



St. Vincent



ASCENSION

Improving Sepsis Mortality: Leveraging Technology

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September 13, 2017

St. Vincent Evansville

436 bed Level II Adult and Pediatric Trauma Center
17,379 admissions per year
4,771 inpatient and 18,903 out patient surgeries per year
64,131 emergency room visits per year
1,408 severe sepsis and septic shock patients per year



Severe Sepsis vs Current Care

Care Priorities	U.S. Incidence	# of Deaths	Mortality Rate
AMI ⁽¹⁾	900,000	225,000	25%
Stroke ⁽²⁾	700,000	163,500	23%
Trauma ⁽³⁾ (Motor Vehicle)	2.9 million (injuries)	42,643	1.5%
Severe Sepsis ⁽⁴⁾	751,000	215,000	29%

Source: (1) Ryan TJ, et al. ACC/AHA Guidelines for management of patients with AMI. *JACC*. 1996; 28: 1328-1428. (2) American Heart Association. Heart Disease and Stroke Statistics – 2005 Update. Available at: www.americanheart.org. (3) National Highway Traffic Safety Administration. Traffic Safety Facts 2003: A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimates System. Available at <http://www.nhtsa.dot.gov/>. (4) Angus DC et al. *Crit Care Med* 2001;29(7): 1303-1310.

Background of Importance

Sepsis is the leading cause of death in non-coronary care intensive care units.

Mortality rate:

- 30% (Severe Sepsis)
- 50% (Septic Shock)

From 2007 to 2009, over 2,047,038 patients were admitted with a sepsis-related illness

- 52.4% are diagnosed in the ED
- 34.8% on the hospital wards
- 12.8% in the ICU

Hall, M.J, et al. NCHS data brief, 62. Hyattsville, MD: National Center for Health Statistics. 2011
Reed K et al. Health Grades. June, 2010 2011;The First Annual Report(1):1-28.

EARLY GOAL-DIRECTED THERAPY IN THE TREATMENT OF SEVERE SEPSIS AND SEPTIC SHOCK

EMANUEL RIVERS, M.D., M.P.H., BRYANT NGUYEN, M.D., SUZANNE HAVSTAD, M.A., JULIE RESSLER, B.S., ALEXANDRIA MUZZIN, B.S., BERNHARD KNOBLICH, M.D., EDWARD PETERSON, PH.D., AND MICHAEL TOMLANOVICH, M.D., FOR THE EARLY GOAL-DIRECTED THERAPY COLLABORATIVE GROUP*

Conclusions Early goal-directed therapy provides significant benefits with respect to outcome in patients with severe sepsis and septic shock. (N Engl J Med 2001;345:1368-77.)

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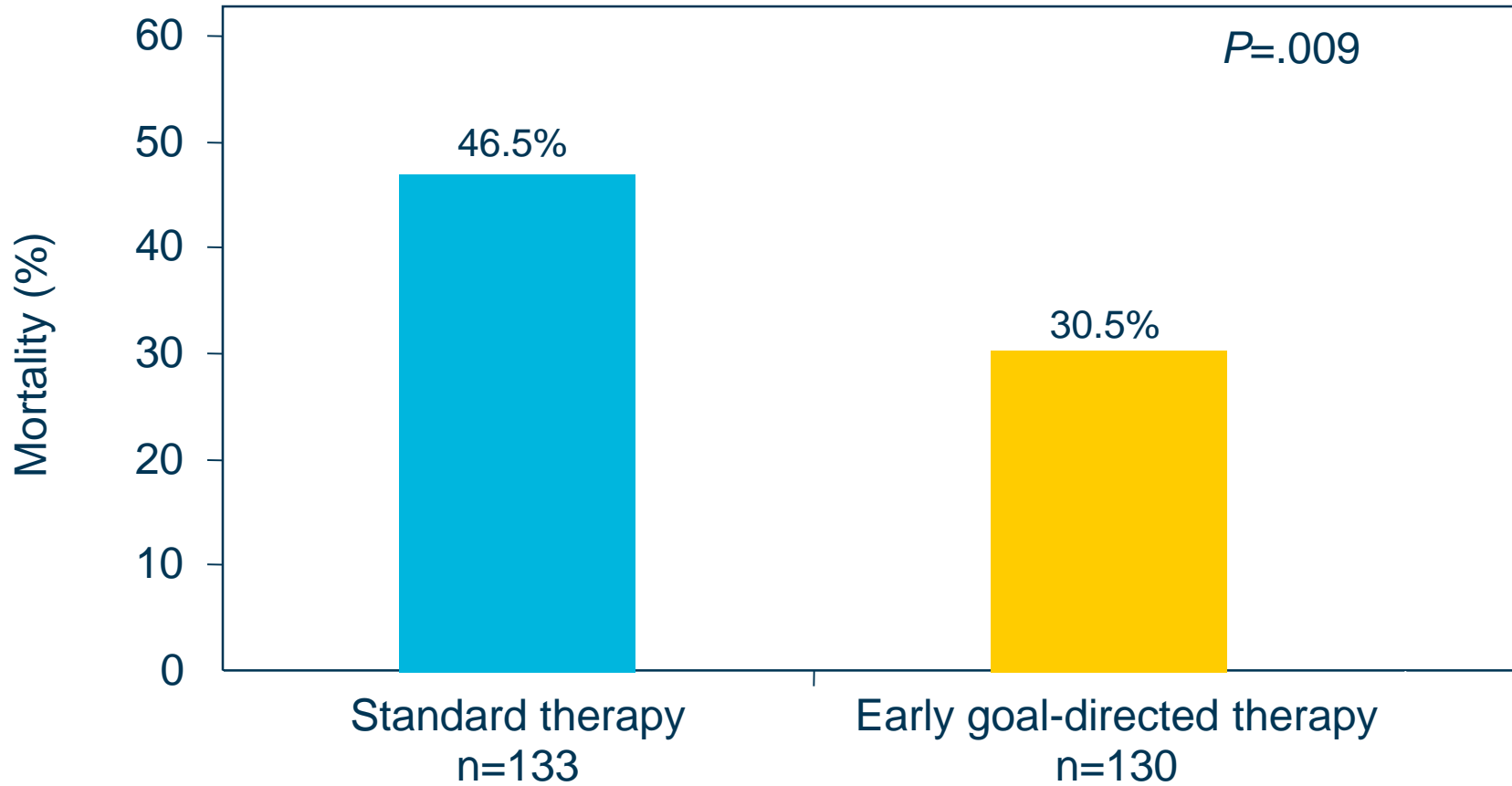
or pulmonary-artery catheterization¹⁴ enrolled patients up to 72 hours after admission to the intensive care unit. The negative results of studies of the use of hemodynamic variables as end points (“hemodynamic

From the Departments of Emergency Medicine (E.R., B.N., J.R., A.M., B.K., M.T.), Surgery (E.R.), Internal Medicine (B.N.), and Biostatistics and Epidemiology (S.H., E.P.), Henry Ford Health Systems, Case Western Reserve University, Detroit. Address reprint requests to Dr. Rivers at the Department of Emergency Medicine, Henry Ford Hospital, 2799 West Grand Blvd., Detroit, MI 48202, or at erivers1@hfhs.org.

*The members of the Early Goal-Directed Therapy Collaborative Group are listed in the Appendix.

EGDT - Outcome

In-hospital Mortality



Rivers E, et al. *N Engl J Med.* 2001;345:1368-1377.

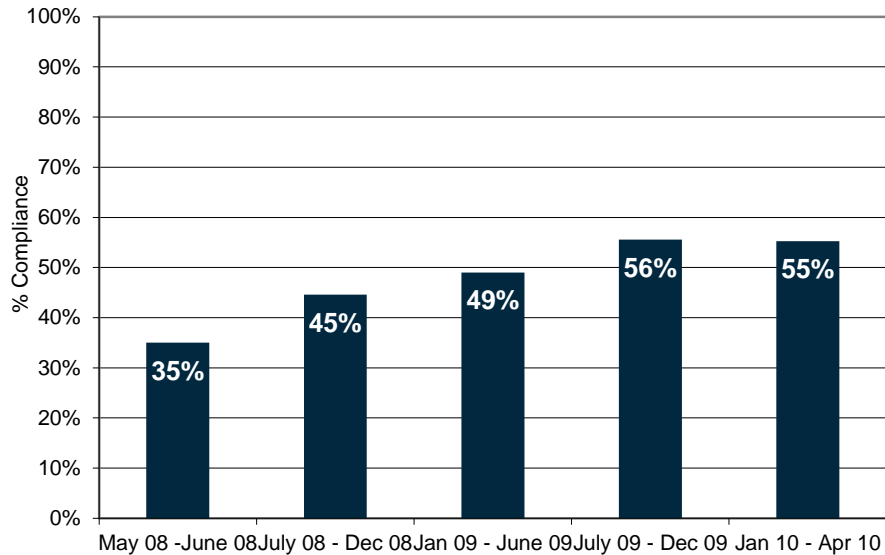
Historical Information



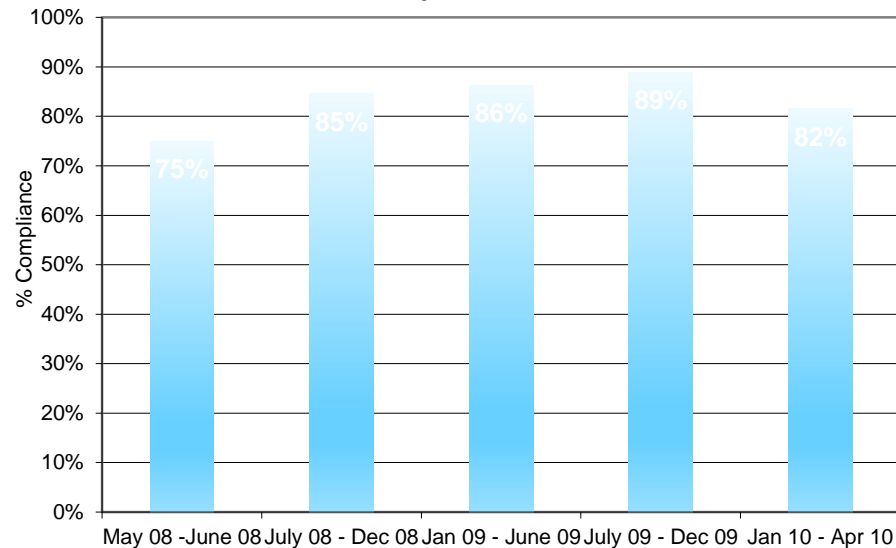
In 2007 we launched a Physician Driven Quality initiative for treatment of Severe Sepsis & Septic Shock based on the 2004 Surviving Sepsis Campaign guidelines.

