Sepsis Resuscitation: Keeping Up the Pace

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Joe's
Java

Compliance = Mortality

- Managing Change
- Placing Power
- Leadership

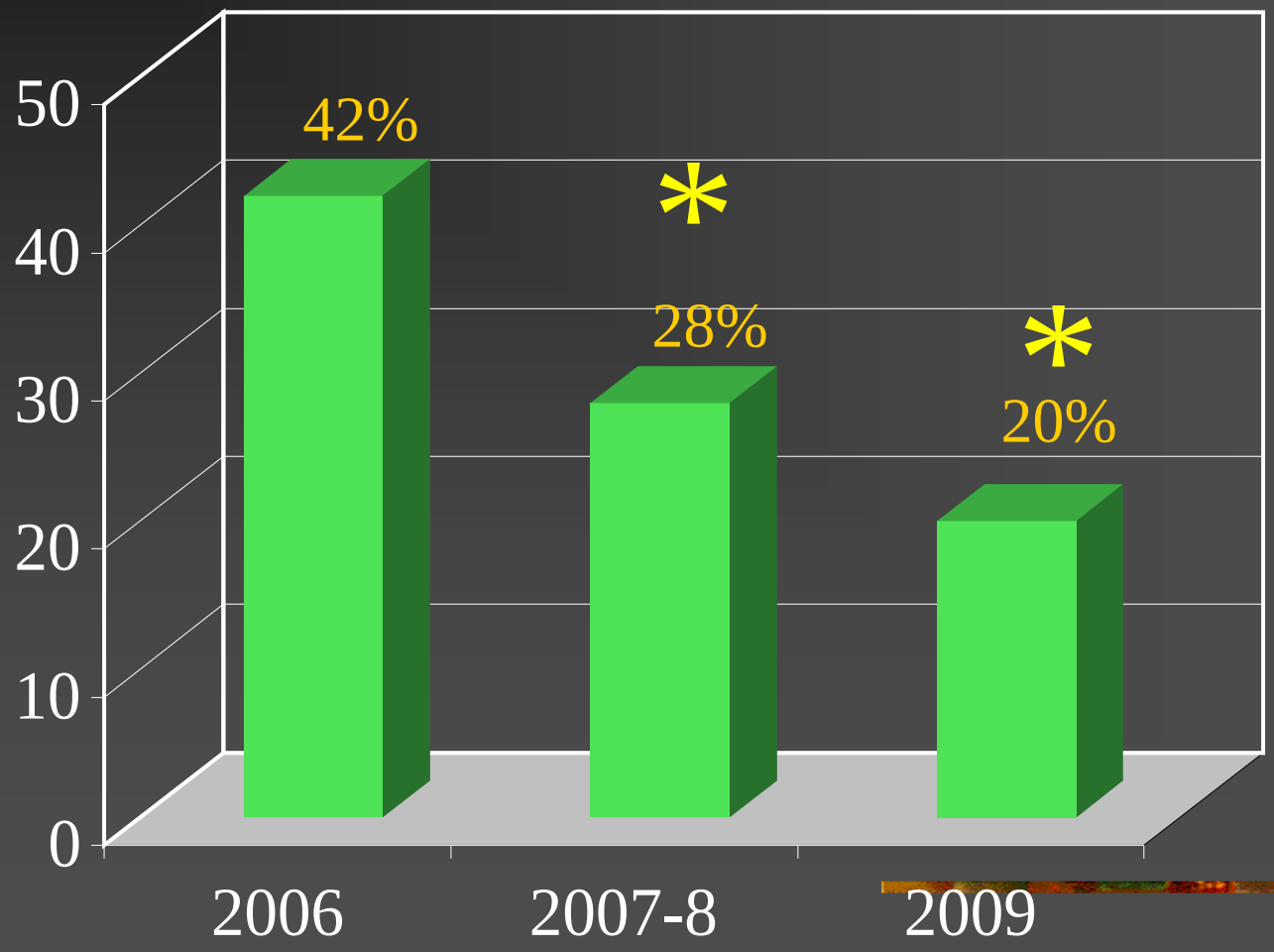
SJMHS SICU Sepsis Outcomes

	2006	2007-2008	2009	p
Mortality	42%	28%	20%	p<0.01
LOS (mean ± days)	38 ± 3	29 ± 36	22 ± 15	p<0.01
DVC (mean ± SD)	$36,756 ± $23,982	$36,568 ± 45,486	$30,428 ± $25,701	n.s.

