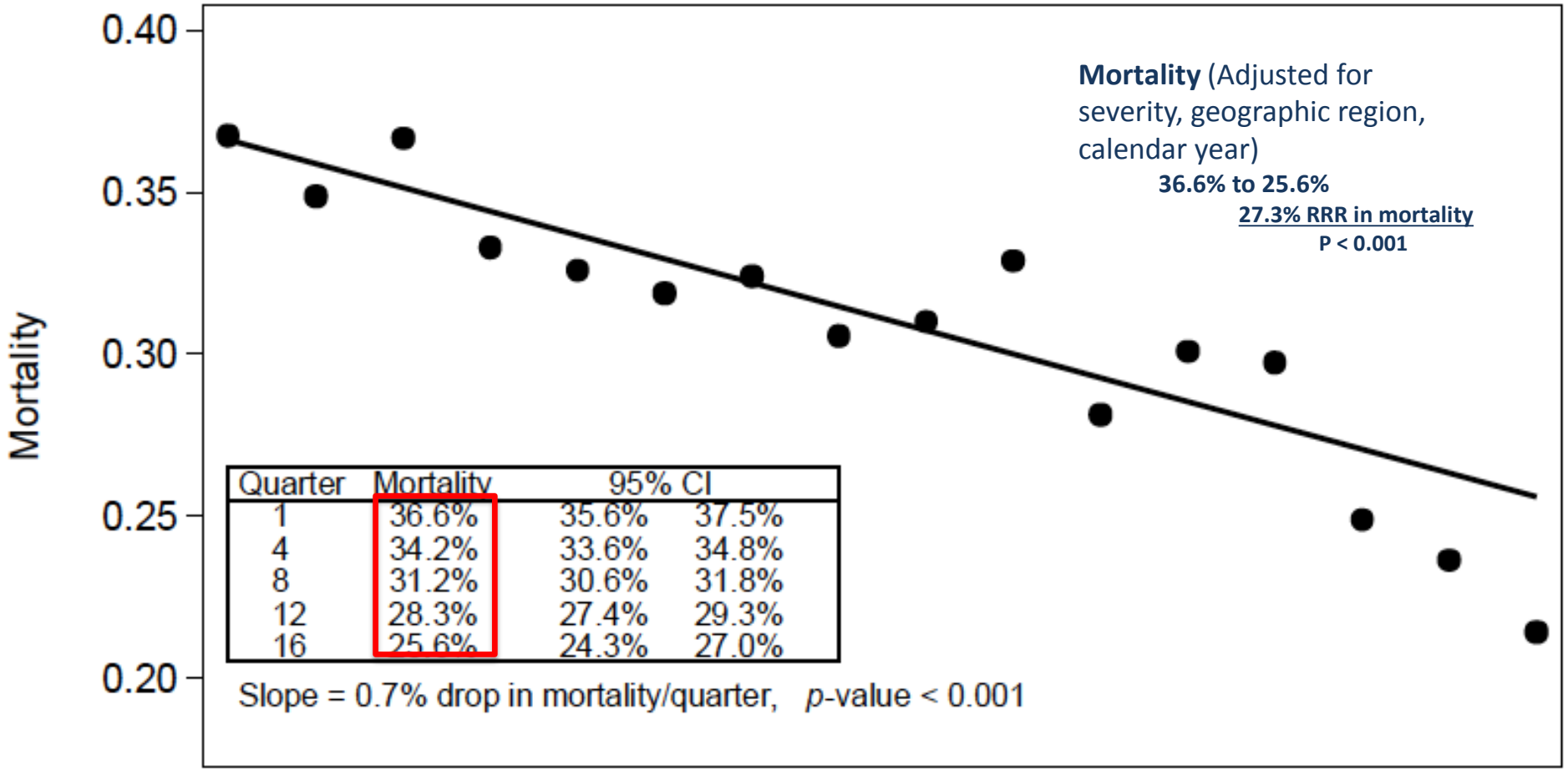
SSC Mortality:
Participation effect



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Levy MM et al; CCM 2015;43:3-12

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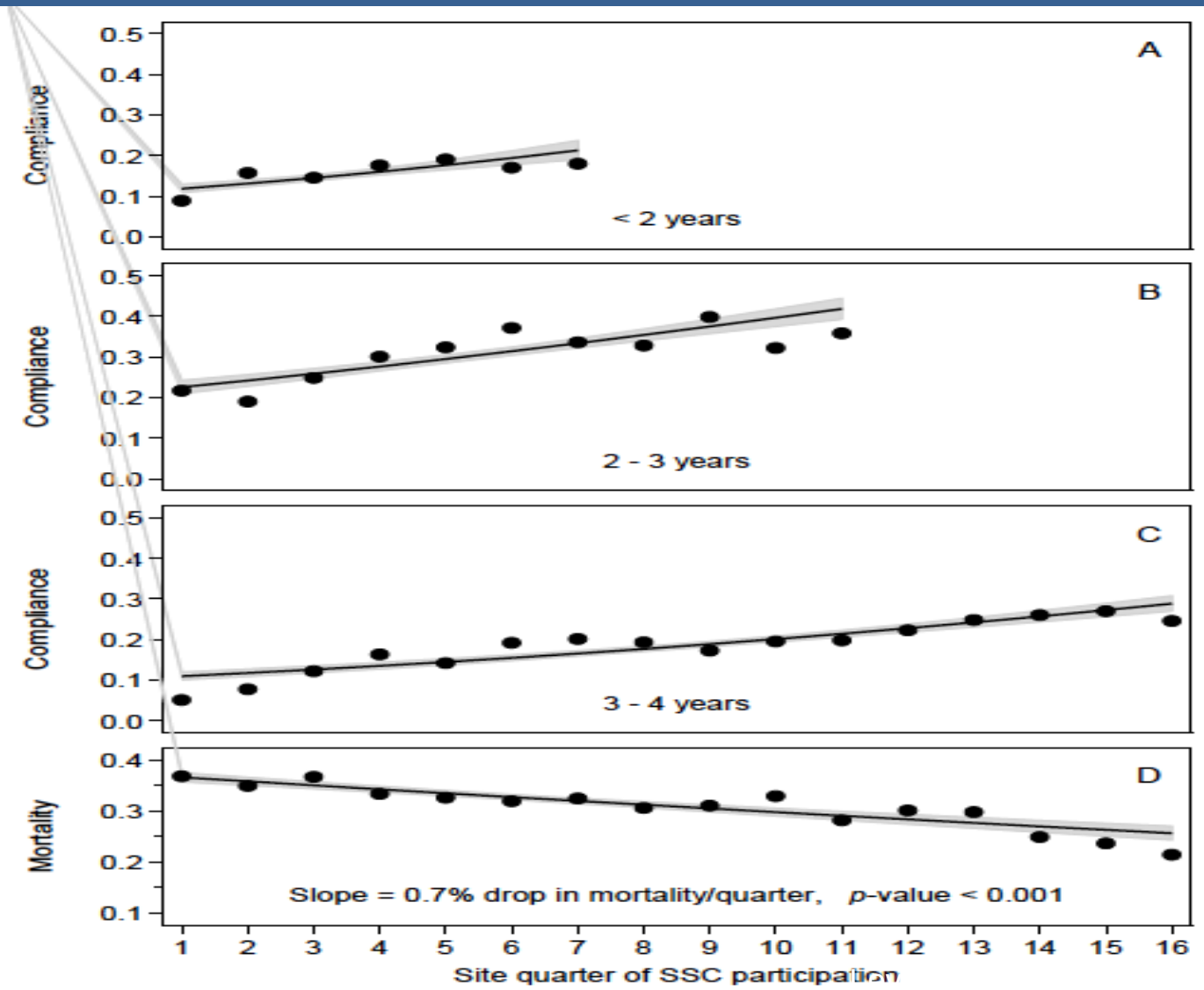
SSC **Duration** Effect



- **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**

Surviving Sepsis Campaign

Levy MM et al; CCM 2015;43:3-12

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Dose Effect: High vs. Low Compliance

Characteristic	Low resuscitation compliance			High resuscitation compliance			Total			p-value[1]
	Total	Died	Percent	Total	Died	Percent	Total	Died	Percent	
Overall	11,609	4,475	38.6	17,861	5,185	29.0	29,470	9,660	32.8	< 0.001
Location of severe sepsis identification										< 0.001
ED	5,984	1,850	30.9	10,465	2,421	23.1	16,449	4,271	26.0	
Ward	3,970	1,800	45.3	5,532	2,032	36.7	9,502	3,832	40.3	
ICU	1,655	825	49.8	1,864	732	39.3	3,519	1,557	44.2	
Site duration										< 0.001
< 2 years	4,960	1,896	38.2	3,352	992	29.6	8,312	2,888	34.7	
2 to < 3 years	1,611	600	37.2	6,557	1,895	28.9	8,168	2,495	30.5	
≥ 3 years	5,038	1,979	39.3	7,952	2,298	28.9	12,990	4,277	32.9	

Surviving Sepsis Campaign

Levy MM et al; CCM 2015;43:3-12

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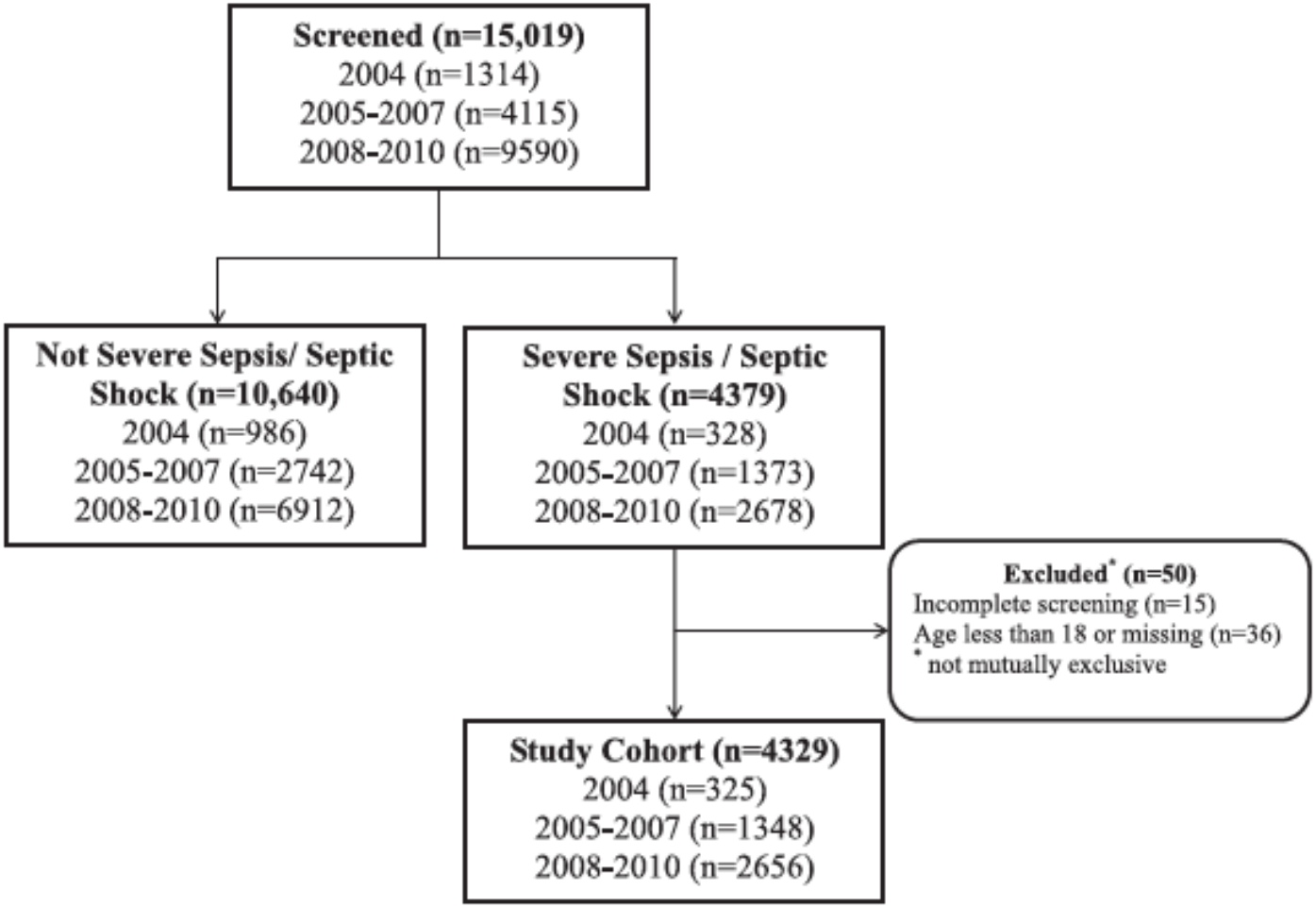
Multicenter Implementation of a Severe Sepsis and Septic Shock Treatment Bundle



Surviving Sepsis Campaign

Am J Respir Crit Care Med Vol 188, Iss. 1, pp 77–82, Jul 1, 2013

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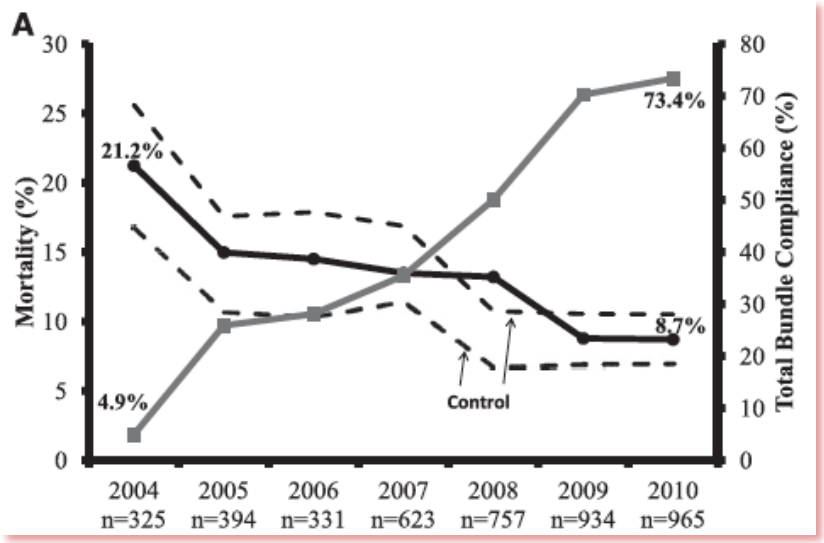
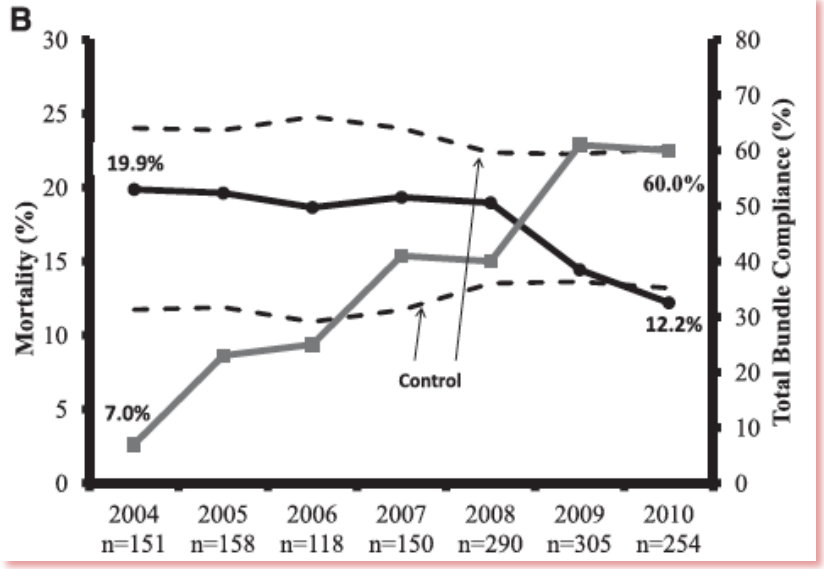
Am J Respir Crit Care Med Vol 188, Iss. 1, pp 77–82, Jul 1, 2013



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.