The initiative was successful, but not sustainable...

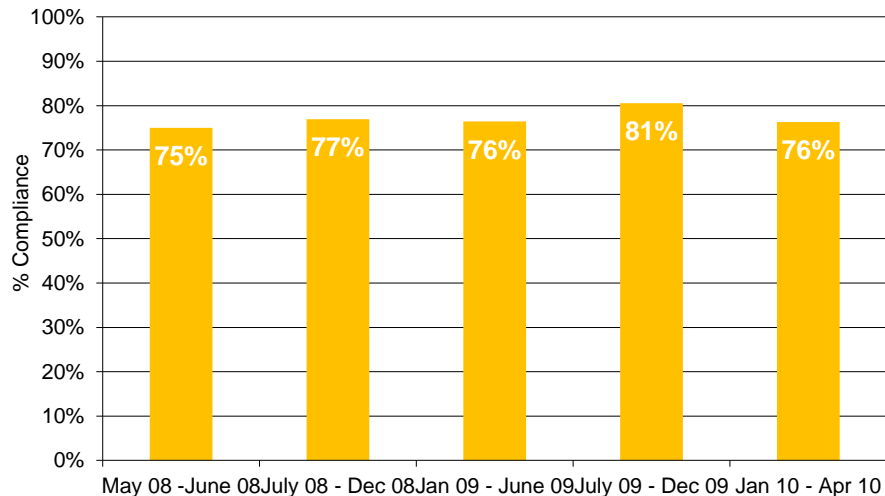
SSC Serum Lactate within 6 hours of Presentation



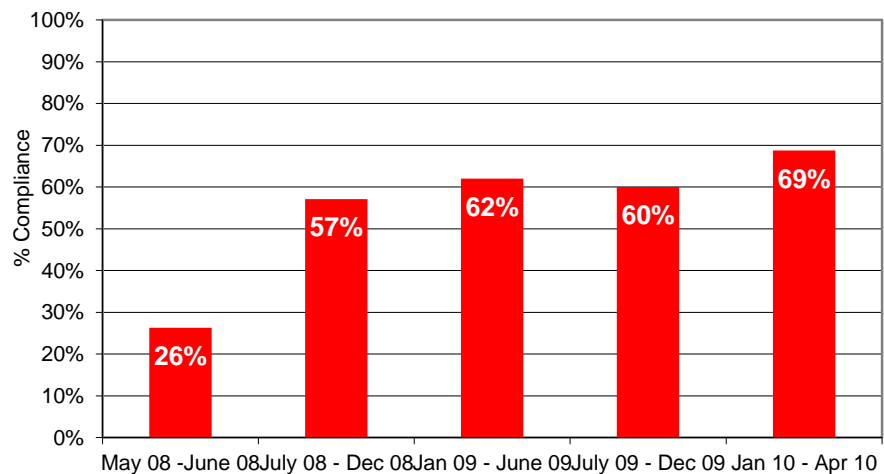
SSC Blood Cultures collected within 3 hours before Broad Spectrum Abx administered



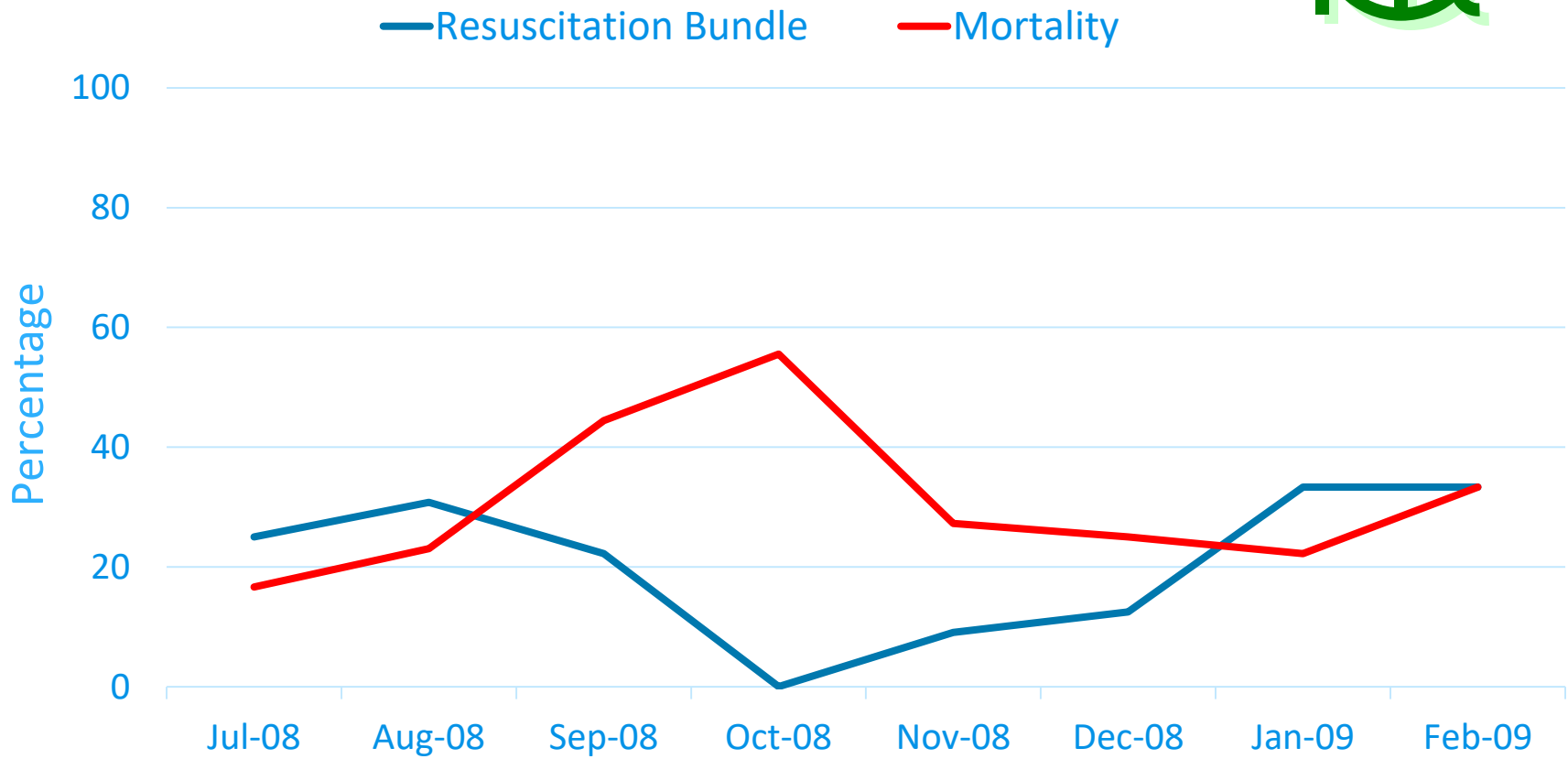
SSC Broad Spectrum Abx administered within 3 hours of ED admission or 1 hour for non-ED admission



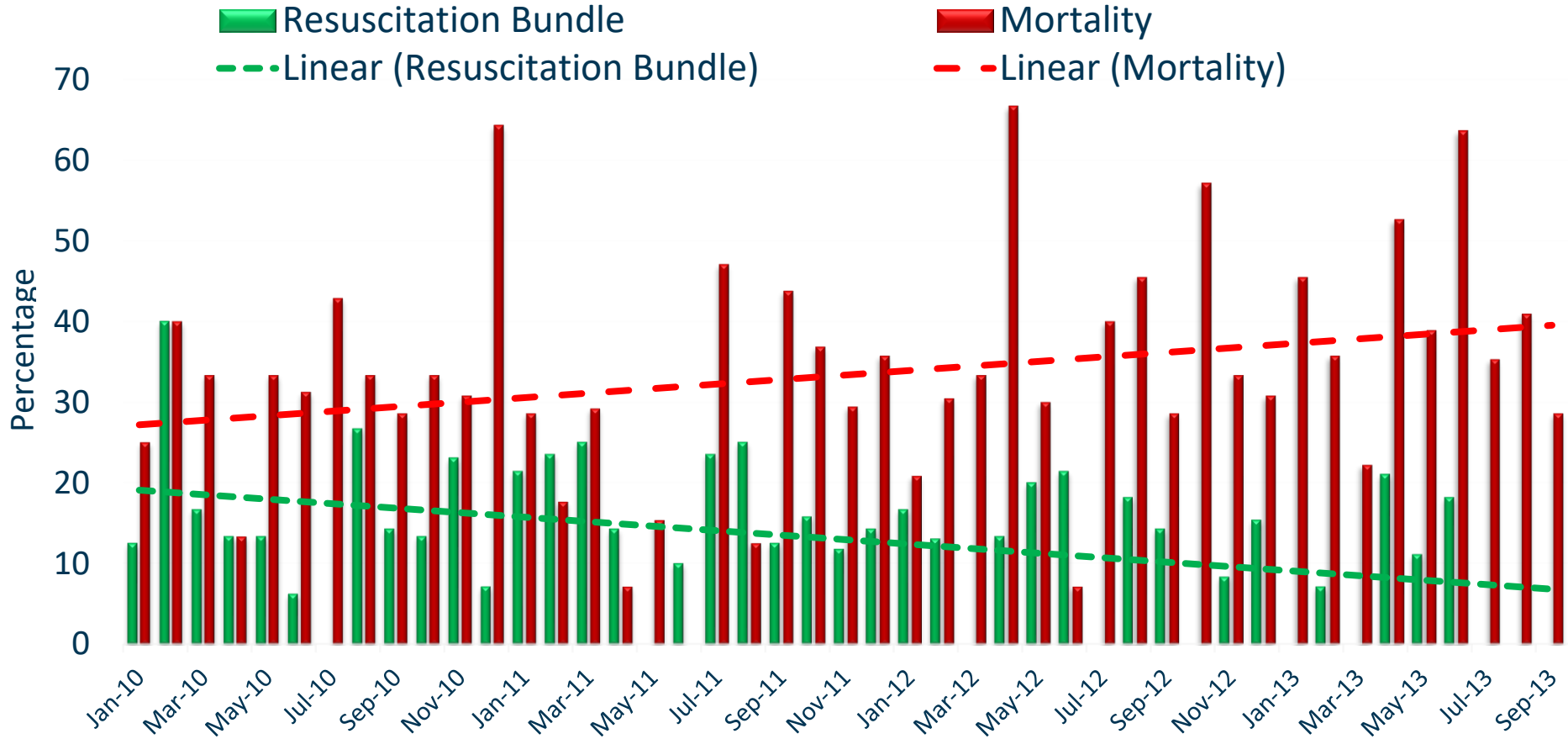
SSC For hypotension or lactate >4 mmol/L, 20 ml/kg Crystalloid Fluid Bolus delivered followed by Vasopressors if