American Journal of Surgery, Silverman, et al 2011

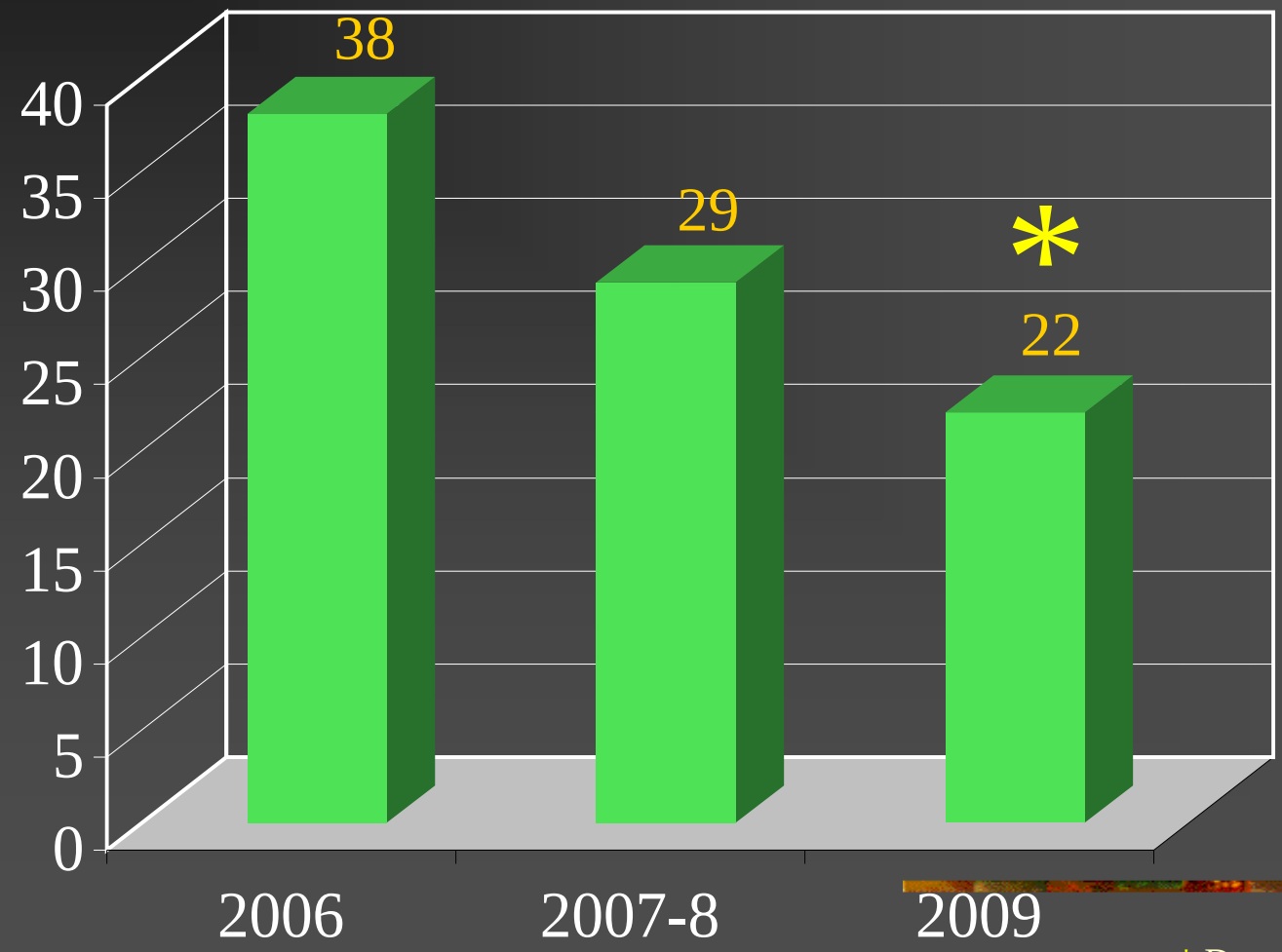
In-Hospital Mortality

* Denotes p <0.01



Average length of stay (LOS)

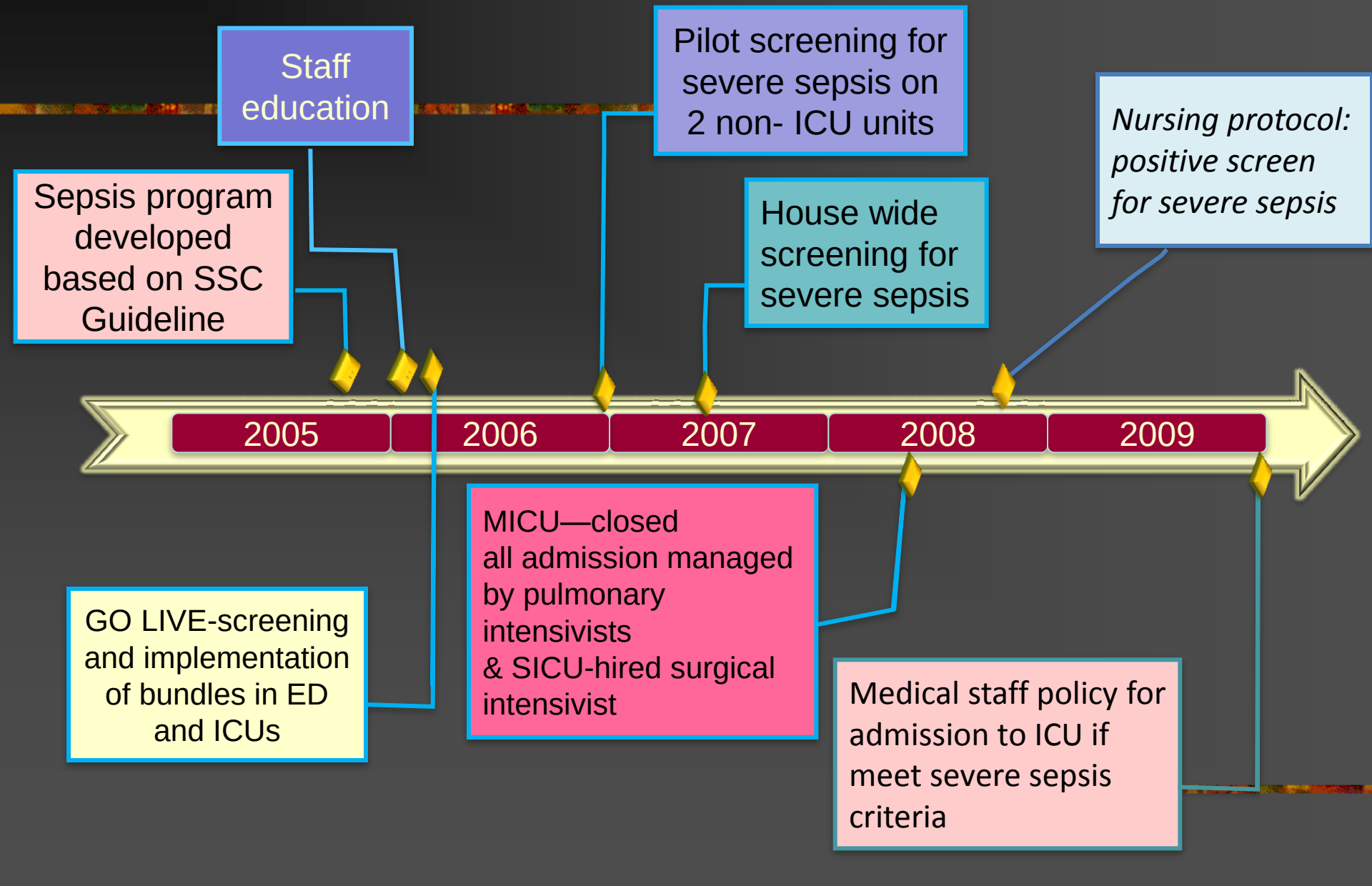
(days)



