MHA Massachusetts Hospital Association

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75th Anniversary

Implementing Systems & Clinical Processes for Managing Sepsis

M-LiNk Sepsis Learning Series

November 10, 2011

5 New England Executive Park, Burlington, MA 01803-5096
(781) 262-6000 www.mhalink.org

Mortality: Learning-in-Network

M-LiNk is peer-based learning opportunity for hospitals to:

1. Identify best practices correlated with a reduction in mortality;

2. Adopt system supports used in high-reliability organizations; and

3. Implement protocols to identify and differentially treat high-risk patients.

M-LiNk Approach

- Learning series with local/national expertise on interventions associated with best practice for reducing hospital mortality rates
- MHA portal with tools & resources in key content areas
- Virtual networking to foster inquiries, share resources, and promote learning across hospitals
- Individualized technical assistance to support implementation of selected interventions
- Communications via MHA's website and Issues Briefs to present case studies and highlight lessons learned

M-LiNk Portfolio of Offerings

- Focus on Structures & Processes
  - Spring-Summer 2011
- Outcome Drivers: Part 1 – Sepsis
  - Fall 2011
- Outcome Drivers: Part 2 - Other Drivers
  - Winter 2012

M-LiNk Portfolio
Focus on Outcomes Part I: SEPSIS

- Sep 8th: *Gain Full Value from Your Root Cause Analysis Investigations* (Using Sepsis Case Study for Review)
- Sep 21st: *Identification and Management of Severe Sepsis in the Emergency Department*
- Oct 6th: *Successful Processes for Detecting Sepsis and Initiating Protocols for Effective Management*
- Oct 13th: *Sepsis bundles: Implementation Strategies*
- **Nov 10th: *Implementing Systems and Clinical Processes for Managing Sepsis***

Successful Processes for Detecting Sepsis & Initiating Protocols for Effective Management

Featuring

- **Khaled Sorour, MD**, Director of Critical Care, Signature Healthcare, Brockton Hospital; Assistant Professor of Anesthesiology and Medicine, TUFTS University School of Medicine
- **Yuka-Marie Vinagre, MD, PhD**, Chief, Critical Care Medicine, Saint Vincent Hospital; Assistant Professor of Medicine & Pediatrics, University of Massachusetts Medical School
- **Gray Ellrodt, MD,** Chief Quality Officer & Chair of Medicine at Berkshire Medical Center, Professor of Medicine, University of MA School of Medicine; **Peter Greenwald MD FACEP,** Emergency Medicine, Berkshire Medical Center

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The Sepsis Continuum

The Number One Cause of Death in the History of Mankind

Khaled A Sorour, MD
Director of Critical care, SHBH
Assistant Professor of Anesthesiology and Medicine, TUFTS

History Funk et al, critical care clinics 2009

- Sepsis in Greek means decomposition
- Hippocrates: Sepsis is a dangerous, odiferous, biological decay due to the release of “dangerous principles” that could cause “auto-intoxication”.
- Wound shock in WW1
- Laennec (1831) was first to describe sepsis as a distinct cause of shock.
- Blalock (1934) described vasogenic shock.
- Frossmann: the first cardiac catheter.
- Bradley (1964) the first PAC
- Wilson (1965): High output shock.
- Shubin and Weil (1967) : bactremic shock.
- Swan, Ganz and Forrester (1970)
- Hinshaw and Cox (1972) ;Distributive shock

Price of the Septic System!!

- Severe sepsis mortality is *30-50%*
- Sepsis continuum kills *1400* people worldwide daily.
- *16 billion* spent annually in the US.
- Incidence of sepsis is expected to increase in the next decade
- Unpredictable host response
- Overwhelmingly unsuccessful studies (steroids, Interleukin 1, Tumor necrosis factor, ibuprofen)

The Sepsis Continuum

- Sepsis Continuum is a complex syndrome that is difficult to define, diagnose and treat. It is a range of clinical conditions caused by the body's systemic response to an infection.

American College of Chest Physicians/ Society of Critical Care Medicine Consensus Conference Definitions

- Infections: microbial phenomenon characterized by inflammatory response to presence of microorganisms or invasion of normally sterile host tissue by those organisms
- Bacteremia: the presence of viable bacteria in blood.
- SIRS: systemic inflammatory response to a variety of clinical insults manifested by 2 of the following;1)temperature *>38°C* or *<36°C*

  2) heart rate > *90 bpm*

  3) RR > *20 bpm* or $PaCO_2$*<32mmHg*

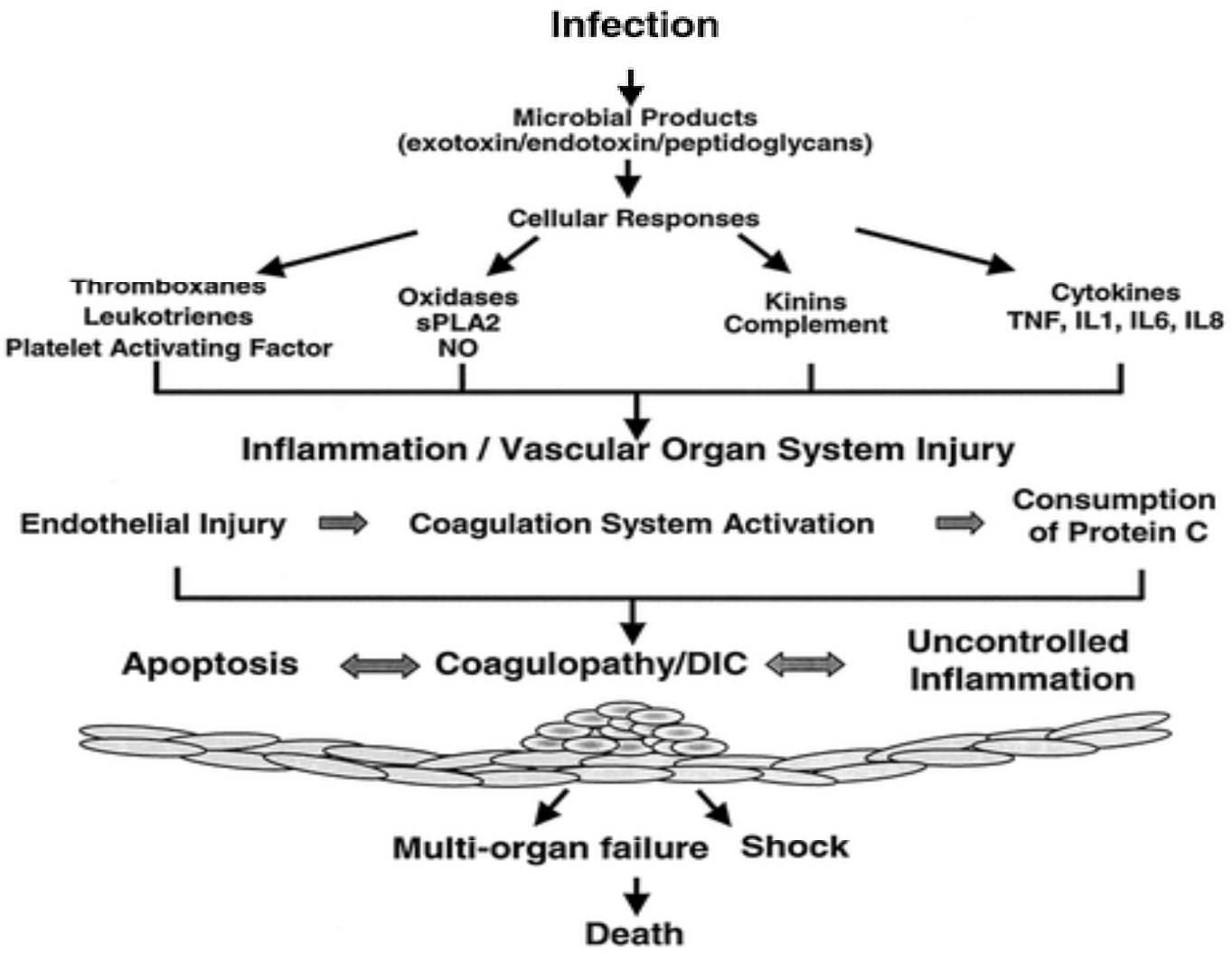
  4) WBC count> *12k/µl*, < *4k/µl* or

  > *10%* bands

Eg surgery, trauma, burn, DVT, hematoma, MI, pancreatitis, transplant rejection, acute adrenal insufficiency, thyroid storm, and malignancy

- **Sepsis:** systemic response to infection associated with 2 of the following conditions as a result of infection:
  1) temperature > *38°C* or < *36°C*
  2) heart rate > *90 bpm*
  3) RR > *20bpm* or $PaCO_2$ <*32* mmHg
  4) WBC count > *12k/µl* or < *4k/µl* or > *10%* bands
- **Severe sepsis:** sepsis associated with;
  1) *organ dysfunction*
  2) *hypoperfusion* (hypoperfusion and perfusion abnormalities may include, but not limited lactic acidosis, oliguria, or an acute alteration in mental status)
  3) *hypotension*

- Septic shock: sepsis with hypotension persisting despite fluid resuscitation along with the presence of perfusion abnormalities, which may include, but are not limited to lactic acidosis, oliguria, or acute alteration in mental status. Patients who are receiving inotropic or vassopressor agents may not be hypotensive at the time that perfusion abnormalities are measured.
- Sepsis-induced hypotension: a systolic blood pressure < *90 mmHg* or a reduction of *40 mmHg* from baseline in the absence of other causes for hypotension.
- Multiple organ dysfunction syndrome (MODS): presence of altered organ function in an acutely ill patient such that homeoatasis cannot be maintained without intervention.



Treatment Approaches

Block Endotoxin

Block Mediators (e.g. anti-TNF)

Block Coagulation

Cytoprotectives

Words of Wisdom

- Critical Care is a concept, not a location, which frequently begins with ED intervention, and culminated in ICU admission and continued management."

Peter Safar

Shock

	CO or SV	SVR	PCWP or CVP	MvO_2
Cardiogenic	Low	High	High	Low
Hypovolemic (eg. hemorrhagic)	Low	High	Low	Low
Distribuative (eg. Septic, neurogenic, anaphylactic)	High	Low	Low, normal or high	High
Obstructive (eg. PE, tamponade, tension pneumo)	Low	High	High	Low

Pathophysiology

- Distributive shock (nitric oxide ERF, pressors, decreased SVR, Increased cardiac output, misinterpretation of MvO2).
- Hyper-metabolism (MvO2 unexplained).
- Hypovolemic shock (cold vs warm shock, resuscitation beyond intravascular volume, recently demonstrated).
- Myocardial Depression (poorly identified, easily demonstrated).
- Micro-shunts and hyperdynamic circulation.
- Disturbance of Tissue Oxygen Utilization.
- Endothelial dysfunction leading to capillary leak and MODS.
- Disseminated intravascular coagulation leading to MODS.

Early Goal Directed Therapy in the Treatment of Severe Sepsis and Septic Shock

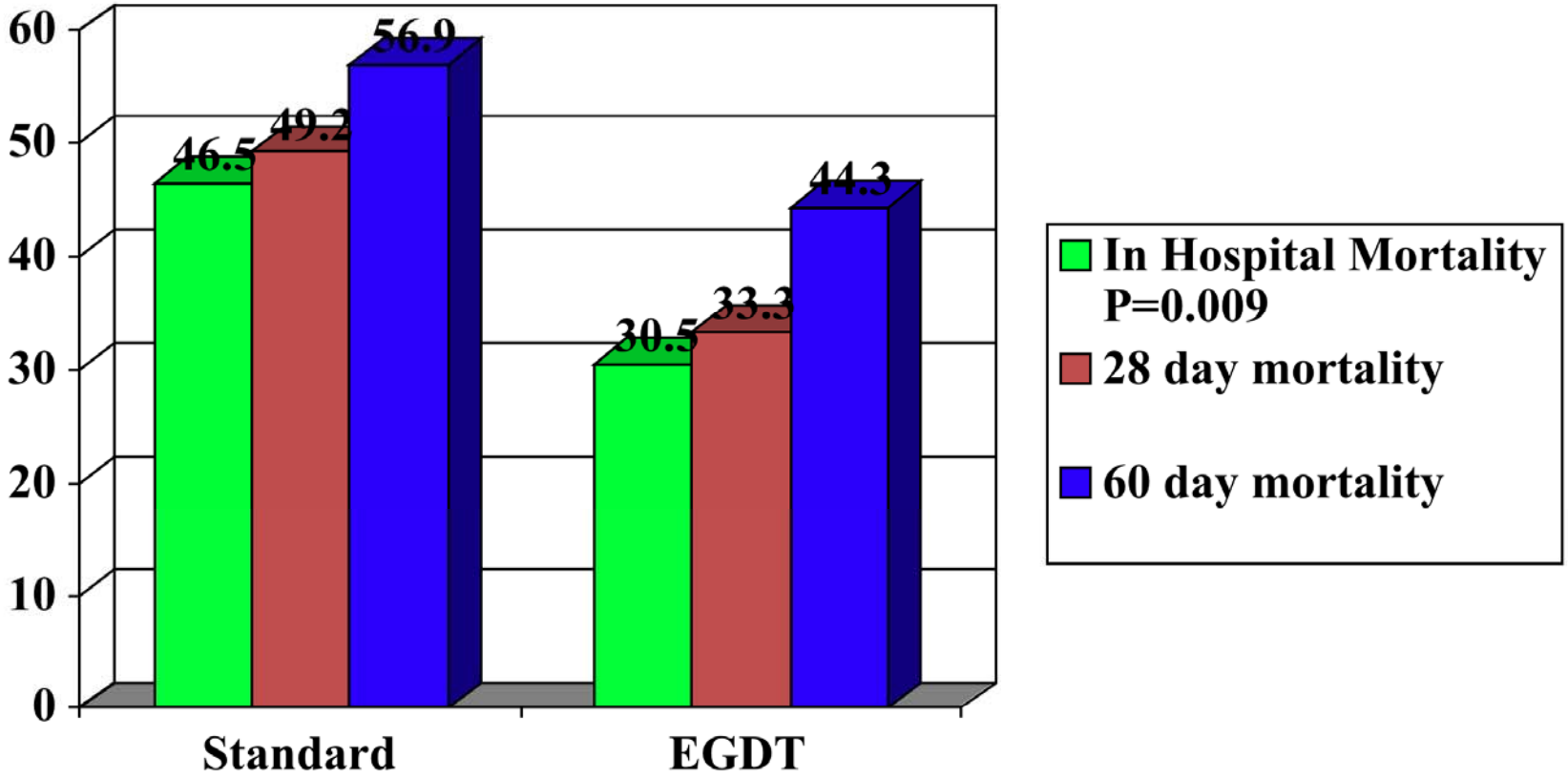
Emanuel Rivers et al,NEJM 2001

- 263 patients with severe sepsis or septic shock randomized to the standard treatment vs 6 hour of intensive early goal directed therapy.
- Non-blinded single center randomized control trial. Blinding occurred between hours 7-72.