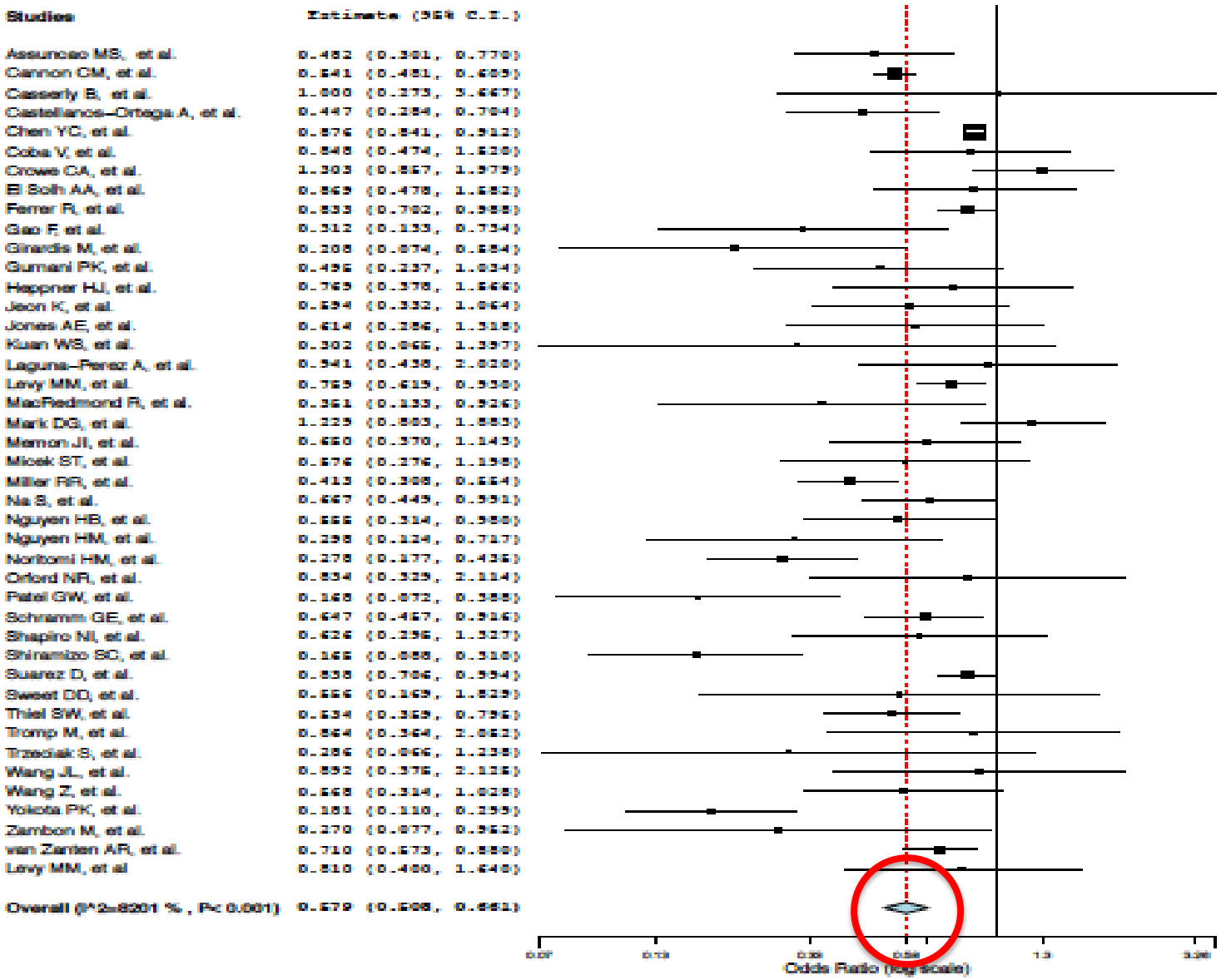
	2004	2010
Hospital Mortality	21.2%	8.7%
All-or-none total bundle compliance	4.9%	73.4%

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

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

* 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

Mitchell M Levy, Antonio Artigas, Gary S Phillips, Andrew Rhodes, Richard Beale, Tiffany Osborn, Jean-Louis Vincent, Sean Townsend, Stanley Lemeshow, R Phillip Dellinger

	USA	Europe	p value*
Count	18766 (74·0%)	6609 (26·0%)	
Origin			<0·0001
Emergency department	12 218 (65·1%)	2159 (32·7%)	
Ward	4763 (25·4%)	3405 (51·5%)	
ICU	1785 (9·5%)	1045 (15·8%)	

Lancet Infect Dis 2012;
12: 919–24

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Outcomes of the Surviving Sepsis Campaign in intensive care units in the USA and Europe: a prospective cohort study

Mitchell M Levy, Antonio Artigas, Gary S Phillips, Andrew Rhodes, Richard Beale, Tiffany Osborn, Jean-Louis Vincent, Sean Townsend, Stanley Lemeshow, R Phillip Dellinger

	USA	Europe	p value*
Count	18766 (74·0%)	6609 (26·0%)	
Hospital mortality if origin is emergency department	3008 (24·6%)	736 (34·1%)	<0·0001
Hospital mortality if origin is ward	1661 (34·9%)	1481 (43·5%)	<0·0001
Hospital mortality if origin is ICU	644 (36·1%)	502 (48·0%)	<0·0001

Lancet Infect Dis 2012; 12: 919–24

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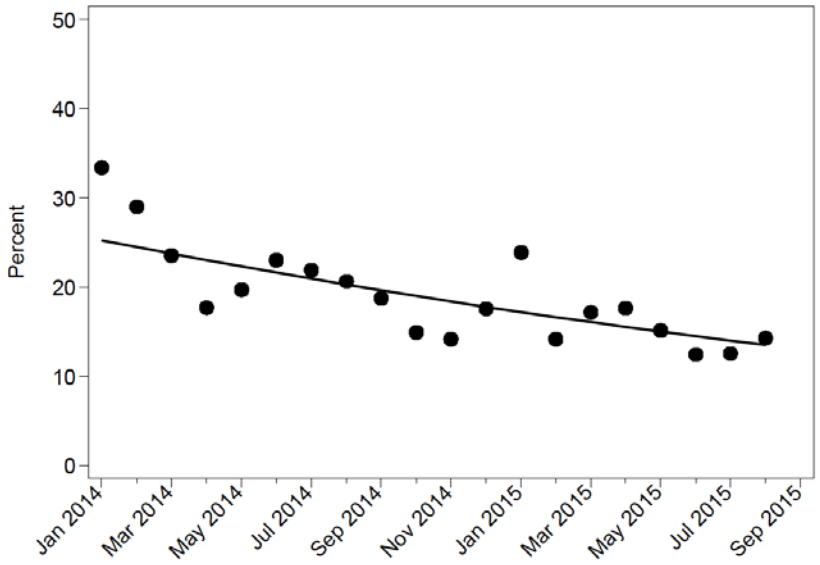
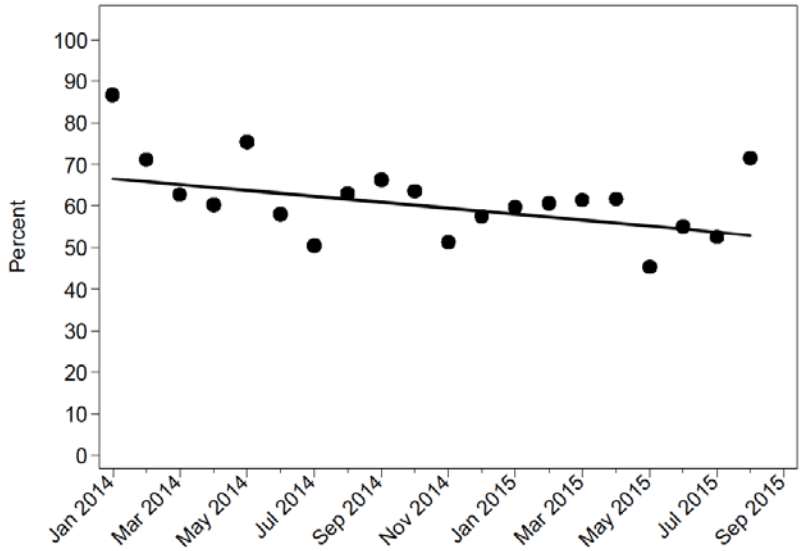
SSC Wards Collaborative (n = 1749)

Mortality



Rate of ICU Transfer



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)

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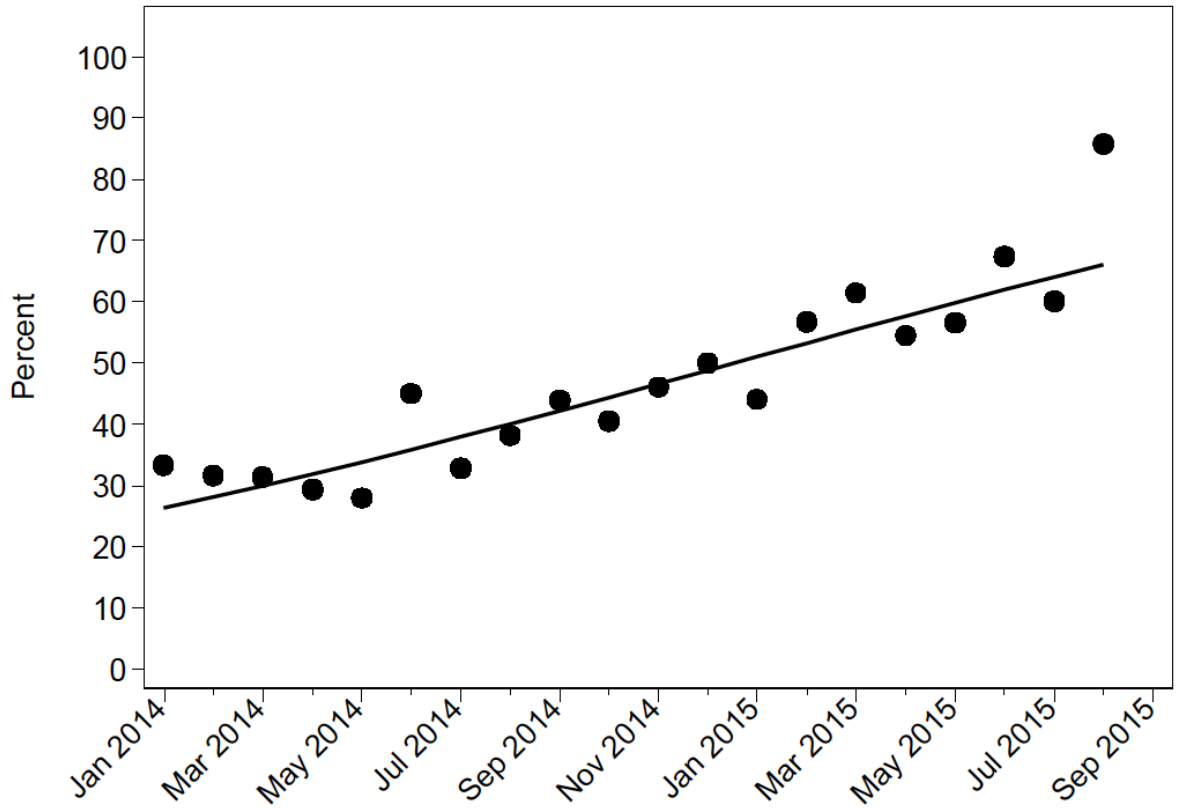
Compliance with 3 hr Bundle Over Time



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)

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Sepsis:
Where are We Going?

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Where are we Going?

- Increased attention to sepsis:
  - Public
  - Governments
- Are we Doing enough?

The New York Times

ABOUT NEW YORK

An Infection, Unnoticed, Turns Unstoppable

Rory Staunton taking his first flying lesson in 2011.

