



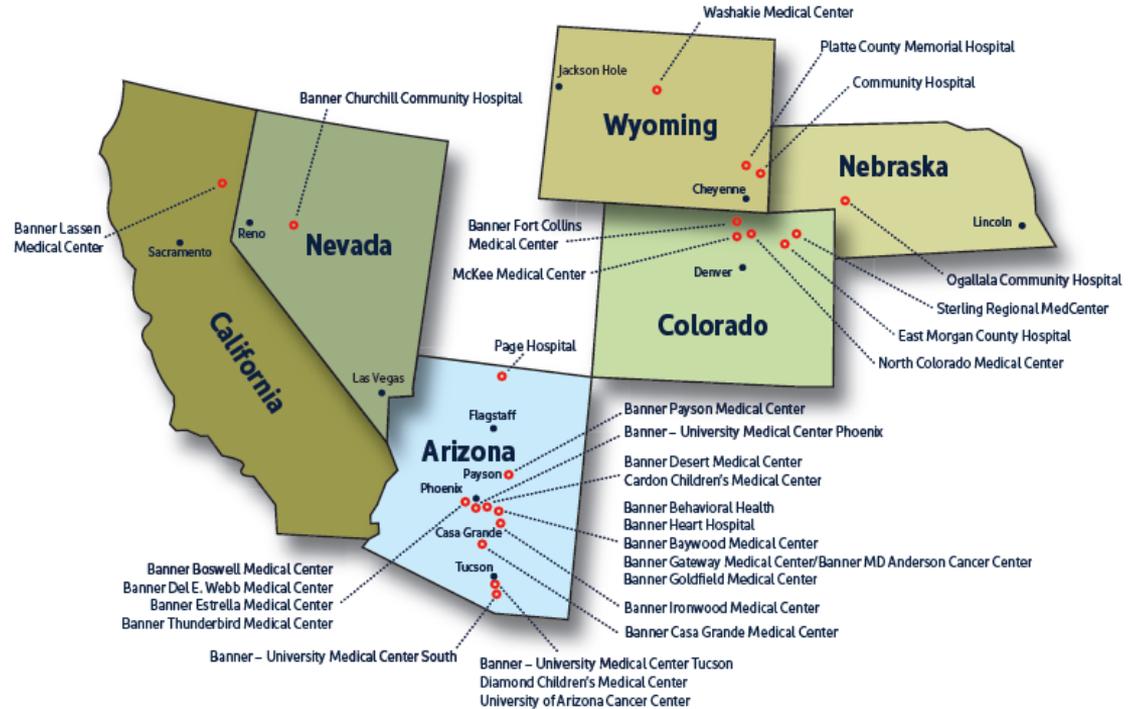
# 2018 Nicholas E. Davies Enterprise Award of Excellence

William Holland, MD, VP Care Management, CMIO

Michael Simons, MD, Medical Director, Virtual Care

# Banner at a Glance

- » 28 Acute Care and Critical Access Hospitals
- » Behavioral Hospital
- » Banner Health Network
- » Banner Network Colorado
- » Banner Medical Group and Banner – University Medical Group with nearly 2,000 physicians and advanced practitioners and more than 200 Banner Health Centers and Clinics
- » Banner Home Care and Hospice
- » Outpatient Surgery
- » Urgent Care
- » Banner – University Medicine division
- » \$7.6 billion in revenue in 2016
- » AA- bond rating
- » \$753 million in community benefits, including \$89 million in charity care (2016)



# Our Mission:

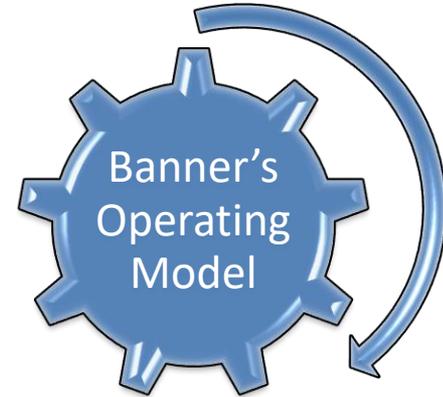
**Making healthcare easier,  
so life can be better.**

# Our Strategy:



# The Banner Operating Model

- Integrated governing process
  - Single Board of Directors
  - Centralized management structure
  - Centralized corporate functions
- Designed to achieve results
  - Enhance clinical quality
  - Affordable cost model
  - Patient/member experience
- Alignment from strategy through initiatives
  - Drives common strategy from senior leaders down through entire organization
  - Allows IT leaders to tightly align technology strategies with Banner strategy
  - Aligns IT sub-strategies and tactics across IT operations



# Clinical Reliability at Banner

- **Banner's approach** to quality and safety is based on ensuring reliability\* of its clinical systems and processes including:



**Defining** clinical standards, **designing** delivery processes, and **implementing** across the organization



**Monitoring** and **assessing** performance to those standards and addressing periodic issues



**Identifying** and **addressing** opportunities for further improvement

*\*The capability of a process, procedure or health service to perform its intended function in the required time under existing conditions. (IHI, 2004)*

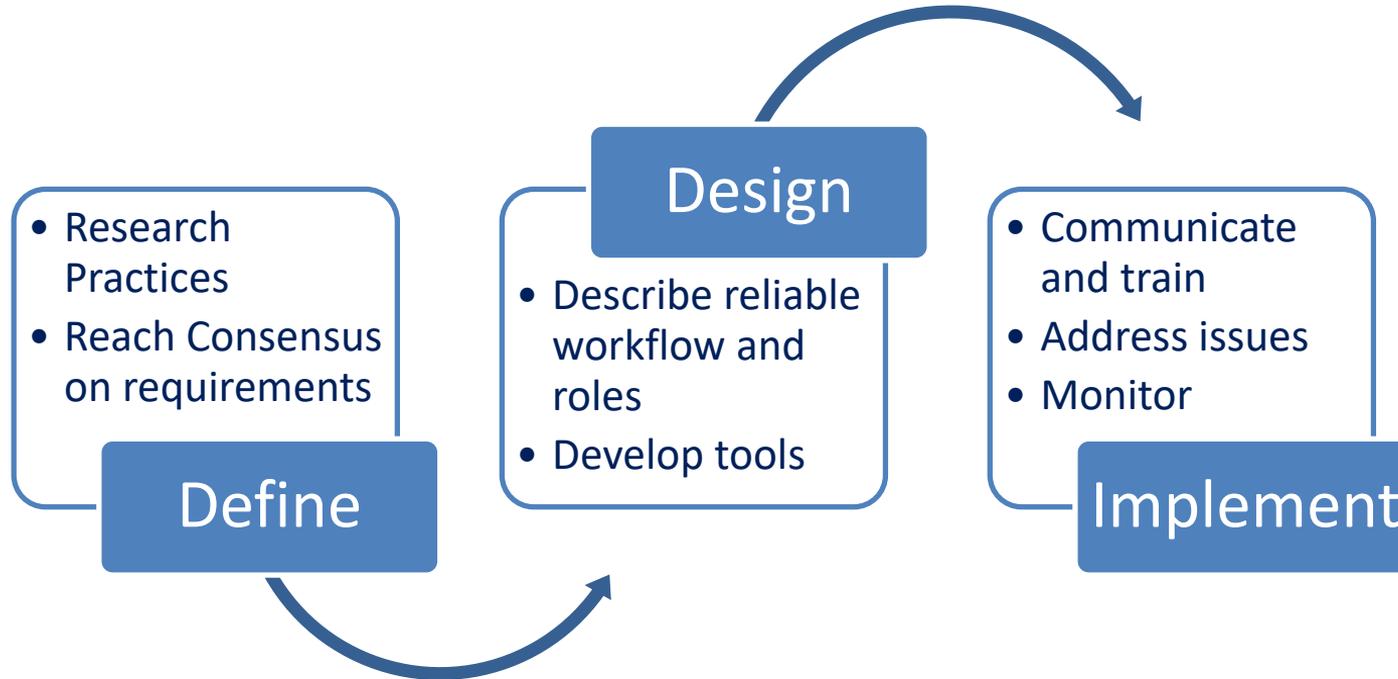
# Clinical Consensus Groups (CCG)