Goals

- MAP above 60mmHg
- CVP 8-12
- Central Venous Oxygen Saturation above 70%
- HCT above 30

The Primary Endpoint



Revolution

- Demonstrated the correlation between $SVCO_2$ and MvO_2
- Demonstrated the early hypovolemic component and the cardiogenic component to septic shock.
- Stressed the fact EARLY, as opposed to Haynes and Shoemaker and others.

- The control arm received more fluids in the first 72 hours.
- PF ratio was the same in the 2 groups and the need for intubation and mechanical ventilation is less.
- Confirmed the gut feeling

Antibiotics

- Every hour delay of delivery of antibiotics increases mortality rate by 7-9% (1B). Kumar et al CCM 2006. Only 50% received antibiotics in 6 hours. Patients who received antibiotics within 1 hour had an 79.9% survival rate.
- Blood cultures before antibiotics (1C)
- Broad spectrum antibiotics (1B).Leibovici et al J Int Med 1998. 20% vs 34% mortality rate. Length of stay decreased. 30% received inappropriate initial antibiotics.

  For Blood stream infection, inadequate antibiotics resulted in 61.9% vs 28.4% mortality rate.
- Reassessment of antibiotic therapy within few days (1C)
- Antibiotic Duration 7-10 days unless clinical deterioration (1D)
- Source control (1C)
- Number of antibiotics matters.
- Determine source within 6hours

Corticosteroids in Sepsis (2C)

- Bollaert et al, CCM 1998.
- Briegel et al, CCM 1999.

Steroid infusion significantly reduced time on presssors.

- Annane et al, JAMA 2002.

Hydrocortisone and fludrocortisone significantly reduced mortality (63% vs 53%) and increased pressor weaning (40% vs 56%).

No difference between responders and non-responders.

- CORTICUS study, NEJM 2010.

No difference in mortality. Decreased time on pressors

Pressors

- Levophed is the preferred pressors (1C).
- Vassopressin created a recent controversy. VASST trial
- Epinephrine is third to be added (2B).
- Maintaining perfusion pressure prevents MODS but stop fluids if fluids fail to improve organ perfusion(1C/1D)

SURVIVING SEPSIS CAMPAIGN

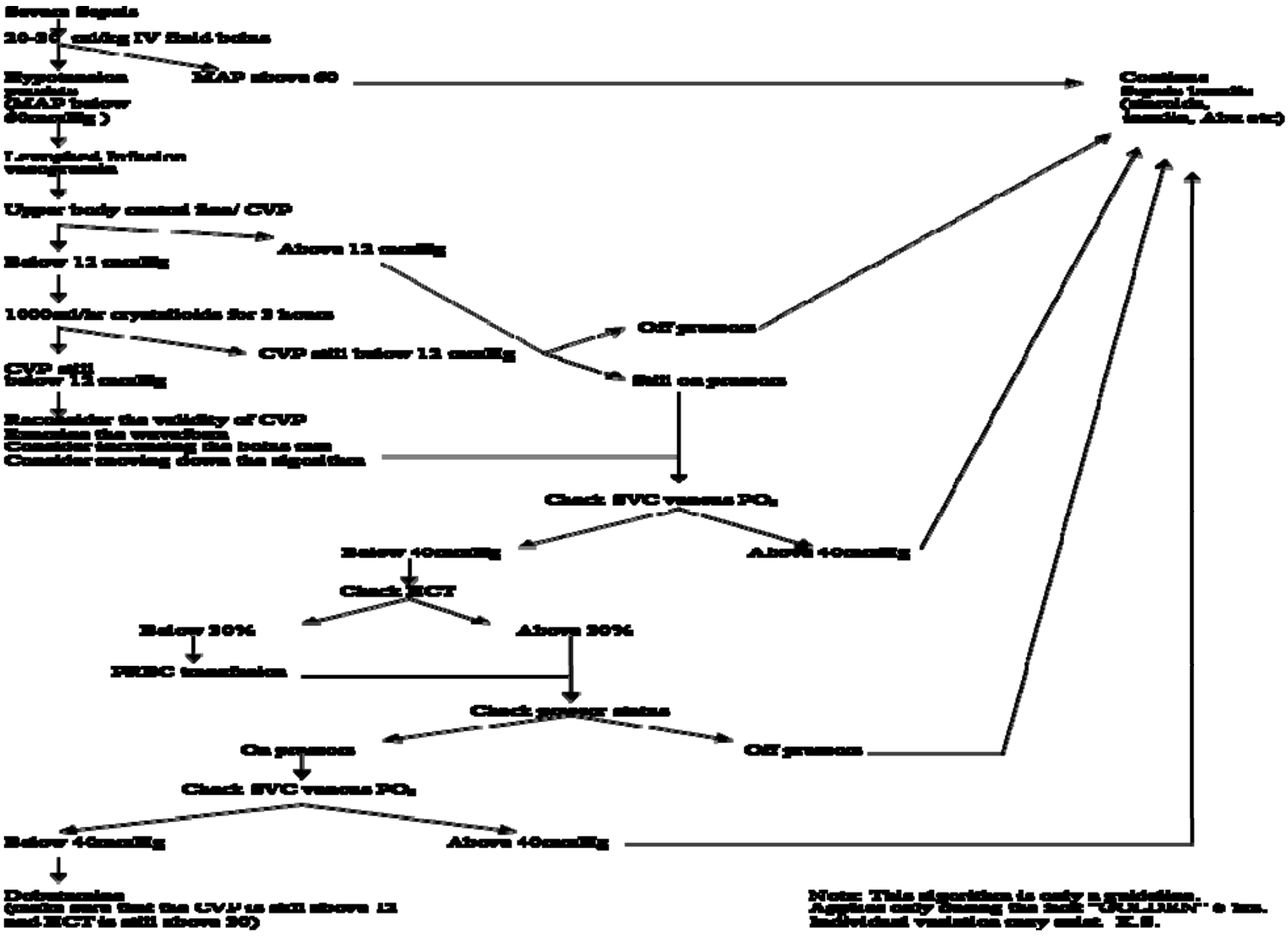
Levy et al, CCM 2010

- Prospectively examined 15,022 patients with severe sepsis from 165 sites.
- Compliance with the bundle was 10.9% in the first quarter which increased to 31.3% at the end of 2 years.
- Mortality dropped from 37% to 30%.

Experience at SHC/Brockton Hospital

- Different components of the septic shock protocol were started with varying regularity in 2007.
- Septic shock protocol was approved and implemented in May 2008.

- DIAGNOSIS TO ICU time 60 min


Severe Sepsis
20-30 ml/kg IV fluid bolus
MAP above 60
Continue
Hypotension
persists
(MAP below
60mmHg)
Upper body central line/ CVP
Above 12 mmHg
Below 12 mmHg
1000ml/hr crystalloids for 2 hours
Off pressors
CVP still below 12 mmHg
CVP still
below 12 mmHg
Still on pressors
Reconsider the validity of CVP
Consider increasing the bolus rate
Consider moving down the algorithm
Check SVC venous PO_2
Below 40mmHg
Above 40mmHg
Check SCT
Below 30%
Above 30%
PRBC transfusion
Check pressor status
On pressors
Off pressors
Check SVC venous PO_2
Below 40mmHg
Above 40mmHg
Dobutamine
(make sure that the CVP is still above 12
and SCT is still above 30)
Note: This algorithm is only a guideline.
Applies only during the first "GOLDEN" 6 hrs.
Individual variation may exist. E.B.

Allergy:

- CCU consult STAT
- Vital signs and Urine Output as per CCU protocol.
- NPO
- Obtain Central Venous Pressure (CVP) STAT and every 1 hour for 6 hours.
- Obtain Central Venous Oxygen Saturation ($ScVO_2$) STAT and every 2 hours for 6 hours.
- Bolus normal saline 1000 mls every 1 hour until CVP is 12 mmHg or above
- Obtain Hematocrit value STAT and every 2 hours for 6 hours
- Obtain lactic acid level STAT and every 2 hours for 6 hours.
- Please send CBC, CHEM10, PT, PTT, INR, 2 peripheral Blood cultures, Sputum Culture, Urine Culture, Portable CXR, 12 lead EKG, liver function tests, type & screen, CPK, CK-MB, Troponin, lactic acid level, central Venous Oxygen Saturation ($ScVO_2$) and Cortisol level (URGENT).
- After lab draw, give Cosyntropin 250 microgram IV followed by repeat cortisol level one hour later
- Antibiotics STAT (administer after cultures were obtained)
  -
  -
  -
  -
- Intensive Insulin Therapy as per order sheet
- Norepinephrine Infusion 0- 60 microgram/min (titrate for MAP greater than 60 mmHg) start at 2 microgram/ min (may be given peripherally until central line is available)
- Vasopressin Infusion 0.04 units/ min (no titration) (may be given peripherally until central line is available)

Inform MD if
- CVP failed to reach 12 at hour 3.
- Starting CVP is more than 12 mmHg.
- $ScVO_2$ is less than 70%
- HCT is less than 30%
- Oxygen saturation less than 93%

SIGNATURE HEALTHCARE	Brockton Hospital Septic Shock Time Flow Tracking Tool (ER phase)	Place Patient Sticker Here

This flow sheet is to be completed by the <u>Emergency Department Staff</u> for patients with suspected <u>Septic Shock</u>. Note that in addition to completion of this tracking tool, all documentation must be in the medical record.

Activity	Target Time	Time
Date and time of symptom onset		Date: _____ Time: _____
Date and time of arrival to Emergency Department		Date: _____ Time: _____
Time of diagnosis of severe sepsis		Time: _____
Time of fluid bolus completion	Within 1 hour of diagnosis	Time: _____
Time of first antibiotic start	Within 1 hours of diagnosis	Time: _____
Time of diagnosis of septic shock	Within 90 minutes of diagnosis of severe sepsis	Time: _____
Time of paging CCU resident	Within 10 minutes of diagnosis of septic shock	Time: _____
Time of CCU resident response	Within 10 minutes of paging	Time: _____
Time of nursing report	Within 30 minutes of diagnosis of septic shock	Time: _____
Time of arrival to the CCU	Within 60 minutes of diagnosis of septic shock	Time:_____

If the patient did not arrive in the CCU within 60 minutes of diagnosis of septic shock, document reason(s) or rationale for not giving:

_____

_____

_____

Return this completed form to the office of the Chief of Emergency Services.

Note
*Septic Shock is the presence of all three following criteria:

1. Two or more signs of inflammation:
    a. Temperature more than 38°C (100.4°F) or less than 36°C (96.8°F)
    b. Heart Rate more than 90 beats per minute.
    c. Respiratory rate more than 20 breaths per minute or $PaCO_2$ less than 32 mmHg.
    d. WBCs more than 12000 cells/mm^3 or less than 4000 cells/mm^3 or more than 10% bands.
2. Suspected or confirmed infection.
3. Systolic blood pressure less than 90 mmHg after a fluid bolus (20-30 ml/kg)

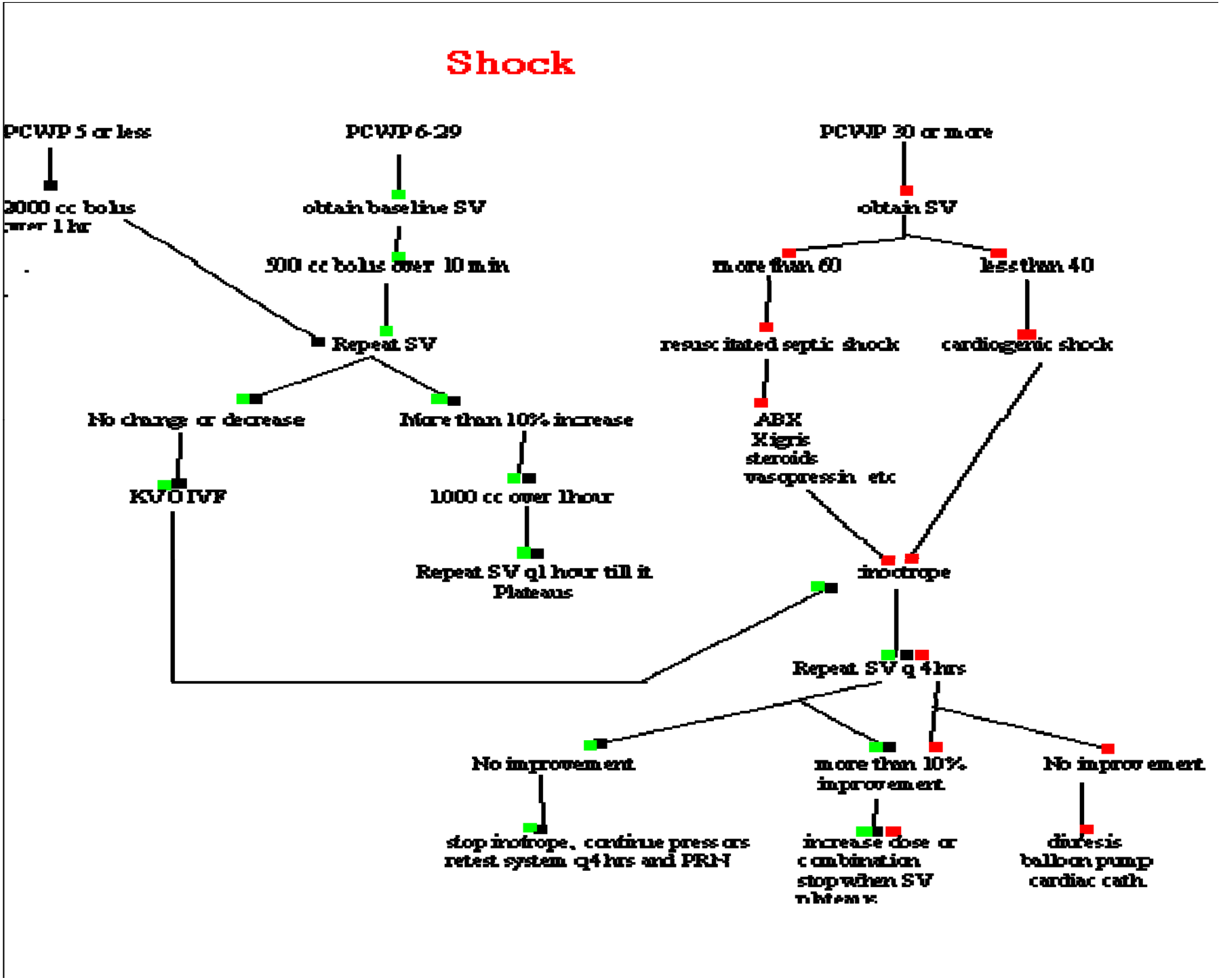
SIGNATURE HEALTHCARE	Brockton Hospital Septic Shock Time Flow Tracking Tool (CCU phase)	Place Patient Sticker Here

This flow sheet is to be completed by the CCU Staff for patients with suspected Septic Shock. Note that in addition to completion of this tracking tool, all documentation must be in the medical record.