SEPSIS BUNDLE AND MORTALITY RATE July 2008-February 2009



Surviving Sepsis Campaign Resuscitation Bundle and Mortality Rate Jan 2010 - Sep 2013



Reviving The Initiative

A grant funded initiative allowed us a full time Sepsis Coordinator position.

The multidisciplinary team was carefully constructed and first brought together in January 2014.

Our Goals

Facilitate early recognition of severe sepsis

- Provider education
- Screening tools
- Treat sepsis as an emergency

Emphasize timely evidence-based management

- Assessment of perfusion
- Early antibiotics
- Fluid resuscitation
- Assessment of adequacy of resuscitation

Achieving Our Goals

Screening tools were updated and a process was put in place for all patients (18 or older) coming through the Emergency Department to be screened at the time of triage

Severe Sepsis order sets were updated to reflect to newest revision of the Surviving Sepsis Campaign Guidelines

A checklist was created for the staff to utilize to ensure they complete all bundled metrics in the 3 hour and 6 hour time frame

Achieving Our Goals

Physician education provided to Emergency Department physicians as well as Hospitalist physicians by February 2014

Surviving Sepsis Campaign 2012 Guidelines Summary Posters framed and hung in each nursing department and physician dictation room

Achieving Our Goals

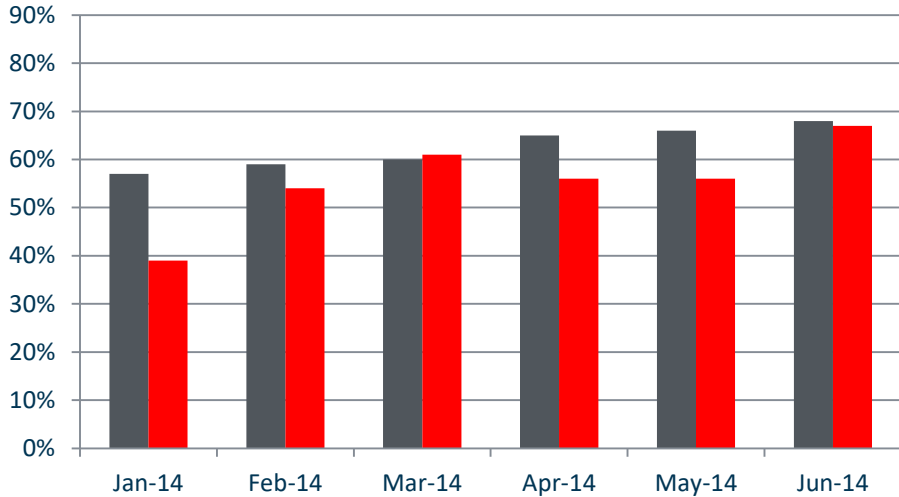
100% of the Critical Care nurses were trained on early identification and treatment of severe sepsis by April 2014

100% of the Emergency Department nurses were trained on early identification and treatment of severe sepsis by May 2014

100% of the Medical/Surgical nurses were trained on early identification and activation of the emergency response team by May 2014

