

# IMPLEMENTING A PEDIATRIC SEPSIS PROGRAM

Fran Balamuth, MD, PhD, MSCE

Mary Kate Abbadessa, MSN, RN, RN-BC, CPEN

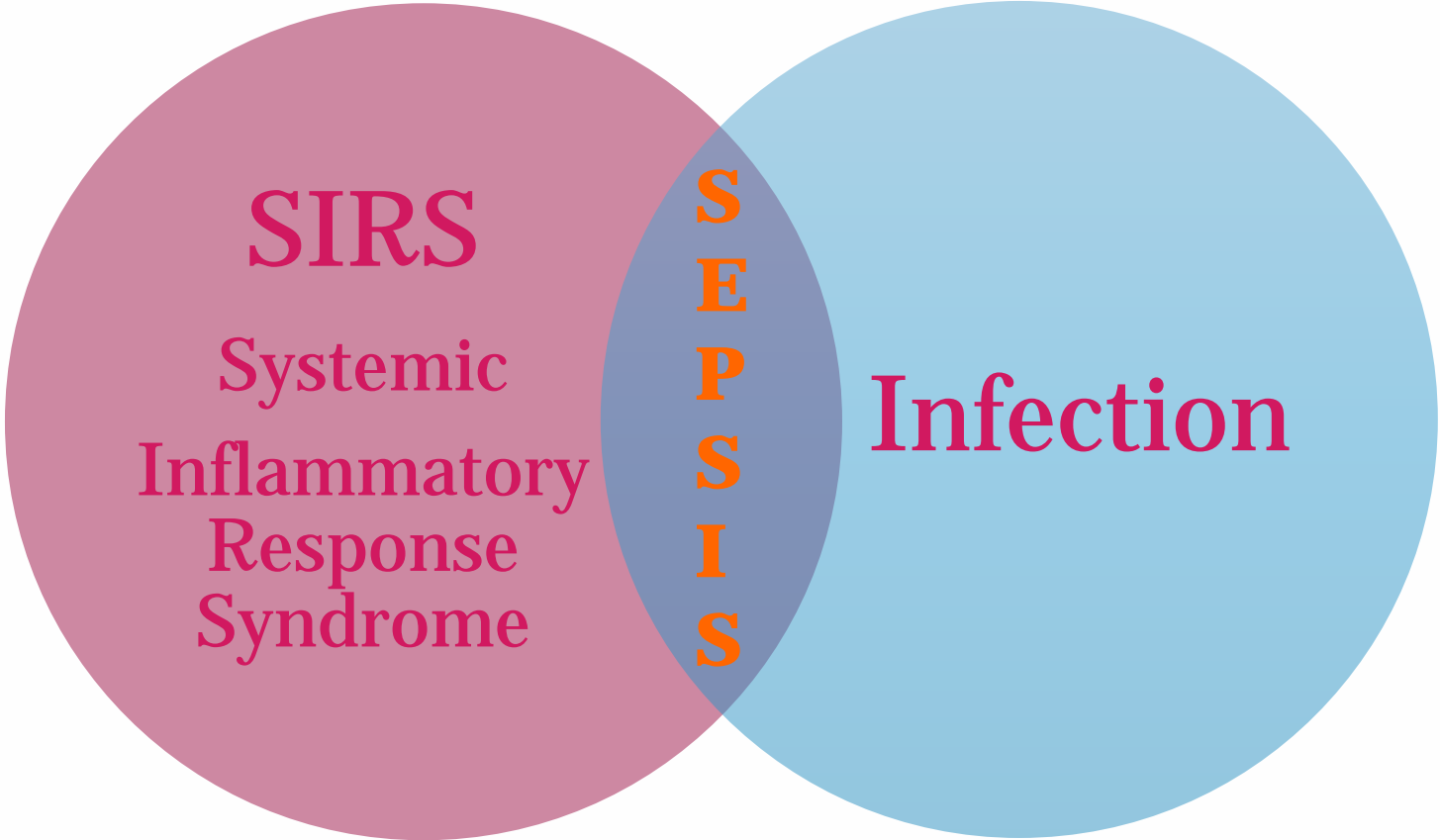
September 20, 2017



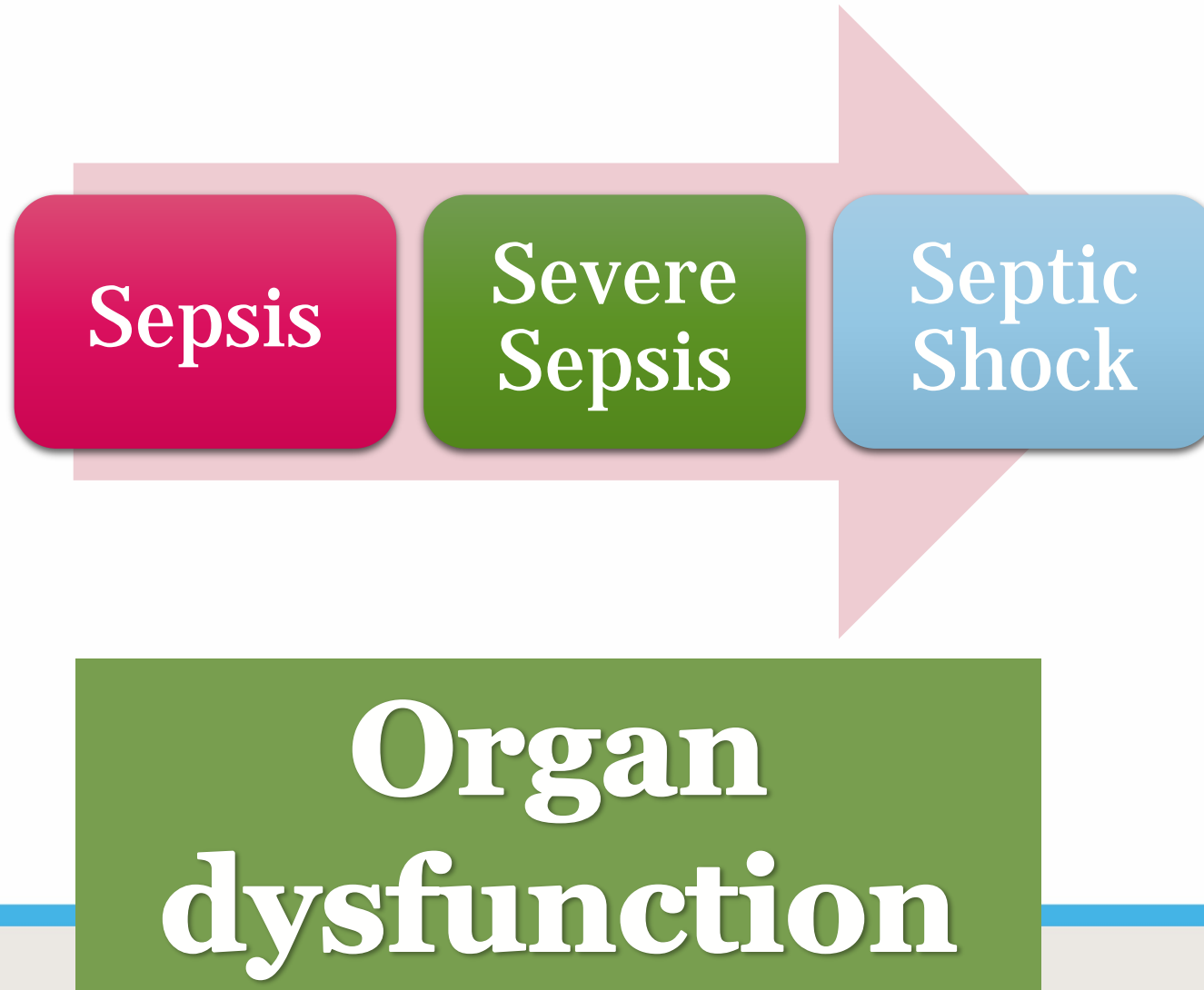
# DISCLOSURES

- None!