By JIM DWYER
Published: July 11, 2012 | 1659 Comments

For a moment, an emergency room doctor stepped away from the

FACEBOOK

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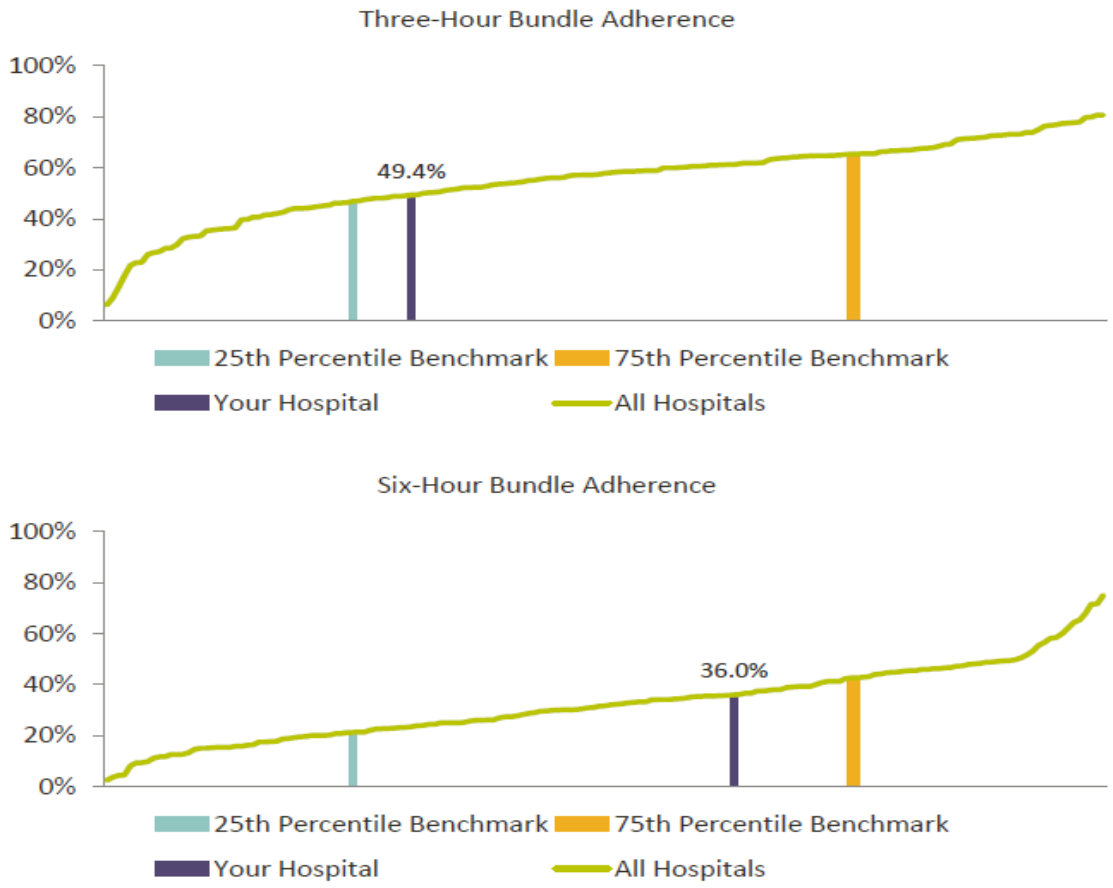
New York State Regulation: Mandated Reporting

- 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

Percentile Benchmarks for 3 & 6-Hour Bundle

Figure 5. Three- and Six-Hour Bundle Adherence Percentages in New York State (4 Qtr YTD).



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SEP-1: First National Core Measure on Sepsis Care

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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.*

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SEP-1

TO BE COMPLETED WITHIN 6 HOURS OF TIME OF PRESENTATION:

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.

SEP-1

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
- Its is 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

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Pediatric Sepsis Guidelines

Centers for Disease Control and Prevention Webinar

Dr. Joseph A. Carcillo M.D.

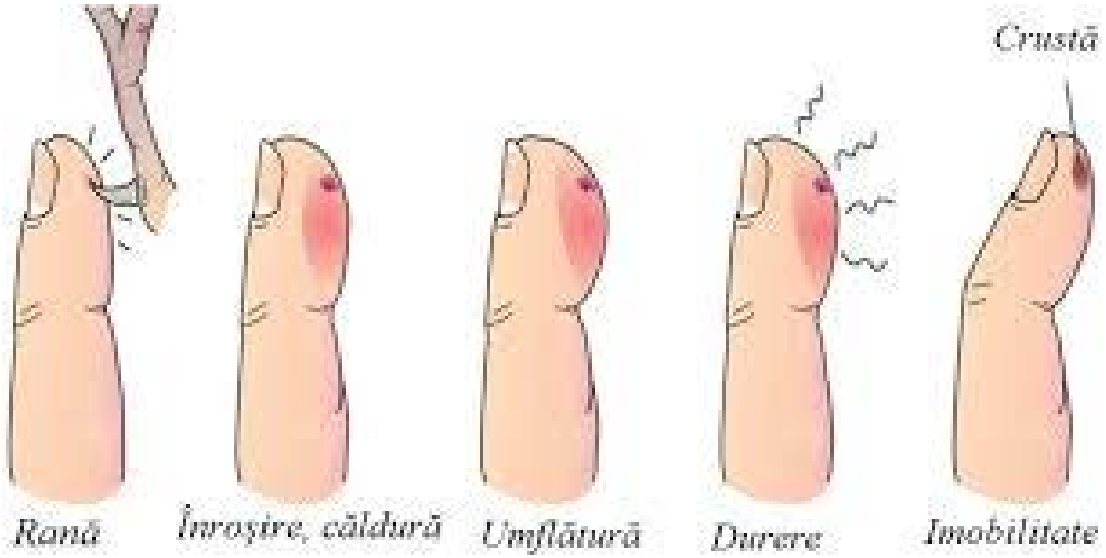
University of Pittsburgh with some slides provided by CHA-AAP IPSO Initiative

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



INFECTION

SEPSIS

Definition – 2000 years ago

- Hippocrates:
  - Breakdown of living tissues: „pepsis" and „sepsis"
- Celsus:
  - Rubor - Peripheral vasodilatation
  - Dolor - Altered mental status
  - Calor - Fever, hypothermia
  - Tumor - Oedema
- Galen:
  - Functio laesa

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

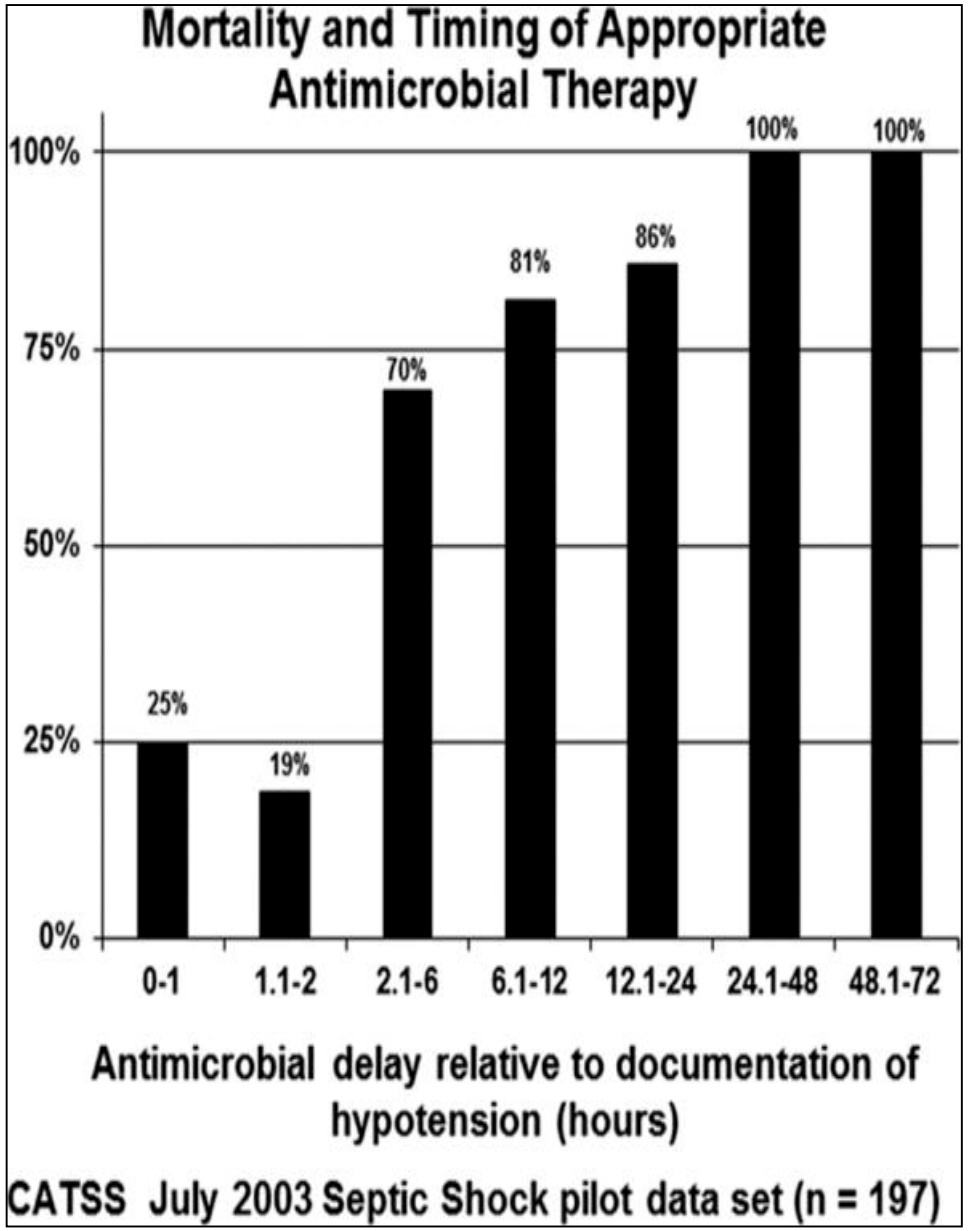


Figure 1 . Previously unpublished pilot data for the relationship of time to antimicrobial and mortality in septic shock among emergency department (ED) patients (n = 192). In this pilot analysis, the index time represents the first documented hypotension in ED, but does not include pre-ED arrival data. 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.

Systematic Bias in Meta-Analyses of Time to Antimicrobial in Sepsis Studies.
Kumar, Anand; MD, FCCM

Critical Care Medicine. 44(4):e234-e235, April 2016. DOI: 10.1097/CCM.0000000000001512

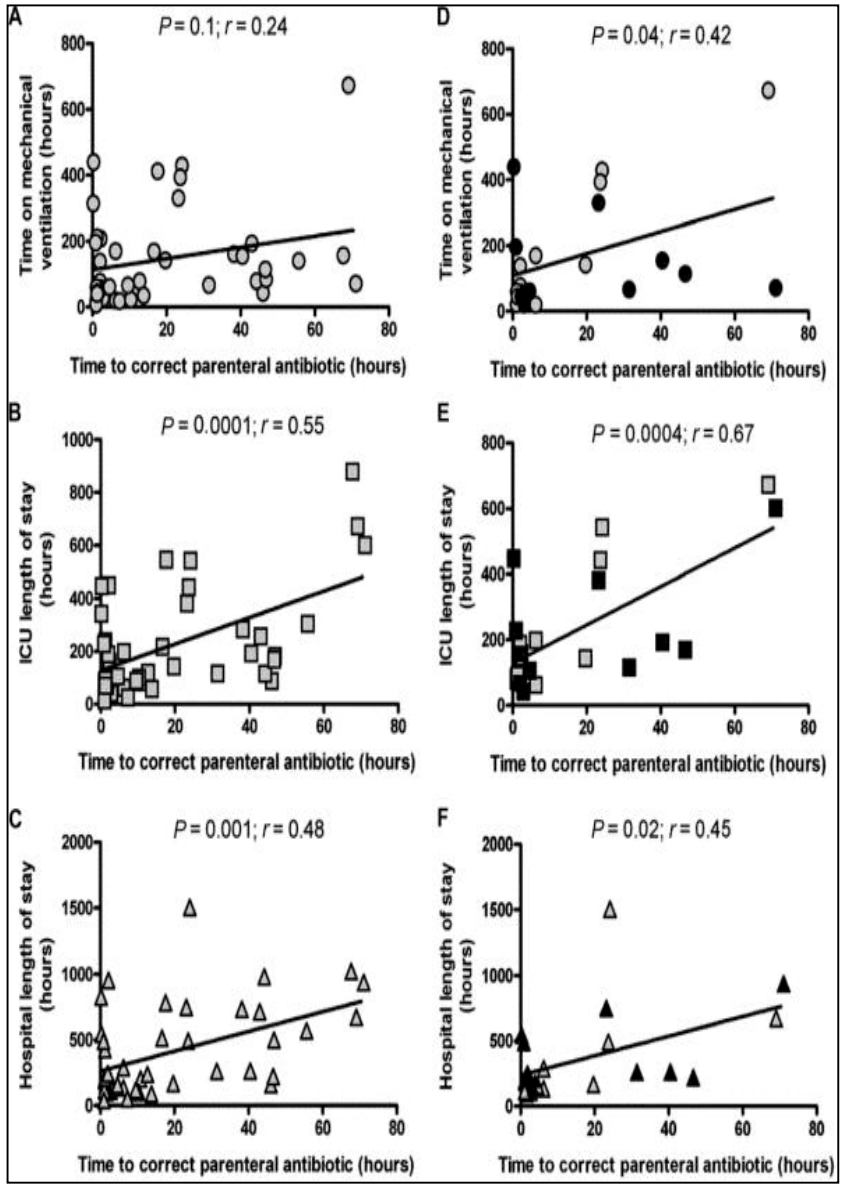
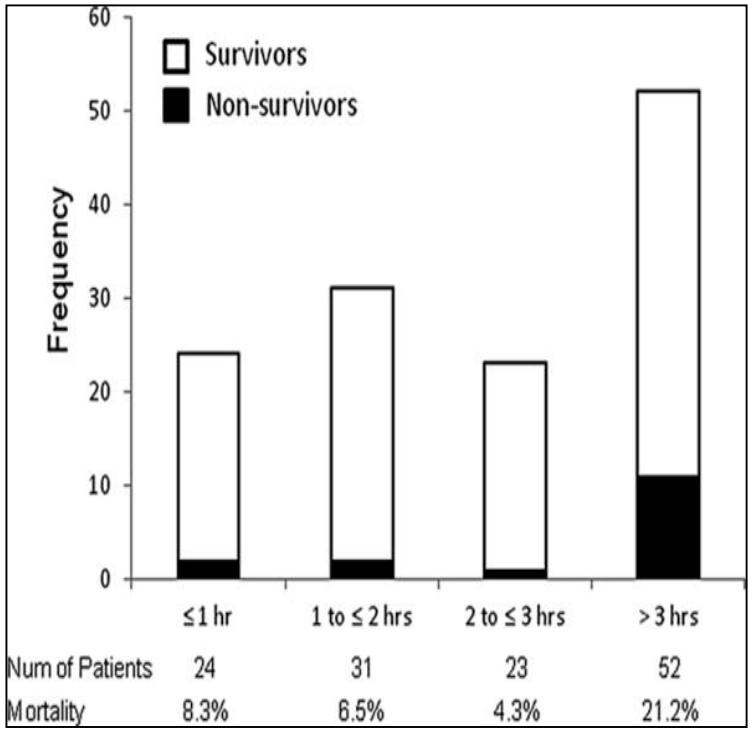