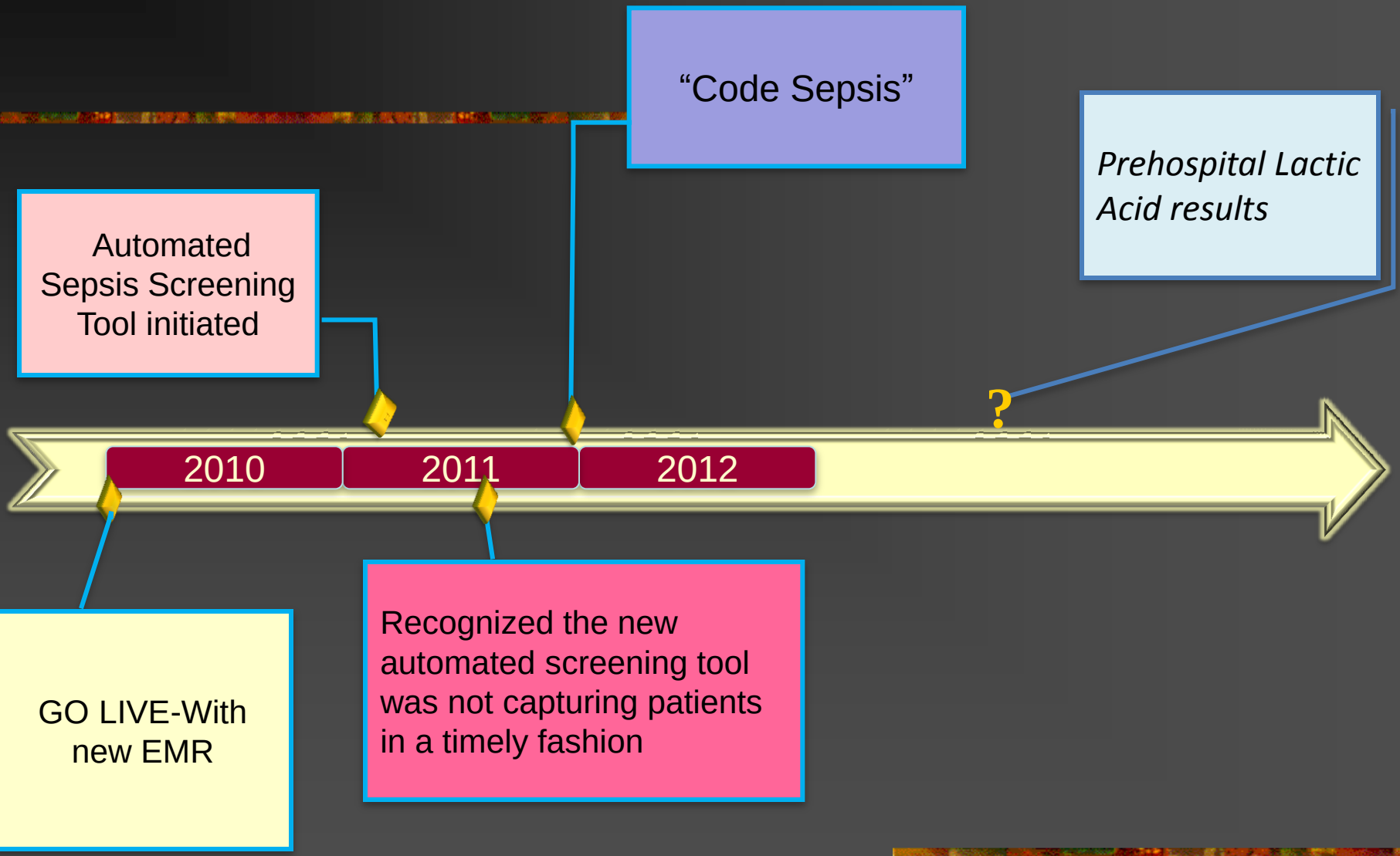
* Denotes p <0.01

Mean Direct Variable Cost

Timeline for the SJMHS Sepsis Journey



Timeline for the SJMHS Sepsis Journey



Compliance Data: Resuscitation Bundle

	Fluid Bolus in first hr	Lactic acid in first 6 hrs	Bld Cultures b/f antibiotic	Antibiotics within 1 hr (mean time to admin) non-ED	% of patients with first 4 interventions completed within one hour
2007 N=209	37%	91%	59%	53% (107 min)	14%
2008 N=323	60%	91%	62%	59% (125 min)	18%
2009 N=389	71%	94%	62%	59% (97 min)	24%
2010 N=286	65%	97%	70%	51% (86 min)	19%
2011 N=169	64%	99%	61%	46% (109 min)	15%

Compliance Data: Resuscitation Bundle

	CVP Placed	CVP to goal in 6 hrs	MAP to goal in 6 hrs	ScvO2 to goal in 6hrs	Median time to meeting all 3 goals	Mortality
2007 N=209	82%	61%	79%	53%	6 hrs	28%
2008 N=323	96%	59%	77%	50%	7 hrs	28%
2009 N=389	96%	78%	83%	61%	4.8 hrs	20%
2010 N=286	83%	74%	91%	50%	5.5 hrs	31%
2011 N=169	85%	67%	89%	67%	5.2 hrs	18%

What do we really think promotes compliance?

- Sepsis Pathway Tool
- Nursing policy to initiate sepsis bundle when patient screens positive for sepsis
- Intensivist leadership / “Nursing Card” /Mulitidisciplinary Critical Care M&M
- Contemporaneous Sepsis Bundle data collection and feedback on performance
- Delirium Control
- Using more decompressive laparotomies
- Early ARDS interventions
- Aggressive hemodynamic monitoring with non-invasive techniques

The Severe Sepsis Bundles: Surviving Sepsis Campaign/IHI

Resuscitation Bundle

(To be accomplished as soon as possible over first 6 hours):

- ✓ **Serum lactate measured.**
- ✓ **Blood cultures obtained prior to antibiotics administered. (1C)**
- ✓ **Perform imaging studies promptly to fine source (1C)**
- ✓ **From the time of presentation, broad- spectrum antibiotics within 3 hours for ED admissions and 1 hour for non-ED ICU admissions. (1D/1B)**
- ✓ **For hypotension and/or lactate > 4 mmol/L:**
  - ✓ **Deliver an initial minimum of 20 mL/kg of crystalloid (or colloid equivalent) (1C)**