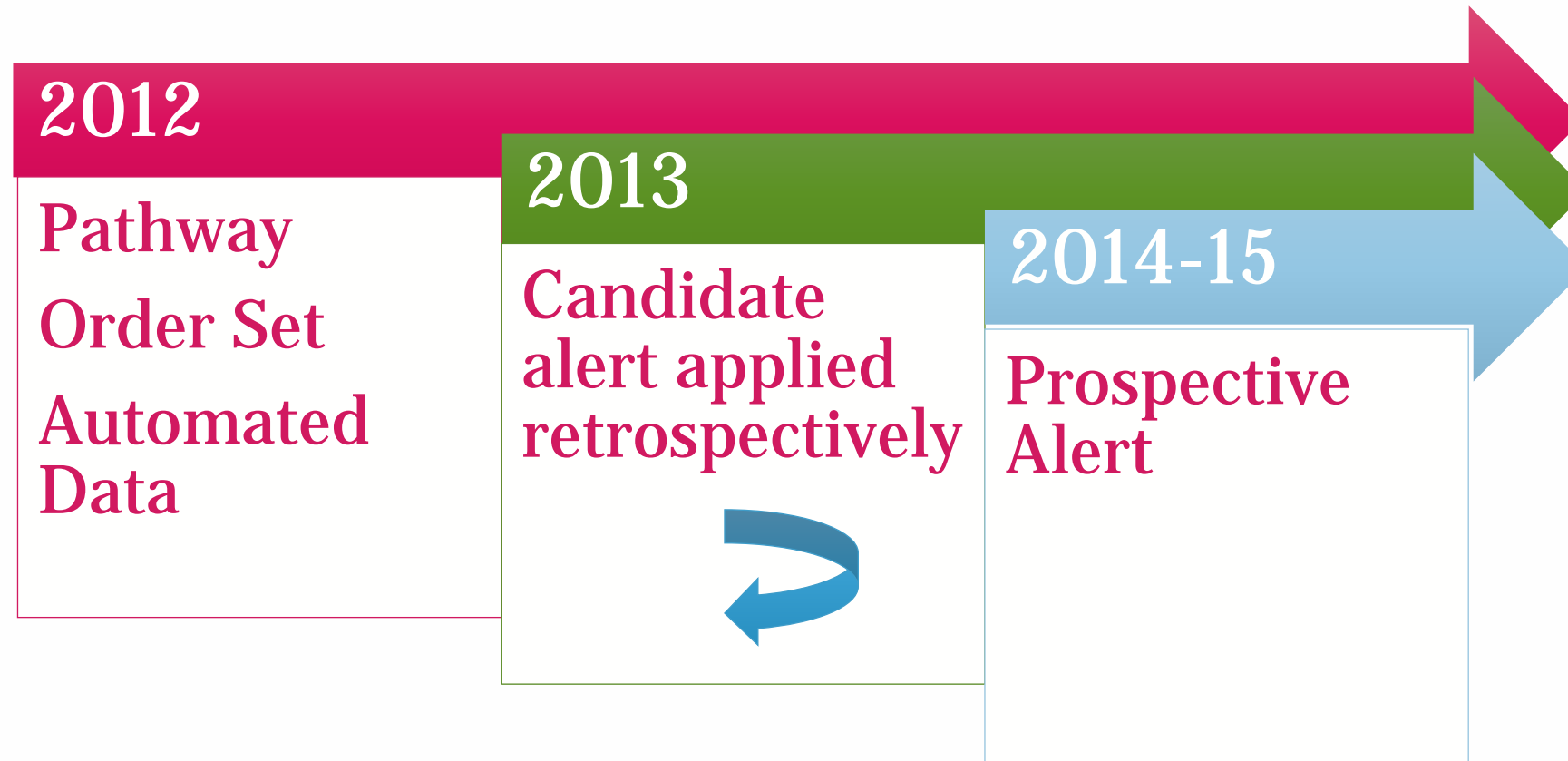
# WHAT IS SEPSIS?



# SEPSIS: A CONTINUUM OF ILLNESS



# SEPSIS QUALITY INTERVENTIONS IN THE CHOP ED

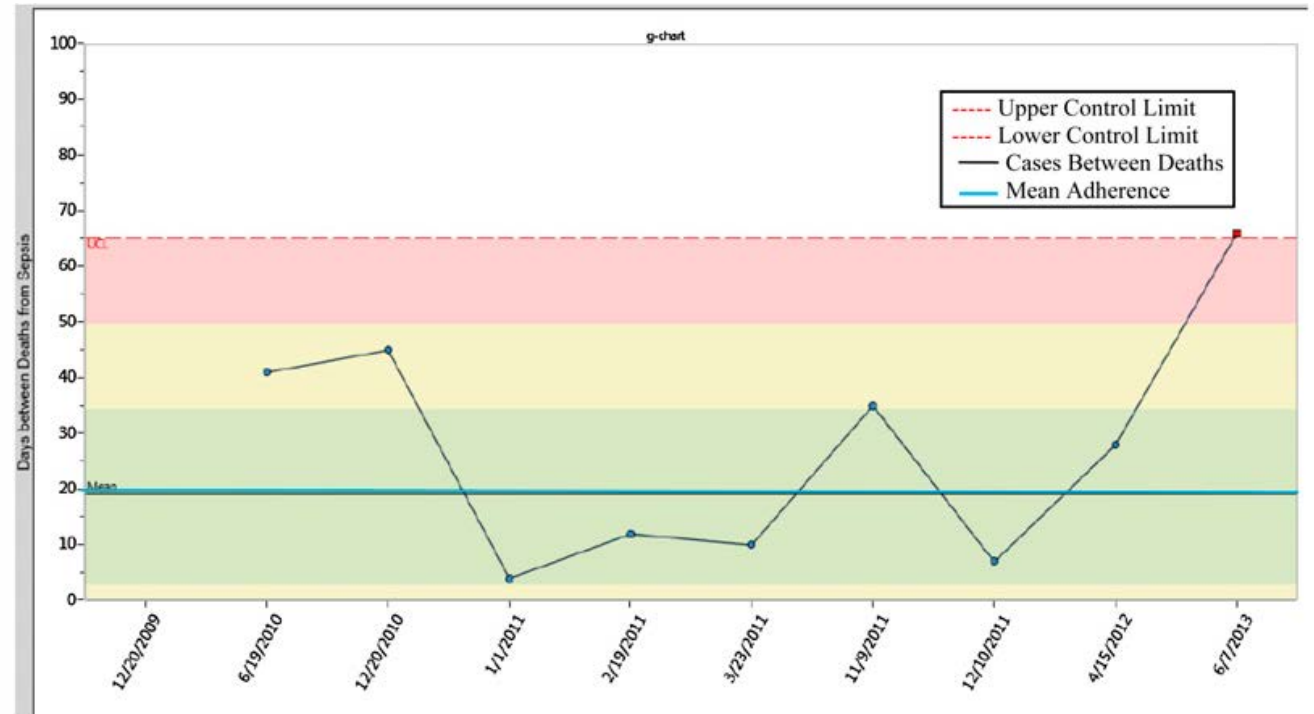


Improve care of sepsis when we know we are worried

# JOURNEY PHASE 1

# SEPSIS BUNDLES IMPROVE CARE

- Improve timeliness
  - Time to antibiotics
  - Time to IV fluids
- Improve outcomes
  - ICU and hospital LOS
  - Organ failure
  - Mortality
- Recommended in 2017 guidelines



# BUNDLE COMPONENTS

- IV access
- Rapid antibiotics
  - 60 min from recognition
- Rapid IV fluids
  - 60 ml/kg in first hour
- Vasoactive agents if needed
- Evaluate for resolution of shock



# TIMELY ANTIBIOTICS

- Prompt antibiotics reduces mortality
- Adults:
  - 7% increase in mortality for every hour delay in abx after onset of hypotension (Kumar CCM 2006)
  - Appropriate antibiotics critical (Gaieski CCM 2010)
- Pediatrics:
  - Increased mortality with long (>3h) delays in abx (Weiss/Fitzgerald/Balamuth CCM 2014)
  - Is too quickly harmful?
    - Increased 1 year mortality in <1hr cohort (Han Shock 2017)



# TIMELY FLUID RESUSCITATION

- EGDT
  - Initial Rivers study 2001 (NEJM): reduced mortality
  - Controversy NOT over prompt treatment
  - IS over how to measure successful resuscitation
  - PROCESS trial (Yealey NEJM 2014)



Operationalize bundle components

# CHOP PATHWAY/ORDER SET



# BUILD A TEAM!

All potential stakeholders at the table:

- Physician Lead
- Nursing Lead
- Mid-level providers
- ICU Providers
- Pharmacy

# ED Pathway for Evaluation/Treatment of Infants > 28 Days of Age and Children with Severe Sepsis

**Related Pathway:**  
[Severe Sepsis/Septic Shock ICU Pathway](#)

[Goals and Metrics](#)

[Antibiotic Recommendations](#)

[Recommended Laboratory Studies](#)

Infants and Children with Severe Sepsis

[Triage](#)

[EPIC Sepsis Alert, Sepsis Huddle Indicated](#)

Sepsis pathway not indicated:  
Care/reassessment continues as clinically indicated

**Initiate Pathway**

[MD/CRNP/RN Rapid Assessment](#)

MS, ABCDE's

Monitors, VS

Administer high flow O<sub>2</sub>

[Immediate IV access, IV Escalation Plan](#)

Order labs, IVF, antibiotics

**Assure 1st antibiotic given within 1st hour**

Consider need for hydrocortisone

10 min

0-20 min

[Rapid Fluid Resuscitation](#)

20 mL/kg bolus

[Order Dopamine to Bedside](#)