**Purpose:** Define expected clinical practices for Banner Health based on best available evidence, including practice- based evidence.



# “Engineering” New Models

## *DDI Process for Implementing Evidence Based Clinical Practices*



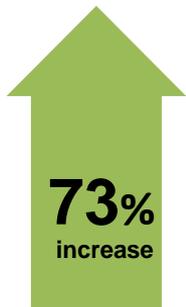
# Virtual Care

*Increasing Capacity to Deliver Highly Reliable Care*

# Local Problem

**How does Banner Health improve outcomes by providing highly reliable care while increasing capacity to deliver care?**





By 2029, when the last round of boomers reaches retirement age, the number of Americans 65 or older will climb to more than

**71 million**

**up from about 41 million in 2011**  
according to Census Bureau estimates.

*The National  
Academies of*

SCIENCES  
ENGINEERING  
MEDICINE

IOM report suggests that, in the United States, one-third of all hospital patients experience harm during their stay and, each year, more than 400,000 preventable hospital deaths occur..



### Mortality rates in ICU

**average 10-20%** Overall, over 200,000 patients die in US ICUs each year. Given the high stakes involved, the quality of care delivered in ICUs is particularly important. Unfortunately, evidence suggests that quality varies widely across hospitals.



The NEW ENGLAND  
JOURNAL of MEDICINE

### Physician Shortages in the Specialties Taking a Toll

The short list includes cardiology, critical care, diagnostic radiology, oncology, and orthopedic surgery. Shortages in dermatology, general surgery, neurology, psychiatry, urology, and vascular surgery



Market Innovation Center

### Virtual Visits Will be the Primary, Preferred Access Points for Routine, Low-Acuity Care

94% Resolution rate for virtual visits – no follow-up care needed after visit.

# Telemedicine: it's more than technology



# Current TeleICU Deployment



## Current Statistics

- > 600 beds
- 26 facilities
- 47 units
- 5 tele-intensivists + 2 AC-NP's / night
- 1 tele-intensivist / day
- ~ 12 CC RN's ATC
- 3-4 unit secretaries ATC

# Keys to Success

## Culture

- Clinical Consensus Group governance
- Educational materials to patients/ families
- 2 way audio/ video in monitored rooms
- Arranged visits to tele-ICU operations center for bedside nurses

## Procedures

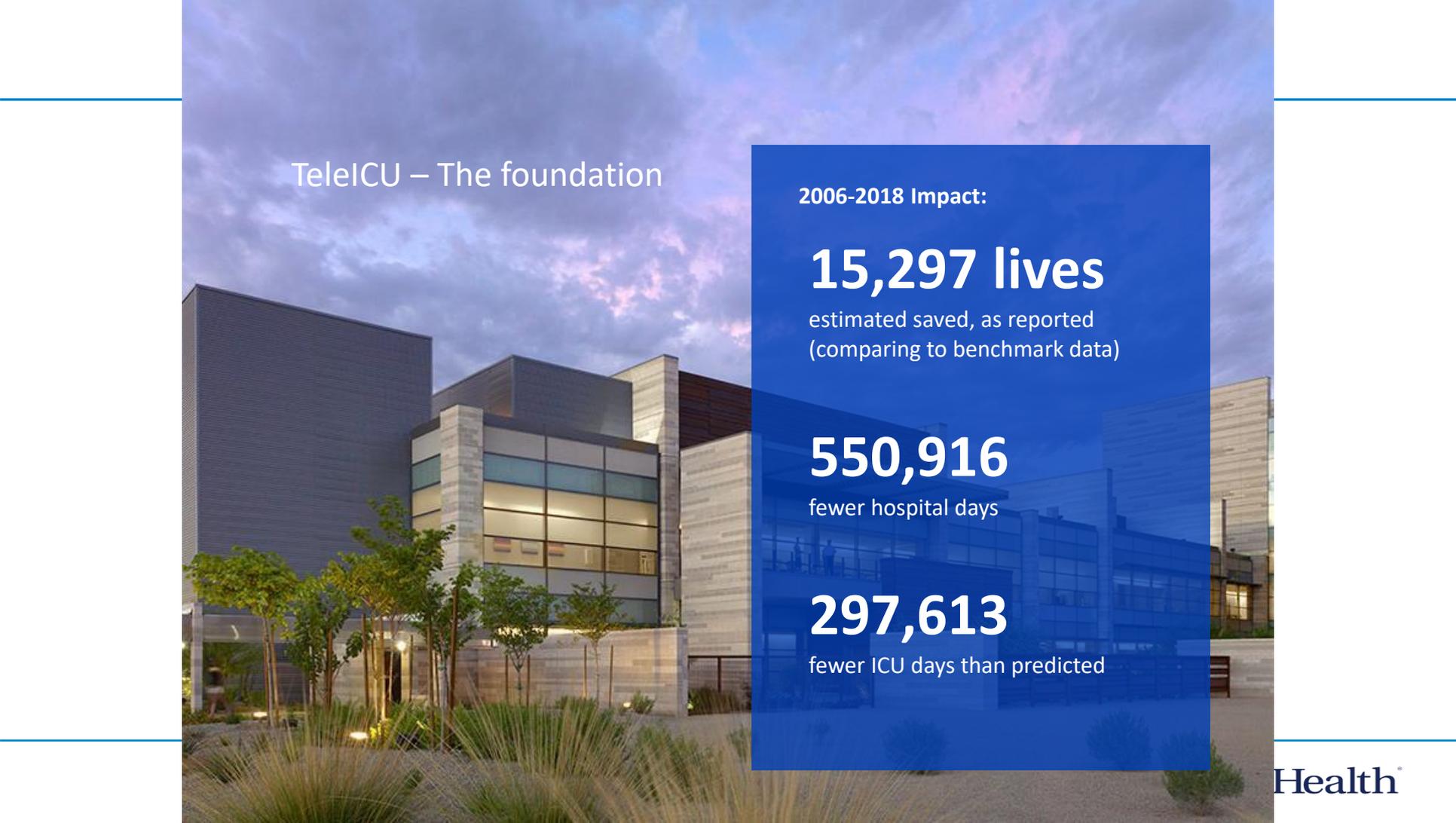
- Managed by alternate, available in-house providers or newly trained non-physician teams