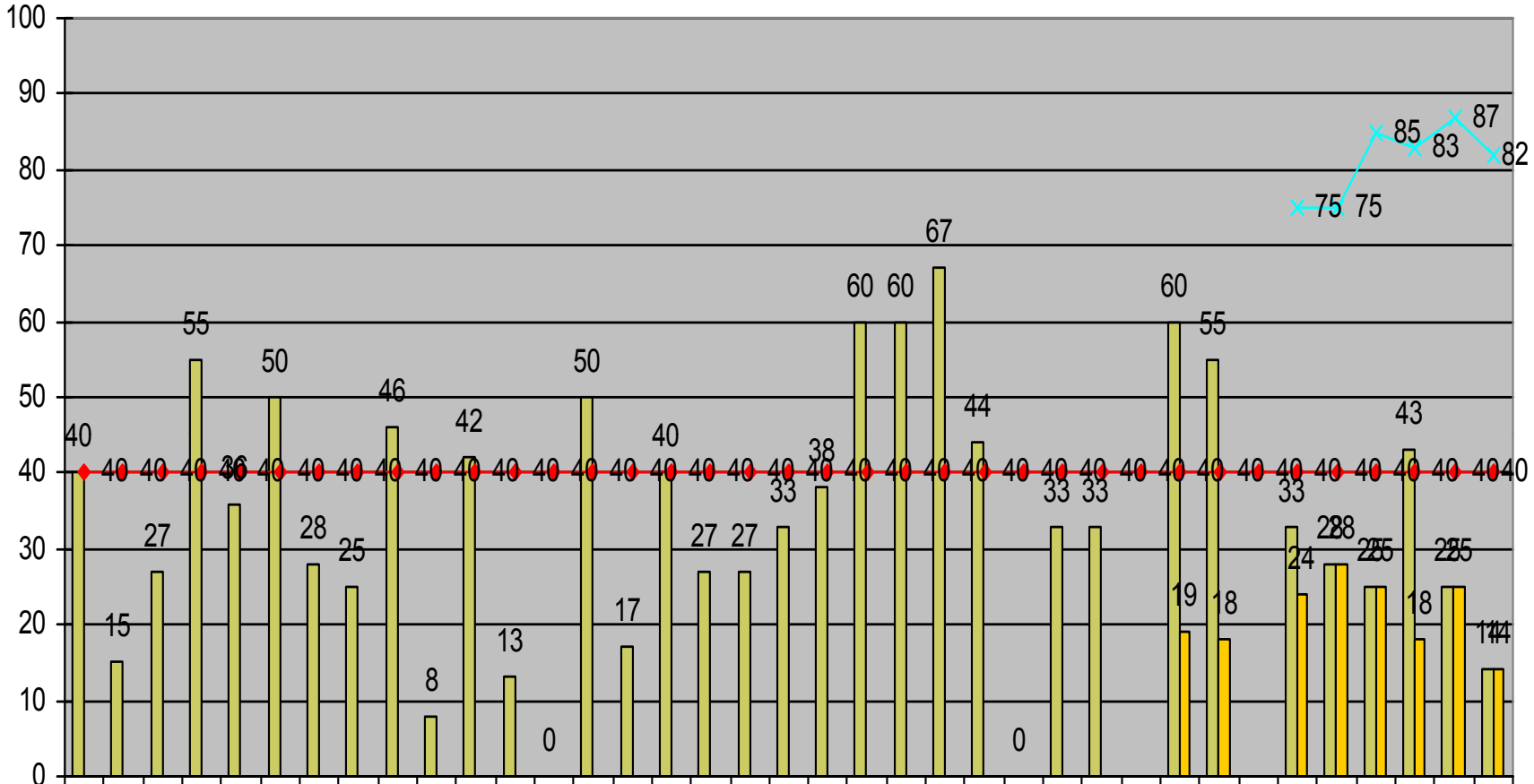
Activity	Target Time	Time
Date and time of arrival in the CCU		Date: _____ Time: _____
Time of the first antibiotic start		Time: _____
Time of central line placement attempt	Within 30 minutes of arrival	Time: _____
Time of central line completion	Within 1 hour of diagnosis	Time: _____
Time of chest X-ray	Within 70 minutes of arrival of diagnosis	Time: _____
Time of first CVP (EGDT algorithm start point I.e. Hour 0)	Within 80 minutes of arrival	Time: _____

Hour 0	**? CVP**	**? SVC-VBG**	**? HCT**	**? Lactate**
Hour 2	**? CVP**	**? SVC-VBG**	**? HCT**	**? Lactate**
Hour 4	**? CVP**	**? SVC-VBG**	**? HCT**	**? Lactate**

Return this completed form to the office of the Director of the CCU.

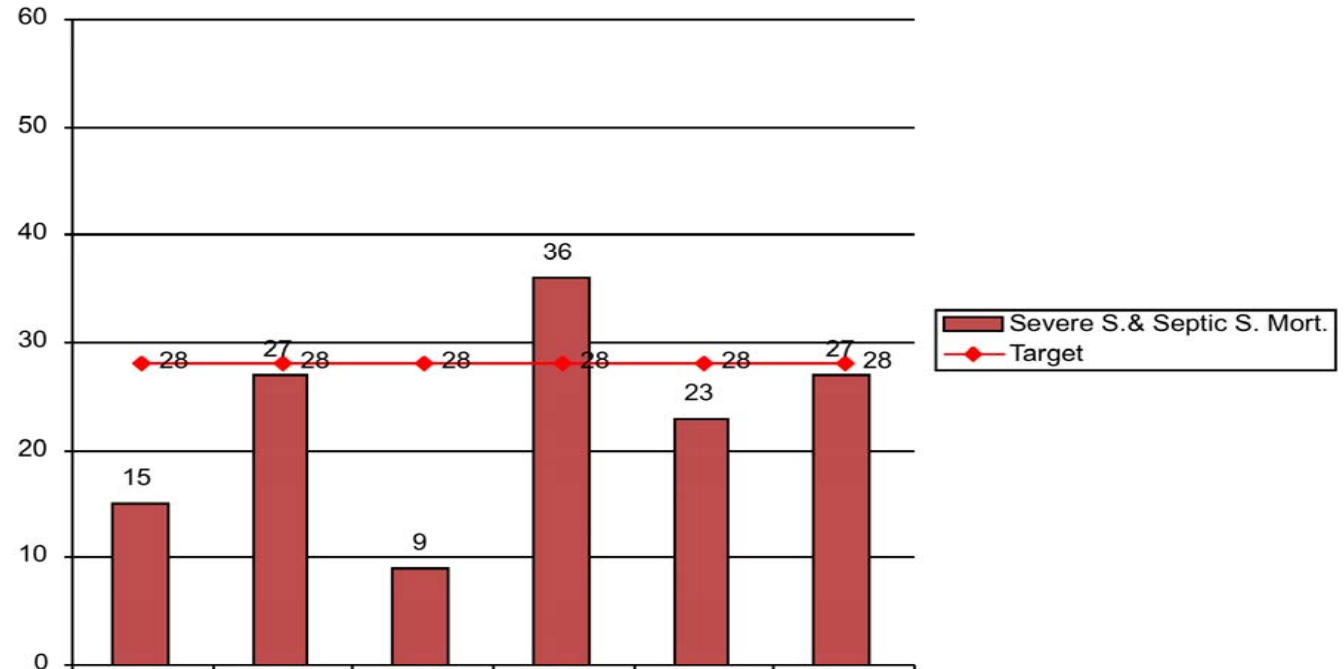

Shock
PCWP 5 or less
2000 cc bolus
over 1 hr
PCWP 6-29
obtain baseline SV
500 cc bolus over 10 min
Repeat SV
No change or decrease
KVO IVF
More than 10% increase
1000 cc over 1hour
Repeat SV q1 hour till it Plateaus
PCWP 30 or more
obtain SV
more than 60
resuscitated septic shock
ABX
Xigris
steroids
vasopressin etc
less than 40
cardiogenic shock
inotrope
Repeat SV q 4hrs
No improvement
stop inotrope, continue pressors
retest system q4 hrs and PRN
more than 10% improvement
increase dose or combination
stop when SV returns
No improvement
diuresis
balloon pump
cardiac cath

Septic Shock 2007: **45%** /// 2008: **35%** /// 2009: **28%**



	jul-08	aug-08	sep-08	oct-08	nov-08	dec-08	jan-09	feb-09	mar-09	apr-09	may-09	jun-09	jul-09	aug-09	sep-09	oct-09	nov-09	dec-09	jan-10	feb-10	mar-10	apr-10	may-10	jun-10	jul-10	aug-10	sep-10	oct-dec	jan-11	feb-11	mar-11	apr-11	May-11	Jun-11	Jul 11	aug 11	sep 11
ss mort.	40	15	27	55	36	50	28	25	46	8	42	13	0	50	17	40	27	27	33	38	60	60	67	44	0	33	33		60	55		33	28	25	43	25	14
CMO SS																													19	18		24	28	25	18	25	14
Target	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Complian																																75	75	85	83	87	82

Severe Sepsis and Septic Shock Mortality



	Apr-11	May-11	Jun-11	Jul 11	Aug 11	11-Sep
Severe S.& Septic S. Mort.	15	27	9	36	23	27
Target	28	28	28	28	28	28

Obstacles

- Busy ER
- Fluids
- Lack of accurate baseline data.
- Filling the tracking tool.
- The issue of over-diagnosis.
- The issue of antibiotic hysteria.
- Antibiotic staggering.
- Antibiotic stewardship.
- Nursing staffing issues.
- DNR patients.

MORTALITY RATE

- In Hospital Mortality for severe sepsis and septic shock in the last 6 months at SHC/Brockton Hospital:

22%

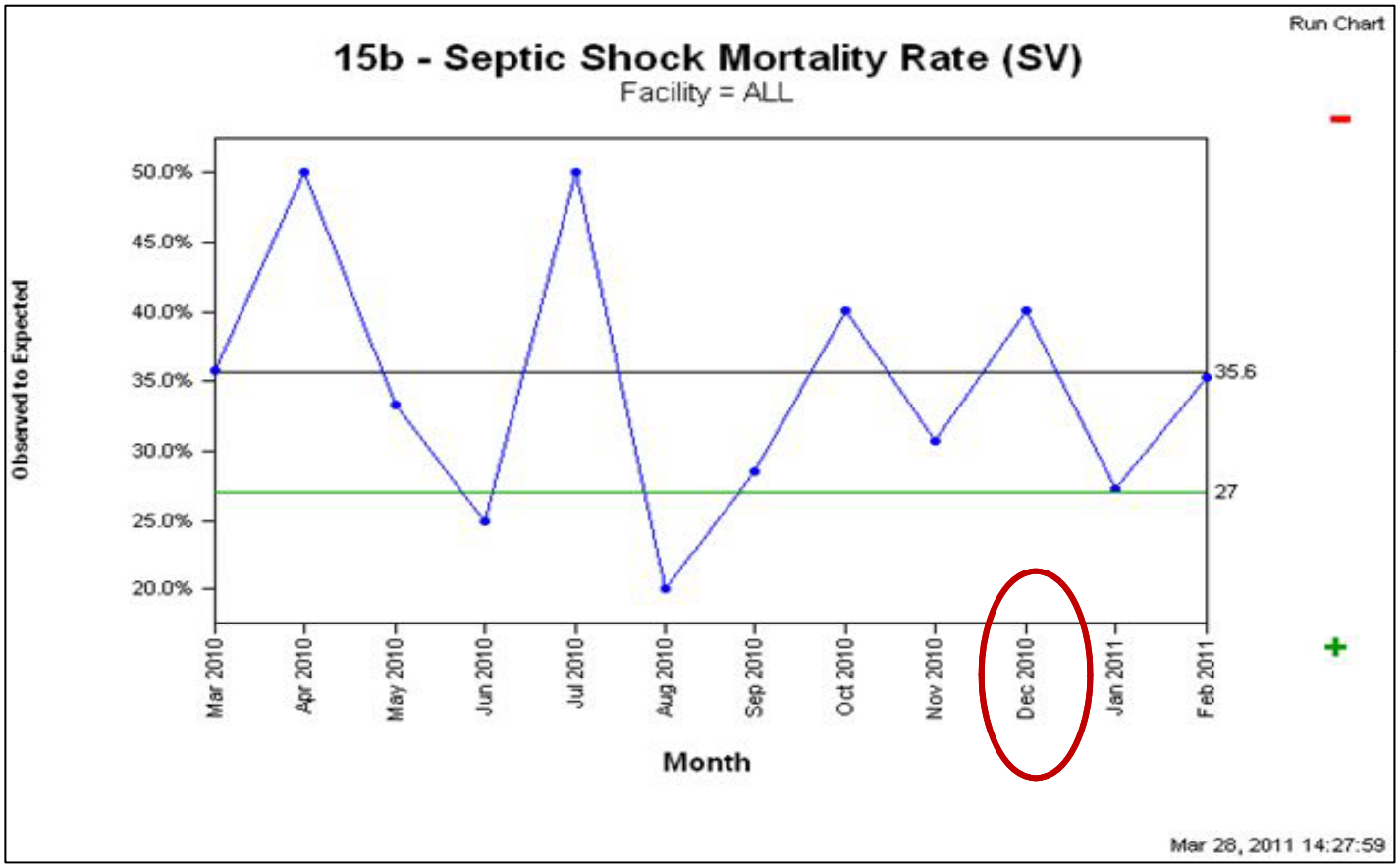
Implementing A Sepsis Protocol at Saint Vincent Hospital