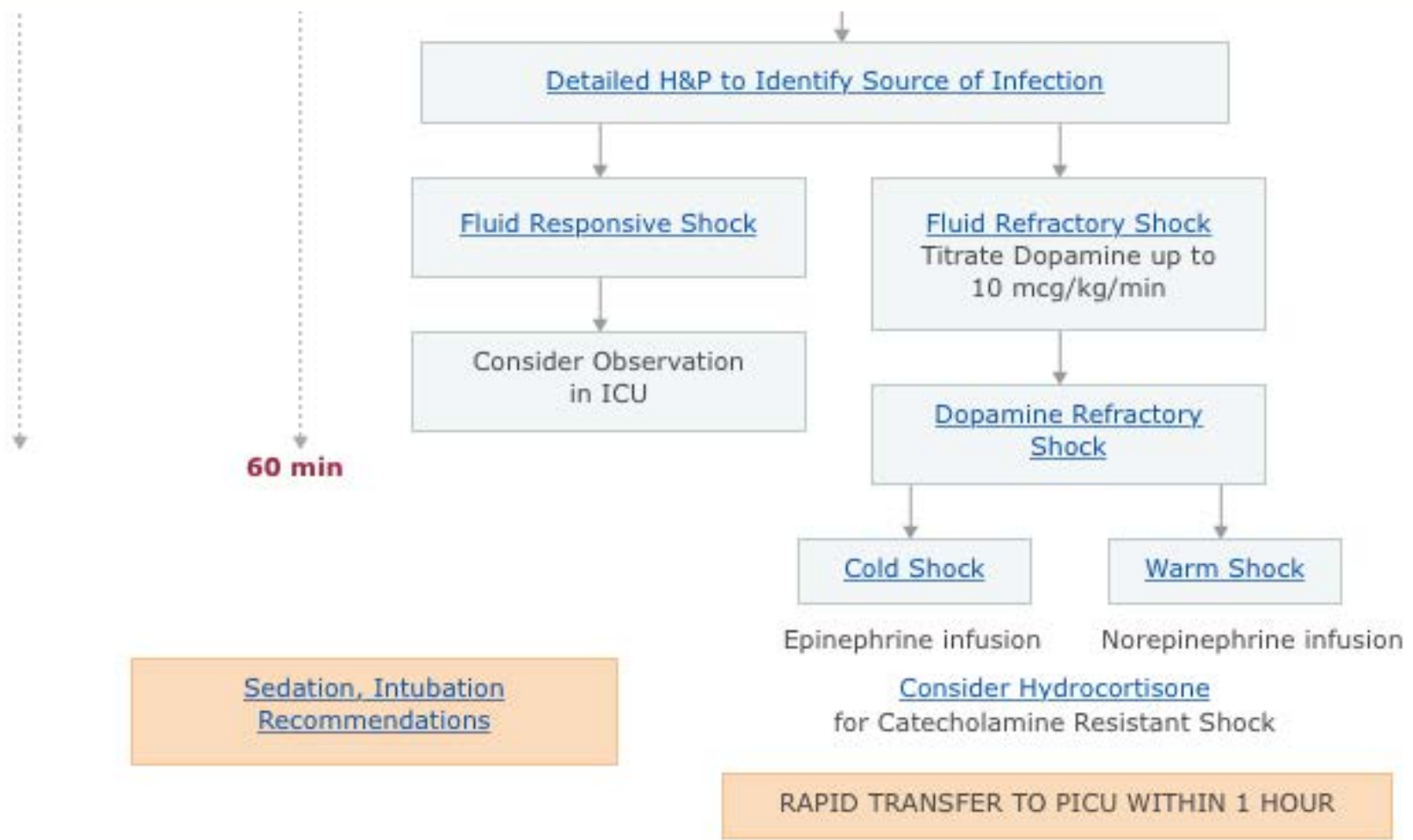
Correct Hypoglycemia, Hypocalcemia

[Monitor MS, VS, ABCDE's, perfusion](#)

[Notify PICU](#)  
Tier 1 or 2 as needed

[Sedation and Intubation](#)

**Rapid NS**  
**20 mL/kg boluses**  
**Repeat as needed**



**Zmasterasap, Tray**  
 Male, 22 year old  
 MRN: 55000758  
 DOB: 01/07/1991

Allergies  
**Penicillins**

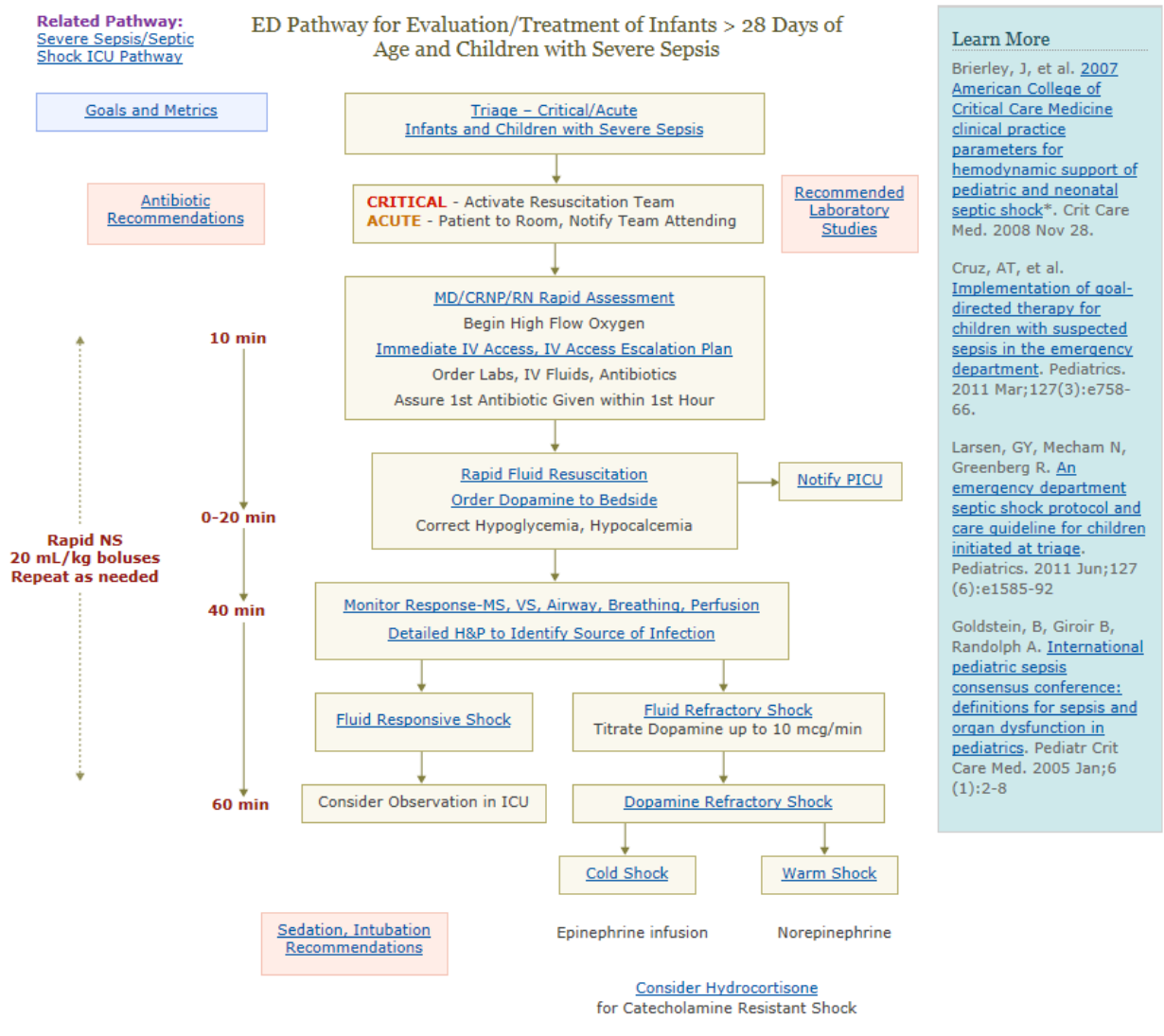
Weight (kg): None  
 Dosing Wt (kg): None  
 MDRO  
 None

Code: Not on file  
 ED WAIT ED WAIT  
 PCP: None  
 Outside CHOP: No

FYI's: None  
 CSN: 1630104071  
 My Sticky Note:

- Snapshot
- Patient Summ...
- Chart Review
- Results Review
- Demographics
- Growth Chart
- ED Charting
- ED Orders
- ED Admission
- ED Discharge
- Home Meds
- Allergies/Rxn
- Problem List
- History
- Notes
- ED Consults
- Diagnosis
- MAR
- Intake/Output
- Doc Flowsheets
- IP Rounding
- ED Navigator
- Remote Viewer

Remote Viewer ? Close X



**Learn More**

Brierley, J, et al. [2007 American College of Critical Care Medicine clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock\\*](#). Crit Care Med. 2008 Nov 28.

Cruz, AT, et al. [Implementation of goal-directed therapy for children with suspected sepsis in the emergency department](#). Pediatrics. 2011 Mar;127(3):e758-66.