## Physical Exam

- All monitored rooms equipped with high-definition, tele-intensivist controlled cameras
- Ability to view all vital signs data from all rooms in real-time
- RT performed, tele-intensivist interpreted real-time limited cardiac US

## Financing

- Funded by all receiving facilities with expectation of cost avoidance savings from LOS reduction



TeleICU – The foundation

2006-2018 Impact:

**15,297 lives**

estimated saved, as reported  
(comparing to benchmark data)

**550,916**

fewer hospital days

**297,613**

fewer ICU days than predicted

## Additional Telemedicine Programs

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- Behavioral Health
  - ED
  - Integrated to PCP offices
- Stroke
- Specialty Consults
  - Inpatient
  - Clinic to clinic
- Direct-to-consumer virtual PCP

# The Evolution of the Sepsis / SaFE Alert



# Origins within Banner

- Sparked by the 100,000 Lives Campaign and Surviving Sepsis
- Developed in 2010-2011, after a trial of 6 months, work was continued in 2012 part of the CIPI Strategic Initiative
  - Comprised of 3 components
    - Severe Sepsis/ Septic Shock expected clinical practice
    - A real-time, automated EMR-based screening system with alert notifications
    - Care sets optimized in alignment with the CP
  - 2012 Metrics included:
    - Outcome measure—severe sepsis house-wide mortality
    - Process Measure—sepsis bundle compliance
    - Context Measure—failure investigation



# The Clinical Practice

**TITLE: Severe Sepsis/Septic Shock Adult**

**PRACTICE APPROACH:**

Expected Clinical Practice\*

**DESCRIPTION:**

Severe sepsis and septic shock patients will be identified on admission or throughout the continuum of hospital stay and have standardized interventions of time-sensitive therapy utilizing the sepsis resuscitation and management bundles leading to reduction in mortality and length of stay.

**RATIONALE:**

Severe sepsis and septic shock are common entities with mortality rates exceeding 30 percent. In 2003, experts representing 11 international organizations developed management guidelines for severe sepsis and septic shock that would be of practical use for the bedside clinician. The Surviving Sepsis Campaign, an international effort to increase awareness and improve outcome in severe sepsis/septic shock, has set a goal of 25 percent reduction in overall mortality due to sepsis by 2009. Reducing mortality due to severe sepsis requires an organized process that guarantees early recognition and consistent application of the best evidence-based practices. The speed and appropriateness of therapy administered in the initial hours of severe sepsis

- Contained requirements for sepsis “resuscitation” and “management” bundles
- Timelines defined for each clinical care expectation
- Has been revised over the years, based upon changes in our local experience and the sepsis literature

# Automated, Real-Time EMR Surveillance

## Systemic Inflammatory Response Syndrome (SIRS) Criteria

- Respiratory Rate > 20
- Heart Rate > 90
- Core temperature < 36°C or > 38.3°C
- WBC < 4 or > 12 or Bands > 10

## Organ Dysfunction (OD) Criteria

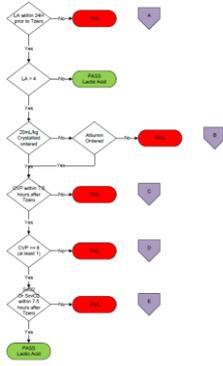
- Creatinine > 2.0 and increased from prior result and not on epoetin alfa (home or IP med)
- Bilirubin Total > 2.0 and increased from prior result by .5
- Platelet < 100k and decreased from prior result
- aPTT > 60 and no active order for anticoagulant
- Hypoxemia: O2 Saturation < 90
- Delirium Assessment = Positive
- MAP < 65
- SBP < 90
- Lactic Acid > 2.2
- INR > 1.5
- Urine output < 0.5 mL/kg/hr for 2 or more hours

Timeframes were critical to ensure the timely capture of a clinically significant change

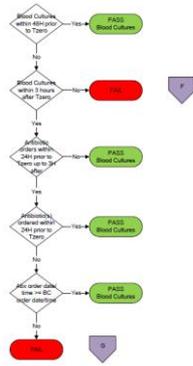
- 2 SIRS criteria must be met within 6 hours\*
- 1 acute, organ system dysfunction
- Each SIRS and OD were independent events, if each occurred within 8 hours of the other, an alert was triggered, and this time was used as “T-zero” for calculating bundle compliance