Yuka-Marie Vinagre, MD, PhD
Chief, Critical Care Medicine
Saint Vincent Hospital
Worcester, MA

Impetus

- Mortality rate
- Interested physician, nurse and Quality leaders
- Support from administration

Dashboard Data



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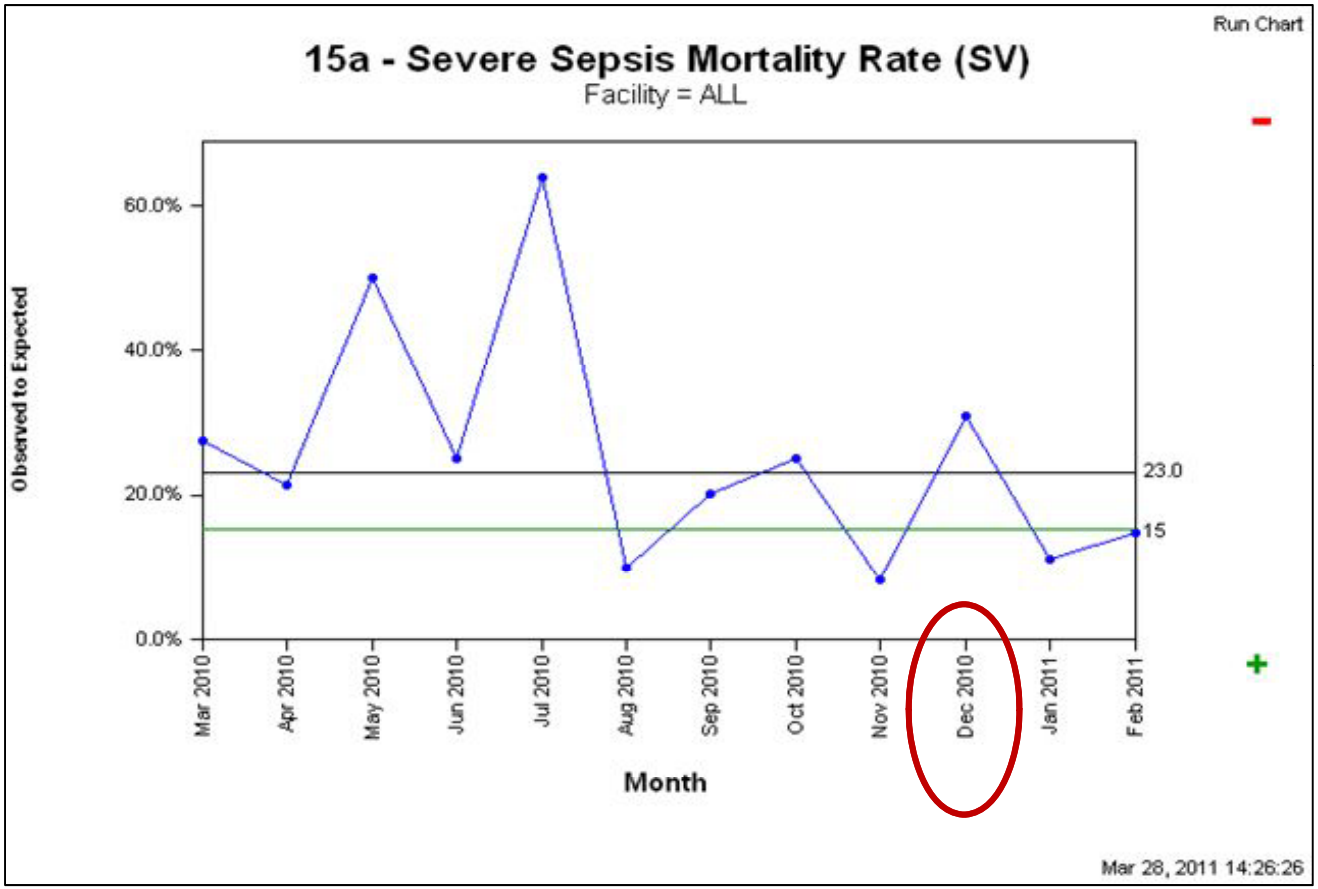
Dashboard Data



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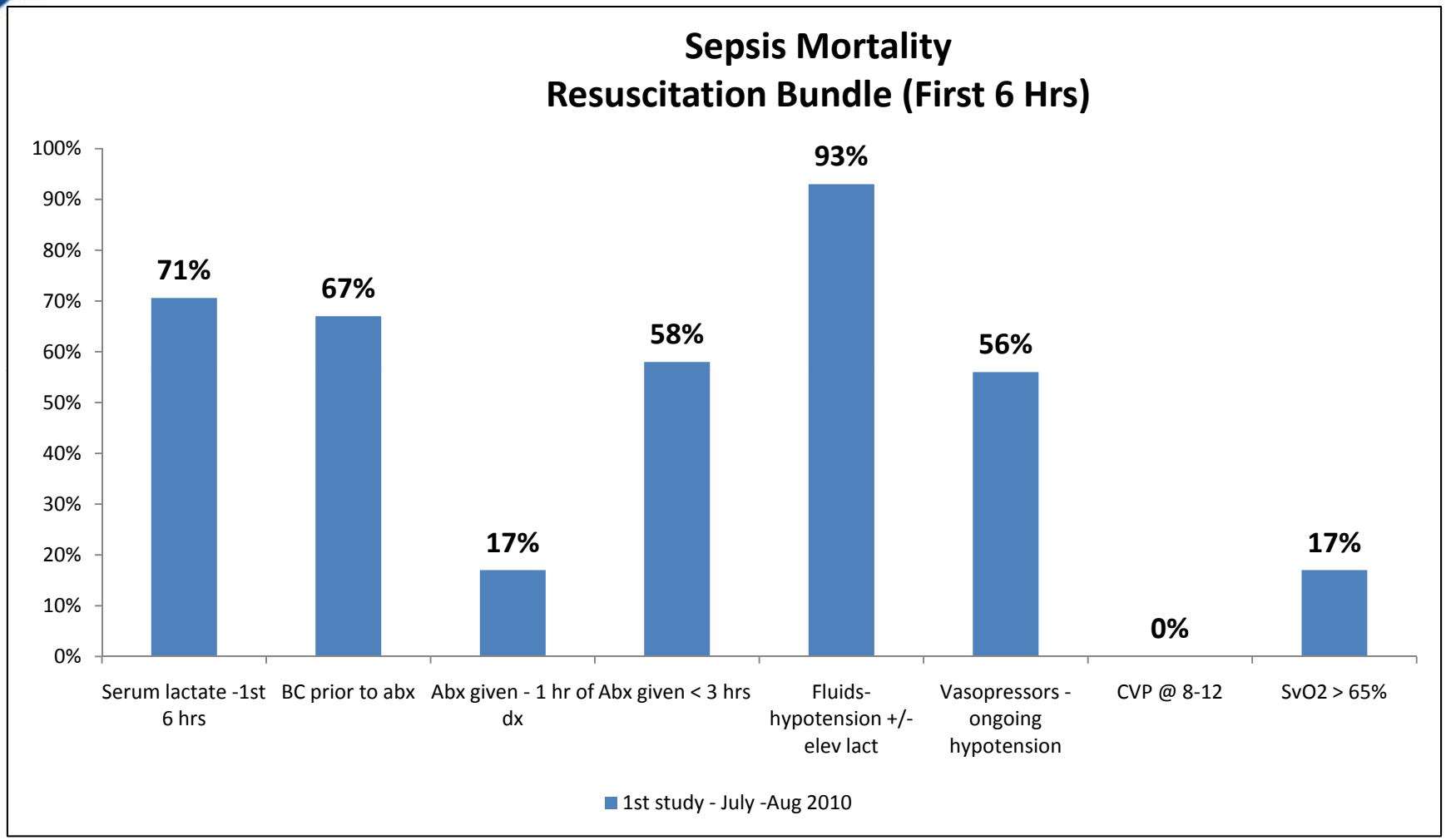
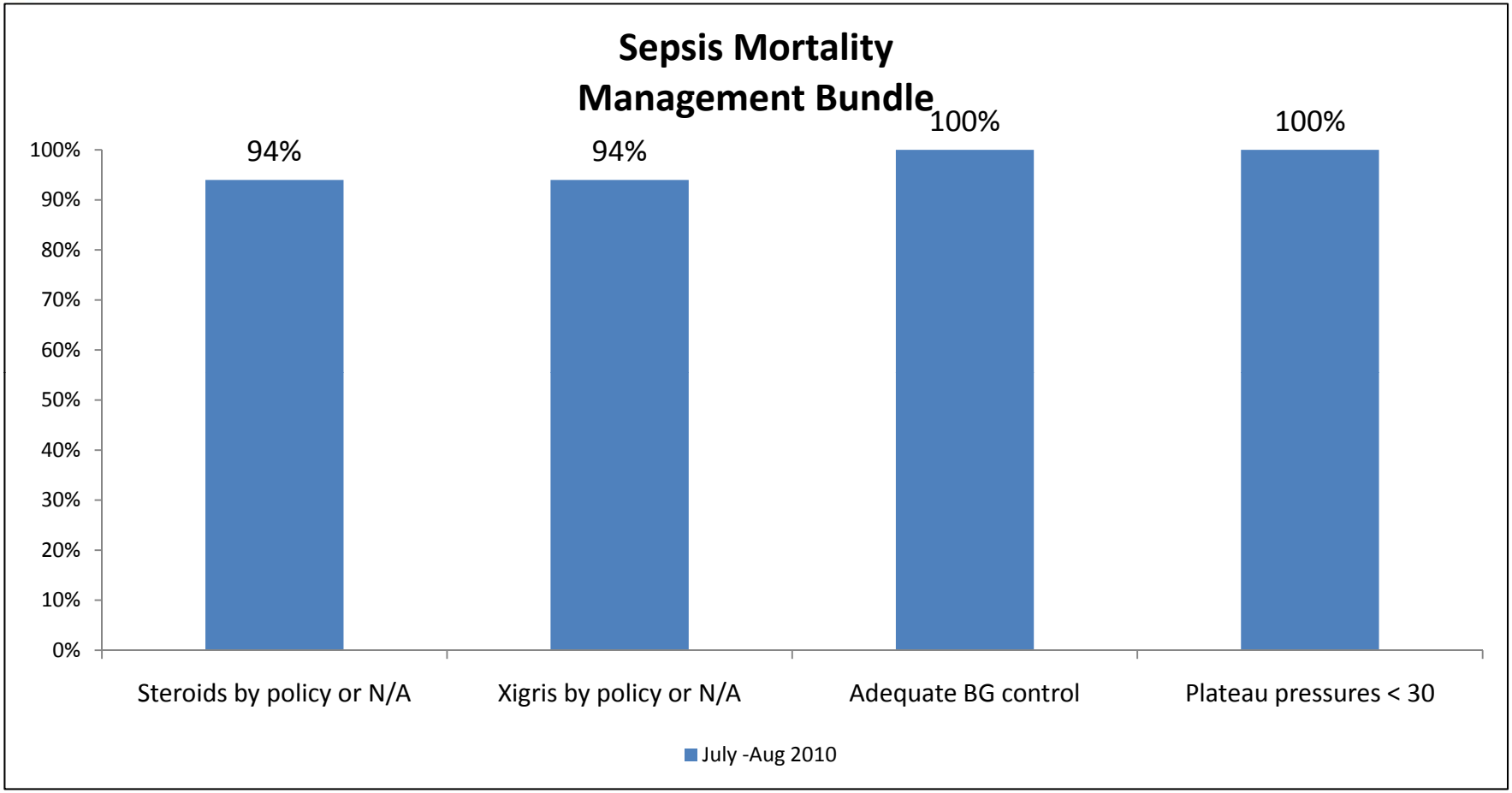
Process

- Initial meeting with physician champion and quality
- Decision to evaluate compliance with all elements of Sepsis bundles in addition to evaluating mortality
- Chart abstraction for starting point