Larsen, GY, Mecham N, Greenberg R. [An emergency department septic shock protocol and care guideline for children initiated at triage](#). Pediatrics. 2011 Jun;127(6):e1585-92

Goldstein, B, Giroir B, Randolph A. [International pediatric sepsis consensus conference: definitions for sepsis and organ dysfunction in pediatrics](#). Pediatr Crit Care Med. 2005 Jan;6(1):2-8

# EHR ORDER SET

| ▼ ED Sepsis Pathway: Order ANTIBIOTICS at time of initial sepsis orders  |                 |
|--|-----------------|
| ▶ Previously Healthy, No Central Line- Administer Ceftriaxone FIRST  | 0 of 2 selected |
| ▶ Difficult IV Access (no IV access within 20 minutes of pathway activation)   | 0 of 1 selected |
| ▶ Suspected Intra-Abdominal Source, Administer Piperacillin/Tazobactam FIRST (if Penicillin allergy, replace Piperacillin/Tazobactam with Cefepime and Metronidazole-see Penicillin allergy section below) | 0 of 2 selected |
| ▶ Suspected CNS source AND intra-abdominal source-Use Cefepime in place of Piperacillin/Tazobactam and add Metronidazole to the Vancomycin; Administer Cefepime FIRST                                      | 0 of 3 selected |
| ▶ Immunocompromised, Immunosuppressed, Central Line, Chronic Medical Condition, Recent Hospitalization with Suspected Source outside the Abdomen- Administer Cefepime FIRST                                | 0 of 2 selected |
| ▶ Oncology Patient   | 0 of 4 selected |
| ▶ For Penicillin Allergy Use   | 0 of 2 selected |
| ▶ For Cephalosporin Allergy Use  | 0 of 1 selected |
| ▶ For Toxin-mediated illness, consider the addition of Clindamycin   | 0 of 1 selected |



▼ ED Sepsis Pathway

▼ ED Sepsis Pathway

ED Sepsis Pathway Order Set Started

[Details](#)

Place peripheral IV

▼ Nursing

Please assess patient per sepsis pathway assessment recommendations: Every 15 minutes: Heart rate, Respiratory rate, Blood Pressure; Every 30 minutes: Mental status, Work of breathing, Perfusion status, Pulses; Every 60 minutes: Temperature and Intak

[Please assess patient per sepsis pathway assessment recommendations: Every 15 minutes: Heart rate, Respiratory rate, Blood Pressure; Every 30 minutes: Mental status, Work of breathing, Perfusion status, Pulses; Every 60 minutes: Temperature and Intake/Output.](#)

Please remind FLOC to order antibiotics as soon as possible. Goal of first antibiotic given within 60 minutes of arrival.

[UNTIL DISCONTINUED starting Today at 0945 Until Specified, Please remind FLOC to order antibiotics as soon as possible. Goal of first antibiotic given within 60 minutes of arrival.](#)

Diet NPO

[DIET EFFECTIVE NOW starting Today at 0945 Until Specified](#)

Discontinue sepsis pathway frequent assessments for vital signs, mental status, work of breathing, pulses and Intake/Output

[Discontinue sepsis pathway frequent assessments for vital signs, mental status, work of breathing, pulses and Intake/Output](#)

▼ Respiratory

Oxygen Therapy Aerosol Mask

[P STAT, CONTINUOUS starting Today at 0945 Until Specified](#)

[Device: Aerosol Mask](#)

[O2 Concentration \(%\): 100](#)

▼ Laboratory

▼ Blood

POC Glucose

Point of Care, Routine, ONE TIME starting Today at 0942 for 1 occurrence, Blood

POC Glucose

Point of Care, Routine, AS INSTRUCTED (SEE COMMENTS) starting Today at 0942 Until Specified, Blood, Every Hour

CBC,Platelet With Differential

P Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

Basic Metabolic Panel

P Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

C-Reactive Protein

P Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

Procalcitonin

P Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

Culture, Blood



P Clinician to Collect, Routine, ONE TIME starting Today at 0942 for 1 occurrence, @Contact Team for critical results (use patient Service if none): @No providers found

Culture, Blood

Clinician to Collect, ONE TIME for 1 occurrence

Hepatic Function Panel

P Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

PT/INR

P Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

PTT Profile

P Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for

Fibrinogen

Clinician to Collect, STAT, ONE TIME for 1 occurrence

D-Dimer

Clinician to Collect, STAT, ONE TIME for 1 occurrence

Type & Screen

**P** Clinician to Collect, STAT, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

Super Gas W/ Lactate Venous

**P** Clinician to Collect, Routine, ONE TIME starting Today at 0942 for 1 occurrence, Blood, @Contact Team for critical results (use patient Service if none): @No providers found

Super Gas with Lactate (Arterial)

Clinician to Collect, Routine, ONE TIME for 1 occurrence

POC ISTAT BGP 7

Point of Care, ONE TIME for 1 occurrence

Co-Oximetry

Clinician to Collect, STAT, ONE TIME for 1 occurrence

Cortisol Series

Clinician to Collect, STAT, ONE TIME for 1 occurrence

Lipase

Clinician to Collect, STAT, ONE TIME for 1 occurrence

Amylase

Clinician to Collect, STAT, ONE TIME for 1 occurrence

Pregnancy, Serum

Clinician to Collect, STAT, ONE TIME

Research Study IMPRESS Study

Name of Research Study: IMPRESS Study

Study Coordinator: Katie Hayes; Pager 75004

1. Collect sample ONLY if patient is between 57 days and 17 years (inclusive) of age. 2. 7A-MN: please contact academic associate who will provide tubes and take care of sample storage/processing 3. 12A-7A (overnight): tubes can be found in IMPRESS marked packets in trauma bay with instructions attached. Please place RNA sample in dirty utility room in marked box and send red top tube to lab as per attached instructions 4. Collection instructions: For patients 57 days- <1 yo : 2ml in syringe, 1 ml Tempus tube for RNA and 1 ml in red top for serum; For patients 1 yo- 17 yo: 3ml in Tempus tube for RNA and 2ml in red top for serum

▼ **Urine**

POC 10 SG Urine Dipstick

Point of Care, Routine, ONE TIME starting Today at 0942 for 1 occurrence, Urine

Urinalysis w/o Microscopic

Clinician to Collect, STAT, ONE TIME

Culture, Urine



P Clinician to Collect, Routine, ONE TIME starting Today at 0942 for 1 occurrence, @Contact Team for critical results (use patient Service if none): @No providers found

Urine Pregnancy - Performed by LAB

Clinician to Collect, STAT, ONE TIME for 1 occurrence, Random Urine

▶ CSF

0 of 5 selected

▶ OASIS Research Study

▼ **Pharmacy**

▼ **IV Fluid and Electrolytes**

sodium chloride 0.9% (BOLUS) inj



Intravenous, ONCE, 1 dose Today at 0945

lactated ringers (BOLUS) injection

Intravenous

dextrose 5 % and 0.9% NaCl infusion

Intravenous

dextrose 10 % (BOLUS) injection

2.5 mL/kg/DOSE, Intravenous, ONCE

dextrose 25% injection bolus

1 mL/kg/DOSE, Intravenous, ONCE

calcium gluconate injection (Dose 50-100 mg/kg/DOSE)

Intravenous, ONCE

▼ **Stress Dose Steroids**

- hydrocortisone critical stress dose panel

▼ **Vasopressors**

- DOPamine infusion (peripheral line)  
5 mcg/kg/min, Intravenous, CONTINUOUS
- DOPamine infusion (central line)  
5 mcg/kg/min, Intravenous, CONTINUOUS
- EPINEPHrine infusion (peripheral line)  
0.1 mcg/kg/min, Intravenous, CONTINUOUS
- EPINEPHrine infusion (central line)  
0.1 mcg/kg/min, Intravenous, CONTINUOUS
- norepinephrine infusion (peripheral line)  
0.1 mcg/kg/min, Intravenous, CONTINUOUS
- norepinephrine infusion (central line)  
0.1 mcg/kg/min, Intravenous, CONTINUOUS

▼ **Sedation/ Intubation/ Other**

- hydroCORTISone SS inj  
2 mg/kg/DOSE, Intravenous, ONCE
- ketAMINE 10 mg/ml injection  
1.5 mg/kg/DOSE, Intravenous, ONCE
- aTRopine injection  
Intravenous, ONCE
- vecuronium injection  
0.2 mg/kg/DOSE, Intravenous, ONCE
- fentaNYL injection  
Intravenous, ONCE

▼ **Blood Bank**

▼ **Blood Bank**

- Packed Red Blood Cells
  
- Transfusion Order: Packed Red Cells
  
- Fresh Frozen Plasma
  
- Transfusion Order: Fresh Frozen Plasma
  
- Platelets, Single Donor
  
- Transfusion Order: Platelets

▼ **Radiology**

▼ **Radiology**

- XR PORT CHEST AP OR PA
  
- XR Chest 2VW Ap Or Pa & Lateral
  
- XR Abd 2VW Ap Supine & Erect



# SEPSIS CARE BAG

### SEPSIS TIMELINE CHECKLIST

T=00:00

|                                 |   |             |             |                          |             |                   |             |                          |
|---------------------------------|---|-------------|-------------|--------------------------|-------------|-------------------|-------------|--------------------------|
| SEPSIS PATHWAY START            | 00:15   | 00:30       | 00:45       | 01:00                    | 01:15       | 01:30             | 01:45       | 02:00                    |
| VITAL SIGNS: HR, BP, RR, O2 SAT | SEPSIS ASSESSMENT: MENTAL STATUS, RESPIRATORY EFFORT, CAPILLARY REFILL, QUALITY OF PULSES, SKIN TEMPERATURES, VITAL SIGNS | VITAL SIGNS | VITAL SIGNS | TEMPERATURE, VITAL SIGNS | VITAL SIGNS | SEPSIS ASSESSMENT | VITAL SIGNS | TEMPERATURE, VITAL SIGNS |