# Sepsis/ Shock Logic

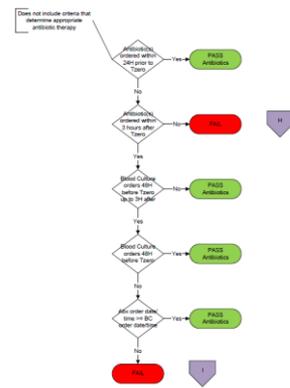
## Lactic Acid Logic



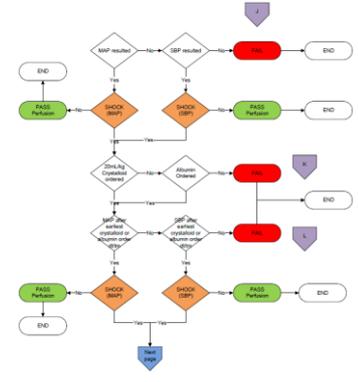
## Blood Culture Logic



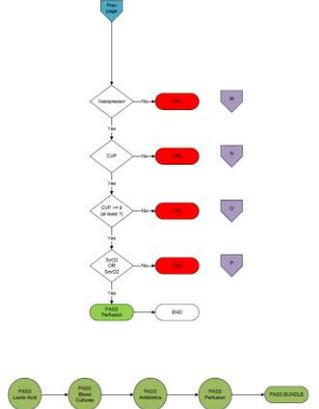
## Antibiotic Logic



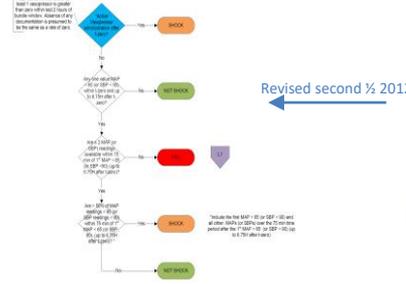
## Perfusion Logic



## Flow Logic

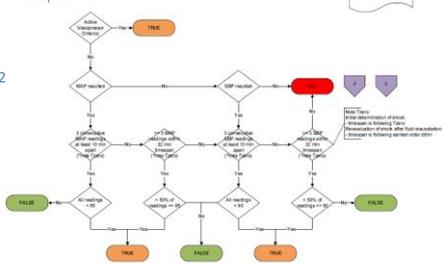


## Shock Logic



Revised second 7/2012

## Shock Logic



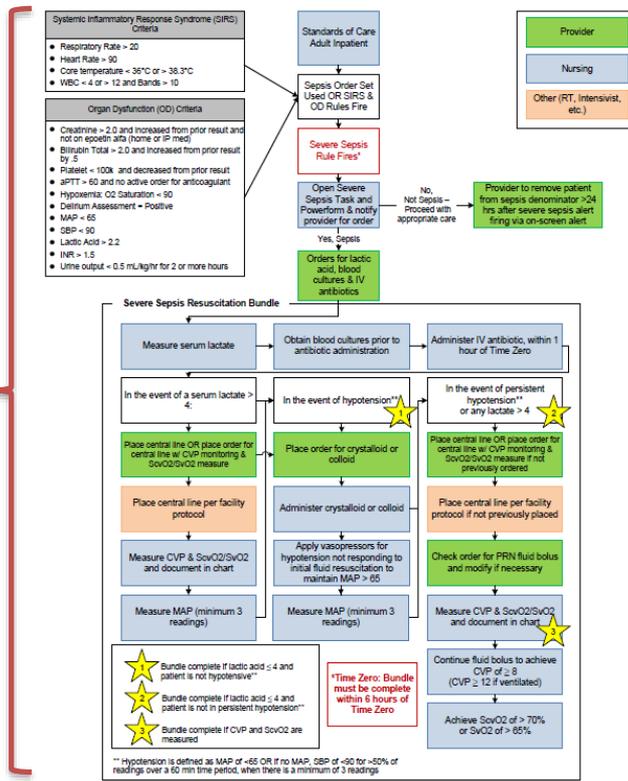
# Placing in the Preliminary Sepsis Denominator

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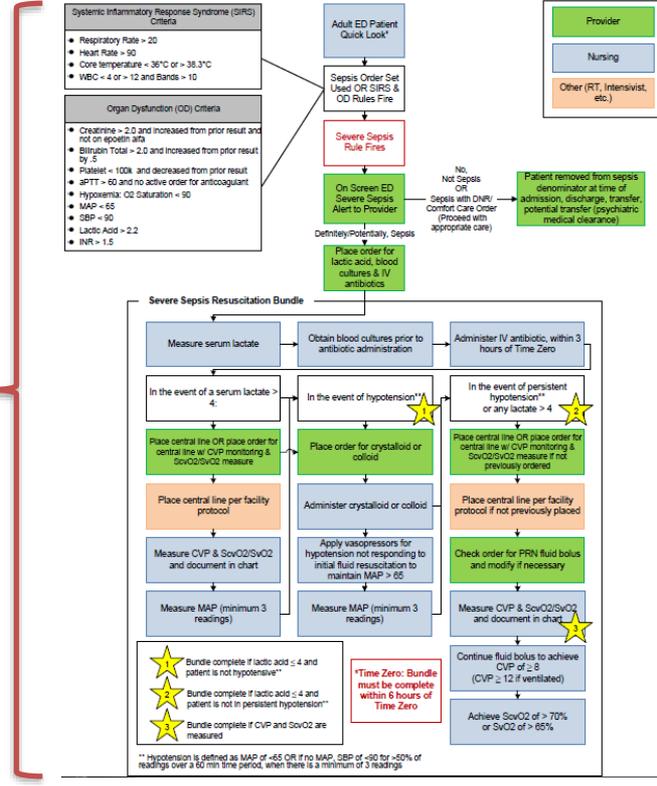
1. + sepsis alert per EMR surveillance
  - a. Inpatient based on listed triggers
  - b. ED based on same triggers + ED statement of “Definitely/ Potentially” infected at time of inpatient status placement
2. Use of sepsis care set
  - \* *exclusion of patient with DNR/ comfort care [cs] prior to or within 6.75 hours of alert*

# Different Workflows were Developed Based on Patient's Location

Inpatient



ED



# Onscreen Alert Facilitated the Expected Management

Severe Sepsis Alert - zzztest, roitest

Performed on: 11/30/2011 0839 MST

**Severe Sepsis Alert**

**ALERT THIS PATIENT HAS 2 OR MORE CRITERIA IDENTIFYING SYSTEMIC INFLAMMATORY RESPONSE SYNDROME (SIRS) AND ORGAN DYSFUNCTION (OD)**

Purpose: Nursing to notify the provider that the Severe Sepsis Alert has fired.

Trigger: Review the Service Sepsis Alert Order or Sepsis mPage for the criteria which has triggered this alert.

Note: If serum lactate is > 4 mmol/L, notify provider or obtain order to insert central line. CVP and ScvO2/SvO2 MUST be obtained within the 6 hours of Time Zero (T0)

**Physician Notification**

Notification Reason	Physician Notified	Notification Status
Severe sepsis alert		

Comments

Provider Collaboration Completed

Yes

Orders Received (selecting the items below, does not place orders)

- Lactic acid
- Blood culture(s)
- Broad spectrum antibiotic
- IV fluid bolus
- Vasopressors
- Central line
- No order received

**Severe Sepsis Resuscitation Bundle**

The Goal is to perform all indicated tasks 100% of the time within the first 6 hours of identification of severe sepsis.

1. Measure serum lactate
2. Obtain blood cultures prior to antibiotic administration
3. Administer broad-spectrum antibiotic, within 3 hour of ED admission and within 1 hour of non-ED admission
4. In the event of hypotension or a serum lactate > 4 mmol/L
  - a. Deliver an initial minimum of 20 ml/Kg of crystalloid or an equivalent
  - b. Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) > 65 mmHg
5. In the event of persistent hypotension despite fluid resuscitation (septic shock) or lactate > 4 mmol/L
  - a. Achieve a central venous pressure (CVP) of  $\geq$  8 mmHg ( $\geq$  12 mmHg if mechanically ventilated)
  - b. Achieve a central venous oxygen saturation (ScvO2)  $\geq$  70% or mixed venous oxygen saturation (SvO2)  $\geq$  65%

RN Provider Notification

**ED SEVERE SEPSIS**

You have signed orders using one of the sets identifying the patient as severely septic.