  - ✓ **Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain MAP ≥ 65 mmHg.**
- ✓ **For persistent hypotension despite initial fluid resuscitation (septic shock) and/or lactate > 4 mmol/L: 1C**
  - ✓ **Achieve CVP ≥ 8 mmHg & MAP ≥ 65 mmHg & UO >0.5mL/kg/hr**
  - ✓ **Achieve $ScvO_2$ of ≥ 70% or SvO_2 ≥ 65%.**
  - ✓ **if $ScvO_2$ not ≥ 70% blood or dobutamine (2C)**

Management Bundle

(To be accomplished as soon as possible over first 24 hours):

- ✓ **Low-dose steroids administered for septic shock in accordance with a standardized ICU policy. (Given to patients who respond poorly to fluids or vasopressors) (2C)**
- ✓ **Drotrecogin alfa (activated) administered in accordance with a standardized ICU policy. (Given to patients with sepsis induced organ dysfunction at high risk of death (2B)**
- ✓ **Glucose control maintained to < 150 mg/dL (8.3 mmol/L). (2C)**
- ✓ **Tidal volume 6 ml/kg (1B) Inspiratory plateau pressures < 30 cmH_2O for mechanically ventilated patients. (1C)**

Adapted from the revised guidelines: CCM 2008;36:296-327.

Sepsis Bundle

SAINT JOSEPH MERCY HEALTH SYSTEM
A MEMBER OF TRINITY HEALTH
REMARKABLE MEDICINE. REMARKABLE CARE.

ST. JOSEPH MERCY HOSPITAL
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SAINT JOSEPH MERCY SALINE HOSPITAL

SEVERE SEPSIS CLINICAL PATHWAY

Room # _____ ICU admission Date: _____ Time: _____

Please complete the following:

- **Severe sepsis or septic shock* diagnosis: Date:** _____ **Time:** _____
- Patient transferred from (unit or hospital): _____
- Patient was identified as having severe sepsis or septic shock: ❑ ED ❑ Floor ❑ ICU Admission ❑ During ICU Stay
- Decision to move to comfort care in first 24 hours after diagnosis Yes No
- ICU discharge: Date: _____ Time: _____
- Discharge status: Alive Expired

***Septic Shock defined as:**
SBP less than 90mmHg or 40mmHg decrease from baseline or MAP less than 65mmHg after 20ml/kg fluid bolus