ANTIBIOTICS: NAME, TIME, AMOUNT

FLUIDS: SOURCE, TIME, AMOUNT

LABS:
 

- HSPCC Chest/abdominal
  - Ventouse super gas, lactate level
  - Obtain co-oximetry if patient has central access
  - Blood culture (obtain before antibiotics are given)
  - CBC with diff, CMP
  - Basic Metabolic Panel, UPTs, Ammonia, Lipase
  - PHL, PT, PTT, fibrinogen
  - Type and Screen
  - Consider random cortisol level!
- Blood
  - UA, urine culture
  - Consider Haves indicator if patient is likely to require prostheses (See urine Cultivar Nursing Policy)
  - Urine HCG for girls > 12 years

IV ACCESS: GAGE, LOCATION

NOTES:



# CHOP SEPSIS ACTIVATION



1. Attending or fellow pushes bedside sepsis activate button
2. Triggers call cascade
3. FLOC opens sepsis order set and initiates pathway/order set
4. Reminders for timely Abx sent to nurse phone automatically



# ADDITIONAL CHALLENGES IN THE PEDIATRIC EMERGENCY SETTING

3 yo patient in triage with the following vital signs:

- Temp: 39.8
- HR: 187
- RR: 38
- BP: 100/67
- Pox: 97% RA



ABOUT NEW YORK

An Infection, Unnoticed, Turns Unstoppable



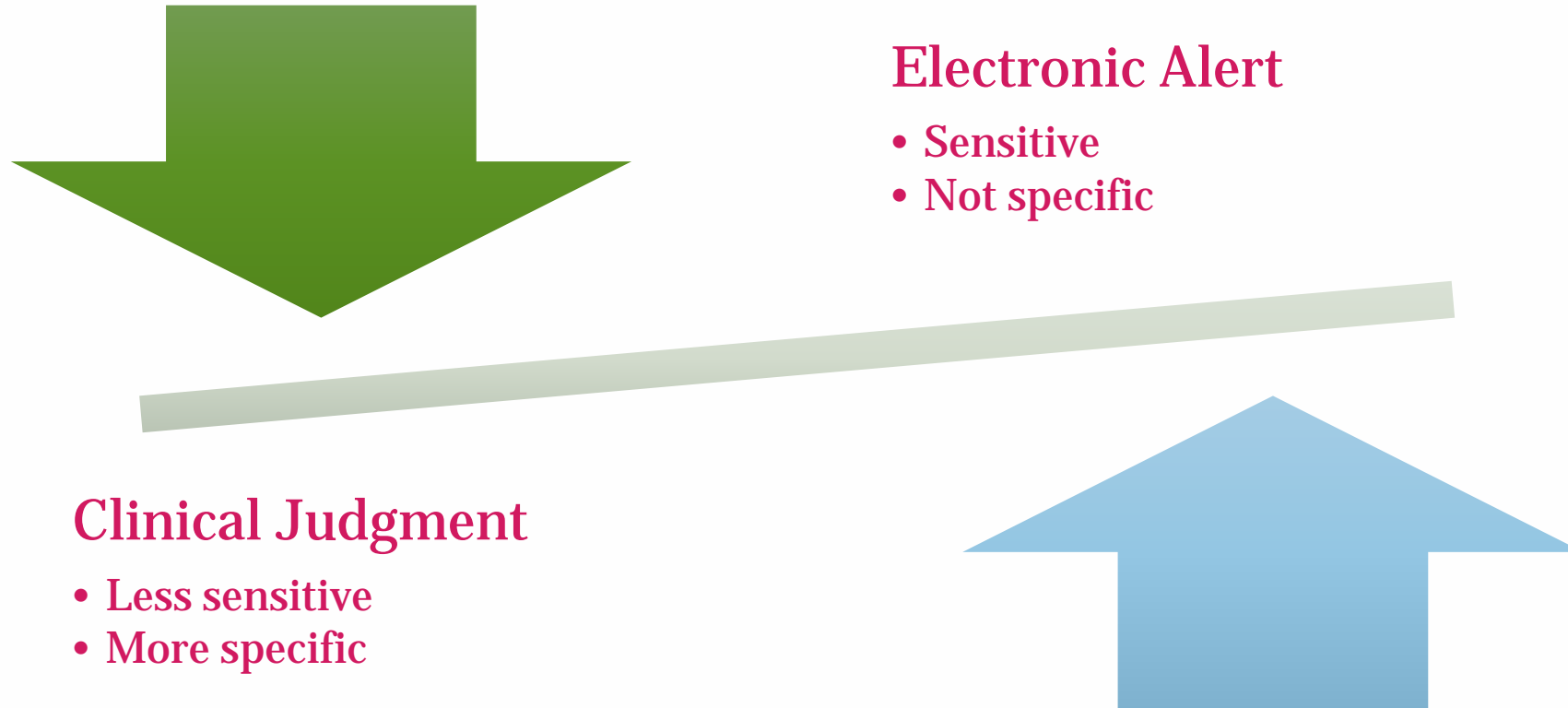
# HOW DO WE FIND THE RIGHT PATIENTS?



Time to tackle sepsis recognition

# JOURNEY PHASE 2

# WOULD AN ELECTRONIC ALERT HELP?



# RETROSPECTIVE ALERT

- **Algorithmic Alert**
  - 2 or more abnormal vital signs
  - High risk condition
  - Altered perfusion
  - Altered mental status
- **Clinical Judgement**
  - MD determined risk for sepsis
  - Patient placed on institutional sepsis protocol

# “IN SILICO” ALERT IMPLEMENTATION

|  | Algorithmic Alert                  | Physician Judgment          | Combined (CM)             | Sequential (SM)             |
|--|------------------------------------|-----------------------------|---------------------------|-----------------------------|
| <b>Severe Sepsis/Septic Shock Prevalence</b> | <b>88 (0.45%)</b>                  |                             |                           |                             |
|  | <b>Test Characteristic (95%CI)</b> |                             |                           |                             |
| Sensitivity                                  | <b>92.1</b> (91.67, 92.43)         | <b>72.73</b> (72.1, 73.35)  | <b>96.6</b> (96.3, 96.9)  | <b>68.2</b> (67.5, 68.8)    |
| Specificity                                  | <b>83.4</b> (82.91, 83.95)         | <b>99.51</b> (99.41, 99.61) | <b>83.3</b> (82.8, 83.8)  | <b>99.6</b> (99.6, 99.7)    |
| Positive Predictive Value                    | <b>2.5</b> (2.24, 2.67)            | <b>40.25</b> (39.56, 40.94) | <b>2.6</b> (2.3, 2.8)     | <b>47.6</b> (46.9, 48.3)    |
| Negative Predictive Value                    | <b>99.96</b> (99.93, 99.99)        | <b>99.88</b> (99.83, 99.93) | <b>99.98</b> (99.96, 100) | <b>99.86</b> (99.80, 99.91) |
| Likelihood Ratio Positive                    | <b>5.6</b> (5.18, 5.95)            | <b>148.79</b> (117.2, 1900) | <b>5.8</b> (5.5, 6.1)     | <b>200.8</b> (151.8, 266.7) |
| Likelihood Ratio Negative                    | <b>0.09</b> (0.05, 0.19)           | <b>0.27</b> (0.19, 0.39)    | <b>0.04</b> (0.01, 0.12)  | <b>0.32</b> (0.24, 0.43)    |
| Receiver Operative Characteristic Curve Area | <b>0.88</b> (0.85, 0.91)           | <b>0.86</b> (0.81, 0.91)    | <b>0.90</b> (0.88, 0.92)  | <b>0.84</b> (0.79, 0.89)    |

**Table 2: Test characteristics of sepsis screening tests.** The algorithmic alert was positive if the patient had 2 or more abnormal vital signs plus either a high-risk condition, altered perfusion, or altered mental status. Physician judgment was positive if the treating physician determined that the patient was at risk for sepsis and placed the patient on the institutional sepsis protocol. Combination was positive if either AA or PJ was positive. Sequential was positive if both AA and PJ were positive.