FIGURE 1. Time to correct parenteral antibiotic initiation and clinical outcomes for all study subjects (n = 45) and those without acute comorbidities (n = 23). For the cohort as a whole, longer time to correct parenteral antibiotic initiation was not significantly associated with duration of mechanical 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

Pediatric Infectious Disease Journal. 30(4):295-301, April 2011.
DOI: 10.1097/INF.0b013e3181ff64ec



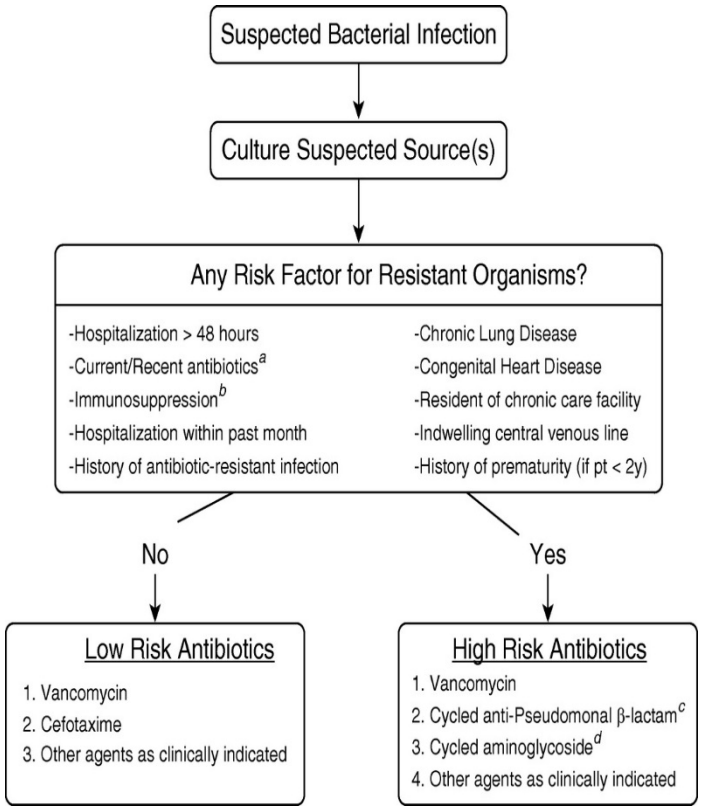
Weiss, Scott; Fitzgerald, Julie; MD, PhD; Balamuth, Fran; MD, PhD; Alpern, Elizabeth; MD, MSCE; Lavelle, Jane; Chilutti, Marianne; Grundmeier, Robert; Nadkarni, Vinay; MD, MS; Thomas, Neal; MD, MSc

Critical Care Medicine. 42(11):2409-2417, November 2014.
DOI: 10.1097/CCM.0000000000000509

Delayed Antimicrobial Therapy Increases Mortality and Organ Dysfunction Duration in Pediatric Sepsis

Outcome	Time to Initial Antimicrobial Administration		Unadjusted *p*	Adjusted *p*[a]
	≤ 3 Hr	> 3 Hr		
Vasoactive-free days	26 (24–28)	26 (23–28)	0.28	0.054
Ventilator-free days	21 (7–28)	18 (2–25)	0.08	0.11
Organ failure-free days	20 (6–26)	16 (1–23)	0.03	0.04
PICU length of stay, days	8 (3–19)	10 (5–17)	0.42	0.58

[a]Adjusted for Pediatric Index of Mortality-2 score.



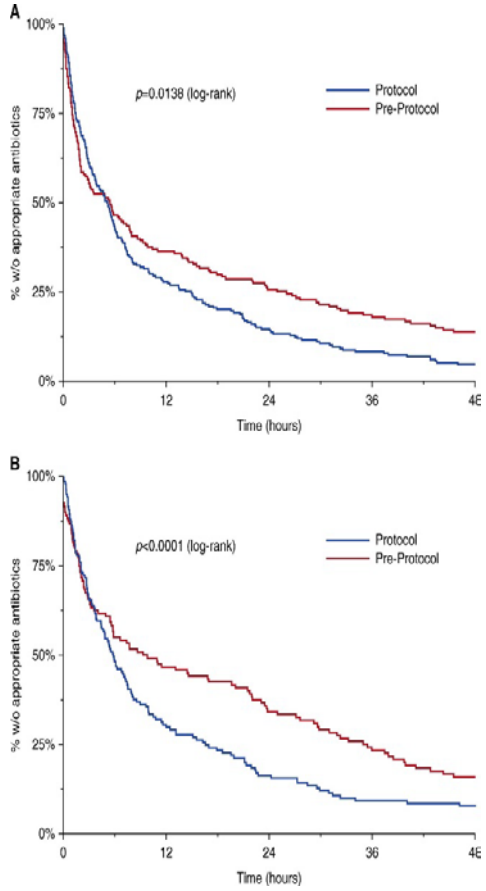


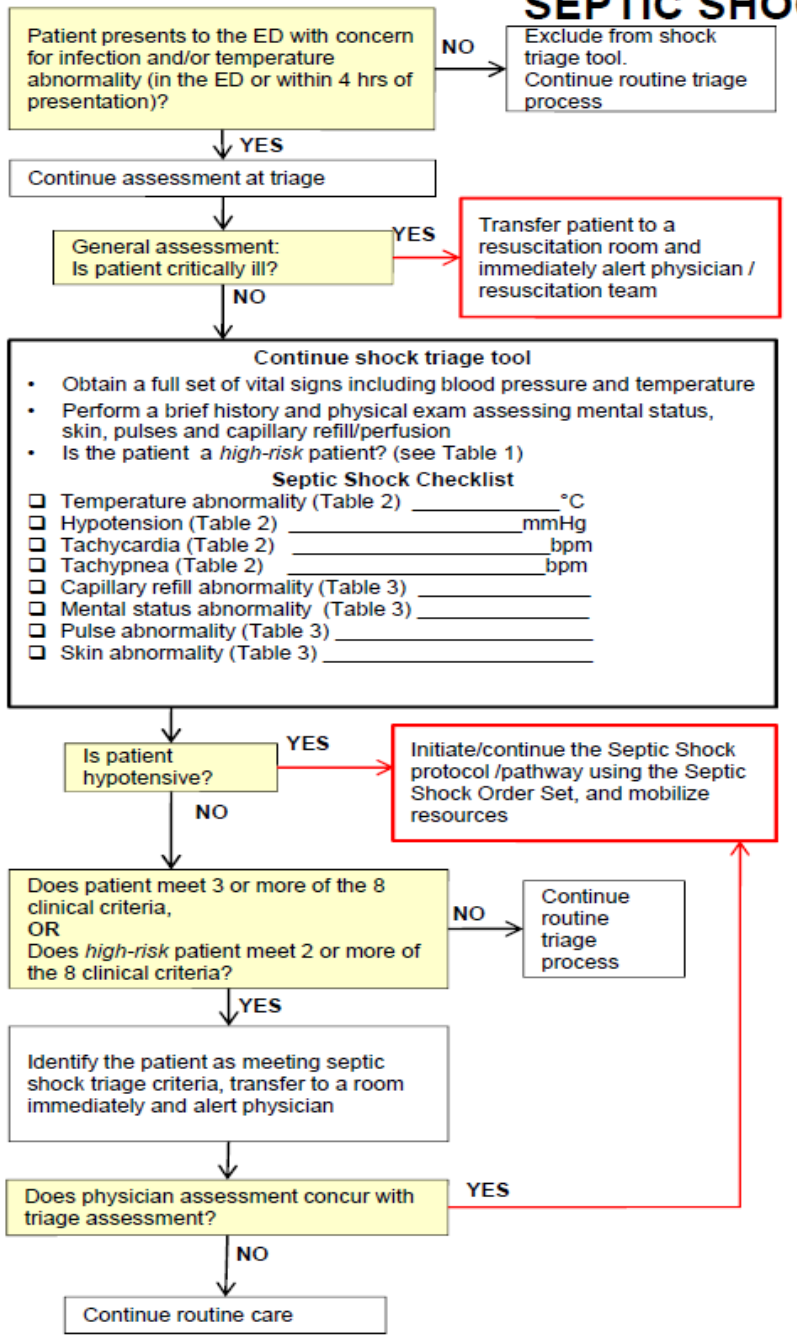
Figure 1. Pediatric intensive care unit empiric antibiotic pathway including risk factors for infection due to healthcare-associated bacteria. *a*Minimum 7 days in previous 6 weeks. *b*Malignancy, chemotherapy, chronic steroid/immunosuppressants, organ transplant, immunodeficiency, or acute steroids >5 days in the past month. *c*Piperacillin-tazobactam, cefepime, and meropenem. *d*Gentamicin, tobramycin, and amikacin.

Annals ATS, 2014
http://www.atsjournals.org/doi/abs/10.1513/AnnalsATS.201408-389OC

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

Recognition Trigger Tools and Emergency Department Sepsis Initiatives

PEDIATRIC SEPTIC SHOCK COLLABORATIVE
SEPTIC SHOCK IDENTIFICATION TOOL



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- Bone marrow transplant
- Central or indwelling line/catheter
- Solid organ transplant
- Severe MR/CP
- Immunodeficiency, immunocompromise or immunosuppression

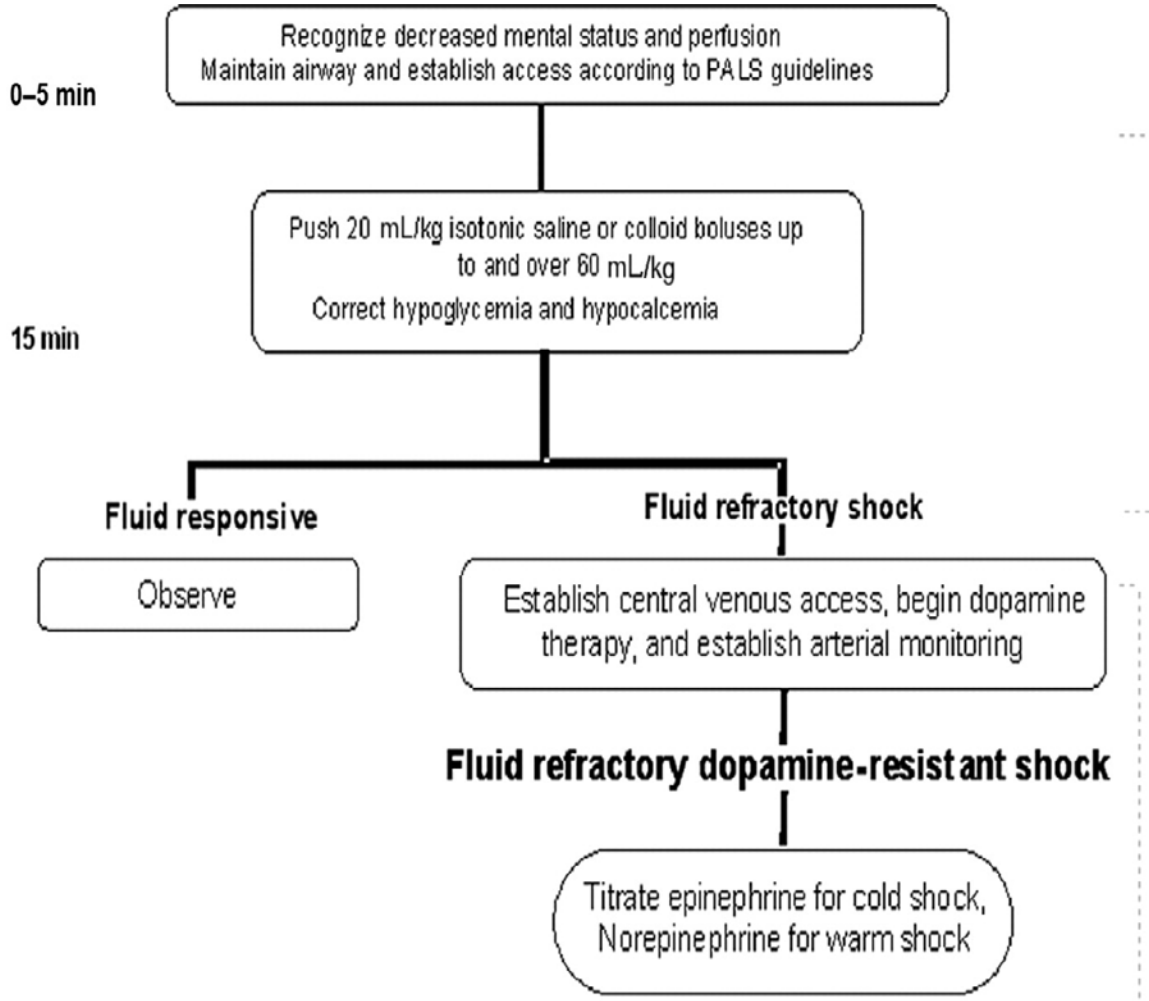
Table 2. Vital Signs (PALS)

Age	Heart Rate	Resp Rate	Systolic BP	Temp (°C)
0 d – 1 m	> 205	> 60	< 60	<36 or >38
≥ 1 m - 3 m	> 205	> 60	< 70	<36 or >38
≥ 3 m - 1 r	> 190	> 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 - 6 y	> 140	> 34	< 70 + (age in yr × 2)	<36 or >38.5
≥6 y- 10 y	> 140	> 30	< 70 + (age in yr × 2)	<36 or >38.5
≥ 10 y - 13 y	> 100	> 30	< 90	<36 or >38.5
> 13 y	> 100	>16	< 90	<36 or >38.5

Table 3. Exam Abnormalities

	Cold Shock	Warm Shock	Non-specific
Pulses (central vs. peripheral)	Decreased or weak	Bounding	
Capillary refill (central vs. peripheral)	≥ 3 sec	Flash (< 1 sec)	
Skin	Mottled, cool	Flushed, ruddy, erythroderma (other than face)	Petechiae below the nipple, any purpura
Mental status			Decreased, irritability, confusion, inappropriate crying or drowsiness, poor interaction with parents, lethargy, diminished arousability, obtunded

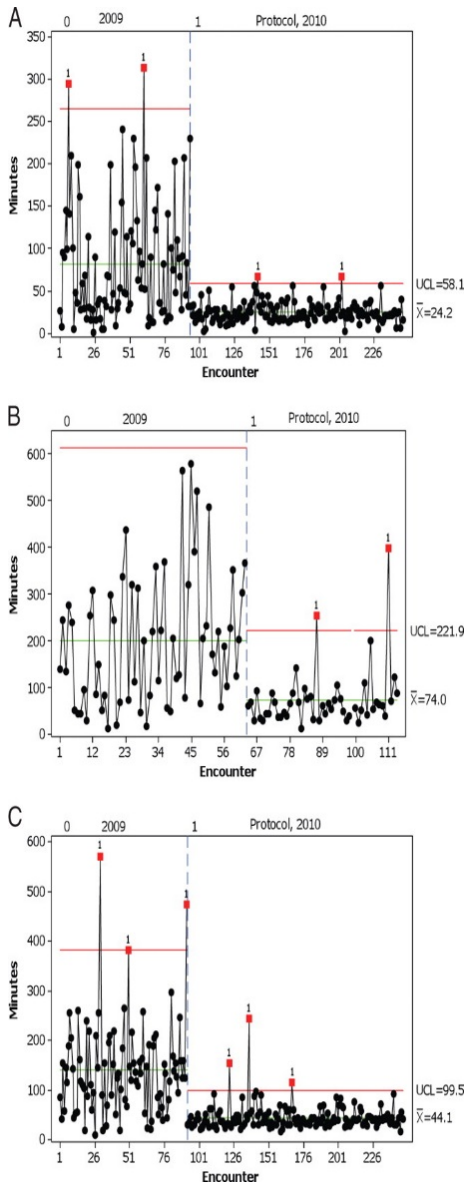
Early care of a child presenting in septic shock.