****Vasopressor unresponsive defined as:**
Requiring vasopressors after fluid resuscitation completed.

Sepsis Daily Goals	Date _____ to _____ 0-1 Hours	Date _____ to _____ 1-6 Hours	Date _____ to _____ 6-24 Hours	Date _____ to _____ 24-72 Hours
1. Goal directed therapy to achieve increased O2 delivery: CVP 8-12mmHg MAP greater than 65mmHg ScvO2 greater than or equal to 70% 2. Blood Glucose 90-140 mg/dl 3. Urine output greater than 0.5 ml/kg/hour 4. In patients with acute lung injury or ARDS; Are the static or plateau inspiratory pressures less than 30cmH2O in first 24 hours? Yes No Is tidal volume 6ml/kg of ideal body weight in first 24 hours? Yes No 5. 6.	_____ Initial Labs: serum lactate, additional labs as ordered by physician Yes No Serum lactate drawn within 6 hours? Yes No Blood Cultures X 2 Time 1: _____ Time 2: _____ _____ Other Cultures: _____ Establish IV access _____ Volume resuscitate: initial 20ml/kg over 30 minutes then additional boluses as needed per order _____ Time 20 ml/kg bolus infused _____ Broad Spectrum Antibiotic-start after obtain blood culture *(see Infonet under Pharmacy Guide to Antimicrobial Therapy)* _____ Time antibiotic hung _____ Source Control	Refer to Severe Sepsis Resuscitation Algorithm Yes No Was initial lactate greater than 4mmol/L? Yes No Was patient hypotensive after initial fluid bolus? Yes No CVP placed If no, why? _____ _____ Record the first time the following is achieved: _____ CVP 8-12 mmHg on vent 12-15 mmHg _____ MAP greater than or equal to 65 mmHg _____ $SCV0_2$ greater than 70%: mixed venous greater than or equal to 65% _____ Confirm Infectious Source	Yes No Is patient on vasopressor at greater than 6 hours Yes No Was patient assessed for Eligibility for Activated Protein C (Xigris) – *(see Infonet under Pharmacy-Drug Information or speak to pharmacist)* Yes No Was patient eligible for Activated Protein C? _____ If Xigris administered, Start Time: _____ Yes No Considered Hydrocortisone if vasopressor unresponsive** _____ If hydrocortisone administered, provide 50mg every 6 hours Start Time: _____ _____ Consider Vasopressin for refractory septic shock	_____ Confirm Infectious Source _____ Re-assess need for broad spectrum antibiotics based on culture reports. Yes No NA Was the organism that was identified sensitive to the initial antibiotic? _____ Discontinue Vancomycin if appropriate _____ D/C or taper steriods if vasopressors off _____ Re-evaluate need for invasive lines and tubes _____ Nutrition Therapy Support
Signature:				

6011-027 R 3/08 (M)D

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SEVERE SEPSIS CLINICAL PATHWAY

Room # ____________ ICU admission Date: ____________ Time: ____________

Contemporaneous Sepsis Bundle data collection and feedback on performance

Please complete the following:

- **Severe sepsis or septic shock* diagnosis: Date:** ____________ **Time:** ____________
- Patient transferred from (unit or hospital): ____________
- Patient was identified as having severe sepsis or septic shock: ❑ ED ❑ Floor ❑ ICU Admission ❑ During ICU Stay
- Decision to move to comfort care in first 24 hours after diagnosis Yes No
- ICU discharge: Date: ____________ Time: ____________
- Discharge status: Alive Expired

***Septic Shock defined as:**
SBP less than 90mm... 40mmHg decrease from b... MAP less than 65mmHg a... bolus

****... efined as:** ...d

Sepsis Daily Goals	Date ______ to ______ 0-1 Hours	Date ______ to ______ 1-6 Hours	...	______ to ______ 24-72 Hours
1. Goal directed therapy to achieve increased O2 delivery: CVP 8-12mmHg MAP greater than 65mmHg ScvO2 greater than or equal to 70%	______ Initial Labs: serum lactate, additional labs as ordered by physician Yes No Serum lactate ... within 6 ... Yes No Bl...	Refer to Sev... Resusc... ... after initial ... us? CVP placed If no, why? ______	... on ...sopressor at greater than 6 hours Yes No Was patient assessed for Eligibility for Activated Protein C (Xigris) – *(see Infonet under Pharmacy-Drug Information or speak to pharmacist)*	______ Confirm Infectious Source ______ Re-assess need for broad spectrum antibiotics based on culture reports.
2. Blood Glucose 90-140 mg/dl				Yes No NA Was the organism that was identified sensitive to the initial antibiotic?
3. Urine output greater than ... ml/kg/hour	...ss ...esuscitate: ...al 20ml/kg over 30 minutes then additional boluses as needed per order	Record the first time the following is achieved: ______ CVP 8-12 mmHg on vent 12-15 mmHg ______ MAP greater than or equal to 65 mmHg ______ SCV0_2 greater than 70%: mixed venous greater than or equal to 65% ______ Confirm Infectious Source	Yes No Was patient eligible for Activated Protein C? ______ If Xigris administered, Start Time: ______ Yes No Considered Hydrocortisone if vasopressor unresponsive** ______ If hydrocortisone administered, provide 50mg every 6 hours Start Time: ______ ______ Consider Vasopressin for refractory septic shock	______ Discontinue Vancomycin if appropriate ______ D/C or taper steriods if vasopressors off ______ Re-evaluate need for invasive lines and tubes ______ Nutrition Therapy Support
4. In patient... inju... Is ... 6ml/kg of ideal bo...ight in first 24 hours? Yes No	______ Time 20 ml/kg bolus infused ______ Broad Spectrum Antibiotic-start after obtain blood culture *(see Infonet under Pharmacy Guide to Antimicrobial Therapy)*			
5.				
6.	______ Time antibiotic hung Source Control			
Signature:				