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| Positive Predictive Value                    | <b>2.5</b> (2.24, 2.67)            | <b>40.25</b> (39.56, 40.94) | <b>2.6</b> (2.3, 2.8)     | <b>47.6</b> (46.9, 48.3)    |
| Negative Predictive Value                    | <b>99.96</b> (99.93, 99.99)        | <b>99.88</b> (99.83, 99.93) | <b>99.98</b> (99.96, 100) | <b>99.86</b> (99.80, 99.91) |
| Likelihood Ratio Positive                    | <b>5.6</b> (5.18, 5.95)            | <b>148.79</b> (117.2, 1900) | <b>5.8</b> (5.5, 6.1)     | <b>200.8</b> (151.8, 266.7) |
| Likelihood Ratio Negative                    | <b>0.09</b> (0.05, 0.19)           | <b>0.27</b> (0.19, 0.39)    | <b>0.04</b> (0.01, 0.12)  | <b>0.32</b> (0.24, 0.43)    |
| Receiver Operative Characteristic Curve Area | <b>0.88</b> (0.85, 0.91)           | <b>0.86</b> (0.81, 0.91)    | <b>0.90</b> (0.88, 0.92)  | <b>0.84</b> (0.79, 0.89)    |

**Table 2: Test characteristics of sepsis screening tests.** The algorithmic alert was positive if the patient had 2 or more abnormal vital signs plus either a high-risk condition, altered perfusion, or altered mental status. Physician judgment was positive if the treating physician determined that the patient was at risk for sepsis and placed the patient on the institutional sepsis protocol. Combination was positive if either AA or PJ was positive. Sequential was positive if both AA and PJ were positive.

# INTERVENTION: 2 STAGE ALERT

**Epic**



- **Electronic Alert**
  - Vital signs
  - Mental Status
  - Perfusion
  - High Risk Condition
- **Clinical Judgement**
  - “Sepsis Huddle”
  - Attending/Fellow MD
  - Bedside RN

# INTERVENTION: INITIAL ALERT

BestPractice Advisory - TeeSystem,MaryJo

**Your patient has tachycardia and/or hypotension documented.**

Filed Sepsis-Related Vitals:  
03/24/15 1221

Pulse: 200



Additional assessments are needed to determine further interventions.

**Is there a fever** (home or ED  $\geq 38$ ), **hypothermia** or **signs/symptoms of infection** for this patient?

Do one of the following:

If **No**, click the **no concern for infection** button below.


If **Yes**, click the **hyperlink** below to document additional assessments.



Acknowledge reason:   

[CLICK HERE TO DOCUMENT ADDITIONAL ASSESSMENTS](#)

**Tachycardia: 1x/patient**  
**Hypotension: unlimited**



# INTERVENTION: ADDITIONAL SCREENING

 Sepsis Screen - Sepsis Screen

Time taken:     Show:

Values By

▼ ED Sepsis Screen

|                              |  |
|------------------------------|--|
| UE Cap Refill                |  <input checked="" type="button" value=" &lt; 2 seconds"/> <input type="button" value=" 2-3 seconds"/> <input type="button" value=" &gt; 3 seconds"/>  |
| Existing High Risk Condition |  <input type="button" value=" &lt; 56 Days Old"/><br><input type="button" value=" Asplenia"/><br><input type="button" value=" Bone Marrow or Solid Organ Transplant"/><br><input type="button" value=" Central Line"/><br><input type="button" value=" Malignancy"/><br><input type="button" value=" Significant CNS/Functional Tech Dependence"/><br><input type="button" value=" Other Immunodeficiency/Immunocompromise"/><br><input checked="" type="button" value=" None"/> |

F9   F7



# INTERVENTION: 2ND STAGE OF ALERT

## “Sepsis Huddle”

BestPractice Advisory - TeeSystem, MaryJo

▼ Critical (1 Advisory)

!!

This patient meets criteria for a sepsis huddle due to tachycardia and a risk factor (high-risk condition, altered mental status, or delayed cap refill).

Please take the following actions based on triage ESI level:

**ESI 1:** Move to Resuscitation Bay  
**ESI 2:** Available Room (Team 1-3) - Move to room and notify team attending for huddle.  
No Available Room - Call Team 1 Attending to triage for sepsis huddle.


\*\*\* Document the sepsis huddle outcome by clicking the hyperlink below or via the nursing narrator.



Open Order Set: ED Sepsis Pathway [preview](#)

[Click Here to Document the Outcome of the Sepsis Huddle](#)

Accept Cancel


# SEPSIS HUDDLE DECISION

 Sepsis Huddle Results

Time taken: 2006  5/13/2014  Show:

Values By

▼ Sepsis Huddle Results

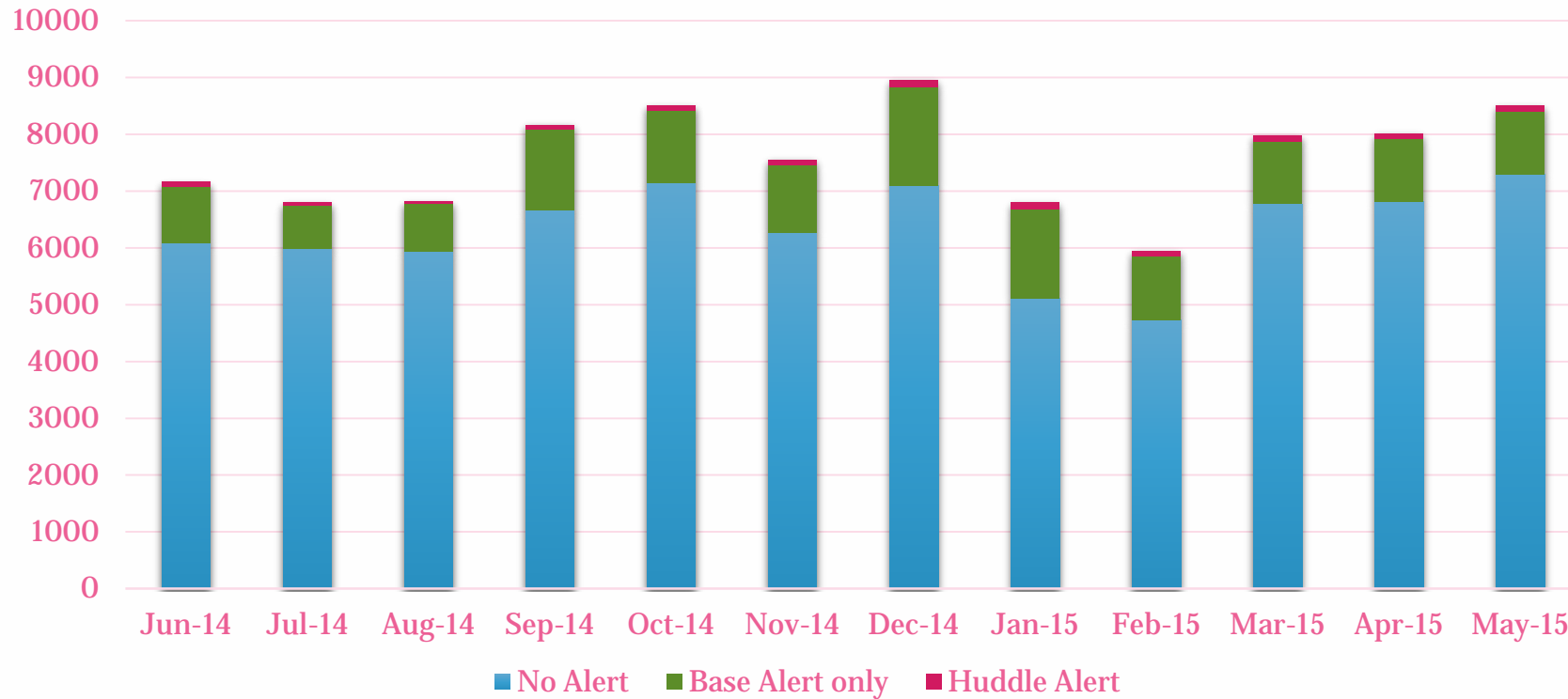
|   |   |
|---|---|
| Sepsis Huddle Results  | <input type="button" value="Sepsis pathway initiated"/>                               |
|   | <input type="button" value="Attending eval: sepsis pathway not currently indicated"/> |

|       |                              |   |     |
|-------|------------------------------|---|-----|
| 19:34 | Triage Completed             |   | MKF |
| 19:34 | Triage Nursing Interventions | Triage Nursing Interventions - Nursing Intervention: Family/Pt instructed to return to triage if condition worsens Allergy Band Placement: Allergy band placed on patient | MKF |