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

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

PEDIATRICS®

Resuscitation Bundle in Pediatric Shock Decreases Acute Kidney Injury and Improves Outcomes

Portions of this study were presented orally at the meeting of the European Society of Intensive Care Medicine, Paris, France, October 5-9, 2013.

Ayse Akcan Arikan, MD[1, 2], Eric A. Williams, MD, MS[1], Jeanine M. Graf, MD[1], Curtis E. Kennedy, MD, PhD[1], Binita Patel, MD[3], Andrea T. Cruz, MD, MPH[3, 4]

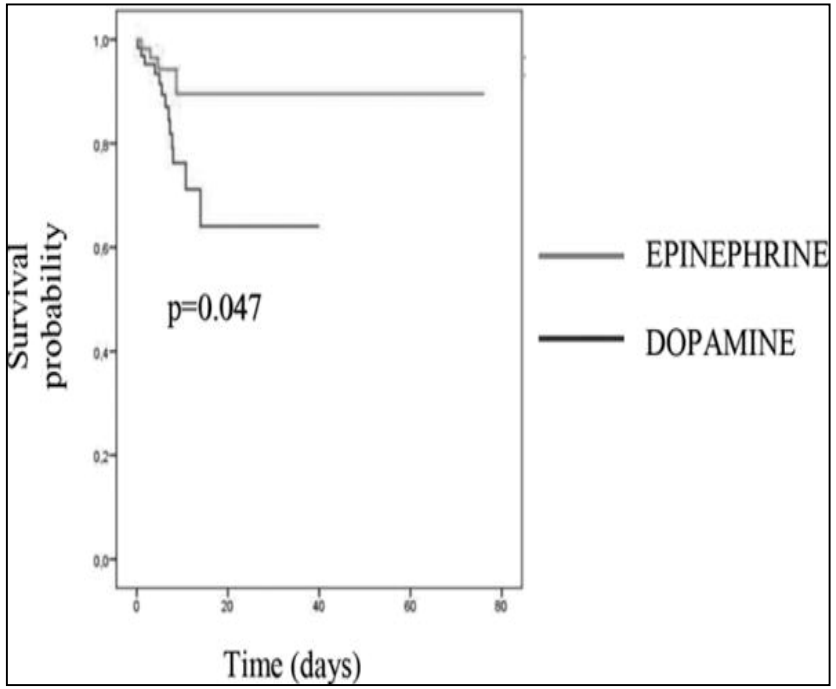
Multivariate analyses of risk factors for the development of AKI

Variables	aOR (95% CI)	*P* value
Shock protocol	0.27 (0.13-0.56)	<.001
PELOD	1.08 (1.03-1.12)	.002
Age	1.01 (0.96-1.07)	.47
Sex	0.99 (0.54-1.84)	.99

The Journal of Pediatrics
Volume 167, Issue 6, December 2015, Pages 1301–1305.e1

Variable	Baseline	Before Randomization	6 Hr After Randomization	At the End of Resuscitation
Heart rate (beats/min)				
Dopamine	159±25 (108–204)	154±23 (96–206)	145±27 (98–207)	142±26 (81–201)
Epinephrine	149±31 (76–205)	143±28 (74–190)	142±25 (81–188)	140±23 (86–185)
p	0.047[a]	0.02[a]	0.50[a]	0.67[a]
Systolic blood pressure (mmHg)				
Dopamine	85±22 (40–135)	85±18 (43–144)	92±19 (55–161)	96±18 (53–143)
Epinephrine	87±19 (56–143)	80±15 (52–120)	99±17 (52–150)	104±19 (53–169)
p	0.59[a]	0.13[a]	0.03b	0.01[b]
Shock index				
Dopamine	1.9±0.6 (1–4.3)	1.9±0.6 (0.9–3.6)	1.7±0.6 (0.9–3.4)	1.5±0.4 (0.7–2.6)
Epinephrine	1.7±0.5 (0.7–3)	1.8±0.6 (0.7–4.t5)	1.5±0.4 (0.6–2.4)	1.3±0.4 (0.6–2.9)
p	0.12[b]	0.87[b]	0.02[a]	0.07[a]
Mean arterial pressure and central venous pressure (cm H_2O)				
Dopamine	47±10 (33–56)	54±13 (35–75)	55±14 (25–87)	57±11 (26–76)
Epinephrine	49±19 (35–77)	53±10 (35–77)	66±10 (46–88)	68±13 (41–93)
p	0.99[b]	0.86[a]	0.003[a]	0.007[a]
$Svco_2$ (%)				
Dopamine	72±8 (59–81)	67±8 (54–80)	74±10 (38–91)	76±8 (42–89)
Epinephrine	67±3 (64–74)	66±8 (50–80)	77±5 (64–89)	79±5 (69–89)
p	0.24[a]	0.70[a]	0.31[b]	0.18[b]

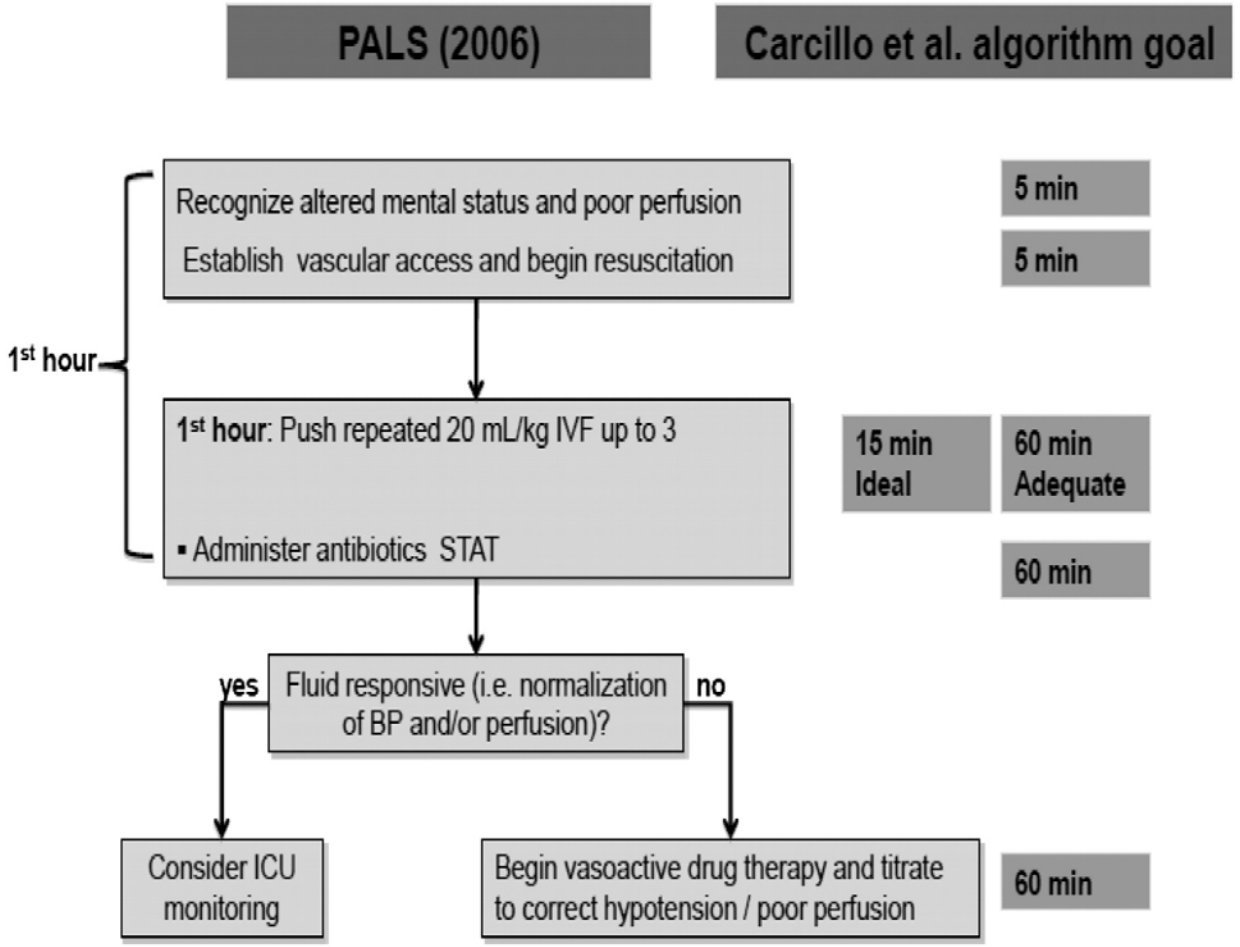
$ScvO_2$ = central venous oxygen saturation.
[a]Student *t* test.
[b]Mann-Whitney test.
Values are expressed as mean ± SD (limits).



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.

THE TEAM APPROACH

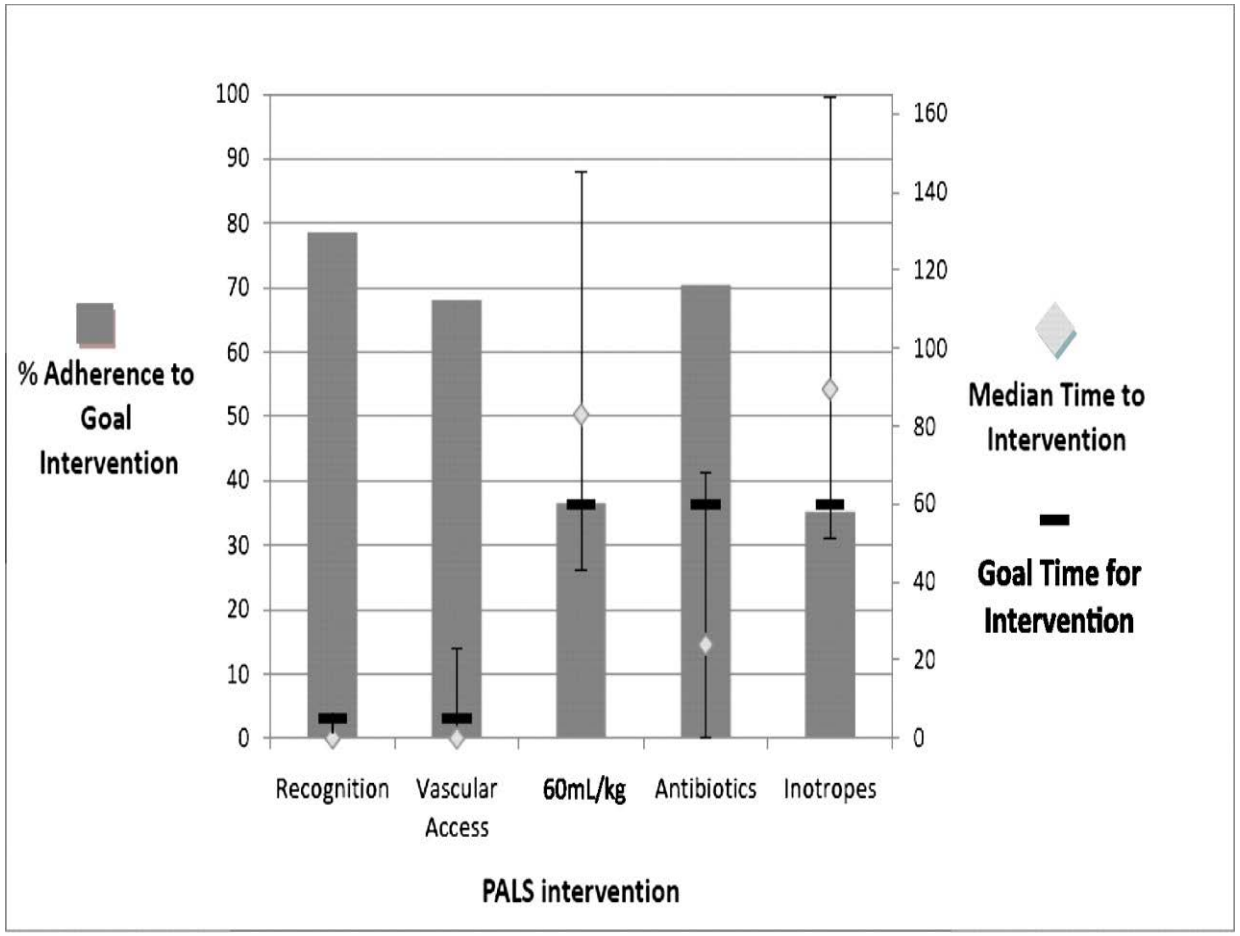
Five time points evaluated for adherence from 2006 PALS algorithm.