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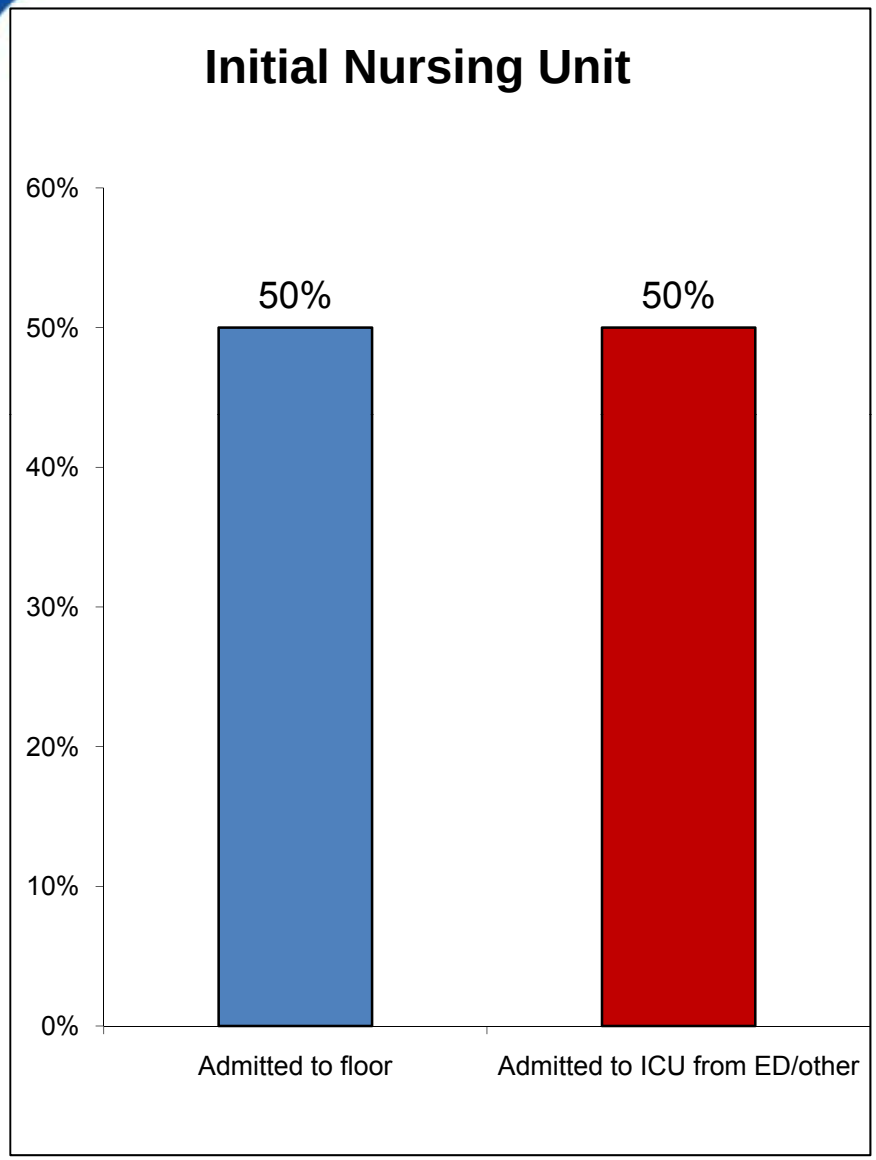
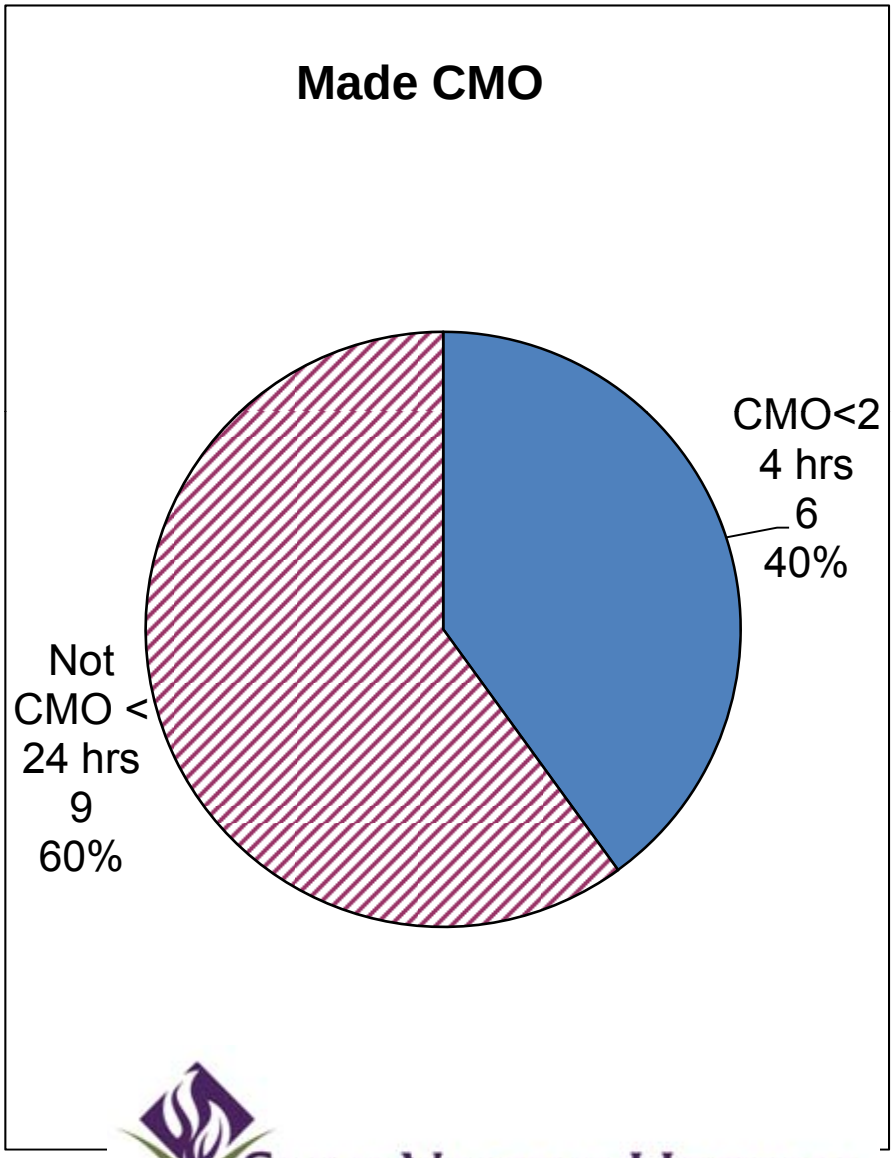
Additional Insight





SAINT VINCENT HOSPITAL
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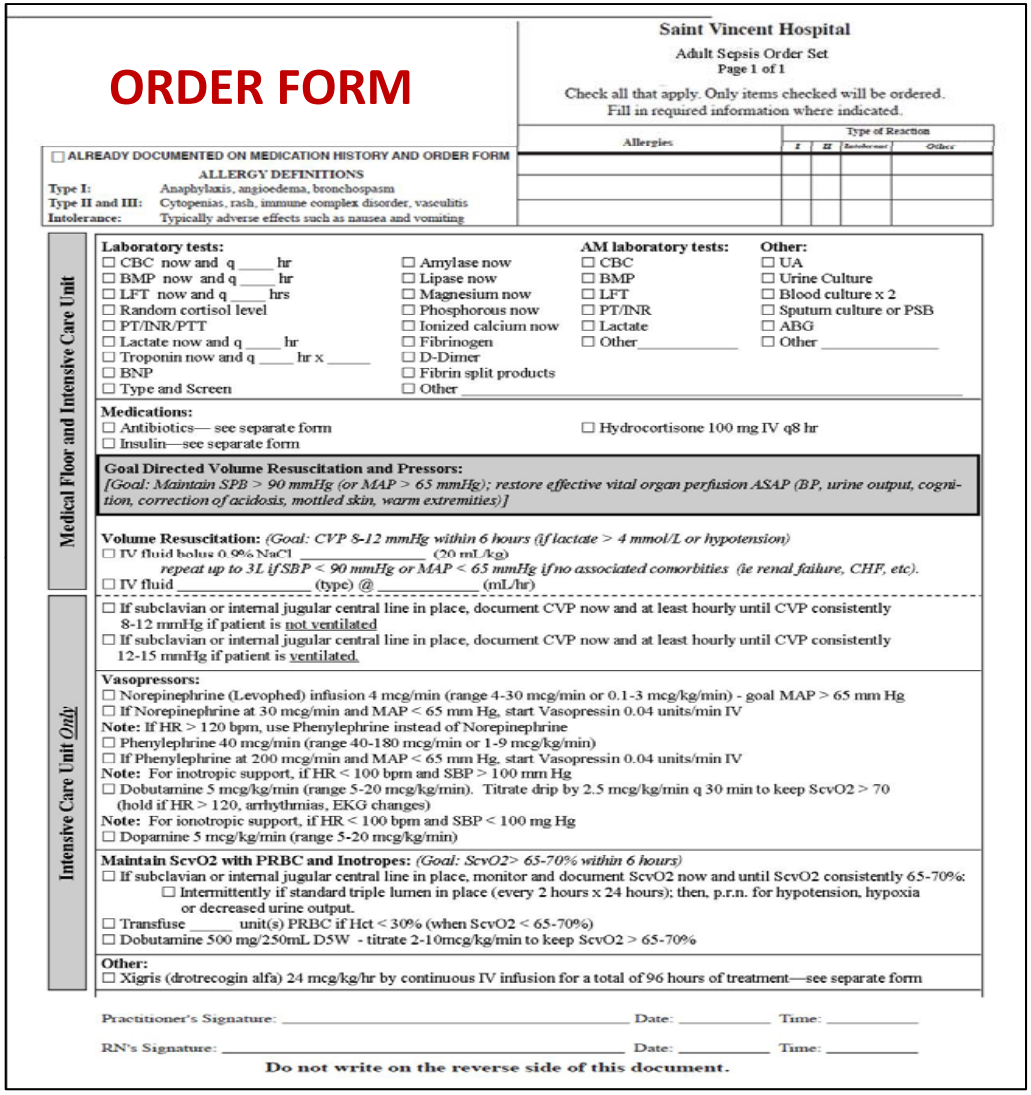
Process

- Found majority of noncompliance was in resuscitation bundle
- Not an isolated ICU issue
- Created a multidisciplinary and multispecialty performance improvement group
  - Members from ED, ICU and floor
  - MD, RN, Nurse Educator, Pharmacy, Resident representation

Process

- Create a standardized order form

ORDER FORM



Saint Vincent Hospital

Adult Sepsis Order Set
Page 1 of 1

Check all that apply. Only items checked will be ordered.
Fill in required information where indicated.

☐ ALREADY DOCUMENTED ON MEDICATION HISTORY AND ORDER FORM

Allergies	Type of Reaction			
	I	II	Intolerance	Other

ALLERGY DEFINITIONS

Type I:	Anaphylaxis, angioedema, bronchospasm
Type II and III:	Cytopenias, rash, immune complex disorder, vasculitis
Intolerance:	Typically adverse effects such as nausea and vomiting

Medical Floor and Intensive Care Unit

Laboratory tests:
- ☐ CBC now and q _____ hr
- ☐ BMP now and q _____ hr
- ☐ LFT now and q _____ hrs
- ☐ Random cortisol level
- ☐ PT/INR/PTT
- ☐ Lactate now and q _____ hr
- ☐ Troponin now and q _____ hr x _____
- ☐ BNP
- ☐ Type and Screen
- ☐ Amylase now
- ☐ Lipase now
- ☐ Magnesium now
- ☐ Phosphorous now
- ☐ Ionized calcium now
- ☐ Fibrinogen
- ☐ D-Dimer
- ☐ Fibrin split products
- ☐ Other _____

AM laboratory tests:
- ☐ CBC
- ☐ BMP
- ☐ LFT
- ☐ PT/INR
- ☐ Lactate
- ☐ Other_____

Other:
- ☐ UA
- ☐ Urine Culture
- ☐ Blood culture x 2
- ☐ Sputum culture or PSB
- ☐ ABG
- ☐ Other _____

Medications:
- ☐ Antibiotics— see separate form
- ☐ Insulin—see separate form
- ☐ Hydrocortisone 100 mg IV q8 hr

Goal Directed Volume Resuscitation and Pressors:
[Goal: Maintain SPB > 90 mmHg (or MAP > 65 mmHg); restore effective vital organ perfusion ASAP (BP, urine output, cognition, correction of acidosis, mottled skin, warm extremities)]

Volume Resuscitation: *(Goal: CVP 8-12 mmHg within 6 hours (if lactate > 4 mmol/L or hypotension)*
- ☐ IV fluid bolus 0.9% NaCl _____ (20 mL/kg)
  repeat up to 3L if SBP < 90 mmHg or MAP < 65 mmHg if no associated comorbities (ie renal failure, CHF, etc).
- ☐ IV fluid _____ (type) @ _____ (mL/hr)

Intensive Care Unit *Only*

- ☐ If subclavian or internal jugular central line in place, document CVP now and at least hourly until CVP consistently 8-12 mmHg if patient is not ventilated
- ☐ If subclavian or internal jugular central line in place, document CVP now and at least hourly until CVP consistently 12-15 mmHg if patient is ventilated.

Vasopressors:
- ☐ Norepinephrine (Levophed) infusion 4 mcg/min (range 4-30 mcg/min or 0.1-3 mcg/kg/min) - goal MAP > 65 mm Hg
- ☐ If Norepinephrine at 30 mcg/min and MAP < 65 mm Hg, start Vasopressin 0.04 units/min IV

Note: If HR > 120 bpm, use Phenylephrine instead of Norepinephrine
- ☐ Phenylephrine 40 mcg/min (range 40-180 mcg/min or 1-9 mcg/kg/min)
- ☐ If Phenylephrine at 200 mcg/min and MAP < 65 mm Hg, start Vasopressin 0.04 units/min IV

Note: For inotropic support, if HR < 100 bpm and SBP > 100 mm Hg
- ☐ Dobutamine 5 mcg/kg/min (range 5-20 mcg/kg/min). Titrate drip by 2.5 mcg/kg/min q 30 min to keep ScvO2 > 70 (hold if HR > 120, arrhythmias, EKG changes)

Note: For ionotropic support, if HR < 100 bpm and SBP < 100 mg Hg
- ☐ Dopamine 5 mcg/kg/min (range 5-20 mcg/kg/min)

Maintain ScvO2 with PRBC and Inotropes: *(Goal: ScvO2> 65-70% within 6 hours)*
- ☐ If subclavian or internal jugular central line in place, monitor and document ScvO2 now and until ScvO2 consistently 65-70%:
  - ☐ Intermittently if standard triple lumen in place (every 2 hours x 24 hours); then, p.r.n. for hypotension, hypoxia or decreased urine output.
- ☐ Transfuse _____ unit(s) PRBC if Hct < 30% (when ScvO2 < 65-70%)
- ☐ Dobutamine 500 mg/250mL D5W - titrate 2-10mcg/kg/min to keep ScvO2 > 65-70%

Other:
- ☐ Xigris (drotrecogin alfa) 24 mcg/kg/hr by continuous IV infusion for a total of 96 hours of treatment—see separate form

Practitioner's Signature: _____ Date: _____ Time: _____

RN's Signature: _____ Date: _____ Time: _____

Do not write on the reverse side of this document.

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Process

- Create a standardized order form
- Create a handoff checklist

Sepsis Handoff Tool

Sepsis Protocol

Please begin data collection on all septic patients and complete when the patient meets all 3 criteria.1. Clinical suspicion of systemic infection 2.Modified SIRS : hyper/hypothermia (>100.4or<96.8); tachypnea (>20 bpm otPaCO2<32); tachycardia w/o other cause or treatment preventing) Leukocytosis/Leukopenia (WBC>12,000 or <4,000) 3.Organ dysfunction or SBP<90 or MAP<65.
Data Collection Tool to follow patient be given to ICU RN from ED RN.