There will be an opportunity to CONFIRM sepsis diagnosis at the time of ED discharge.

Thank you!

**IP SEVERE SEPSIS**

You have signed orders using one of the sepsis order sets identifying the patient as severely septic.

There will be an opportunity to CONFIRM or REMOVE the sepsis diagnosis at the time of the patient's discharge.

Thank you!

Care Set Inclusion Notifications

**SEPSIS BUNDLE REQUIREMENTS**

ATTENTION: Severe sepsis is a medical emergency! The patient has been tentatively identified as severely septic by the following criteria:

SIRS: Respiratory Rate > 20, Heart Rate > 90, and Abnormal Blood Pressure < 90

and, the following sepsis bundle items are currently missing:

- Lactic Acid
- Blood Culture
- IV Antibiotics

Please ensure that Lactic Acid and Blood Cultures are ordered and initiated.

Links to Sepsis Ordersets have been provided below for your review.

Add Order for:

SEPSIS Resuscitation Bundle, Inpatient (Int)

**LACTIC ACID >4**

This patient's Lactic acid is >4mmol/L.

If this abnormality is due to suspected/confirmed infection, this patient REQUIRES the following:

- > IV fluids (20 mL/kg normal saline)
- > Central line placement (internal jugular, subclavian, PICC acceptable)
- > CVP goal obtained within 6 hours of t-0
  - Obtain CVP > 8mmHg for non-vented patents
  - Obtain CVP > 12 mmHg for vented patents
- > Obtain ScvO2 or SvO2 measurement within 6 hours of t-0 (Goal  $\geq$  70%)

Activate Sepsis Alert Team per facility protocol. Arrange for transfer to ICU.

Thank you!

OK

Missing Bundle Elements

Elevated Lactic Acid Notification

# Customized Care Sets Deployed

## SEPSIS Resuscitation Bundle, Inpatient [cs]

Use of this order set will add the patient to the sepsis denominator. At the time of patient's discharge, you will have the opportunity to confirm sepsis diagnosis or remove the patient if clinically appropriate.

### TRANSFER

There is no need to create a Transfer Order if the patient is already housed in an ICU

- Transfer To** - T;N, CONTINUOUS Cardiac Monitoring, ICU | Severe Sepsis/Septic Shock | Norepinephrine

### VITAL SIGNS

- Vital Signs** - Q15MIN x 2 hours, then Routine ICU frequency, T;N

### LABORATORY (Bundle Elements)

- Lactic Acid**- T;N, Stat, ST, Print Label
- Blood Culture (Blood Culture #1)** - T;N, TS
- Blood Culture (Blood Culture #2)** - T;N+1, TS
- RSP ABG Lactic Acid** - Timed Study, Arterial, Q6H, 2, time(s)
- POCT by Nursing 1x only - Routine, Lactic Acid, Q6H 2 times, If your facility is not certified for POC lactic acid testing, please place the Lactic Acid Serum order in Cerner and verify that a specimen gets drawn and sent to lab., T;N

### Initial IV FLUIDS

- Sodium Chloride 0.9% (NS (bolus))** - 20 mL/kg IV, 1XONLY, Solo, PRN Other (see comment), Spec 1x; Give over 30 min. Administer for MAP<65 mmHg or SBP<90 mmHg or lactic acid>4.0 mmol/L, If not already given.

If MAP < 65 mmHg or SBP < 90 mmHg after initial bolus (above) patient needs central line: (?) Add nested order set?  
Follow initial bolus with

- Central Venous Pressure Monitoring** - Continuous (Preferred) or Q1H for the first 24 hours., T;N (add comment re: MAP If MAP < 65 mmHg or SBP < 90 mmHg after initial bolus (above) patient needs central line)

Add ScvO2 Proposed Change: Should be pre-checked, ScvO2/SvO2 monitoring - "new Order"

- ScvO2/SvO2 monitoring order**- new order which will be a shared task between nursing and RSP.

Will be a done/not done with a new order and frequency of q2 x2. ED- nursing head icon and RSP-  
icon. This will replace the nursing and respiratory communication orders in the ED severe  
sepsis, Inpatient Sepsis, Inpatient Transfer Severe Sepsis and Severe Sepsis/Septic Shock care sets.

- Sodium Chloride 0.9% (NS (bolus))** - 500 mL IV, Q30MIN, Solo, PRN Other (see comment),  
Spec 1x; Administer IF CVP < 8 mmHg (OR < 12 mmHg if mechanically ventilated) over 30  
minutes.  
Administer IF CVP < 8 mmHg (OR < 12 mmHg if mechanically ventilated) over 30  
minutes.
- Notify Physician** - T;N, If fluid bolus exceeds 5 liters.

- Notify Physician** - T;N, If fluid bolus exceeds 5 liters.
- norepinephrine (norepinephrine (Levophed) infusion)** - Start infusion at 2 mcg/min, IV, Titrate Q1MIN by 5 mcg/min IV, Begin if MAP < 65 after initial fluid bolus. (Max rate = 50 mcg/minute). SEE ORDER COMMENTS 8 mg/250 mL 0.9% NaCl (0.032 mcg/mL; 32 mcg/mL) (max 16 mg/250 mL; 64 mcg/mL), keep MAP > 65, IV...  
Begin if MAP < 65 after initial fluid bolus. (Max rate = 50 mcg/minute). If the patient is severely hypotensive a higher starting dose and titrating dose may be necessary initially. Notify physician if there is more than a 25 mcg/min increase in maintenance rate. If above maximum reached, contact physician for higher dosing (no absolute maximum dosage has been defined for this drug)
- vasopressin (vasopressin (Pitressin) infusion)** - Start infusion at 0.03 units/min, IV, Titrate Down Q10MIN by 0.01 units/min IV, May titrate down every 10 minutes by increments of 0.01 units/min (Max rate = 0.04 units/min) 60 units/100 mL 0.9% NaCl (0.6 units/mL) (max same as standard), keep MAP > 60, I
- DOPamine (DOPamine infusion)** - Start infusion at 5 mcg/kg/min, IV, Titrate Q10MIN by 5 mcg/kg/min IV, (Max rate = 20 mcg/kg/min). If the patient is severely hypotensive, a higher starting dose and titrating dose may be necessary initially. standard 400 mg/250 mL DSW (1.6 mg/mL; 1600 mc
- DQBUTamine (DQBUTamine infusion)** - Start infusion at 2.5 mcg/kg/min, IV, If SvO2 < 70% or SvO2 < 65% despite CVP > 8 mmHg, MAP > 65 mmHg, and Hct > 30%, then start infusion. Titrate Q5MIN by 2.5 mcg/kg/min IV, (Max rate = 20 mcg/kg/min) to achieve an SvO2 greater than 65% OR ScvO2 greater  
If SvO2 < 70% or SvO2 < 65% despite CVP > 8 mmHg, MAP > 65 mmHg, and Hct > 30%, then start infusion.  
Hold titration for HR>120 and Notify Physician.
- DQBUTamine (DQBUTamine infusion)** - Start infusion at 2.5 mcg/kg/min, IV, Physician to manage further changes. standard 500 mg/250 mL DSW (2 mg/mL; 2000 mcg/mL) (max 1250 mg/250 mL; 5000 mcg/mL), IV solution = DSW 250 mL, ISN
- phenylephrine (phenylephrine (Neosynephrine) infusion)** - Start infusion at 50 mcg/min, IV, Titrate Q1MIN by 20 mcg/min IV, (Max rate = 200 mcg/minute) 40 mg/250 mL 0.9% NaCl (0.16 mg/mL; 160 mcg/mL) (max 100 mg/500 mL; 200 mcg/mL), keep MAP > 60, IV solution = 0.9% NS 250 mL, T;N
- epinephrine (EPINEPHrine infusion)** - Start infusion at 1 mcg/min, IV, Titrate Q3MIN by 1 mcg/min IV, (Max rate = 10 mcg/min) Standard 8 mg/250 mL 0.9% NaCl (0.032 mcg/mL; 32 mcg/mL) (max same as standard), keep MAP > 65, IV solution = 0.9% NS 250 mL, T;N