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

PEDIATRICS®

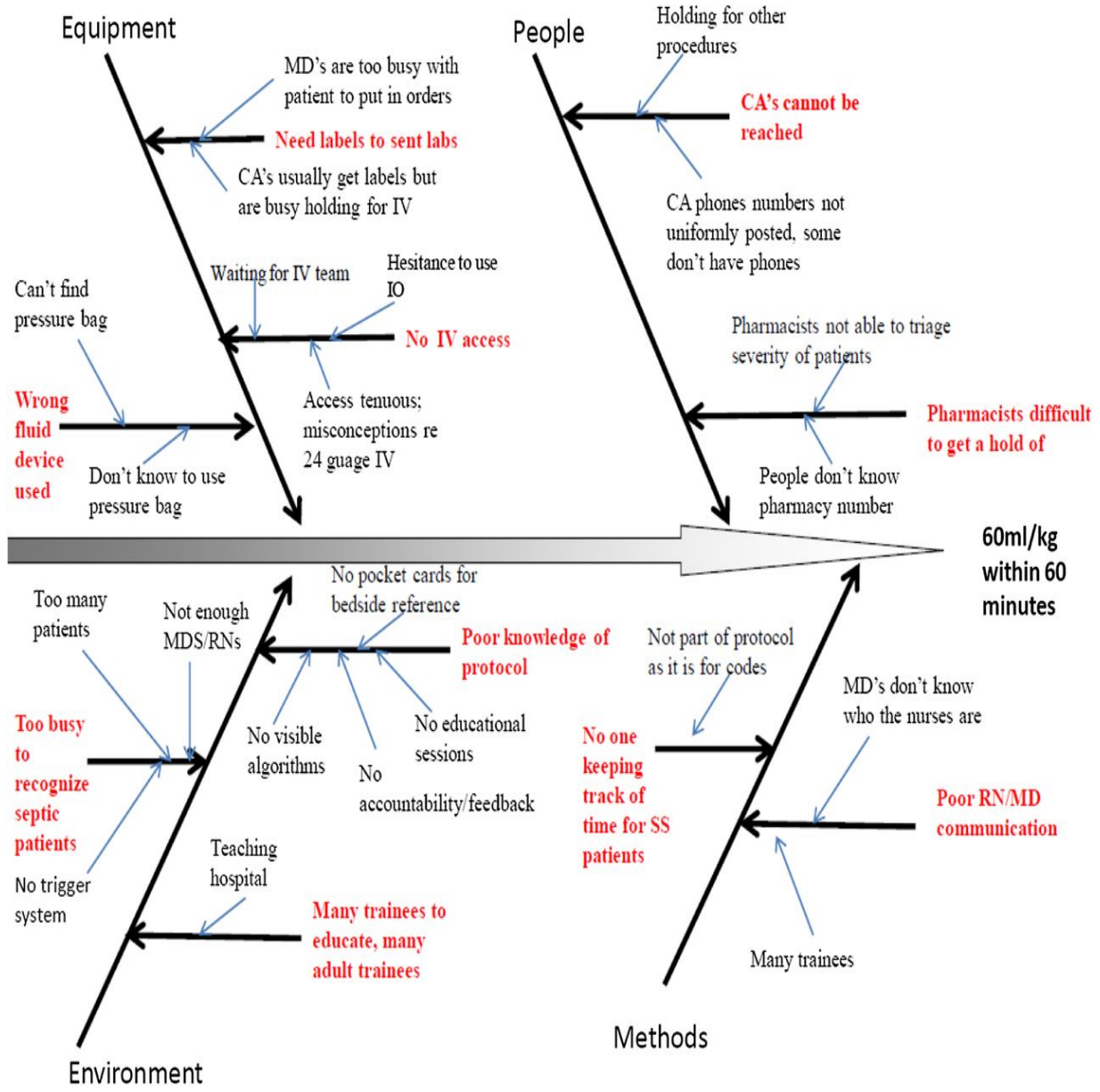
Percent adherence to 5 algorithm time points and median time to intervention (with goal time displayed). *Error bars represent IQRs for median times.



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

PEDIATRICS®

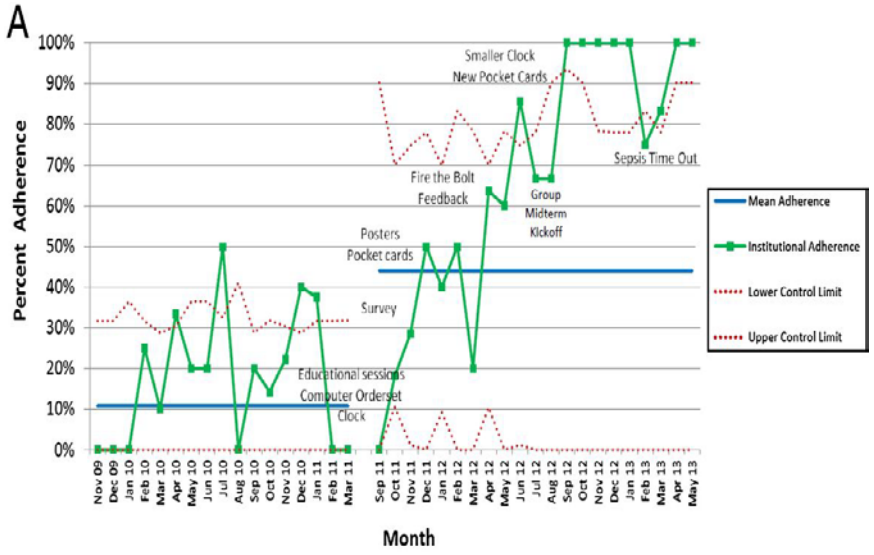
Ishikawa fishbone diagram for fluid delivery.

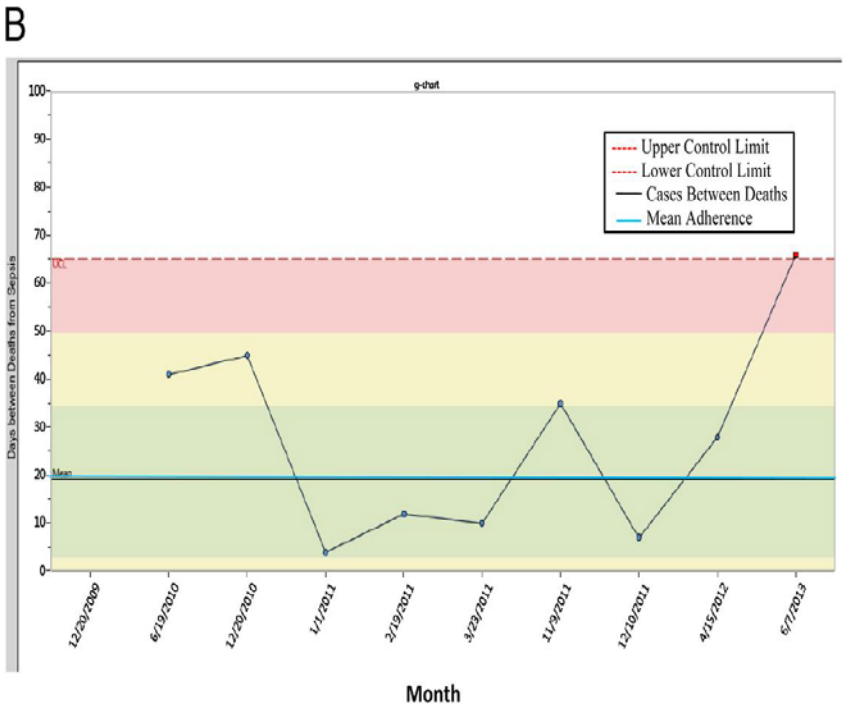


PEDIATRICS®

Raina Paul et al. Pediatrics 2014;133:e1358-e1366

Statistical process control charts for outcome measures.





Mortality 4% to 1.7%

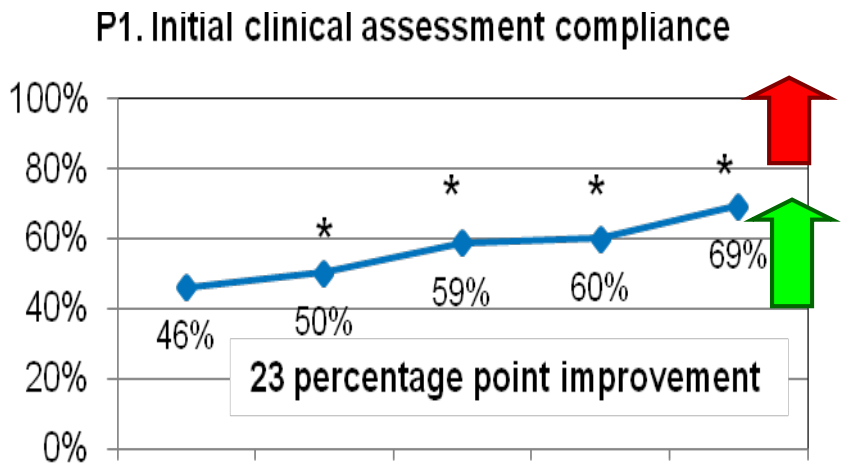
PEDIATRICS®

Raina Paul et al. Pediatrics 2014;133:e1358-e1366

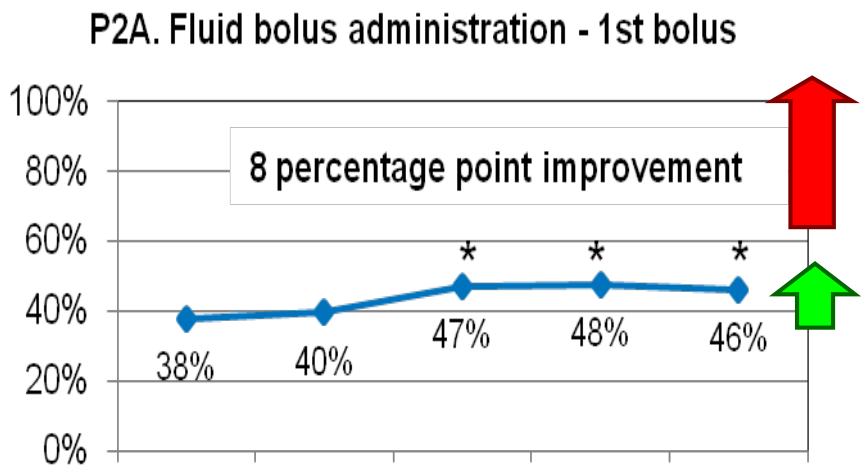
THE INSTITUTIONAL APPROACH

Pediatric Septic Shock Collaborative

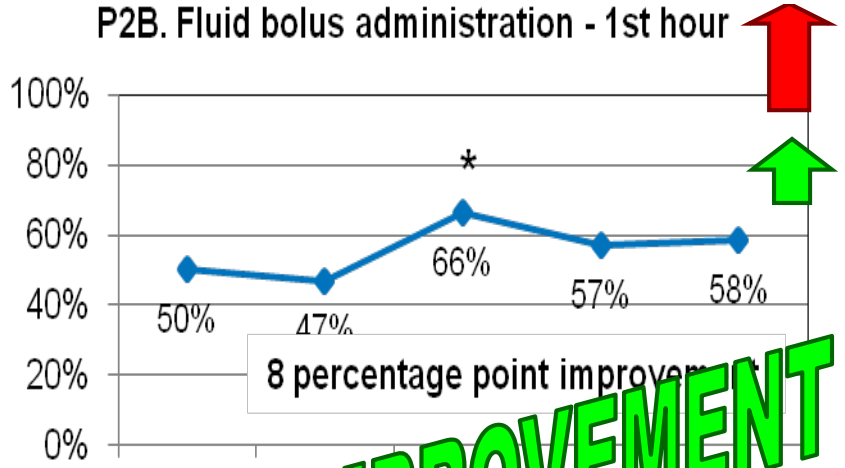
Initial Clinical Assessment Compliance



Time to First Fluid Bolus (wi 20 min)

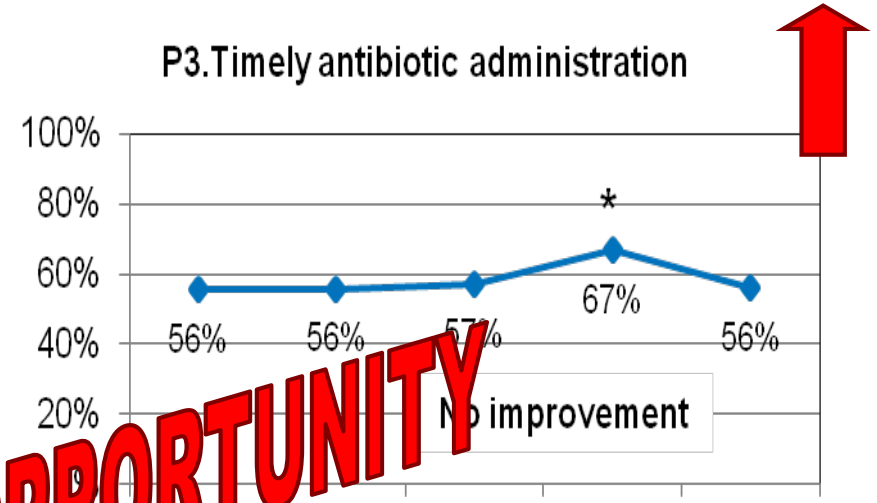


Fluid within First Hour (2 or 3 boluses)



IMPROVEMENT

Timely Antibiotic Administration (1 hr)