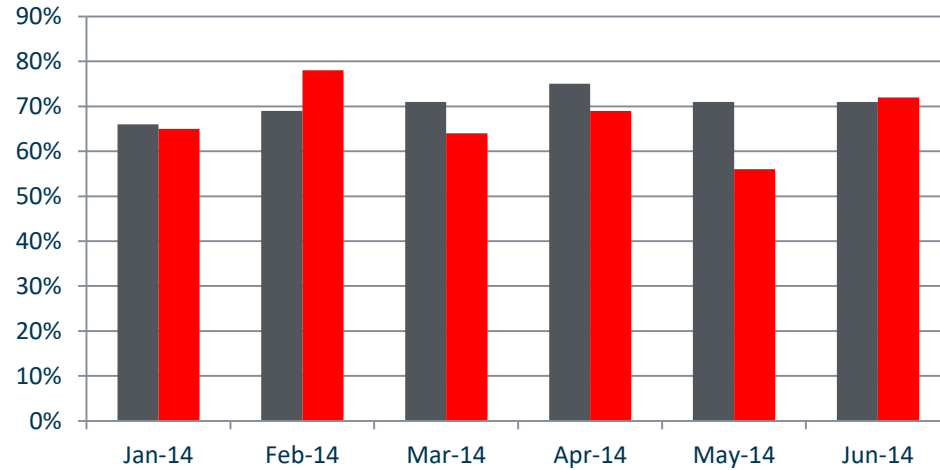
Lactate Acid

Overall LEAPT Participants St. Mary's Medical Center



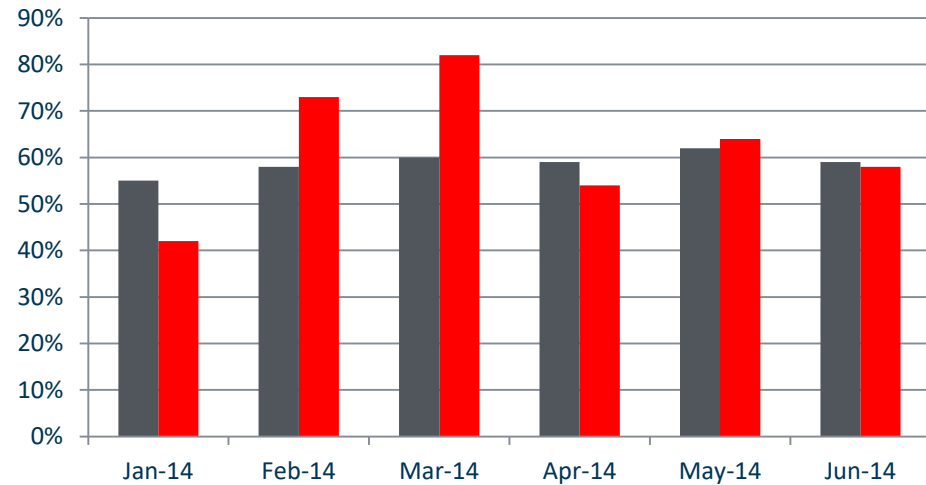
Blood Culture

Overall LEAPT Participants St. Mary's Medical Center



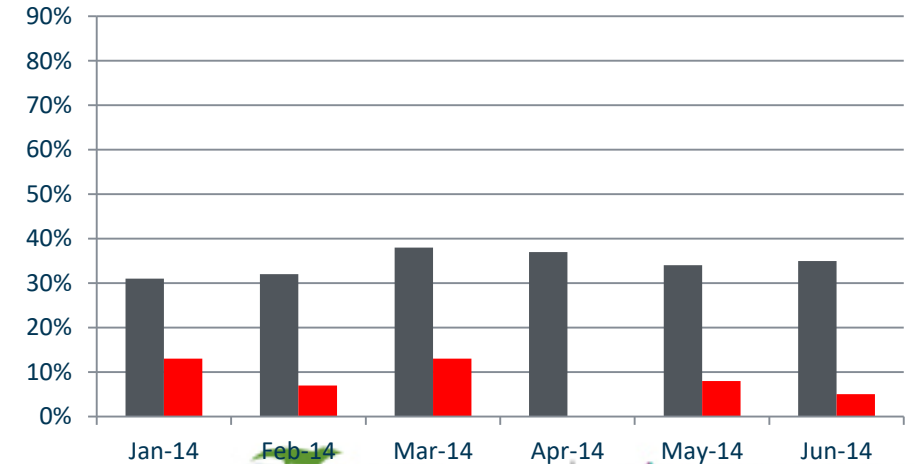
Antibiotic

Overall LEAPT Participants St. Mary's Medical Center

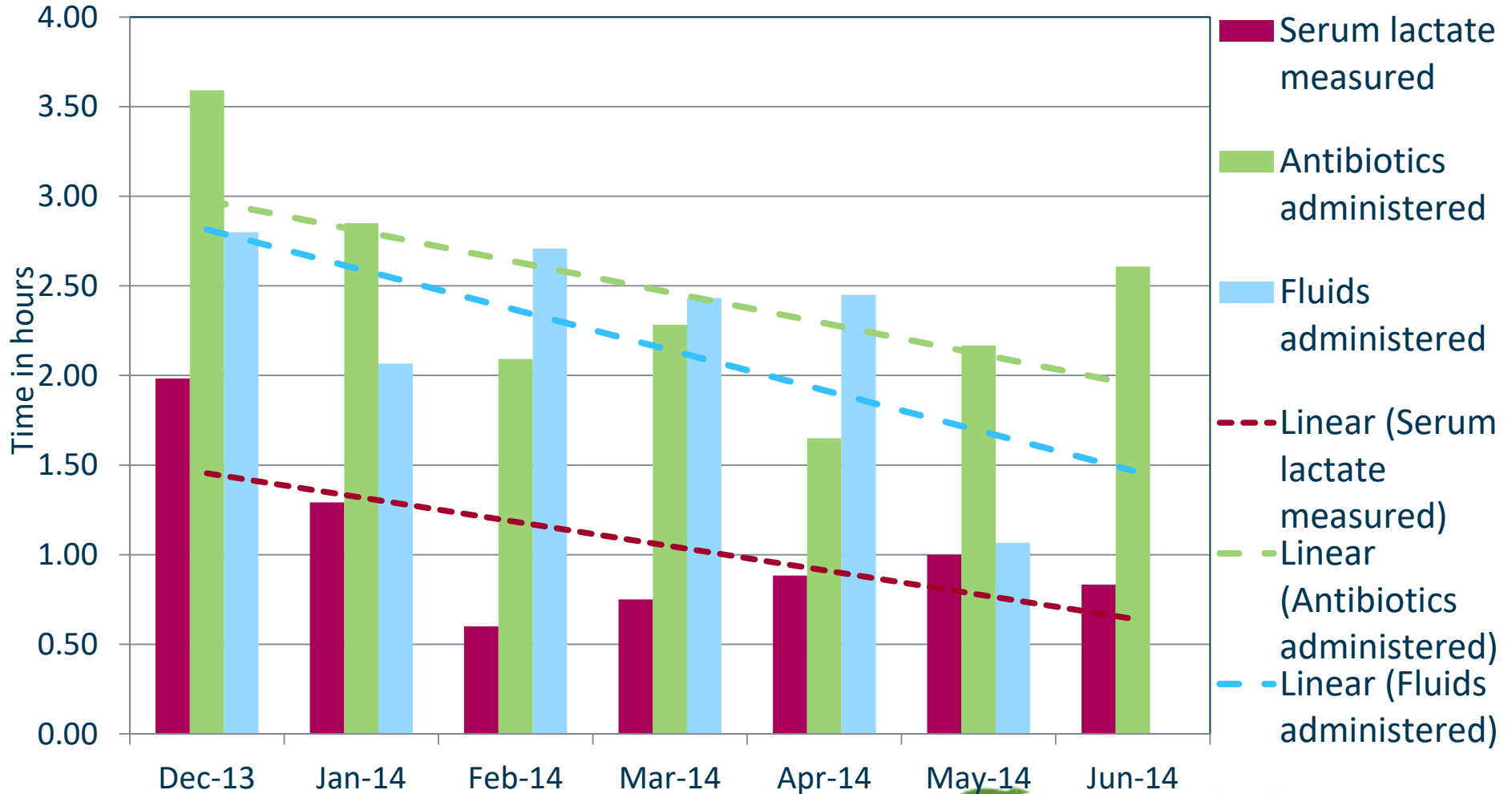


IVF Bolus

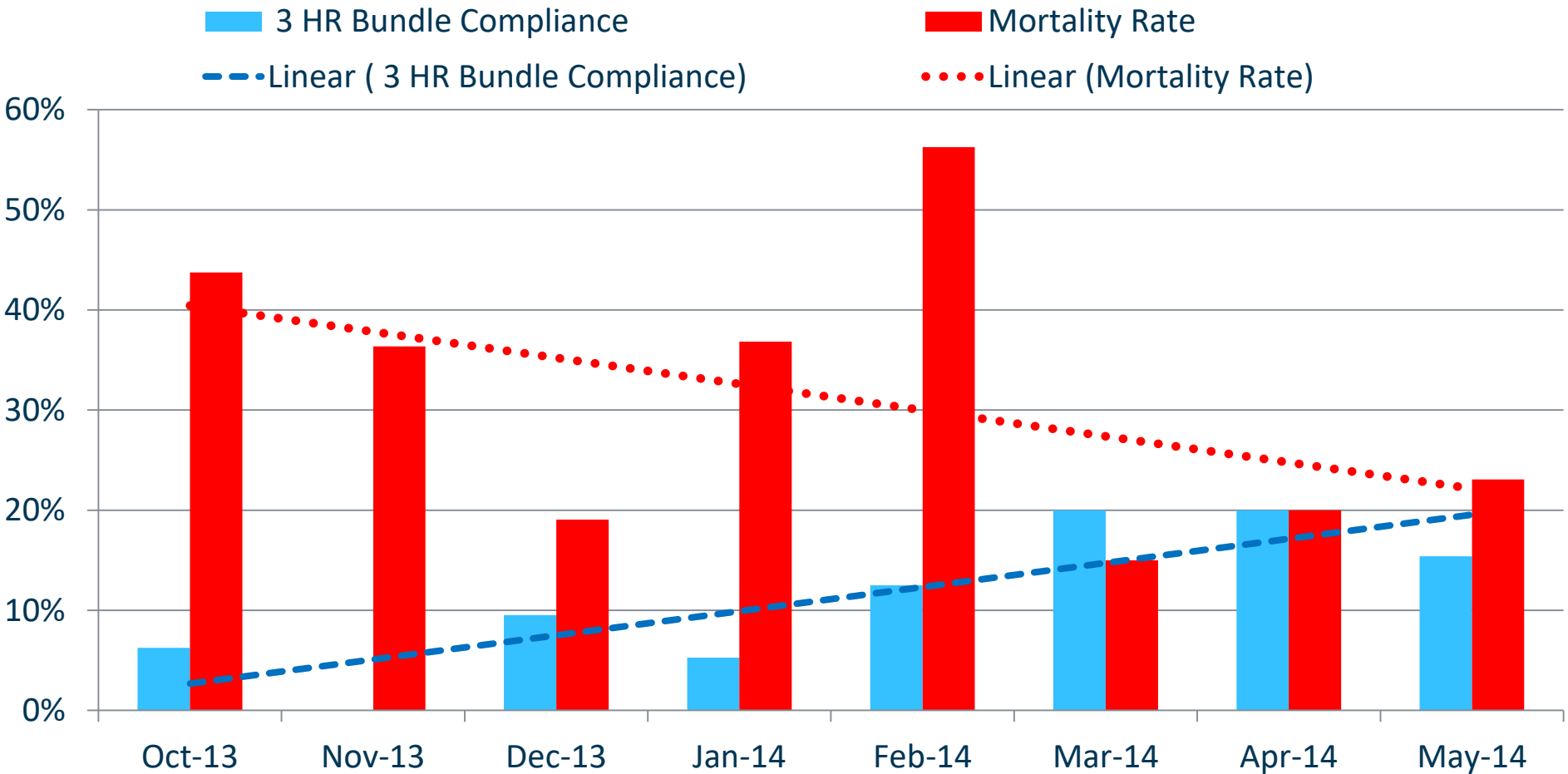
Overall LEAPT Participants St. Mary's Medical Center



Surviving Sepsis Campaign 3 Hour Bundle Median Time (hrs) to Quality Indicators



Surviving Sepsis Campaign 3 Hour Bundle and Mortality Oct 2013 - May 2014



What we learned...

Success depends on:

- 1: Identify Severe Sepsis as an Institutional Priority
- 2: Implement Early Detection Screening Procedures
- 3: Implement Aggressive Treatment Policies/Standards
- 4: Track, Evaluate, and Report Outcomes

Sepsis becomes a Core Measure

Bundled management for Sepsis was announced as a CMS Core Measure beginning October 2015.

With much debate on the definition of sepsis, severe sepsis, and septic shock as well as much debate about methods to abstract data for bundled compliance, official reporting of metrics for Sepsis as a core measure did not begin until July 2016

New Guidelines Released January 2017

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

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DOI: 10.1097/CCM.0000000000002255

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Continued Process Improvement

Early Screening

ED CNS retrained every RN in the emergency department on sepsis screening tool

ED CNS reviews sepsis screens performed in the ED for QI

ED CNS performs 1:1 education and remediation on missed opportunities

Early Management

Missed opportunity report is reviewed by Sepsis team monthly.

Physician representatives bring missed opportunities back to colleagues for awareness

CNSs review and remediate staff on missed opportunities related to nursing

Revisions to the screening tool

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Adult Severe Sepsis Screening Tool

Instructions: Use this tool to screen patients equal to or older than 18 years of age for Severe Sepsis

<p>1. SUSPICION OF INFECTION:</p> <p><input type="checkbox"/> Acute abdominal infection</p> <p><input type="checkbox"/> Blood stream/catheter infection</p> <p><input type="checkbox"/> Bone / joint infection</p> <p><input type="checkbox"/> Endocarditis</p> <p><input type="checkbox"/> Implantable device infection</p> <p><input type="checkbox"/> Meningitis</p> <p><input type="checkbox"/> Pneumonia, empyema</p> <p><input type="checkbox"/> Skin / soft tissue infection</p> <p><input type="checkbox"/> Suspect infection, source unknown</p> <p><input type="checkbox"/> Urinary tract infection</p> <p><input type="checkbox"/> Wound infection</p> <p><input type="checkbox"/> Other _____</p> <p>MUST HAVE AT LEAST ONE ___ Yes ___ No</p>	<p>2. BIR 8:</p> <p>Check ALL that apply & date/time when present</p> <p><input type="checkbox"/> Hyperthermia > 38.3C (101.0 F) Date _____ Time _____</p> <p><input type="checkbox"/> Hypothermia < 36 C (96.8 F) Date _____ Time _____</p> <p><input type="checkbox"/> Tachycardia > 90 bpm Date _____ Time _____</p> <p><input type="checkbox"/> Tachypnea > 20 resp per min Date _____ Time _____</p> <p><input type="checkbox"/> Leukocytosis (WBC > 12,000/L-1) Date _____ Time _____</p> <p><input type="checkbox"/> Leukopenia (WBC < 4,000/L-1) Date _____ Time _____</p> <p>NEED TO HAVE AT LEAST TWO ___ Yes ___ No</p>
---	---

If the answer is YES to both questions 1 and 2 above, suspicion of infection is present. Call the physician to obtain orders for a STAT lactate, blood cultures x 2 sets, CBC with platelets and differential, and complete metabolic panel per protocol (if not completed in the past 4 hours).