6011-027 R 3/08 (M)D

Nursing Policy on Sepsis Screening

- Complicated
- Frequently misunderstood
- Screening every shift
  - EMR interfered
  - Delayed time to diagnosis
  - Went back to paper
- If you screen positive in our hospital:
  - RRT re-evaluates and verifies
  - Institutes early therapy

- Positive Screen
  - Blood cultures
  - Lactic acid and CBC
  - Fluid bolus
- Instituted by the nurse to assure no delay in care
- Hospital policy allows this in the nursing scope of practice

Accountable Multi-disciplinary Rounds

Who Shows Up?

- Nursing bedside
- Physician Team
- Pharmacy
- Respiratory therapy
- Nutrition
- Family

Accountable Multi-disciplinary Rounds

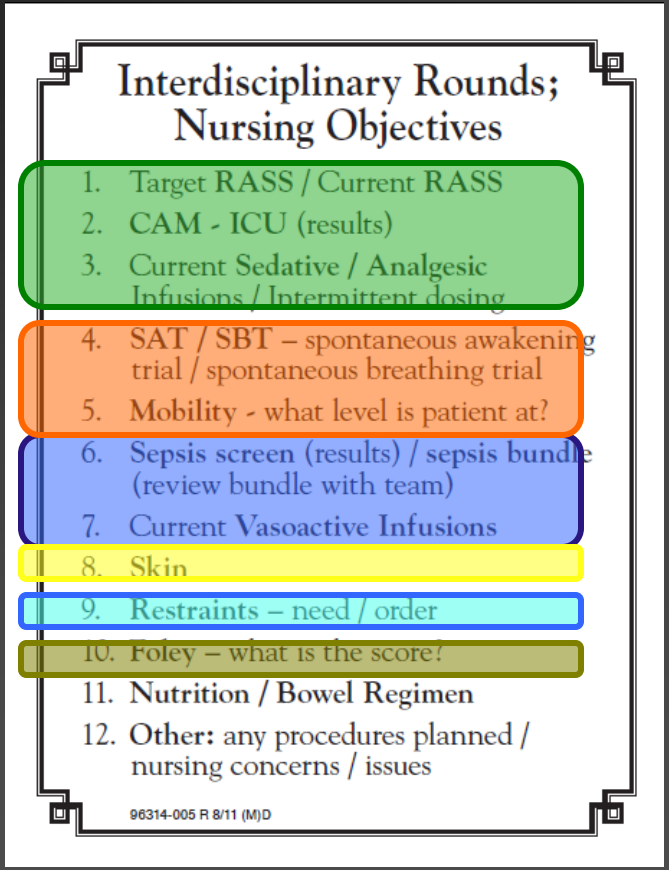
- Pre-defined content
  - Time constrained
  - Presented in specific order
  - Nursing card gone through in detail
  - Plan by systems with goals in each category
    - communicated clearly
    - follow-up defined

Interdisciplinary Rounds Card

Delirium

Sepsis

CaUTI



VAP

JCAHO

"Never Events"

Interdisciplinary Rounds Card

Interdisciplinary Rounds; Nursing Objectives

1. Target **RASS** / Current **RASS**
2. **CAM - ICU** (results)
3. Current **Sedative / Analgesic** Infusions / Intermittent dosing
4. **SAT / SBT –** spontaneous awakening trial / spontaneous breathing trial
5. **Mobility –** what level is patient at?

(Continued on back)

6. **Sepsis screen** (results) / **sepsis bundle** (review bundle with team)
7. Current **Vasoactive Infusions**
8. **Skin**
9. **Restraints –** need / order
10. **Foley –** what is the score?
11. **Nutrition / Bowel Regimen**
12. **Other:** any procedures planned /nursing concerns / issues