OPPORTUNITY

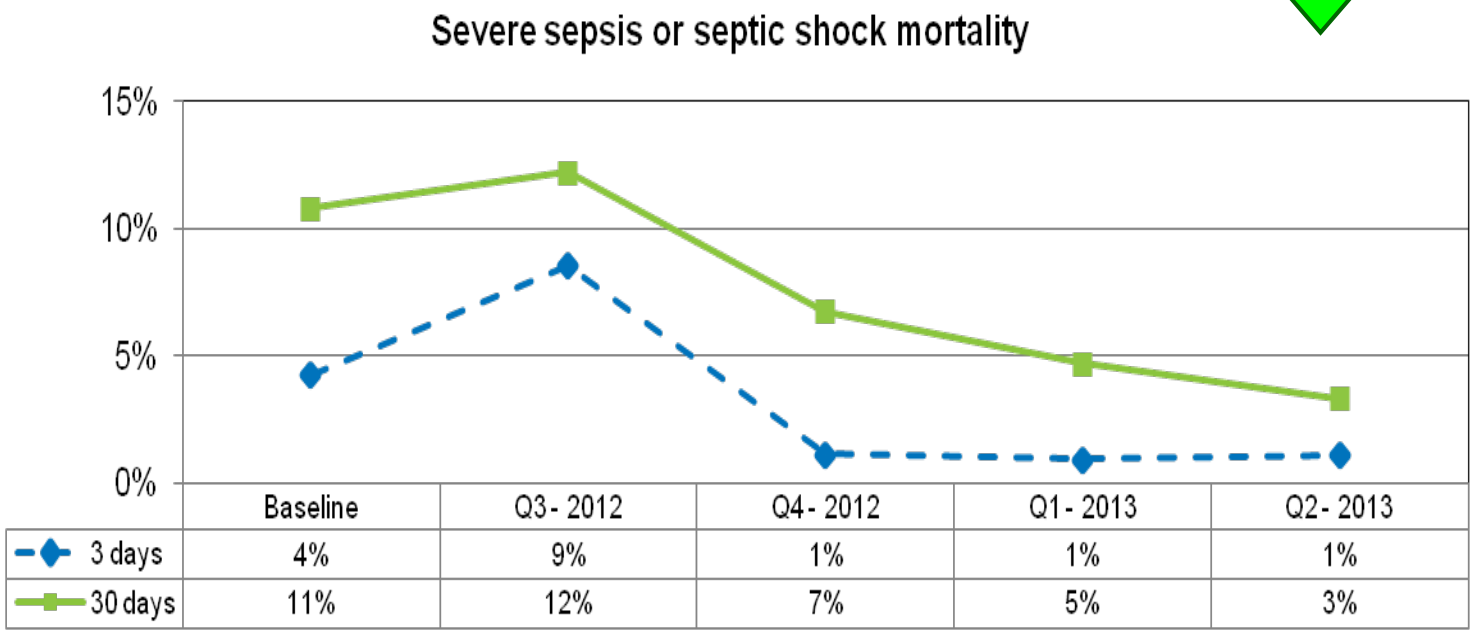
CHA Rapid Cycle Collaborative

Phase II:
Mortality Outcomes

Severe Sepsis / Septic Shock

IMPROVEMENT *

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

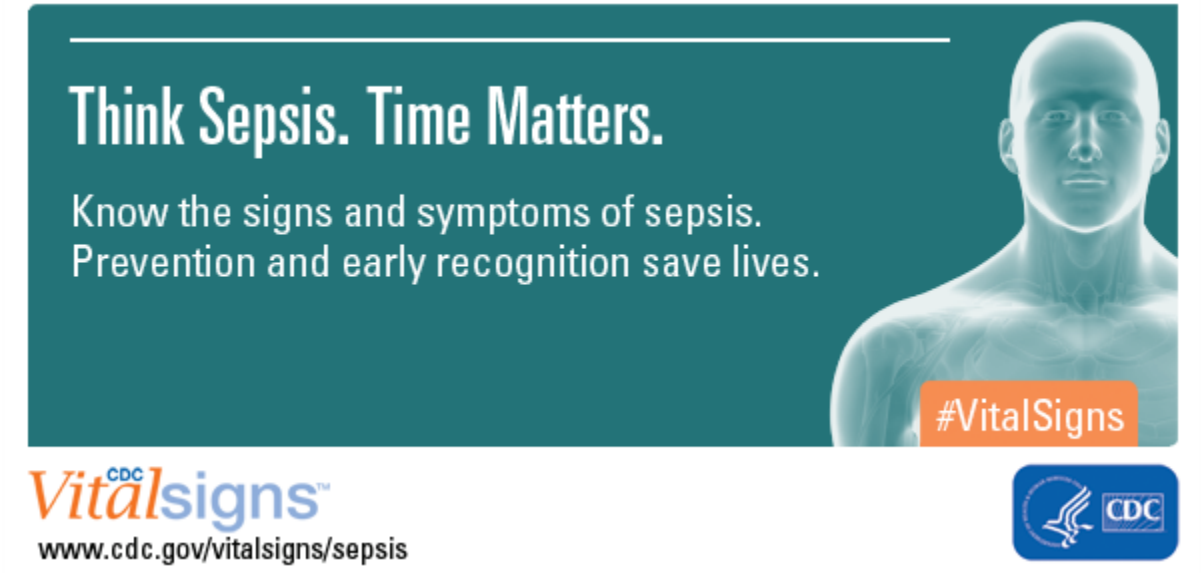


ON ADVOCACY, GOVERNOR CUOMO, AND THE CENTERS FOR DISEASE CONTROL AND PREVENTION

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

SEPSIS IS A MEDICAL EMERGENCY!

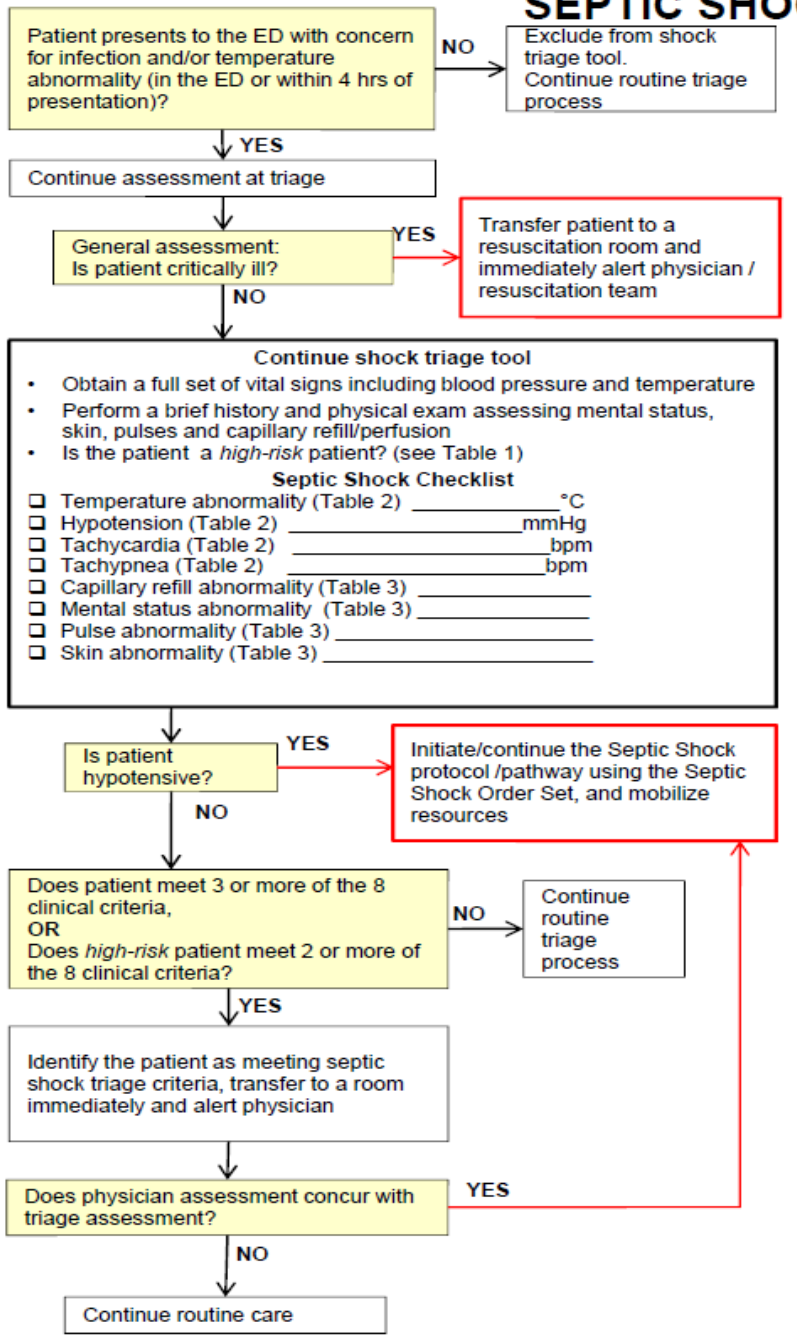


HOSPITAL STANDARDS FOR SEPSIS SHOULD BE AS STRINGENT AS FOR STROKE, ACUTE MYOCARDIAL INFARCTION, STATUS EPILEPTICUS, TRAUMA, STATUS ASTHMATICUS, AND DIABETIC KETOACIDOSIS

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



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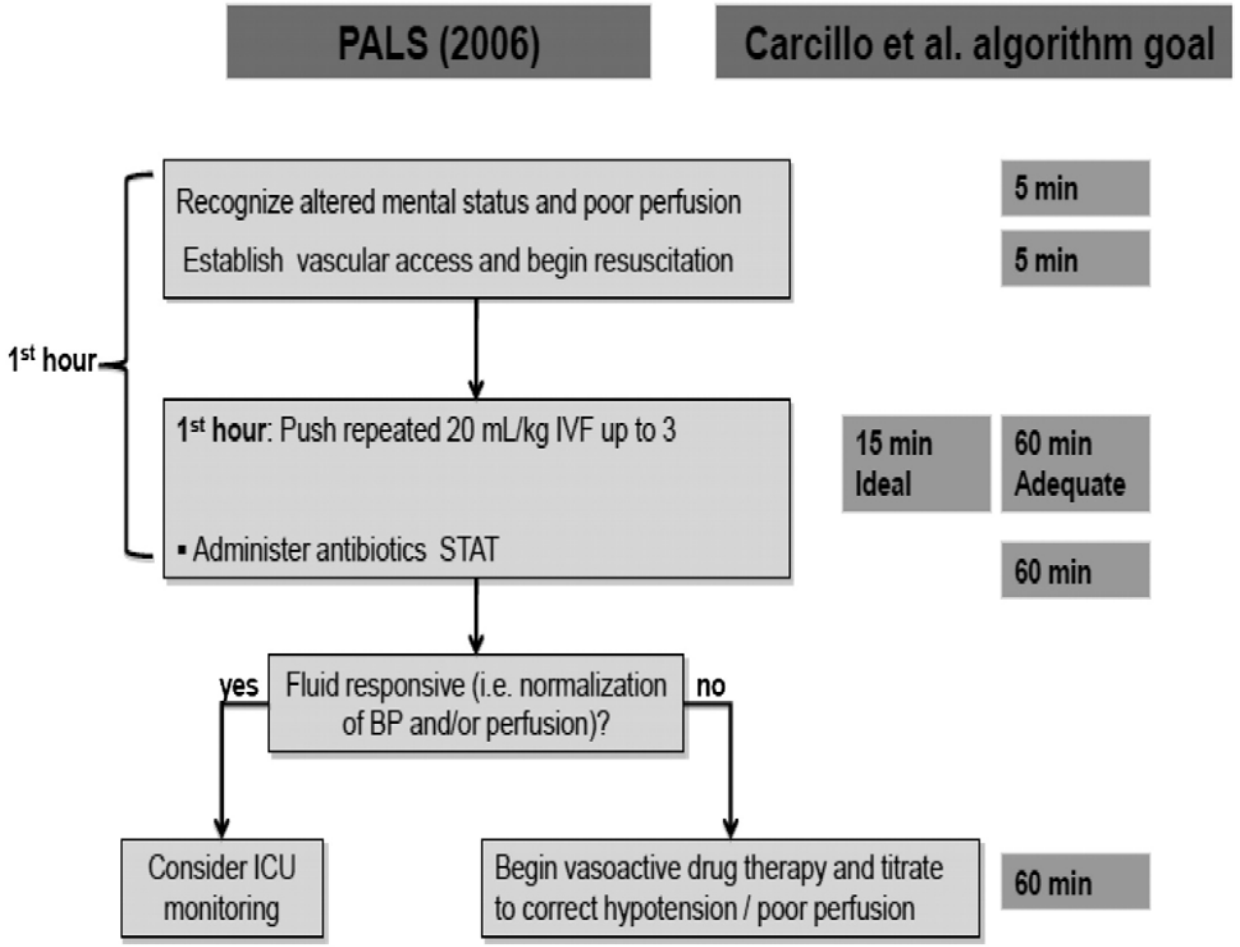
Mental status			Decreased, irritability, confusion, inappropriate crying or drowsiness, poor interaction with parents, lethargy, diminished arousability, obtunded

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

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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

CHILDREN'S HOSPITAL ASSOCIATION

Improving Pediatric Sepsis Outcomes

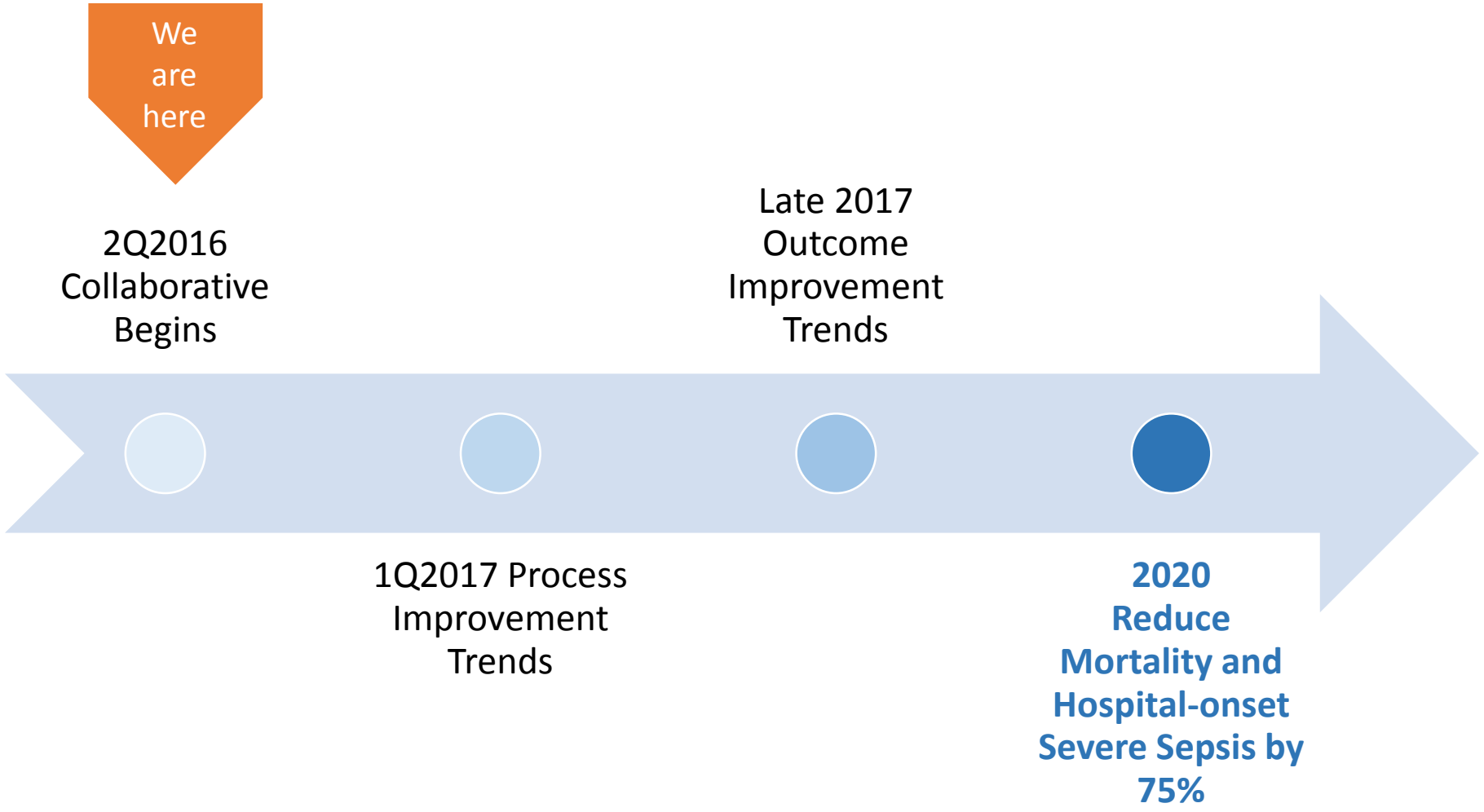
A collaboration of children's hospitals to prevent severe sepsis and sepsis deaths