<p>3. ORGAN DYSFUNCTION:</p> <p>Are there any of the following organ dysfunction criteria present at a site remote from the site of infection that are NOT considered to be chronic conditions? (Note: In the case of bilateral pulmonary infiltrates the remote site stipulation is waived). Check ALL that apply & date/time when present</p>	
<input type="checkbox"/> SBP < 90 mmHg or MAP < 65 mm Hg	Date _____ Time _____
<input type="checkbox"/> SBP decrease > 40 mmHg from baseline	Date _____ Time _____
<input type="checkbox"/> Creatinine > 2.0 mg/dl or Urine output < 0.5 ml/kg for two hours	Date _____ Time _____
<input type="checkbox"/> Bilirubin > 2 mg/dl	Date _____ Time _____
<input type="checkbox"/> Platelet count < 100,000/L	Date _____ Time _____
<input type="checkbox"/> Lactate > 2 mmol/L (18.0 mg/dl)	Date _____ Time _____
<input type="checkbox"/> Coagulopathy (INR > 1.5 or aPTT > 60 sec)	Date _____ Time _____
<input type="checkbox"/> Acute respiratory failure as evidenced by a new need for invasive or non-invasive mechanical ventilation. (Invasive mechanical ventilation requires an endotracheal or tracheostomy tube. Non-invasive mechanical ventilation may be referred to as BIPAP- uses a mask)	Date _____ Time _____
NEED AT LEAST ONE ___ Yes ___ No	

If suspicion of infection is present (questions 1 and 2 marked "YES" AND organ dysfunction is present - question 3 marked "yes"), the patient meets the criteria for SEVERE SEPSIS, consider entering patient into the severe sepsis protocol.
Soreener's Summary: Infection + BIR 8 + Organ dysfunction = POSITIVE screen suggestive of SEVERE SEPSIS

_____ Positive Screen _____ Negative Screen

Notify the physician of positive results immediately to obtain orders.

Physician notified _____ Date/Time notified _____

Screeners signature _____ Date/Time _____

Screeners signature _____ Date/Time _____

Revisions to the check list

+

+

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Adult Severe Sepsis Checklist

Time Zero: _____

3-Hour Bundle

STAT Lactic Acid
 Time _____ Initials _____ Result _____

Blood Cultures Collected Prior to
 Antibiotics 1st set: Time _____ Initials _____
 2nd set: Time _____ Initials _____

Broad Spectrum Antibiotics Administered
 Time _____ Initials _____ Antibiotic 1 _____
 Time _____ Initials _____ Antibiotic 2 _____
 Time _____ Initials _____ Antibiotic 3 _____

Normal Saline 30 mL per kg bolus given for mean arterial pressure less than
 65, Systolic Blood Pressure less than 90 millimeters of mercury and/or Initial Lactate greater than or
 equal to 4 millimoles per liter
 30 mL x _____ kg equal to _____
 Start time _____ Stop time _____ Amt IV Fluid given _____ Initials _____
 Start time _____ Stop time _____ Amt IV Fluid given _____ Initials _____
 Start time _____ Stop time _____ Amt IV Fluid given _____ Initials _____
 Start time _____ Stop time _____ Amt IV Fluid given _____ Initials _____

6-Hour Bundle

Apply Vasopressors to Maintain mean arterial pressure greater than 65 millimeters
 of mercury and Systolic Blood Pressure greater than 90 millimeters of mercury Time
 _____ Initials _____ Vasopressor _____

Re-measure Lactic Acid (if initial greater than 2mmol per
 L) Time _____ Initials _____ Result _____

Complete repeat volume status and focused exam document (8015-118)
 Perfect serve MD/PA/ARN to sign and place under progress notes in chart
 Provider may also choose to document that the focused exam was performed
 in their progress note (must be within 6 hours)
 OR

Any 2 of the following four:
 Measure central venous pressure Time _____ Initials _____ central venous pressure _____
 Measure ScvO2 Time _____ ScvO2 _____
 Bedside Cardiovascular Ultrasound performed Time _____ Initials _____
 Passive Leg Raise performed Time _____ Initials _____
 OR Fluid Challenge performed Time _____ Initials _____

Nurse Signature _____ Initials _____ Date / Time _____

Nurse Signature _____ Initials _____ Date / Time _____

* 1 NP n *

Adult Severe Sepsis Screening Tool
 8720-100 Page 2 of 2 Rev. 07/24/2017

Continued Process Improvement

Hard wiring the bundle

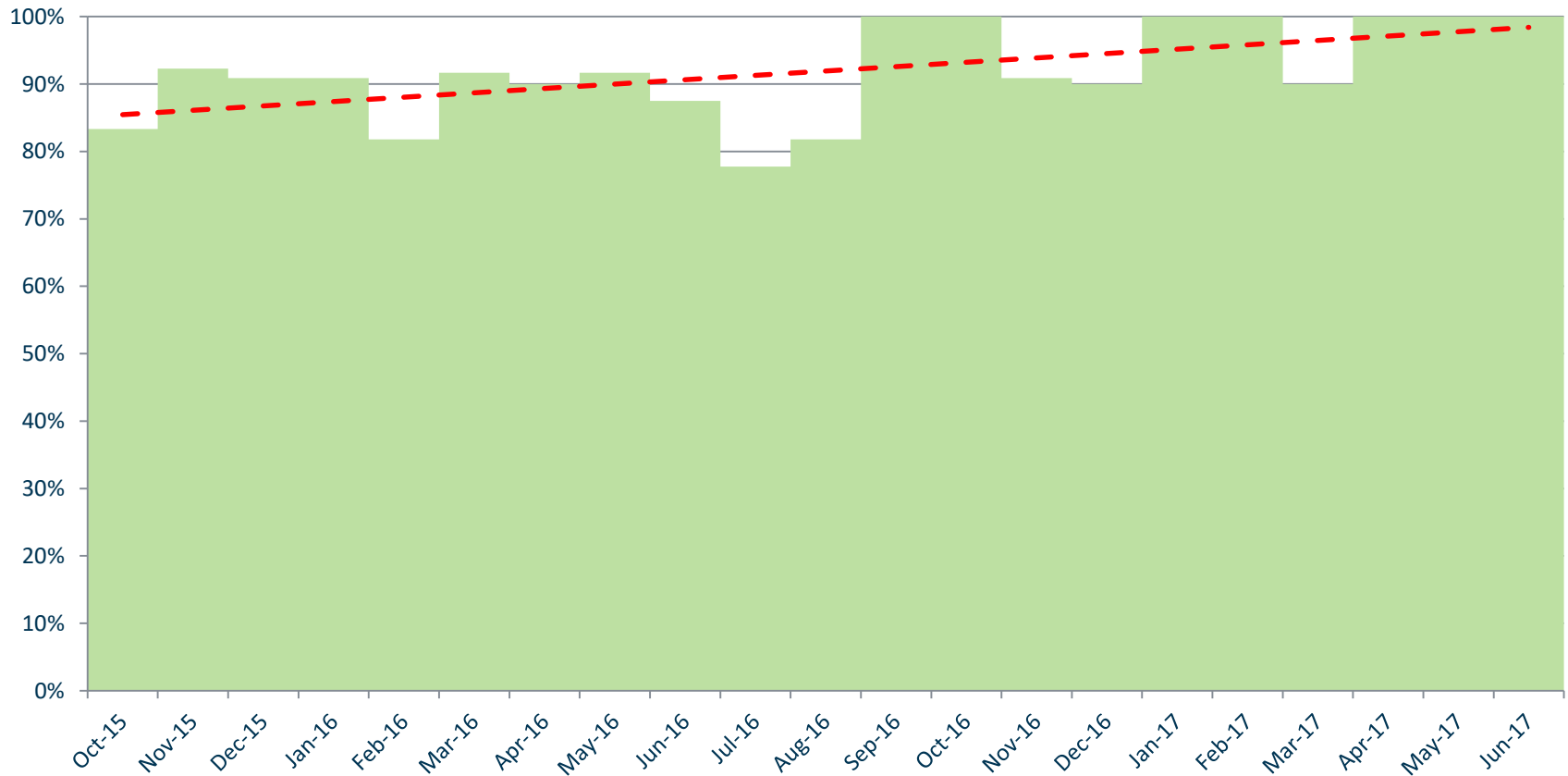
Sepsis lactate was created when ordered and resulted >2 mmol/L, the system automatically orders another repeat lactate to be performed in 3 hours

Sepsis 3 hour bundle order set created

All 3 hour bundle metrics included in order set, including sepsis lactate and an automatically calculated 30cc/kg fluid bolus that pushes to the EMAR so that it is documented