### NURSING ORDERS

- Notify Physician Output** - Output below Urine output below 0.5 mL, x 2 hours, T;N
- Notify Physician** - T;N, SEE ORDER COMMENTS  
FOR ANY OF THE FOLLOWING:  
IF unable to maintain MAP > 65 mmHg,  
IF HR >= 130,  
IF need to initiate norepinephrine OR > 25 mcg/min increase in rate,  
IF > 2 IVF boluses required OR fluid boluses exceed 5 liters,  
IF oxygen saturation < 90%,  
IF significant decline in mental status, and  
IF central venous oxygen saturation consistently < 65% (SvO2) or 70% (ScvO2).

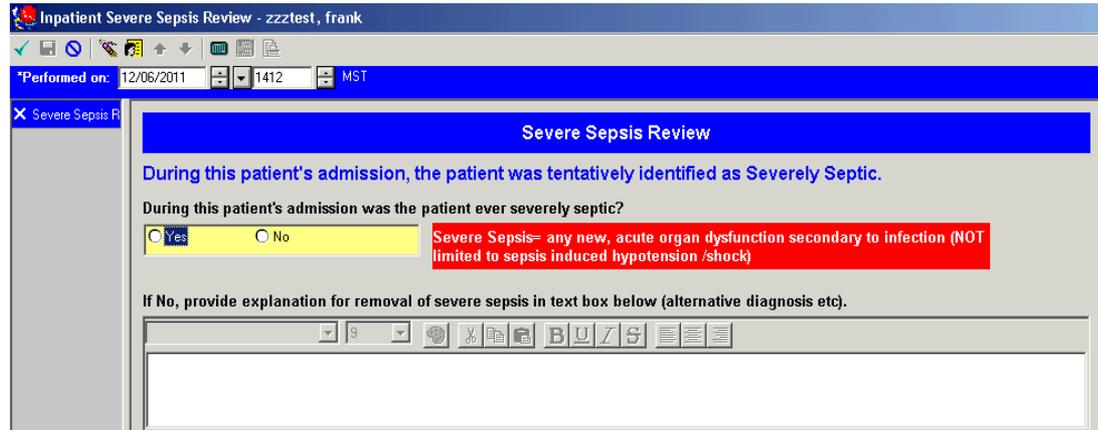
### ANTIBIOTIC ORDER SETS - move to end

Select the order set below applicable to your patient If antibiotics are not currently ordered for the suspected infectious process

- SEPSIS Suspected Community Acquired Pneumonia [cs]**
- SEPSIS Suspected Healthcare-Associated Pneumonia [cs]**
- SEPSIS Suspected Intraabdominal [cs]**
- SEPSIS Suspected Line Infection or Unknown Source [cs]**
- SEPSIS Suspected Meningitis [cs]**
- SEPSIS Suspected Skin and Soft Tissue [cs]**
- SEPSIS Suspected Urosepsis [cs]**

# Locking the Denominator (early 2012)

- Determined by physician attestation at discharge



The screenshot shows a web-based form titled "Inpatient Severe Sepsis Review - zzztest, frank". The form includes a header with the title "Severe Sepsis Review" and a blue bar containing the text "During this patient's admission, the patient was tentatively identified as Severely Septic." Below this, a question asks "During this patient's admission was the patient ever severely septic?". There are two radio buttons: "Yes" (which is selected) and "No". To the right of the radio buttons is a red box containing the text "Severe Sepsis= any new, acute organ dysfunction secondary to infection (NOT limited to sepsis induced hypotension /shock)". Below the question, there is a text box with the instruction "If No, provide explanation for removal of severe sepsis in text box below (alternative diagnosis etc.)". The text box is empty and has a toolbar with icons for undo, redo, bold, italic, and other text formatting options.

\*If no response by 7 days after discharge, patient was defaulted into sepsis denominator

# ...Late 2012

### Severe Sepsis Review

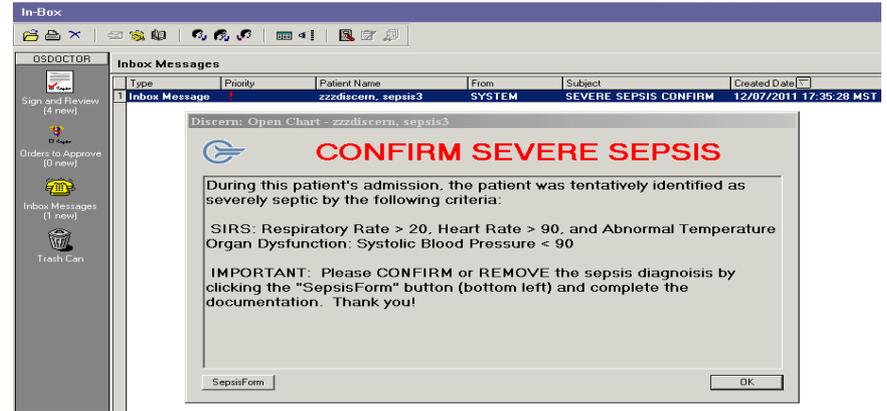
Greater than or equal to 24 hours ago, this patient was tentatively identified as Severely Septic.

Based upon additional information, does the patient meet the criteria for Severe Sepsis?