**\*\*Could also activate sepsis huddle based on concern even if alert did not fire**

**\*\*\*Plan to add "maybe" option**

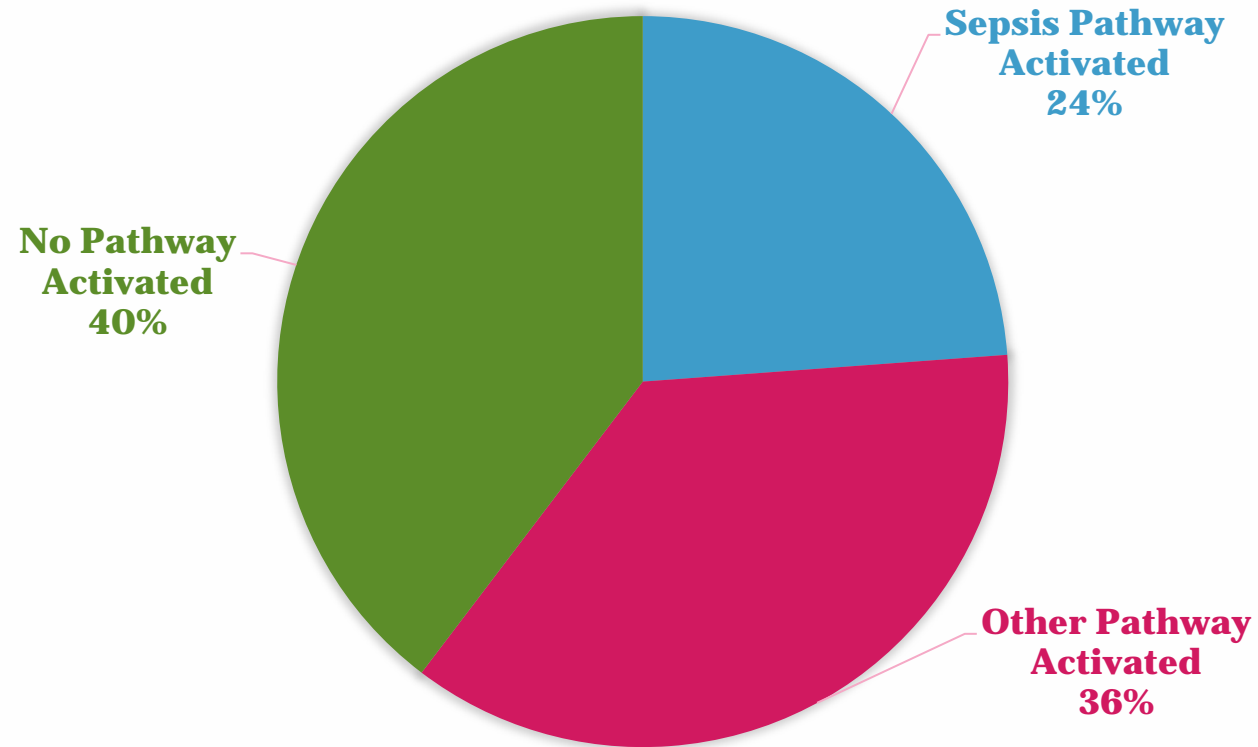
# MONTHLY FREQUENCY OF ALERTS/HUDDLES



- ED Census: 96,427 visits
- 1<sup>st</sup> Stage Alerts: 16% of census
- Huddles: 7% of alerts (1% of census)

# RESULTS: HUDDLE OUTCOMES

## 1112 SEPSIS HUDDLES





# TEST CHARACTERISTICS OF ALERT

|                           | <b>Alert alone</b> | <b>Alert + MD judgment</b> |
|---------------------------|--------------------|----------------------------|
| Sensitivity               | 86.2 (82.0, 89.5)  | 99.4 (97.8, 99.8)          |
| Specificity               | 94.5 (94.1, 94.8)  | 94.5 (94.1, 94.8)          |
| Positive Predictive Value | 25.4 (22.8, 28.0)  | 28.1 (25.6, 30.8)          |
| Negative Predictive Value | 99.7 (99.6, 99.8)  | 99.9 (99.9, 100)           |
| Likelihood Ratio Positive | 15.6 (14.4, 16.9)  | 18.0 (16.8, 19.2)          |
| Likelihood Ratio Negative | 0.15 (0.12, 0.20)  | 0.01 (0.00, 0.03)          |

# MISSED PATIENTS: 2013-2017

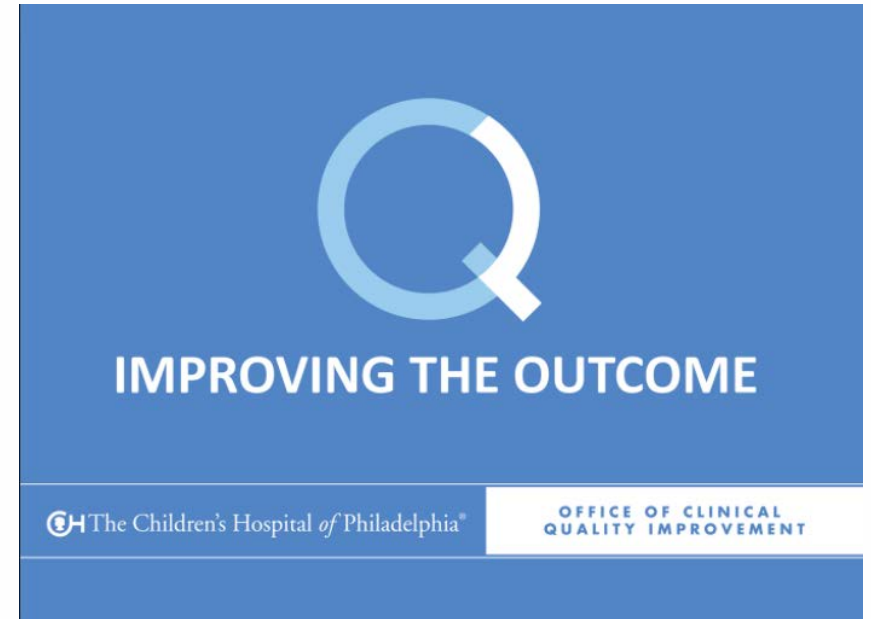


Hitting the mark

# JOURNEY PHASE 3

# ENSURING QUALITY

- Multidisciplinary ongoing QI team
- Monitor pathway adherence and response
  - Use of Sepsis Alert/Huddle
  - Timeliness of antibiotics
  - Timeliness of fluids
  - Appropriate antibiotics
- Provide feedback and re-education
- Update ED on current progress



# DATA MONITORING: QLIKVIEW

Sepsis  
ED

- Antibiotics
- Fluids
- ICU Admits
- Missed Patients / Death
- BPA

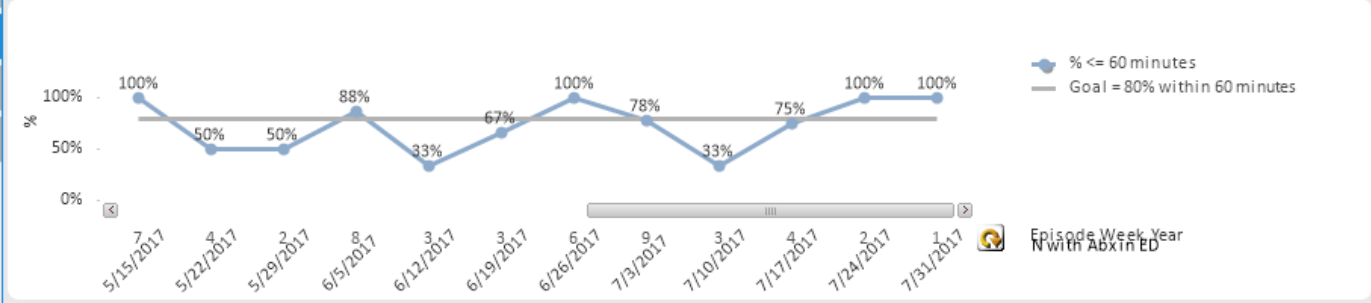
- Administration Time – 180 Min
- Pathway to Abx Admin
- Screen to Abx Admin
- Triage to Abx Admin

Current Selections  
SEPSIS\_DEPT\_  ED  
MONTHYEAR  2017-Feb, 2017-M  
 May, 2017-Jun, 2017

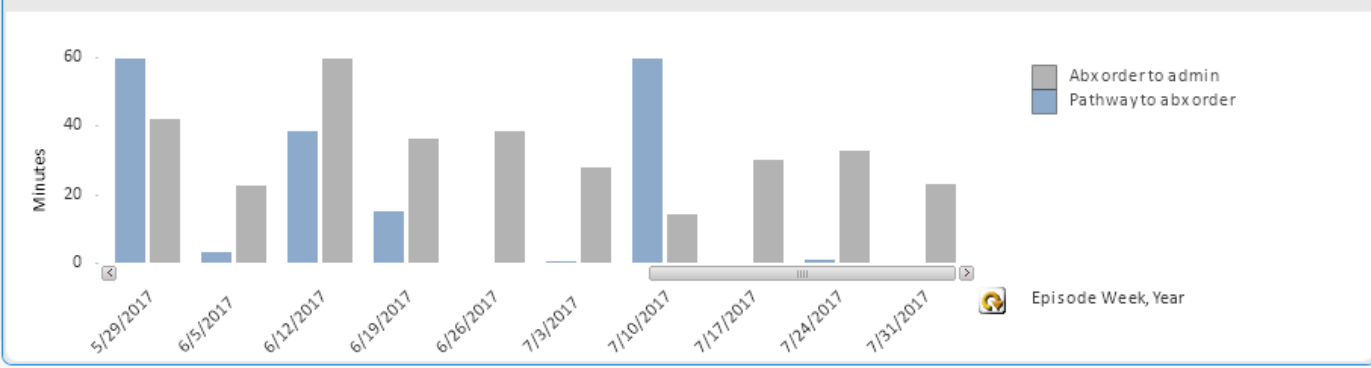
Clear Selections

Pathway Order to Antibiotic Administration

% within 60 min      Median



Median Pathway Activation to Antibiotic Administration (excluding where abx ordered before pathway)