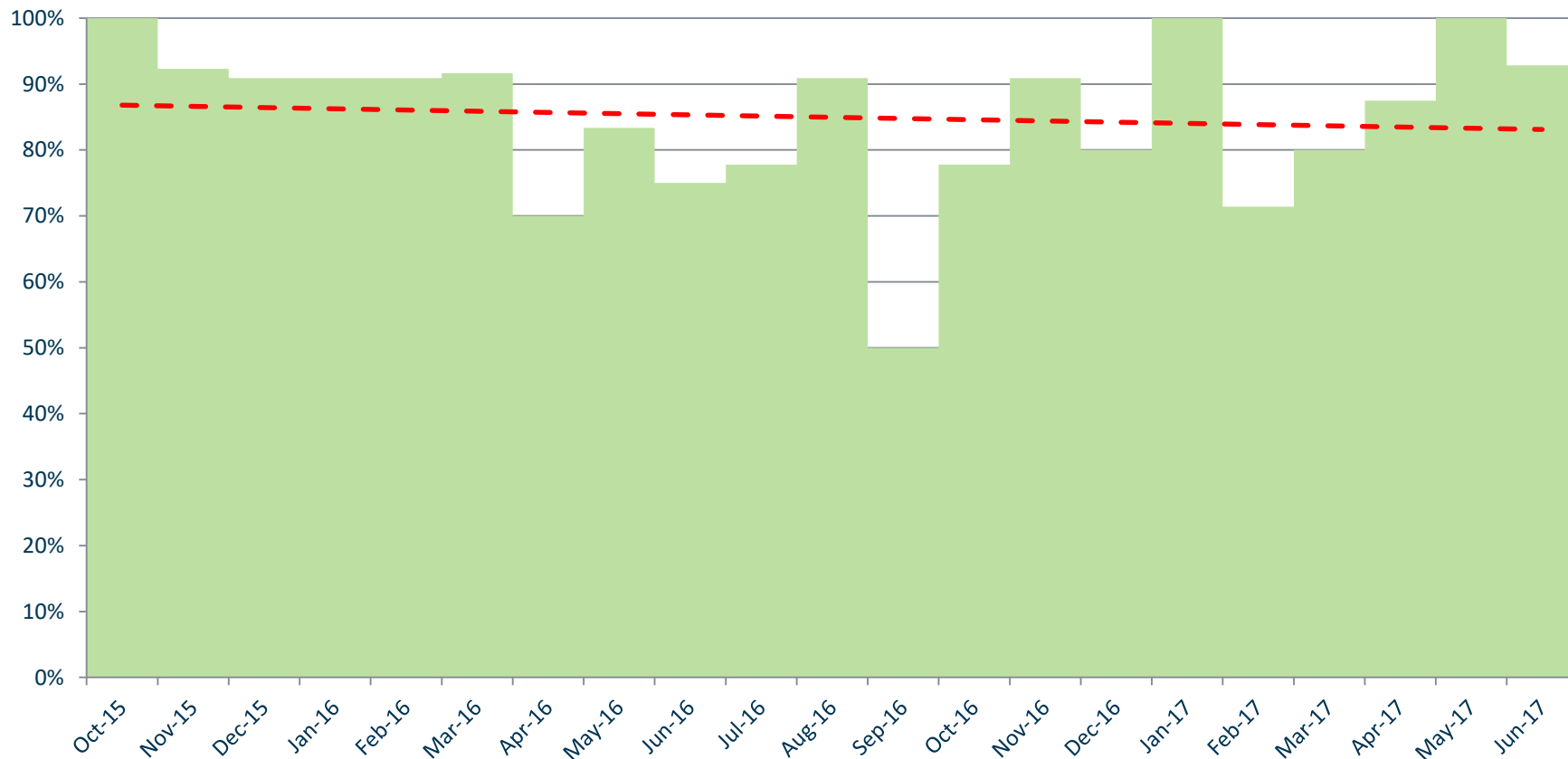
3 hour bundle: Blood Cultures

% Blood cultures prior to antibiotics

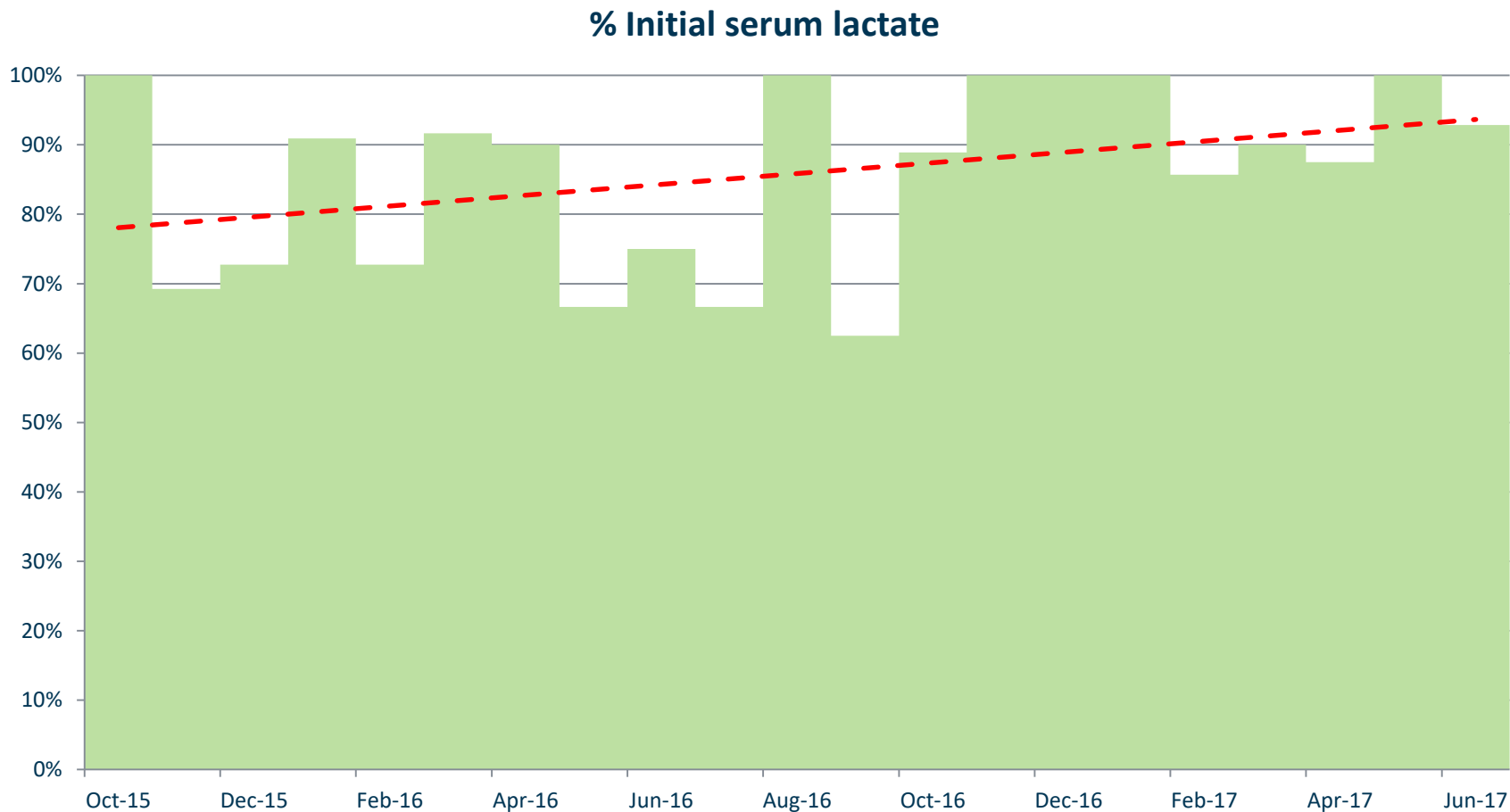


3 hour bundle: Antibiotics

% Antibiotic and/or Appropriate selection

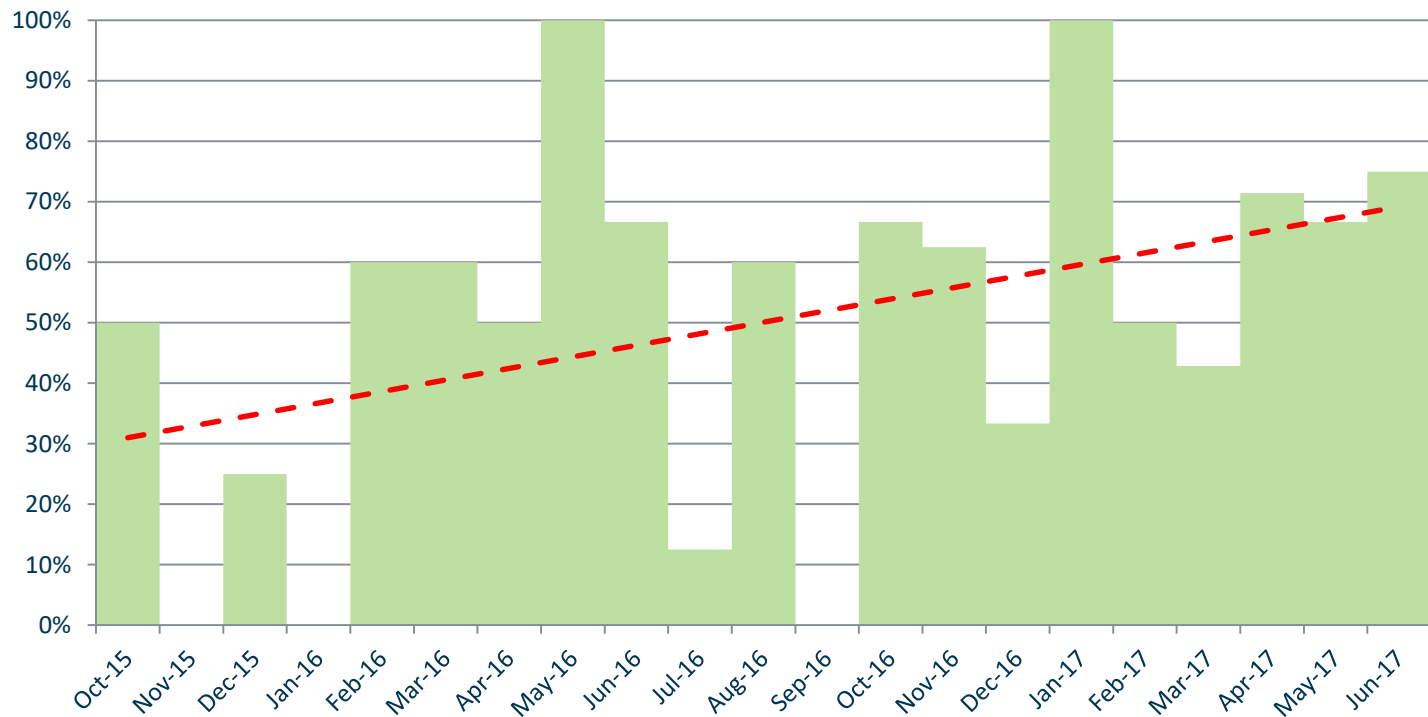


3 hour bundle: Initial Serum Lactate



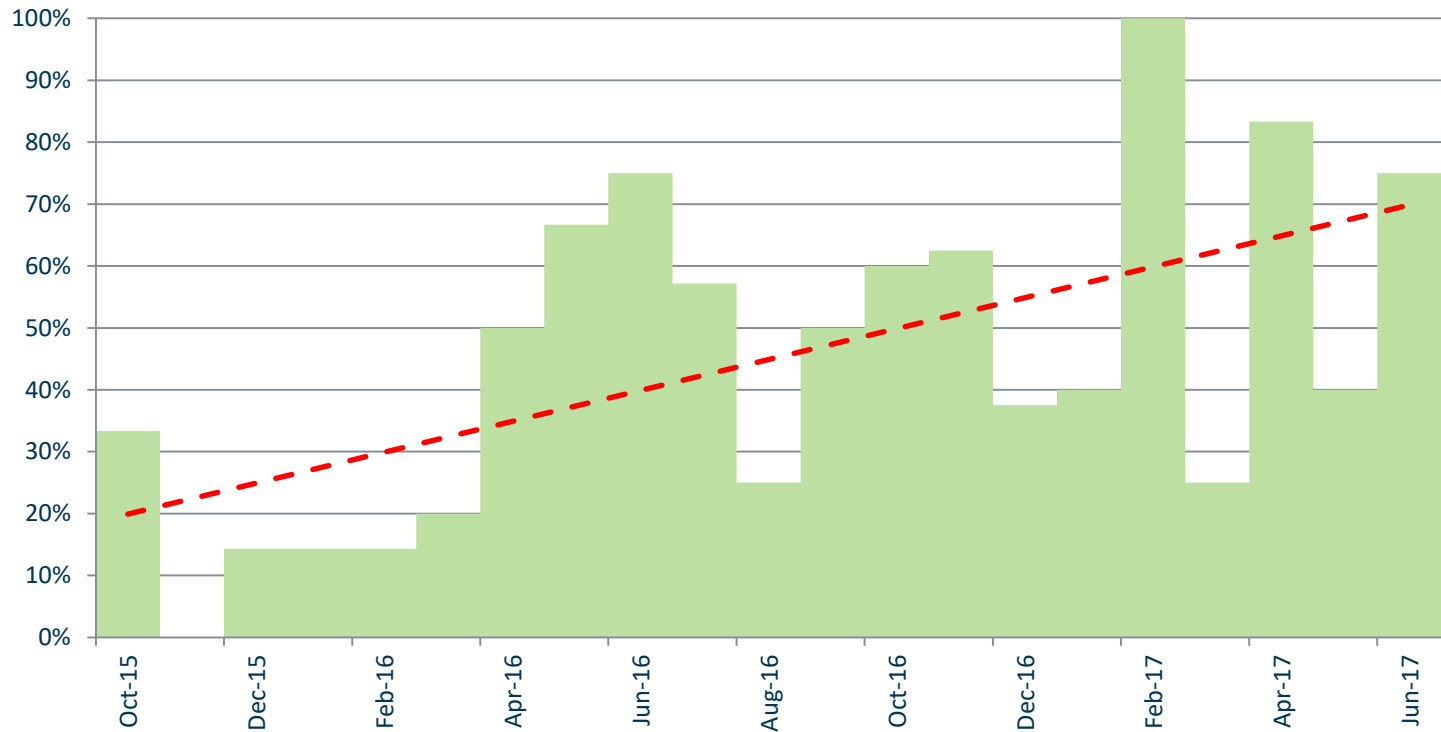
3 hour bundle: 30cc/kg fluid bolus

% Crystalloid fluids = to 30 ml/kg fluids



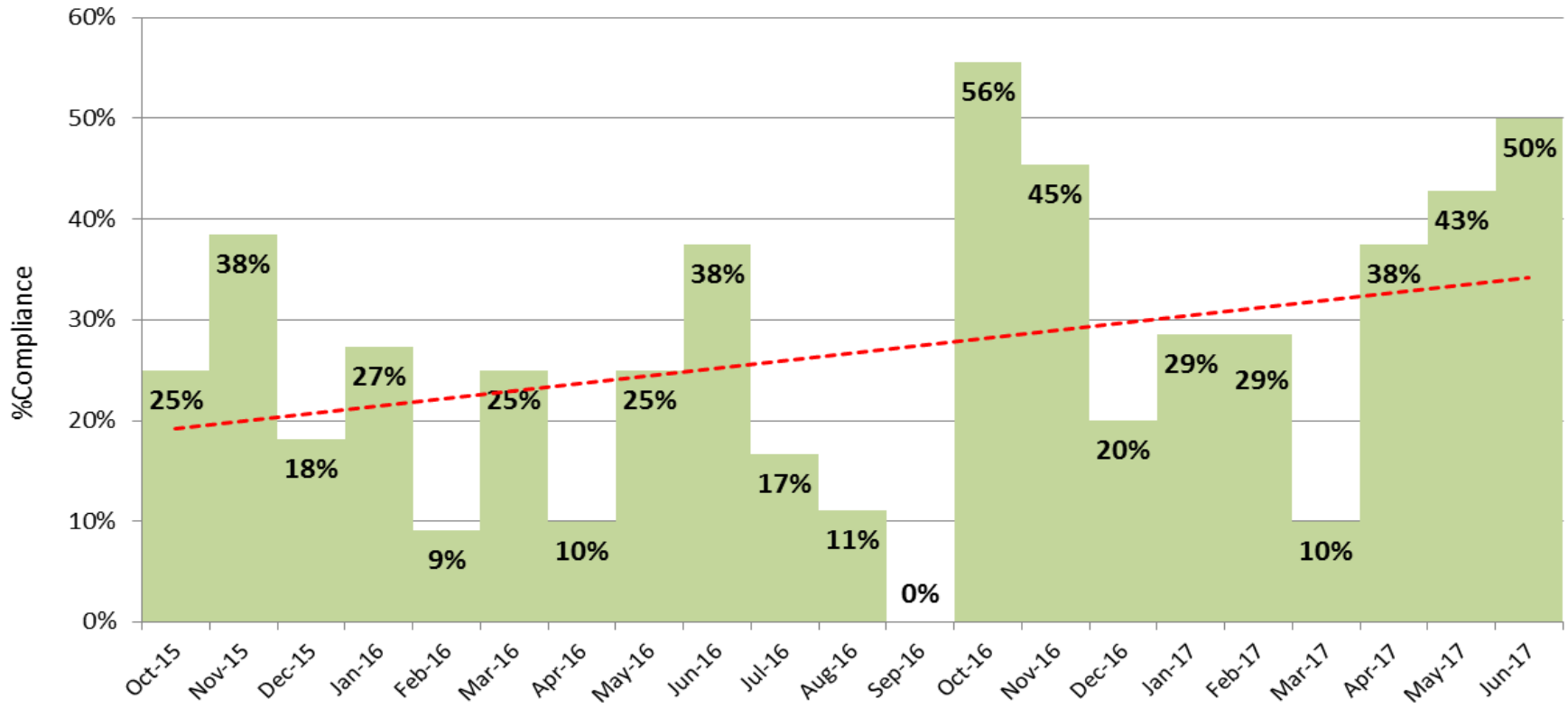
6 hour bundle: Repeat lactic acid level

% Repeat lactate for initial lactate > 2



What about the entire bundle?

SEP-1 Severe Sepsis/Septic Shock Early Management Bundle
% Received all appropriate care



How to focus our efforts and continue improvement

June 2017

116 cases
21 in sample

7 excluded due to

- 2 transfer from other acute care
- 4 no severe sepsis/septic shock criteria by documentation
- 1 comfort measures within 3 hours

BUNDLE COMPLIANCE:

50% (7/14) ALL bundle care

93% (13/14) Initial lactate

100% (14/14) Blood cultures

93% (13/14) Antibiotics