Leadership

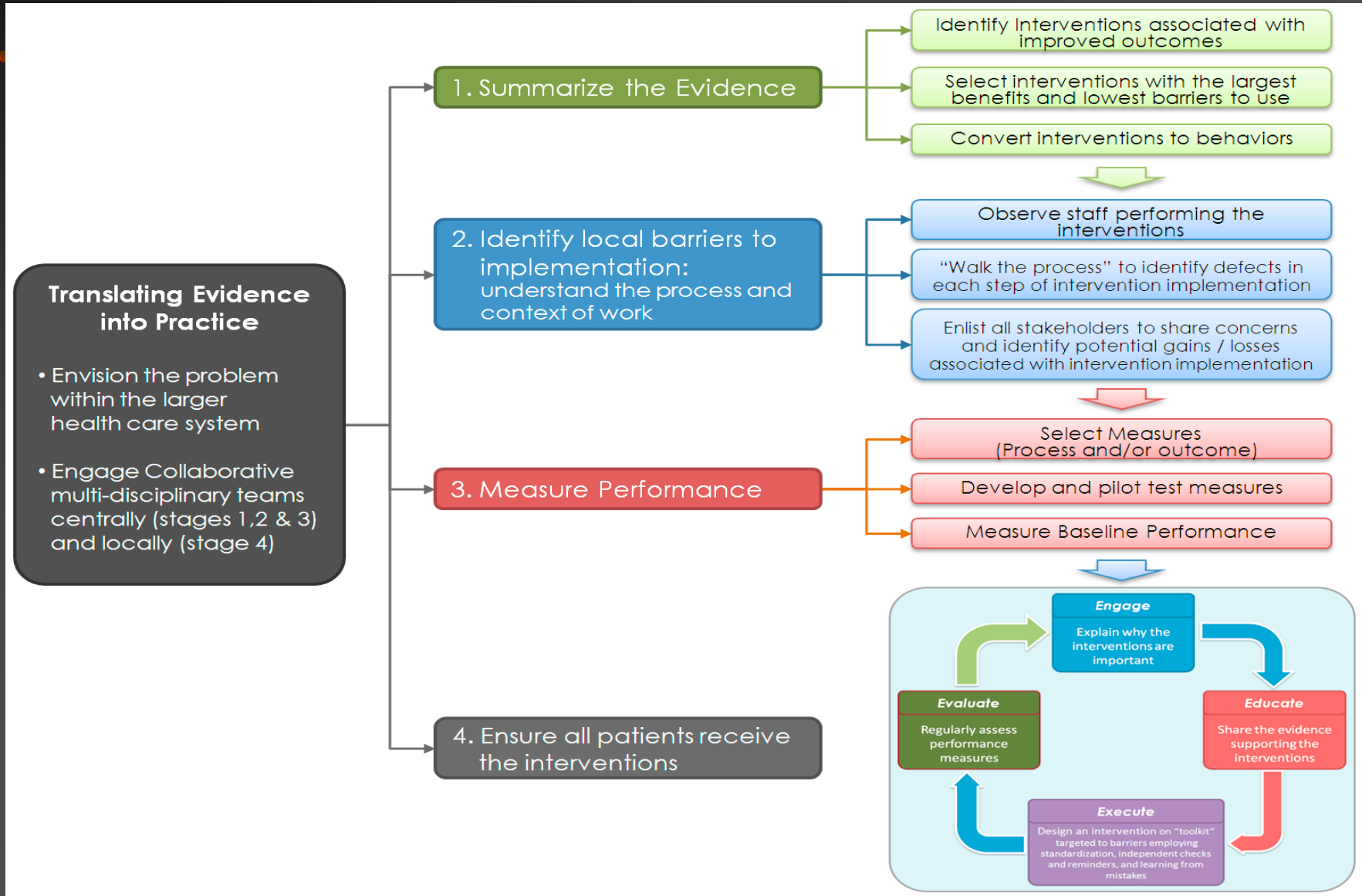
The People (Keystone ICU Group)

- Bedside nursing
- RT
- Pharmacy
- Doctors
- Administrators
- Performance Improvement

The Questions they answer

- Can we change practice through process improvement alone?
- Will successful change require altering the value structure?

Translating Evidence into Standard Practice



Leadership

- Closed SICU
- Multidisciplinary Rounds with “Nursing Card”
- Learn from a defect
- Define/implement Critical Care Standards of Nursing and Medical Practice
- Standardize RN-RN Shift Handoff
- Standardized Physician-to-physician Handoff
- Set protocols for managing common and life threatening diseases
- Enforce evidence based practices

Leadership: Mandatory Admission to the ICU for Severe Sepsis

- Difficult decision
- Because process alone showed non-compliance with evidence based practice
- Vetted through executive management
- All patients are admitted to an ICU if:
  - Suspected or documented infection and
  - Lactic Acid >4
  - We DO NOT require end organ dysfunction

Multidisciplinary Critical Care M&M

- M&M established
  - facilitate hospital-wide communication on issues related to Critical Care.
- Participants:
  - MICU
  - SICU
  - CICU
  - CT-ICU
- Meets Quarterly
  - Tracks all deaths & complications in all adult ICUs