Yes  No

**Severe Sepsis = any new, acute organ dysfunction secondary to infection (NOT limited to sepsis induced hypotension/shock)**

If No, provide explanation for removal of severe sepsis in text box below (alternative diagnosis etc).



- Attestation now appeared 24 hours after alert firing
  - If “yes,” patient locked in denominator
  - If “no,” patient was removed from denominator and screening would resume 24 hours after attestation
  - Failure to respond to form by 7 days post discharge would still lock patient in denominator

# “Just Culture” Failure Review Process

**Banner Health**  
Home Clinicians Employees Docs and Residents Leaders Students

**Just Culture Procedural Review (DEV)** [Go to Dashboard](#)

**Nursing Mant. Queue**

Choose Facility  
BANNER BAYWOOD MEDICAL CENTER

Unit  
EDP - ED Holding Purple

Refresh

Include:  
 Failed Central Line Bundles  
 Failed Sepsis Bundles

**Active Patient Queue** [Go to Dashboard](#) **1 Records**

MRN	Patient Name	Failed Bundle	I_Zero	Failed Element
187218	Doe - 52404532, Joe	Sepsis	5/18/2011 3:14:25 PM	2

Patient Name: Doe - 52404532, Joe  
Bundle: Sepsis  
T Zero: 5/18/2011 3:14:25 PM  
[View Failure Details](#)

**Missed Element(s)** [Create New Incident](#) [Flag as System Error](#) [Refer to Quality Director](#)

Element	Description	Select
2	Broad Spectrum Antibiotic	<input type="checkbox"/> Select All / <input type="checkbox"/> Unselect All
3	Crystalloid or Colloid, Vasopressors, Inadequate CVP, No Venous O2	<input type="checkbox"/> Select All / <input type="checkbox"/> Unselect All

**Banner Health**  
Home Clinicians Employees Docs and Residents Leaders Students

**Just Culture Procedural Review (DEV)** [Back to Patient Queue](#)

**Incident Report**

Patient Information  
Patient Name: Joe Doe - 52439146  
Bundle: Sepsis  
T Zero: 5/18/2011 4:34:04 PM

**Missed Elements**

Element	Description	Select
3	Crystalloid or Colloid, Vasopressors, Inadequate CVP, No Venous O2	<input checked="" type="checkbox"/> Select All / <input type="checkbox"/> Unselect All

**Incident Wizard: Duty To Follow a Procedural Rule**

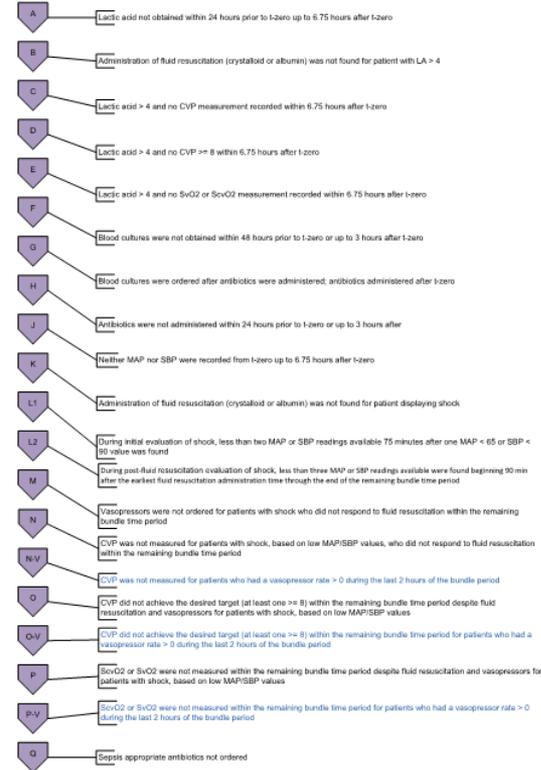
Step: **Actions**

What Action did you take? Console Employee

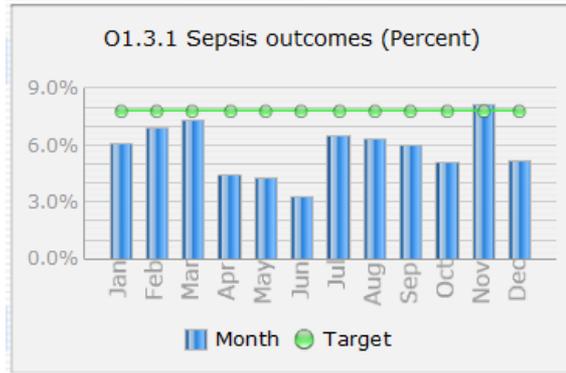
Your action was different than the recommended action. Please explain below.

**General Comments**  
Acknowledgement of failure

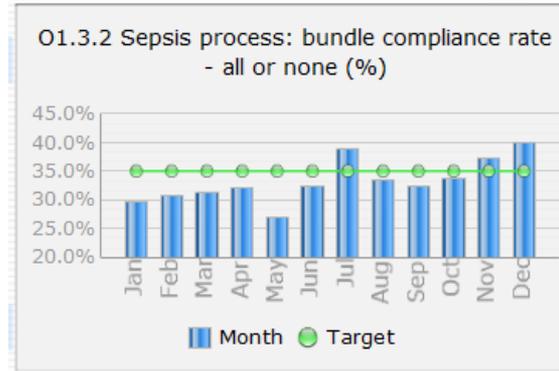
[Previous](#) [Next](#)



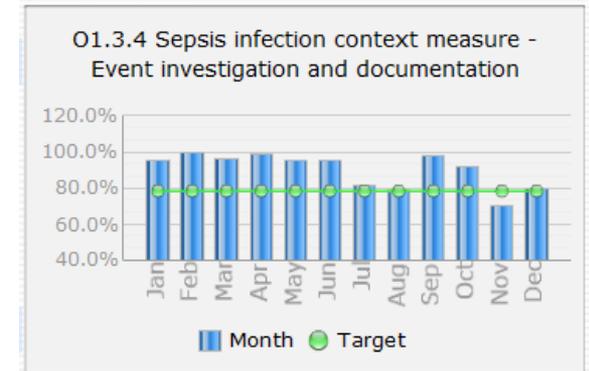
# 1<sup>st</sup> Year Results from Representative Facility



Outcome- Sepsis Mortality\*



Sepsis Process—Bundle Compliance



Sepsis Context—Just Culture Investigation

# End of Story???

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True measure of “**industry leadership**” is not in achieving a transient metrical success, regardless of how profound, but in the **development and cultivation** of those institutions which permit **continued progress**.