75% (9/12) Fluids \geq 30ml/kg

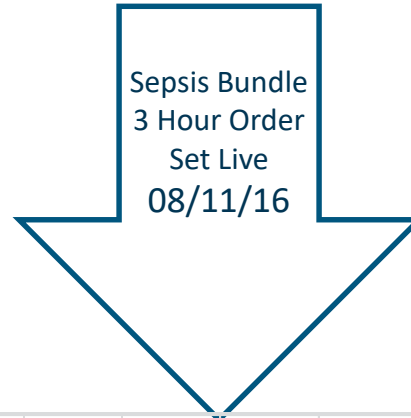
75% (6/8) Repeat Lactate

67% (2/3) Vasopressor

100% (3/3) Focused Exam

Tracking order set utilization

Sepsis Bundle
3 Hour Order
Set Live
08/11/16



Sepsis Order Set Use	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17
Core Measure Sepsis Focused Population Outcome Cases	117	112	119	115	131	116	100	132	116	106	112	100	112
Rapid Sepsis Screen	8	6	2	8	3	5	2	4	1	1	1	Not in use	
Sepsis Bundle 3 Hr Orders				19	32	30	32	53	38	44	39	42	79
Used in Sepsis Core Measure Population Sample											0/10	2/8	
Sepsis Bundle 6 Hr Orders	7	23		15	11	14	17	14	7	21	21	17	17

6 hour reperfusion exam note

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ADULT SEPTIC SHOCK

For Adults in septic shock with hypotension persisting after fluid administration OR initial lactate is greater than or equal to 4 mmol/L

This assessment is to be completed by the Physician/APN/PA in the time frame BETWEEN crystalloid fluid administration and no later than 6 hours after presentation of Septic Shock.