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



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

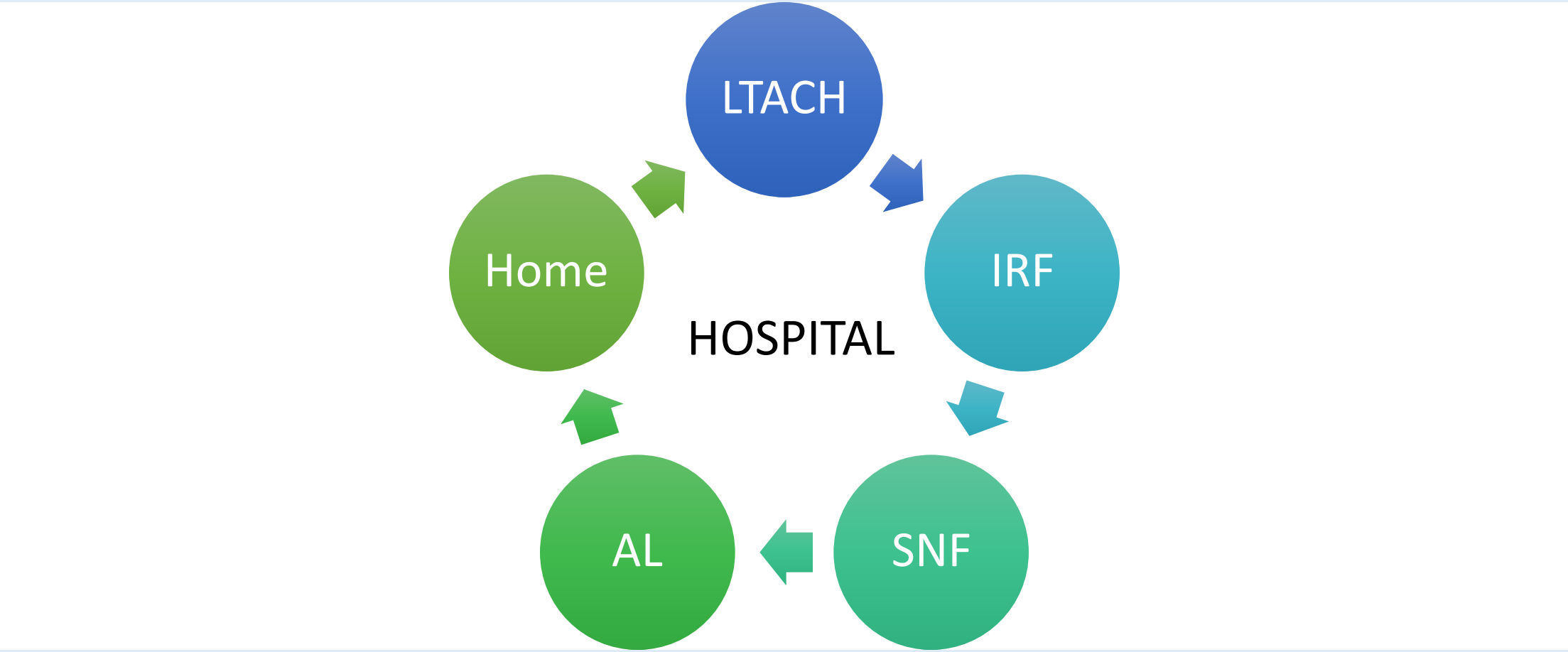
Sepsis and Aging

- 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



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

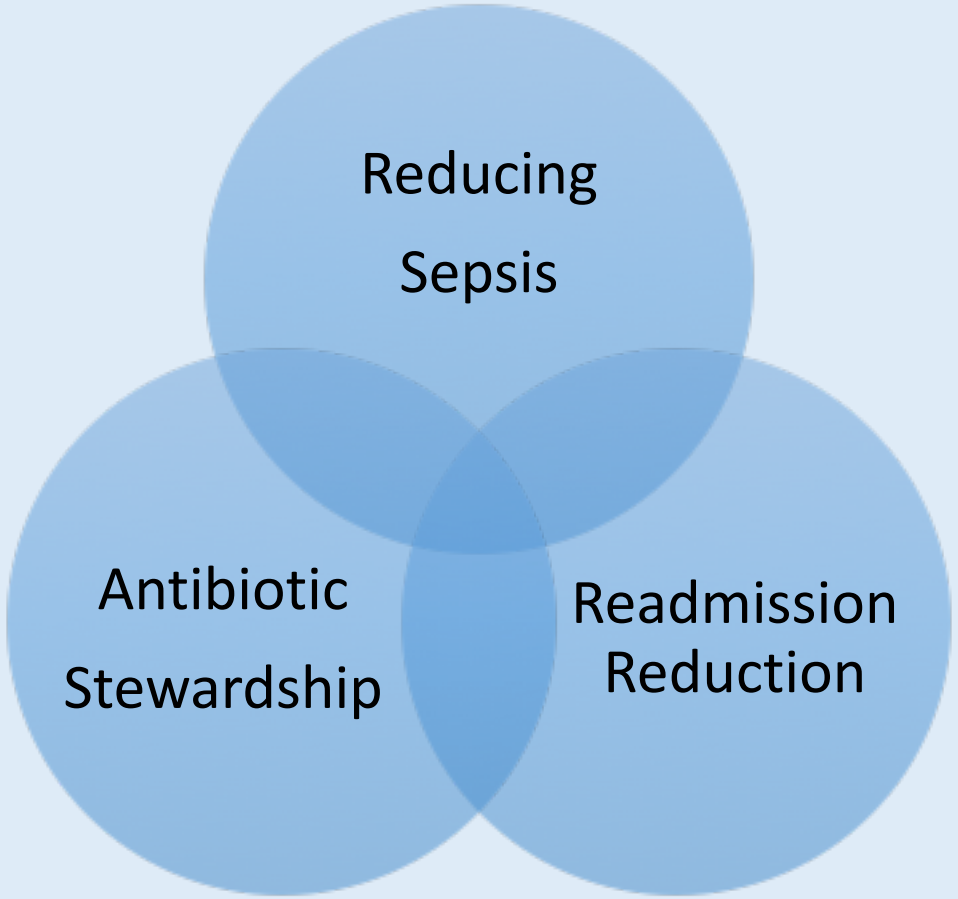
- Infection prevention
  - Immunizations (resident, visitors, staff)
  - Handwashing and other appropriate precautions
  - Environmental cleaning
- Early recognition tools/triggers
  - qSOFA as a trigger
  - Need to Know
  - INTERACT
- Early empiric treatment when the risk is high
- Access to oral and 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 ≥2 Criteria Suggests a Greater Risk of a Poor Outcome

Multiple Initiatives in Nursing Homes



Department of Health and Human Services

OFFICE OF
INSPECTOR GENERAL

MEDICARE NURSING HOME RESIDENT HOSPITALIZATION RATES MERIT ADDITIONAL MONITORING

Daniel R. Levinson
Inspector General

November 2013
OEI-06-11-00040

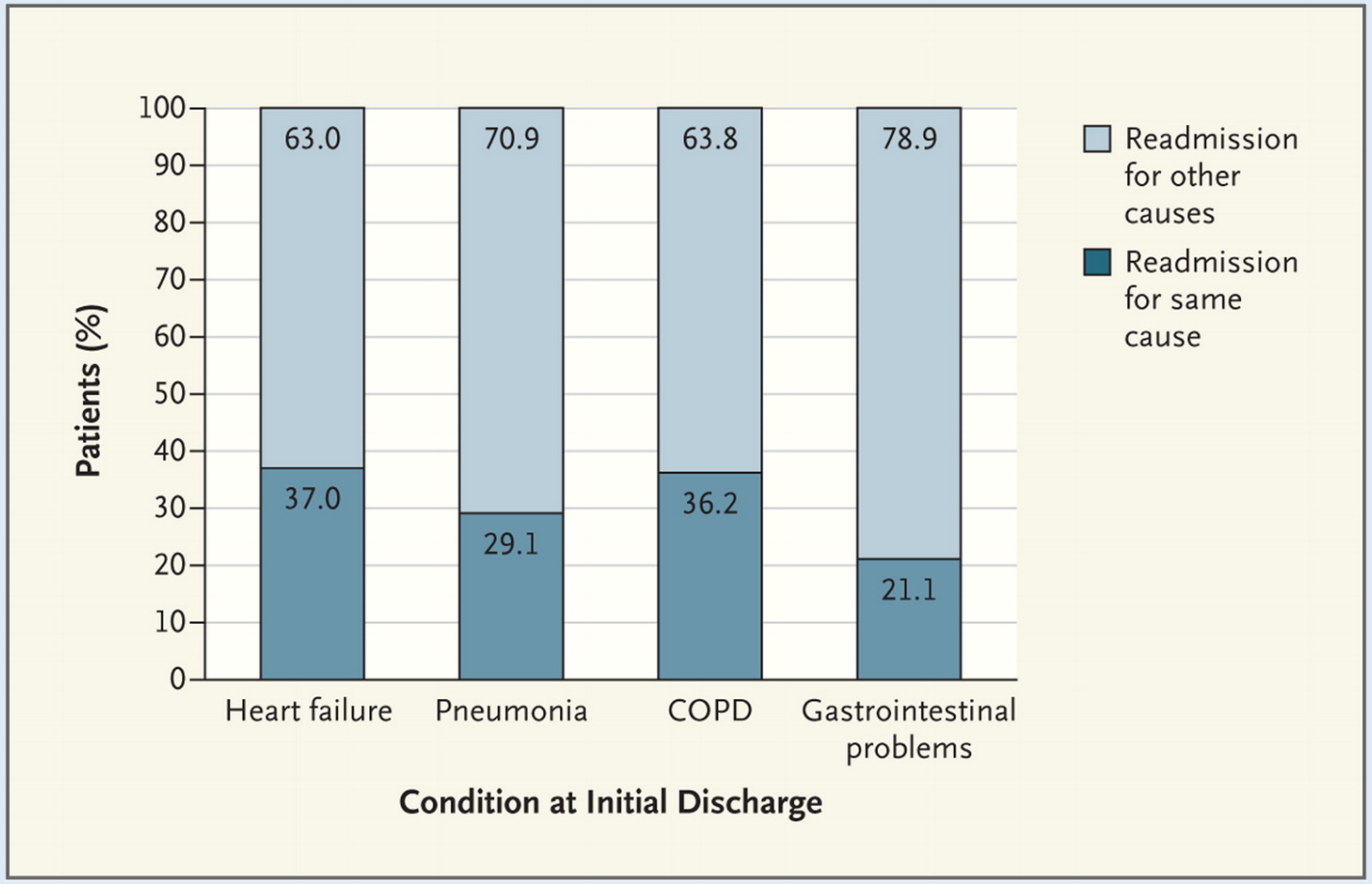
all resident hospitalizations (see Table 1).

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

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

Source: OIG analysis of data on FY 2011 hospitalizations of nursing home residents.

Sepsis: Causes of Re-admissions

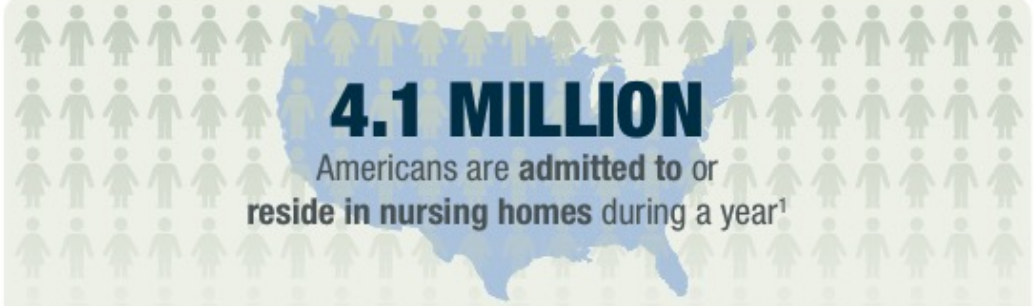


Jencks SF, et al, N Engl J Med 2009;360:1418-1428

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

- Post-Hospital Syndrome — An Acquired, Transient Condition of Generalized Risk: *Harlan M. Krumholz, M.D.N Engl J Med 2013; 368:100-102* *January 10, 2013*
- 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[1]

UP TO **70%**

of nursing home residents **received antibiotics** during a year[2,3]

UP TO **75%**

of antibiotics are **prescribed incorrectly***[2,3]

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] AHCA Quality Report 2013.
[2] Lim CJ, Kong DCM, Stuart RL. Reducing inappropriate antibiotic prescribing in the residential care setting: current perspectives. Clin Interven Aging. 2014; 9: 165-177.
[3] Nicolle LE, Bentley D, Garibaldi R, et al. Antimicrobial use in long-term care facilities. Infect Control Hosp Epidemiol 2000; 21:537–45.

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

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

ABPLM
American Board of Post-Acute and Long-Term Care Medicine, Inc.

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

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amda THE SOCIETY FOR POST-ACUTE AND LONG-TERM CARE MEDICINE™