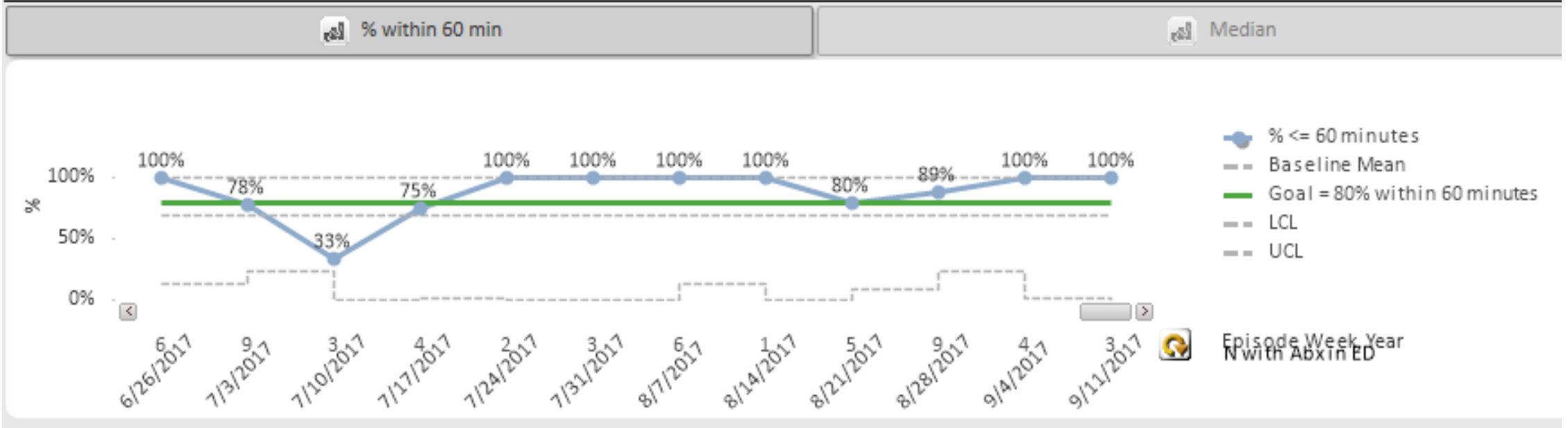
**COHORT:**  
Patient encounters that have the ED Sepsis Pathway Order set (500PATH16) activated (excluding those where the order set is discontinued within 15 minutes of order).

**TIMESTAMP DEFINITIONS:**  
MD Eval: Minimum of attending assignment time and resident/NP assignment time  
Minimum antibiotic administration: The earliest antibiotic administration time while the patient is in the ED. If no antibiotics are administered in the ED, this field is null.

Last Updated: 9/14/2017 8:14:26 AM Data  
Source: CDW

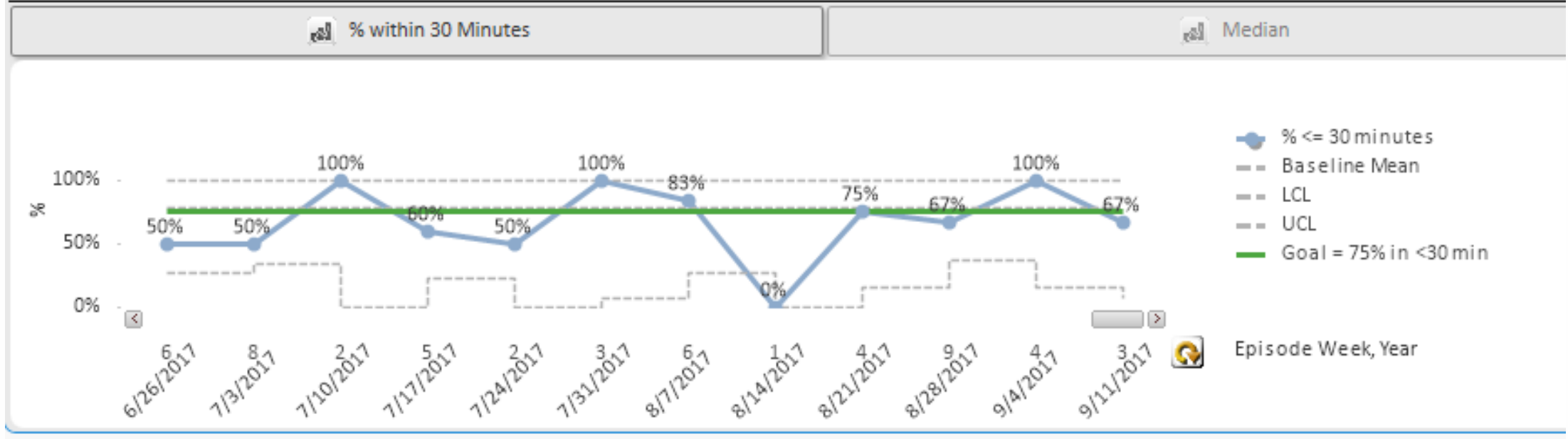
# ANTIBIOTIC ADMINISTRATION

## Pathway Order to Antibiotic Administration



# FLUID ADMINISTRATION

## Pathway Order to 1st Fluid Bolus



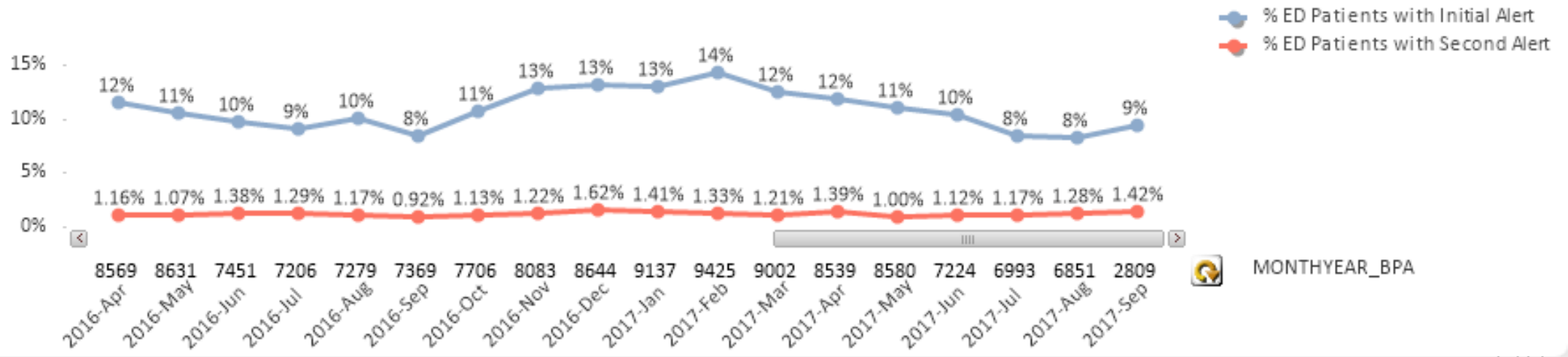


# BPA ALERT TRACKING

## BPA Alert Data

% Patients with an Alert

% Patients with Alert within 10 min of Triage



# TEAM FEEDBACK

- Weekly chart review of outliers & “missed” patients
- Outreach to identify
  - Barriers
  - Best practices
  - Systems issues
  - Areas for improvement
- Monitor for common themes → widespread re-education

# COMMON BARRIERS

- Recognition/Cognitive Bias
- IV Access
- Antibiotic preparation
- Appropriate fluid administration technique
- Competing priorities

# HOSPITAL WIDE ACTIVITIES

- Governance Committee
  - Multi-unit/disciplinary team
  - FY 2017 Aim: Reduce rate of new organ dysfunction related to hospital-wide suspected sepsis episodes
- Participation in CHA Sepsis Collaborative

# NEXT STEPS

- Continuing QI work
- Individual “score cards”
- Consideration of additional middle tier of response



## Questions?

Fran Balamuth, MD, PhD, MSCE: [balamuthf@email.chop.edu](mailto:balamuthf@email.chop.edu)

Mary Kate Abbadessa, MSN, RN: [funarimk@email.chop.edu](mailto:funarimk@email.chop.edu)

## Pediatric Sepsis Program

The Pediatric Sepsis Program is dedicated to improving prevention, early recognition, treatment and follow-up for infants, children and adolescents with sepsis. Through the implementation of quality improvement projects, clinical decision support and scientific research, our team is helping to lead the international medical and scientific community in our search for a cure.

SEARCH  
PEDIATRIC SEPSIS  
PROGRAM