REPEAT VOLUME STATUS AND TISSUE PERFUSION FOCUSED EXAM ASSESMENT

Vital Signs	TEMPERATURE _____ HEART RATE _____ RESPIRATORY RATE _____ BLOOD PRESSURE _____
Cardiopulmonary Exam	HEART: <input type="checkbox"/> REGULAR RATE AND RHYTHM <input type="checkbox"/> IRREGULAR <input type="checkbox"/> 21, 22 <input type="checkbox"/> 23 <input type="checkbox"/> 24 <input type="checkbox"/> MURMUR LUNGS: <input type="checkbox"/> CLEAR <input type="checkbox"/> CRACKLES <input type="checkbox"/> DIMINISHED <input type="checkbox"/> DULL
Capillary Refill	<input type="checkbox"/> BRISK <input type="checkbox"/> LESS THAN 3 SECONDS <input type="checkbox"/> GREATER THAN 3 SECONDS
Peripheral Pulses	PODUL: <input type="checkbox"/> 1+ <input type="checkbox"/> 2+ <input type="checkbox"/> 0 POSTERIOR TIBIAL: <input type="checkbox"/> 1+ <input type="checkbox"/> 2+ <input type="checkbox"/> 0 DORSALIS PEDIS: <input type="checkbox"/> 1+ <input type="checkbox"/> 2+ <input type="checkbox"/> 0
Skin Examination	COLOR: <input type="checkbox"/> MOYLEAS <input type="checkbox"/> ROPY MOYLEAS
Comments	

Completed by:

Time _____ Date _____ Physician /APN/PA Signature _____

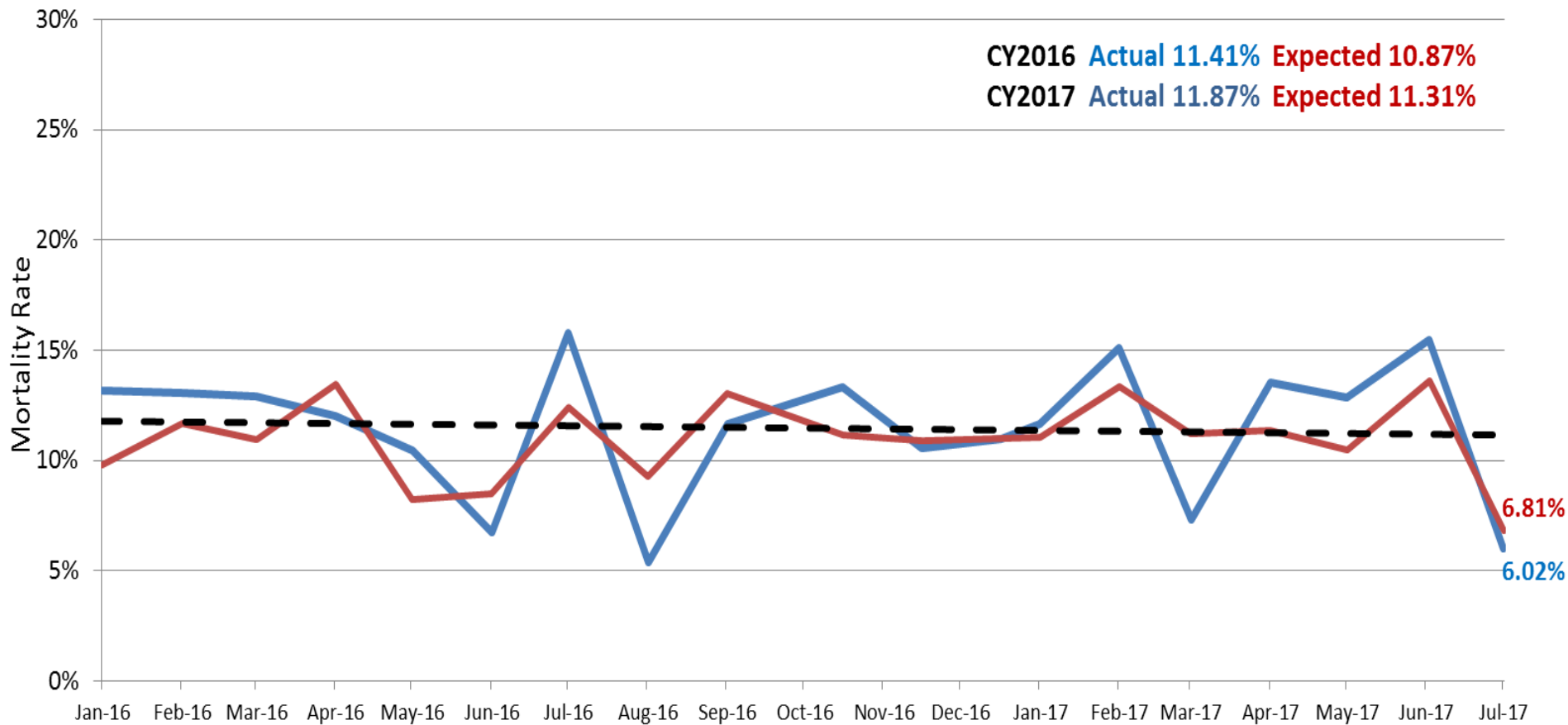
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ADULT SEPTIC SHOCK
 6015-110 Page 1 of 1 Rev. 09/2016

Are we saving lives?

MORTALITY RATE SEPSIS CORE MEASURE FOCUSED POPULATION* - ICD-10 Codes

— Actual — Expected - - Linear (Actual)



CareScience Methodology, Standard

We ARE saving lives!!

Take July 2017 for example:

116 severe sepsis/septic shock admissions

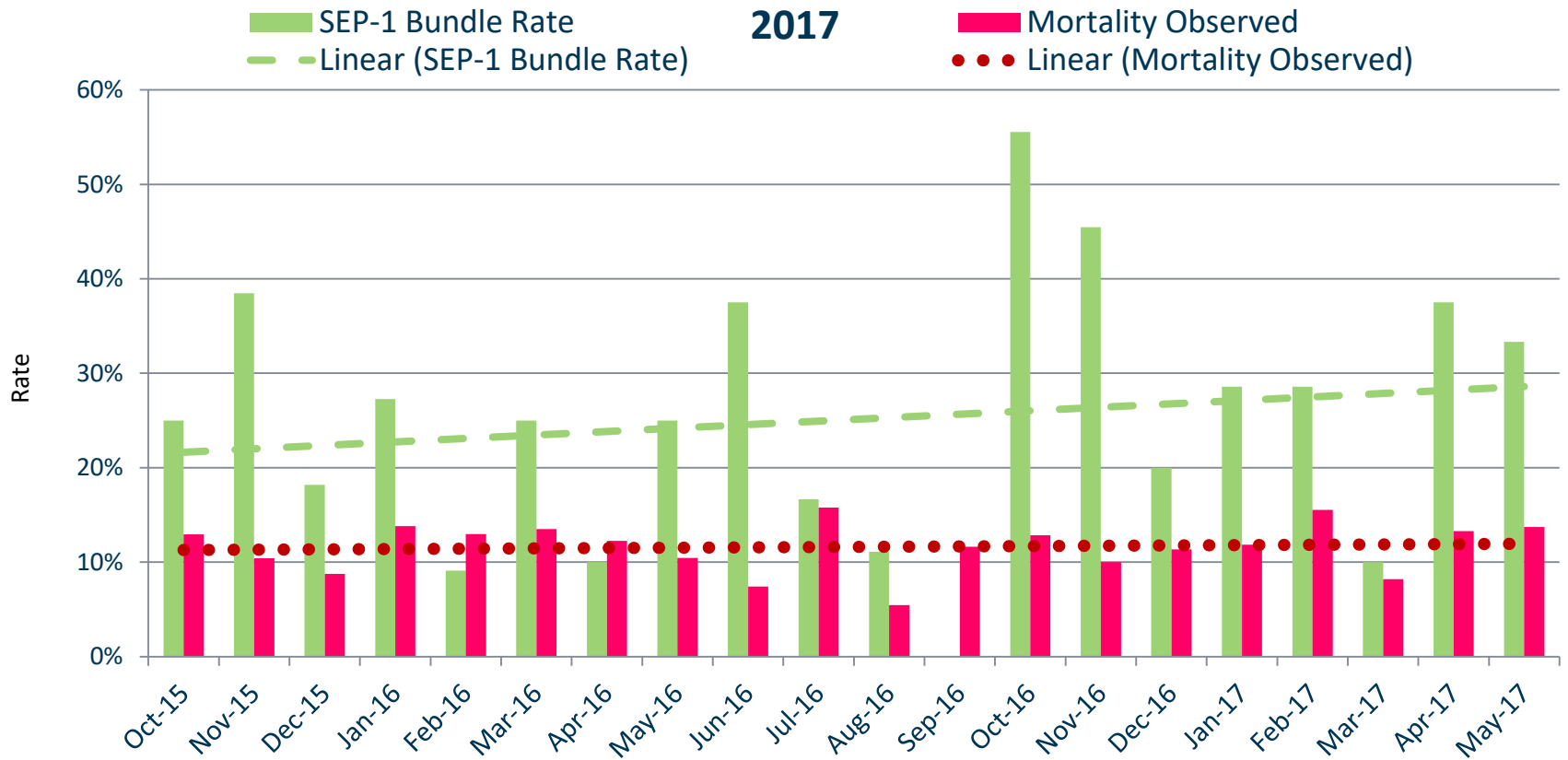
Using the mortality data found with Early Goal Directed Therapy of 30% risk of mortality- that would equal 35 patient deaths

We experienced a 6.02% mortality for the month of July- this meant 7 patient deaths

This means, just from the month of July, there are 109 people alive because of our focused efforts to reduce sepsis mortality and 28 of them beat the odds because of the same

Relationship between bundle compliance and mortality

Severe Sepsis/Septic Shock Core Measure* October 2015 – May 2017



*ICD-10 Severe Sepsis/Septic Shock Core Measure Focused Population -Premier Quality Advisor

A BIG THANKS to our team!

Committee Chair/Critical Care: Victor Chavez, MD

Co Chair/Critical Care: Joanna Johnson, RN

Emergency Department: Gladys Lopez, MD

Emergency Department: Becky Basham, RN

Hospitalist: Ramanand Heeralall, MD

ICU Nursing Director: Brian Marvel, RN

ICU Stepdown RN: Debra Gogel, RN/Jenanne Locker, RN

Med & Surg Floors: Kim Salee, RN

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