# Subsequent Changes

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Since the end of the 2012 Strategic Initiative period:

- Change from denominator determination by physician attestation to post-discharge coding per Angus Criteria
- Changes in advanced bundle elements, permitting POC cardiac US assessment of volume status or CVP transduction
- Removal of requirement for ScvO<sub>2</sub> measurement
- Changes in volume resuscitative approach
- Temporary alert suppression based on care set usage for patient frequently triggering “false alerts”
- Automation of lactic acid measurement on alert triggering

# Custom MPage Deployed in Late 2012

mPage Hub Full screen Print 0 mins

**S.A.F.E Alert** Monday, August 27, 2018 at 16:25:14 S.A.F.E Site  
Refresh rate: 5 mins

BGMC	Rules Fired	ED Alerts	IP Alerts	Not Completed (IP)	Nursing % completed (IP) (<45 minutes)
Today	7	4	3	1	0%
Yesterday	6	3	3	0	33%

**19 cases at BGMC for the past 72 hours**

**Facility**  
BGMC

**Patient**  
 All Patients  
 Not Completed  
 Last 6 Hours

**Alert**  
 All Alerts  
 IP Alerts  
 ED Alerts

**Legend**  
 Inpatient alert  
 ED alert  
 S.A.F.E bundle  
 LA, BCx, ABx (Hover for details)  
 Nurse  
 LA <2.0 2.0-3.9 >3.9  
 No data  
 N C Not Completed

Unit	Patient	Alert Dt/Tm	Alert	Nursing Review	Analysis	Lactic Acid Post alert	Lactic Acid Pre alert	Blood Cx	Antibiotics
50 A2N		08/27/2018 06:34		08/27/2018 07:31		3.2 mmol/L	N/A		
50 A2N		08/26/2018 04:25				3.2 mmol/L	N/A		
50 A2E		08/25/2018 19:01		08/26/2018 01:43		1.9 mmol/L	2.2 mmol/L		
50 A2N		08/26/2018 20:06				1.7 mmol/L	N/A		
50 A2N		08/26/2018 08:10				1.7 mmol/L	N/A		
50 A5N		08/24/2018 18:31		08/24/2018 18:53		1.5 mmol/L	N/A		
50 A3E		08/26/2018 22:11				1.4 mmol/L	N/A		
50 A5E		08/26/2018 04:50		08/26/2018 05:21		1.1 mmol/L	N/A		
50 A5E		08/24/2018 22:29				0.4 mmol/L	N/A		
50 A2E		08/27/2018 12:42 (02:17)		N C			2.4 mmol/L		
50 A4E		08/25/2018 08:45		N C			N/A		

Sortable by:

- Facility and/or unit
- ED/ Inpatient
- 6 hours or 72 hours

Displayed:

- Triggers
- Bundle timeline
- Nursing notification
- Pre/ post alert lactate
- Blood cx\*
- Antibiotics\*

# Renaming the Alert

Renamed from “Sepsis alert” to “SAFE alert”  
(Sepsis And perFusion Evaluation) in June 2014

- Done after above analysis revealed the mortality of those that triggered the alert to be ~ 30x higher than those that never triggered it (5.2-5.8% vs 0.2%), with the mean time from alert to death being ~ 5.3 days
- Mortality extended to those who were not identified nor coded for severe sepsis
- Rebranding was intended to encourage a broader diagnostic consideration than simply sepsis in triggering patients, so that “mitigable causes” of morbidity/ mortality could be limited

## CLINICAL RESEARCH STUDY

THE AMERICAN  
JOURNAL of  
MEDICINE®

## Real-Time Automated Sampling of Electronic Medical Records Predicts Hospital Mortality



Hargobind S. Khurana, MD,<sup>a,b,c</sup> Robert H. Groves, Jr., MD,<sup>a,b,c</sup> Michael P. Simons, MD,<sup>d,e</sup> Mary Martin, PharmD,<sup>f</sup> Brenda Stoffer, RN,<sup>g</sup> Sherri Kou, MS,<sup>h</sup> Richard Gerkin, MD,<sup>i</sup> Eric Reiman, MD,<sup>j,k</sup> Sairam Parthasarathy, MD<sup>l</sup>

### CLINICAL SIGNIFICANCE

- An alert based upon “real-time” electronic medical record data can identify hospitalized patients at risk for death.
- Patients who triggered the alert had 4 times the chance of dying the next hospital day when compared with patients who did not trigger the alert.
- Such predictive analytics was implemented in a “real-world” setting involving 24 hospitals and enabled early and targeted medical intervention.
- Triggering the alert was associated with additional hospitalization days and ventilator days.

The American Journal of Medicine, Vol 129, No 7, July 2016

# Centralized 2<sup>nd</sup> Look for Selected Patients

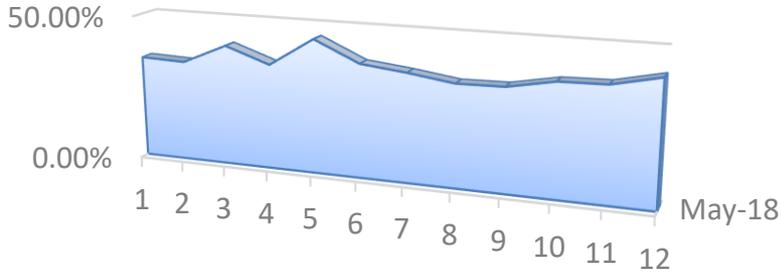
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- Pilot was conducted in June 2012 at 3 facilities with teleICU intensivists reviewing all sepsis alert and intervening in concert with bedside as deemed necessary
- Later pilot was expanded to ~ ½ of patient population in June 2014
  - Preliminary analysis reveals an improvement in “bundle compliance” with this approach vs. solely bedside response
- Systemwide implementation occurred in October 2015, under the following guidelines:
  - Central review of patients with SAFE alert and automated lactate retuning > 2.0
  - Bedside providers continue to receive the alert at the time of firing

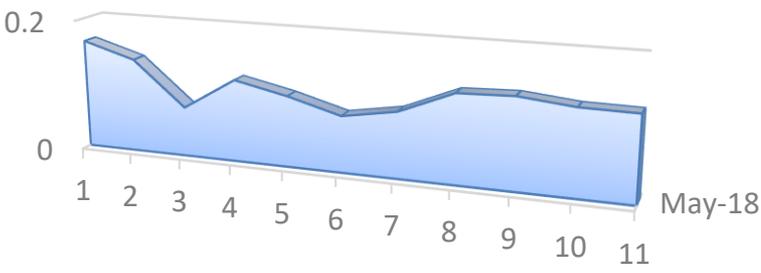


# Recent Data with New Denominator

### Representative Bundle Compliance



### Representative Sepsis Mortality



# Ongoing work...

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- Sepsis is a Banner Strategic Initiative for 2019
- Clinical practice review and revision
- Re-evaluation of [cs]/[pp]-based alert suppressions
- Development of targeted [pp]'s for those *non-sepsis* clinical entities found to frequently trigger SAFE alerts