_____Blood Cultures x2

_____Random Cortisol level, Lactate, Chem-7, CBC, PT, PTT

_____ Antibiotic _____
Given ☐ Hanging ☐

_____U/A and urine culture sent to Lab

_____Intake
_____ Output

_____Y Central Line CVP_____
_____N

_____Y Vasopressor Name_____ Rate_____
_____N

Comments:

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Process

- Create a standardized order form
- Create a handoff checklist
- Create posters of algorithm

Poster

The MUST Protocol

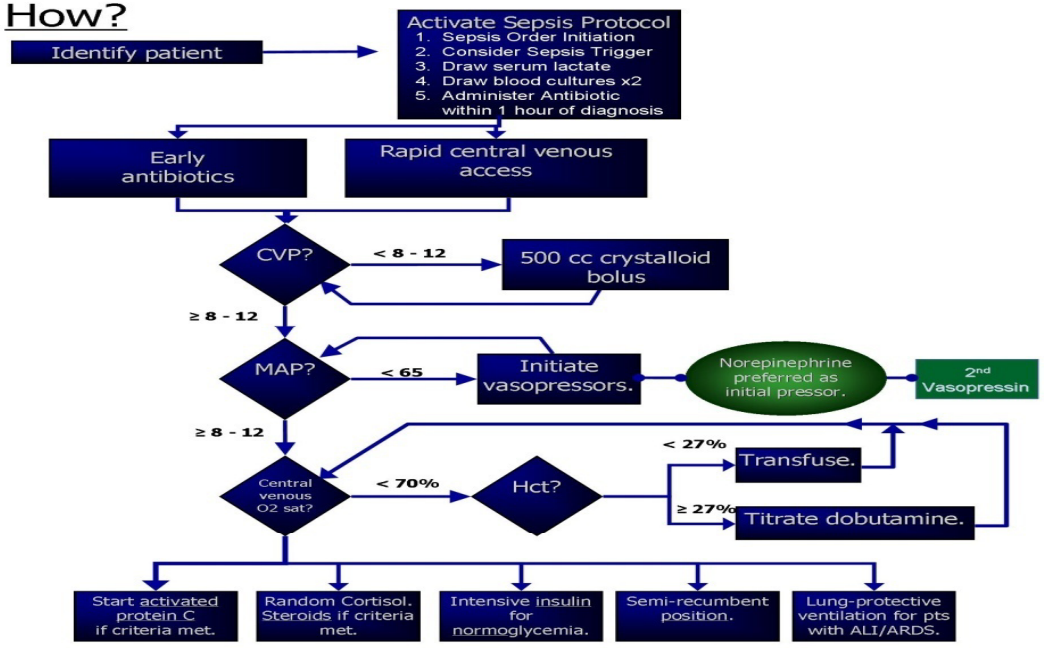
Multiple Urgent Sepsis Therapies

Why? Sepsis is common and lethal — it kills as many people as acute MI. Recent research proves that new sepsis treatments save lives — to save one life you only need to treat 6 people (or, maybe, less).

Who? Only 3 things are needed to qualify for the protocol:

1) suspected **infection**
2) Two out of four:
   - Fever (>100.4) ... or hypothermia (T<96.8)
   - Fast heart rate (>90)
   - Fast respiratory rate (>20) ... or PaCO2 < 32
   - High white count (>12,000)
     ... or WBC < 4,000
     ... or > 10% bands
3) SBP<90 **after** a 20-30 cc/kg fluid bolus, *or* Lactate > 4.0

How?



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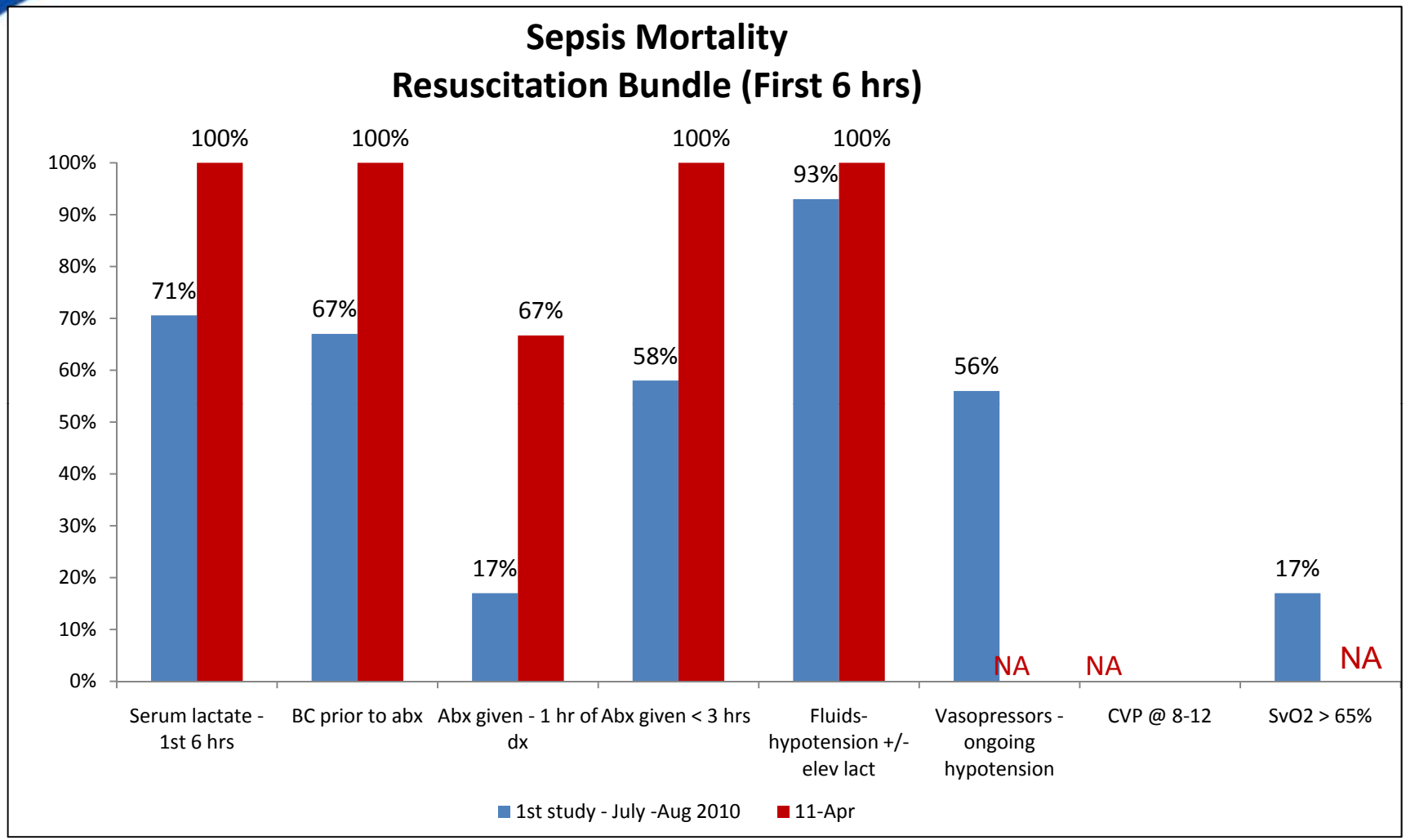
Process

- Create a standardized order form
- Create a handoff checklist
- Create posters of algorithm
- Education sessions
  - Inservices for nurses
  - Education for attendings at business meetings
  - Resident conferences



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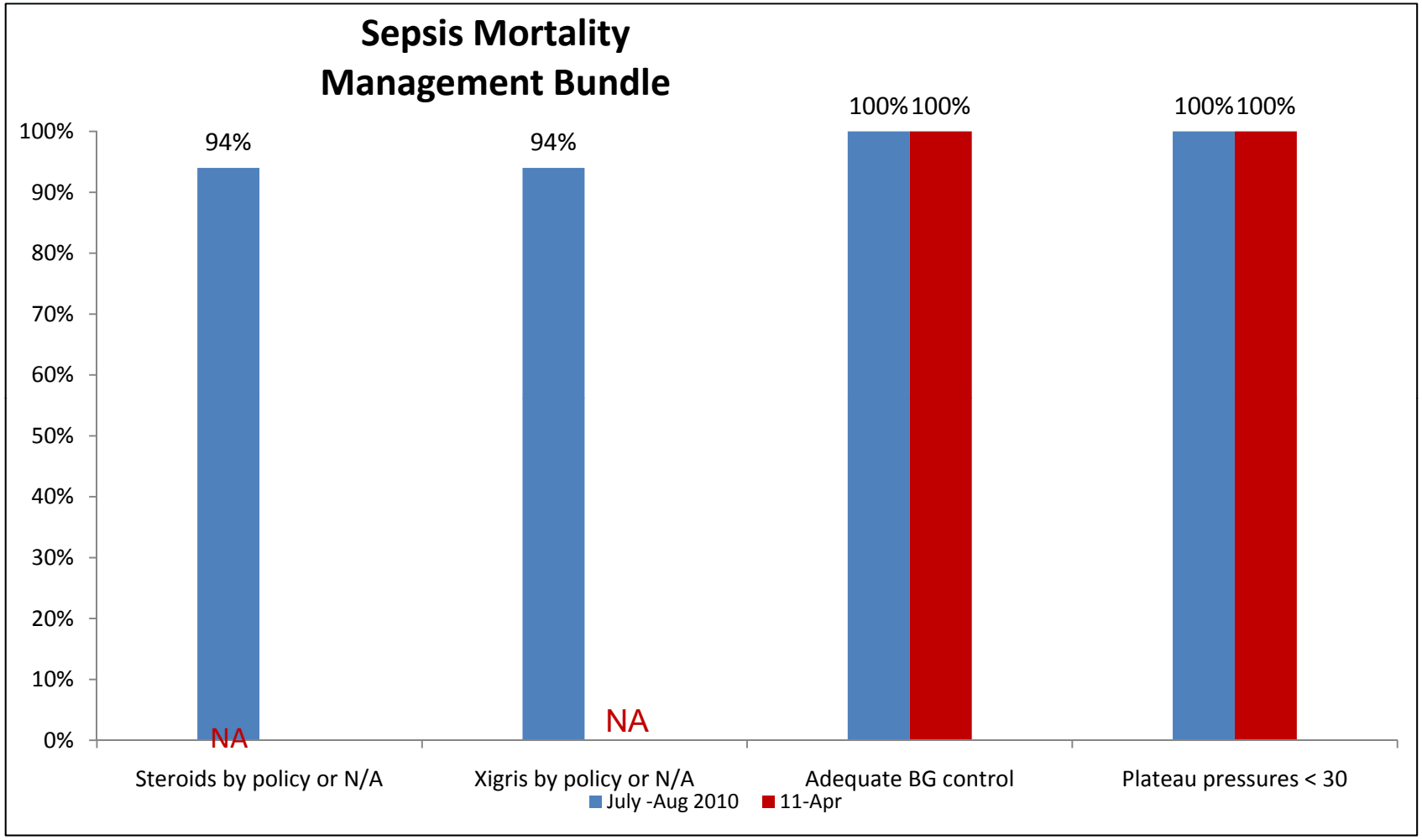

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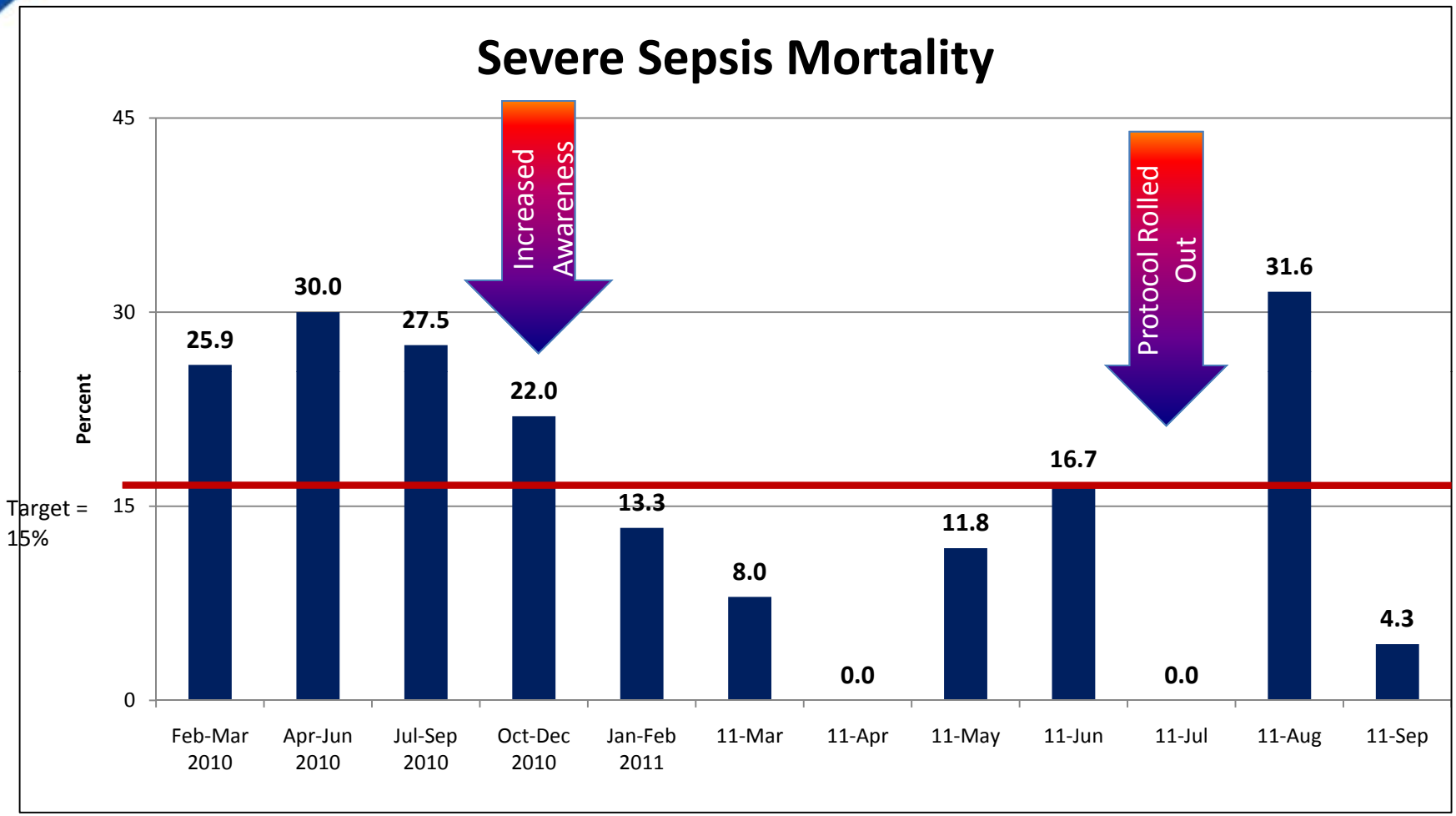

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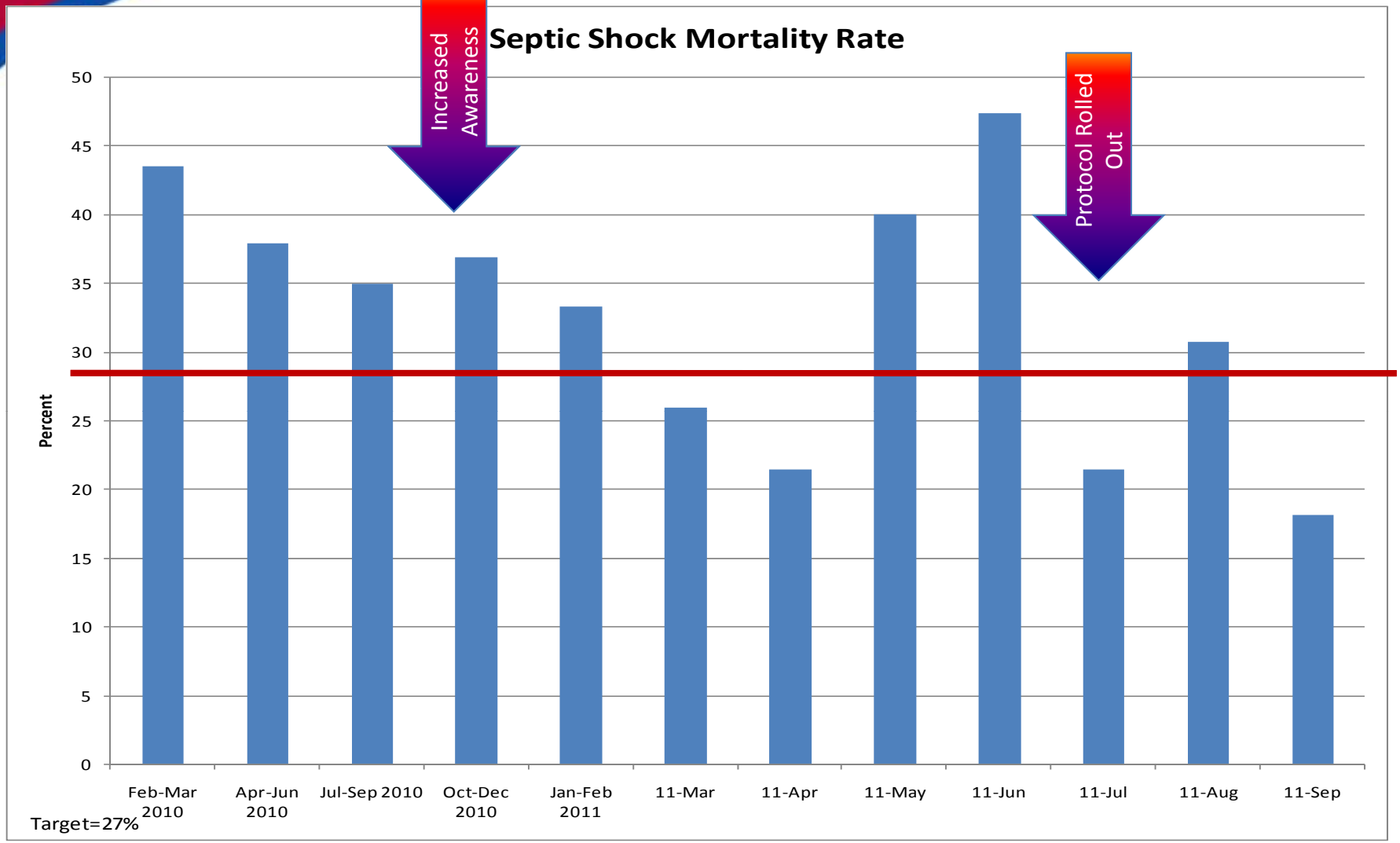

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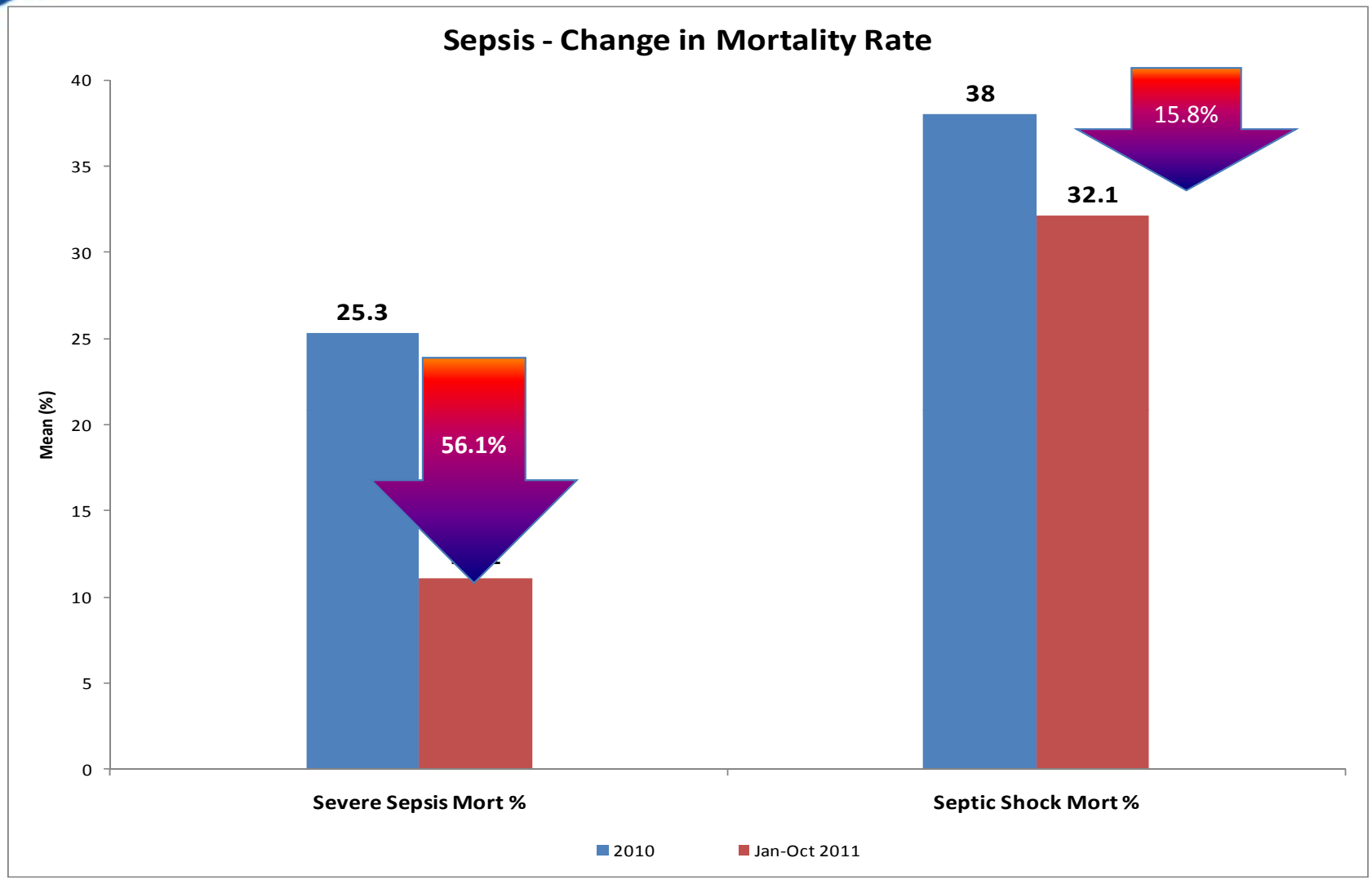

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Summary – Key Elements

- Physician or nurse champion
- Support from administration
- Multidisciplinary and multispecialty involvement
- Data tracking

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Mortality Analysis to Implementation of a Severe Sepsis Protocol

- **Gray Ellrodt, MD,** Chief Quality Officer & Chair of Medicine at Berkshire Medical Center, Professor of Medicine, University of MA School of Medicine
- **Peter Greenwald MD FACEP,** Emergency Medicine, Berkshire Medical Center

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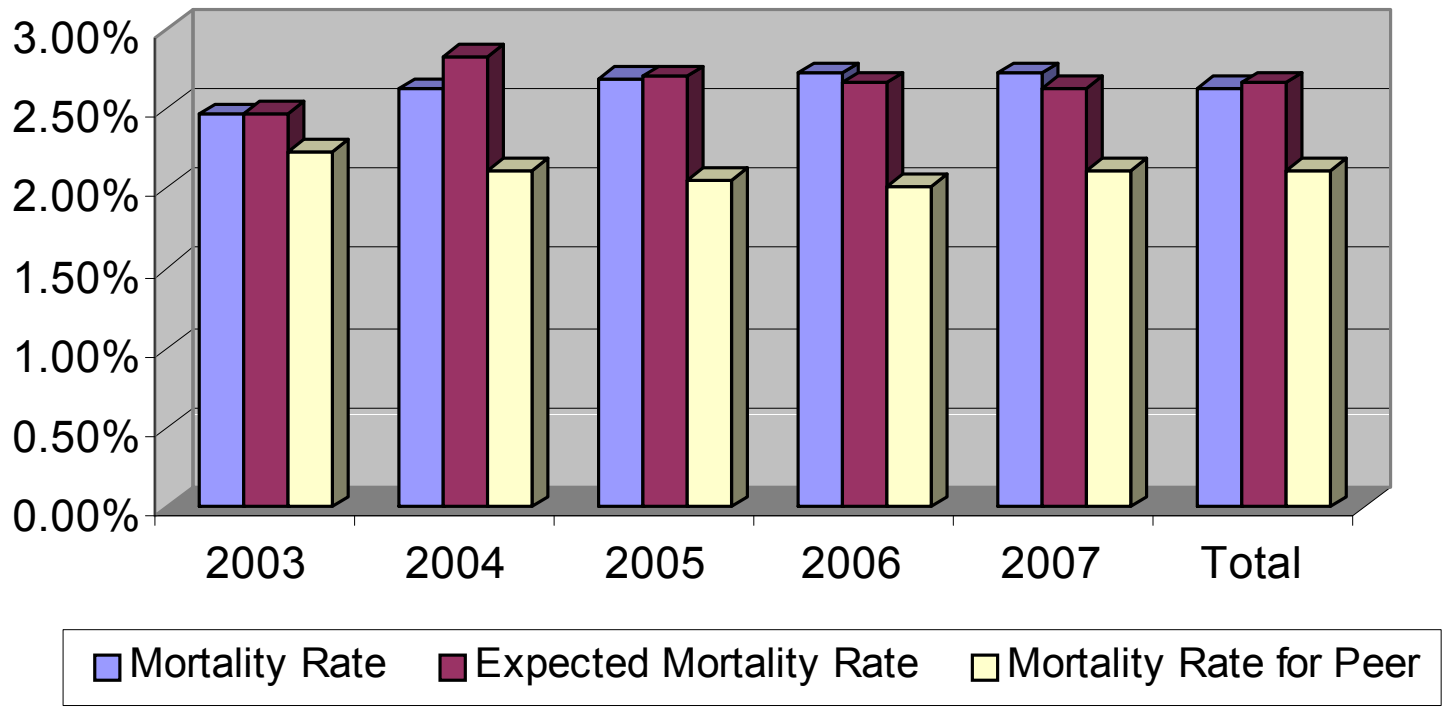
Diagnostic Journey: Developing a Learning System

- Do people die unnecessarily every single day in our hospitals?
- In order for us to understand this, we need a diagnostic journey that moves out of a model for judgment and into a model for learning.
- New model:
  - What can we learn from the deaths?
  - Was perfect care given?
- We need to get a clearer understanding of local conditions that contribute to mortality.

BMC Overall Mortality Rate



Year	Cases	Mortalities	Mortality Rate	Expected Mortality Rate	Expected Mortality Rate Index	Mortality Rate for Peer
Total	**55,076**	**1,448**	**2.63%**	**2.66%**	**0.99**	**2.11**
2007	4,266	116	2.72%	2.63%	1.03	2.12
2006	**12,681**	**345**	**2.72%**	**2.67%**	**1.02**	**2.02**
2005	12,189	328	2.69%	2.70%	1.00	2.06
2004	**12,627**	**331**	**2.62%**	**2.83%**	**0.93**	**2.12**
2003	13,313	328	2.46%	2.48%	0.99	2.23

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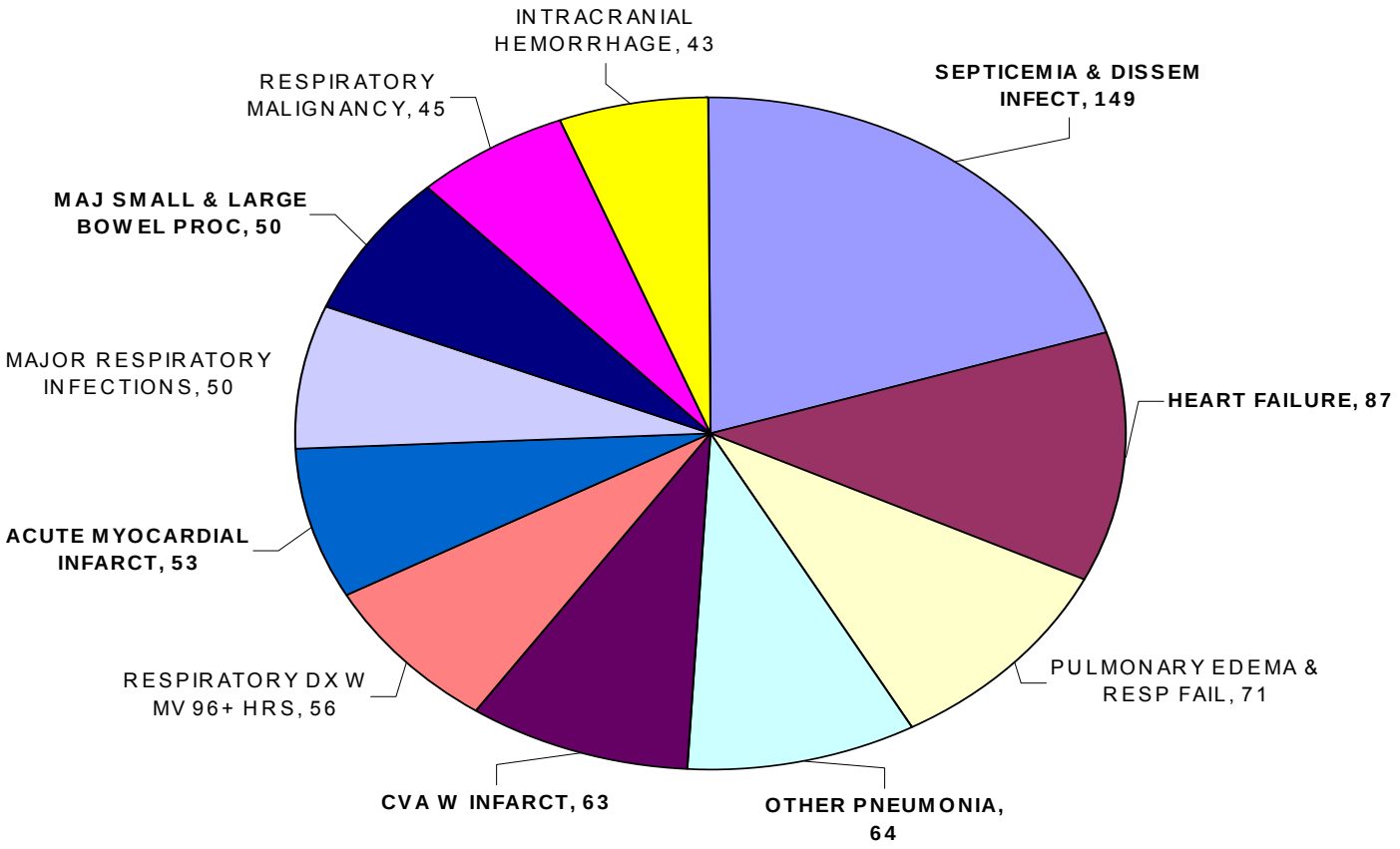
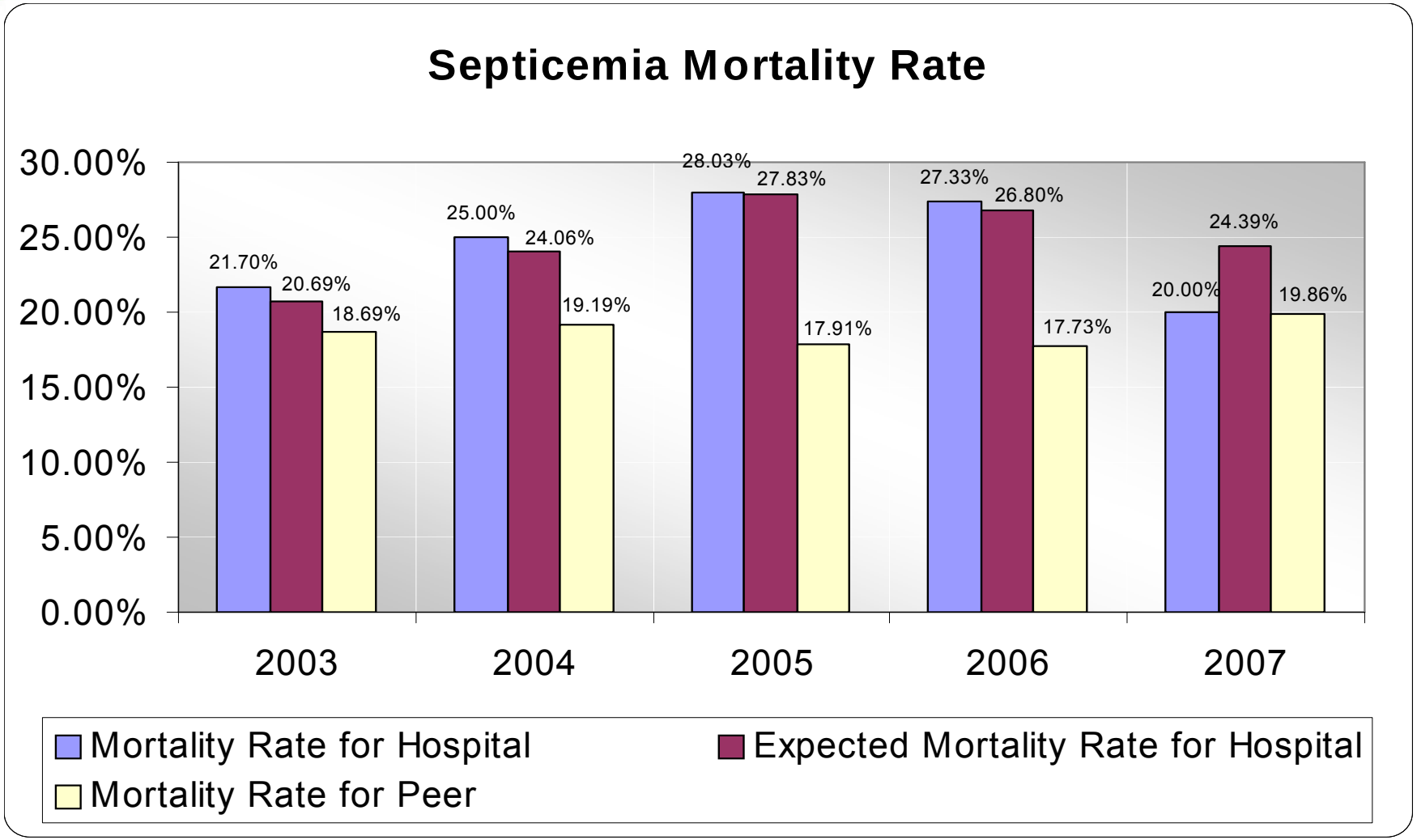
Top Mortalities at BMC

2003-2007



Back in June 2007 ….



Peer=Hospitals w/ 301 to 400 Beds

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Initial Organization

1. Get people to realize there is a problem

   Sepsis high profile cases were reviewed in QA, mortality reports, and Morbidity and Mortality rounds

2. Goal defined: Reduce sepsis mortality

3. Organize a multidisciplinary task force to formulate a plan that works hospital wide

Who is it going to hurt?
(stakeholder analysis)

- Lessons learned from an earlier project of developing BMC's rapid response team:
  - Involve all affected departments and individuals
  - Make each member feel that they have a stake and recognize their expertise
  - Elicit cooperation needed for success
  - Identify champions in each area affected
  - Direct support from Senior Team

Who did we Invite?

- ED and ICU Physicians
- ED and ICU Nursing Staff
- Pharmacy
- Quality Improvement
- Respiratory Therapy
- Infectious Disease Physicians
- Medical Residents
- Nursing Admin
- Hospitalist Service

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What We Needed To Do

- Group recommended specific responses to sepsis by the creation of:
  - a sepsis team
  - a flow sheet for nurses to better document care
  - a physician order set to help guide therapy

Developed over the next three months:

- Physician order set
- Nursing flow sheet
- Notification of personnel-paging
- Changes in Lab processing of lactate
- Streamline antibiotic order process
- Quality Measuring tool
- System for prioritizing ICU bed
- Pocket Card for identification of sepsis and key treatment points

What Happens:

- ED identifies infected patients with SIRS
- Begins hydration and antibiotics
- Screens for presence of severe sepsis and septic shock criteria.
- “Sepsis page” initiated

Sepsis Page

- ICU resident, respiratory therapist, crisis nurse respond to the ED
- ICU charge nurse notified and assigns ICU bed.
- Intensivist consulted by resident team.
- ED physician or resident place ScVO2 central line and start monitoring CVP

Feedback loops

- Quality monitoring group
- Monthly meetings for first year
  - ICU, ED MD and RN, QI, ID, PharmD
- Pre-analysis of data by QI
- Case review, common trends

Feedback loops

- Nurse to nurse, physician to physician feedback
- Resident related issues addressed through residency leadership

Lessons Learned

- Include Surgery and Anesthesia
- Developing a sense of urgency a bigger challenge than anticipated
- Better coordination/buy-in from a newly formed hospitalist service
- Mechanisms to improve residents compliance
- Identification of inpatient early sepsis

What can I do right now?

- Immediately in the ED you can:
  - Make it possible to measure CVP
  - Start a program to identify patients with severe sepsis and septic shock
  - Standardize care for patients you have identified

Start CVP monitoring

- Allows assessment of adequacy of fluid resuscitation
- Gets physicians and healthcare team accustomed to goal directed resuscitation

Start a program to identify severe sepsis/septic shock

- Start changing attitudes
- Create a sense of emergency.
- Place septic shock on par with STEMI.
- If they are infected and hypotensive "THEY ARE DYING IN FRONT OF YOU"

Standardize care for patients you have identified

- Set standards for antibiotic timing, for fluid volume and vassopressor use.
- Target resuscitation to defined endpoints

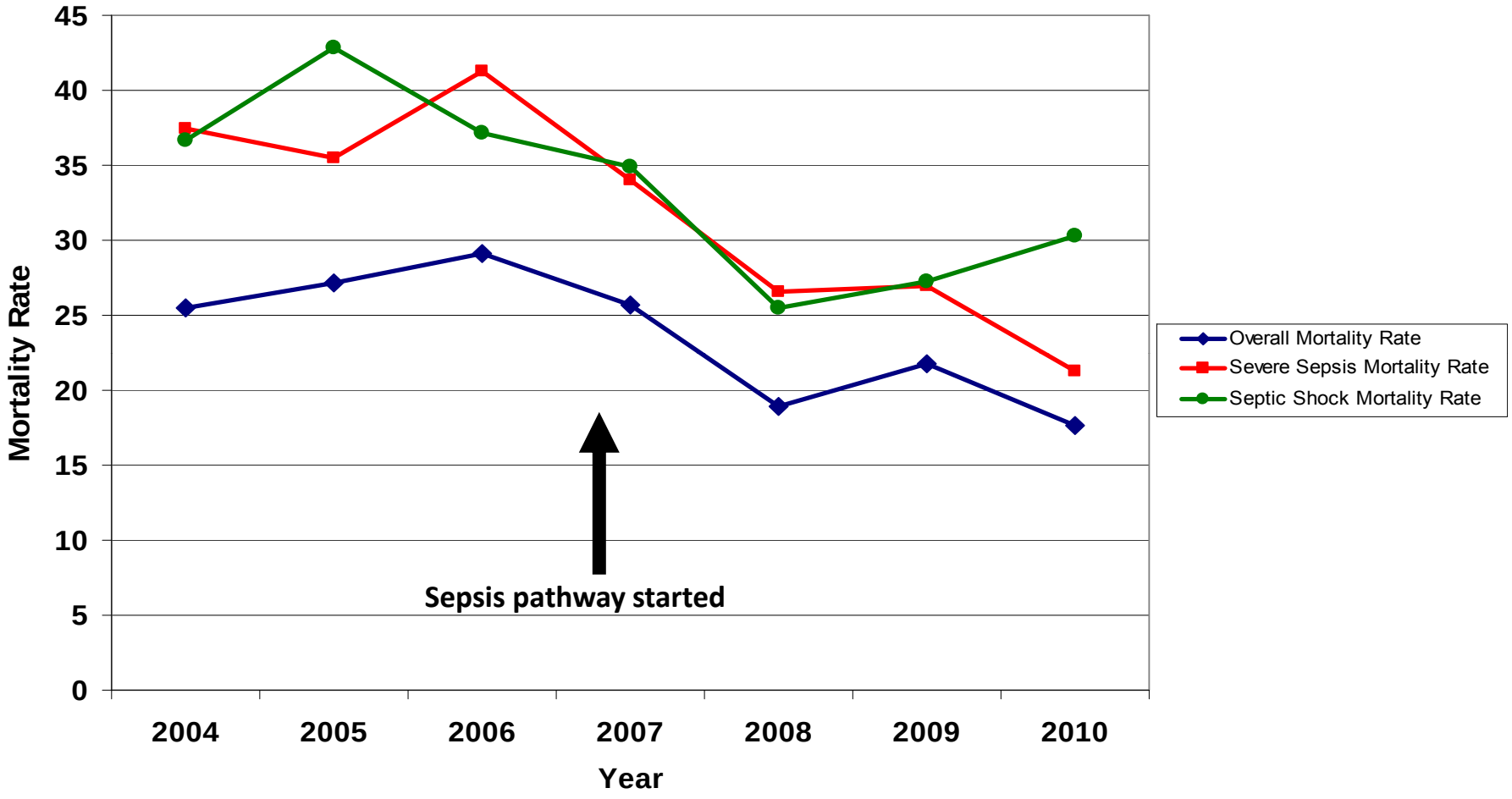
Build a system: Stakeholder analysis

- "Who will it hurt?" to identify who to invite
- Encourage contribution and ownership
- Identify champions in each department/area involved

Build a Team: Start Large, End Small

- Solicit ideas and input widely
- Trim team to a small working group, include representative champions
- Champions are important and drive uptake, but systems are needed for sustainability

BMC Sepsis Mortality



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M-LiNk Portfolio
SEPSIS LEARNING SERIES

Questions & Discussion

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SEPSIS LEARNING SERIES

Please visit the M-LiNk page of PatientCareLink to access slides, audio recordings and related resources from M-LiNk webinars and events.

Thank you for your participation and we value your input on an online survey to be sent shortly.

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