The Insidious Complication

Delirium Control

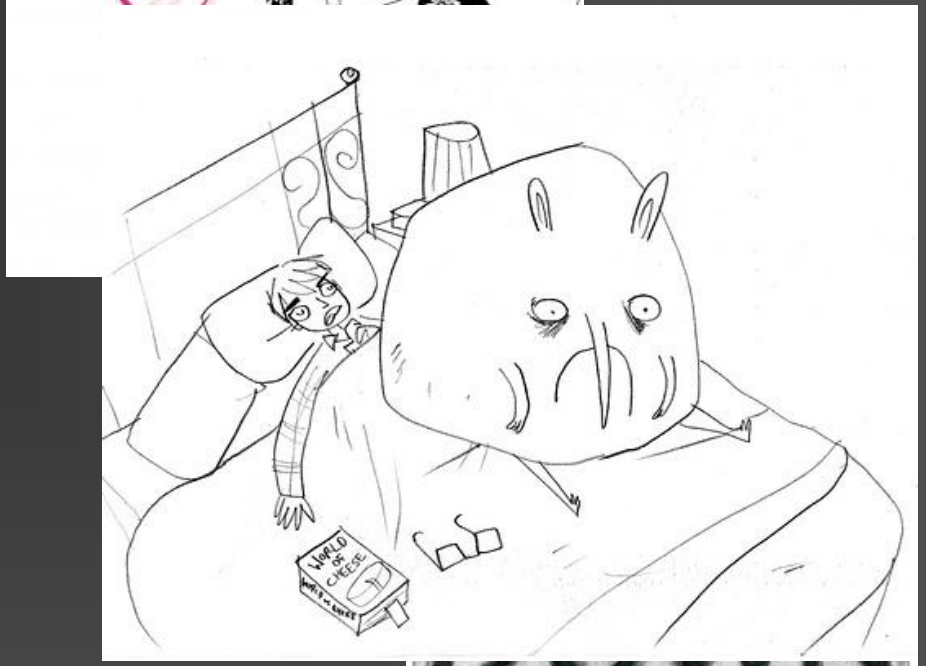
The Problem

- 33% increase in mortality
- 33% increase in ICU LOS and hospital LOS
- Poor quality of life
- PTSD

The Solution (…at least in part)

- Reducing exposure to sedatives
  - No dripped sedatives, PRN only if possible
- Non-pharmacological approaches to delirium control
  - Sleep protocols

Delirium Control



Delirium Education in a Surgical Intensive Care Unit Decreases the Use of Sedation in Critically Ill Patients

Lafond C, Yang A, Leichtle S, Nieman W, Posa P, Bander J, Anderson H, Brandt M, Purtill MA

Purpose: The objective of this study was to investigate the impact of a delirium prevention program on the use of continuous intravenous sedatives and analgesics in a surgical intensive care unit (SICU).

Hypothesis: A delirium prevention program will lead to a decrease in continuous, intravenous sedation (measured as average sedative days, S_{AD}) without an increase in self-extubation or inadvertent line removal.

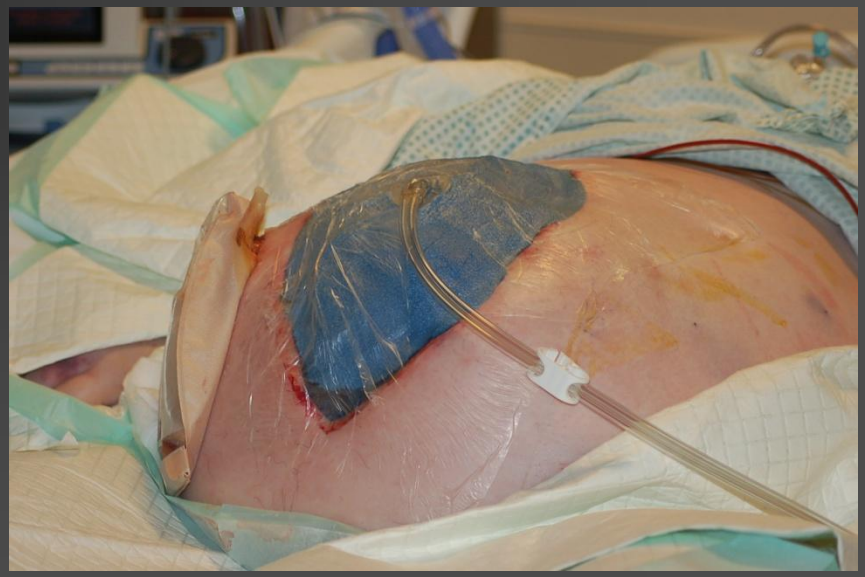
Design: Review of a prospectively collected database including all patients hospitalized in the SICU who were mechanically ventilated and had at least one continuous infusion of a sedative for the year before (Y_0) and after (Y_1) implementation of a delirium prevention program.

Results: One hundred eighty-four patients with a mean APACHE III score of 64 were recorded in the database in Y_0, and two hundred fourteen patients with a mean APACHE III score of 65 were recorded in Y_1. The number of S_{AD} decreased from 3.2 to 2.6 following implementation of the program ($P < .05$). The reduction of average days on propofol was significant (Y_0: 2.8 days, Y_1: 2.0 days; $P < .01$). There was no significant difference between Y_0 and Y_1 in regards to the risk of inadvertent line removal (4% versus 3%, $P > .05$) or self-extubation (3% versus 6%, $P > .05$). Patients did not require an increased amount of analgesic infusions (mean number of days on continuous IV analgesics, Y_0: 4.8, Y_1: 4.0, $P > .05$). There was no statistically significant difference between Y_0 and Y_1 in days of mechanical ventilation, length of stay in the SICU, and hospital length of stay ($P > .05$). Mortality was 14% (26/184 patients) in Y_0, and 15% (33/214 patients) in Y_1 ($P > .05$).

Conclusions: An ongoing delirium prevention program in a SICU significantly reduced the use of continuously infused sedatives. This reduction did not increase the number of adverse events. The program did not change the use of analgesic infusions, days of mechanical ventilation per patient, length of stay in the SICU, hospital length of stay, and mortality.

Decompressive Laparotomies

- Screening program
  - identifies people at risk for intra-abdominal hypertension
- Open Abdomens
  - Using more open abdomens for:
    - Sepsis
    - GI complications
    - Trauma



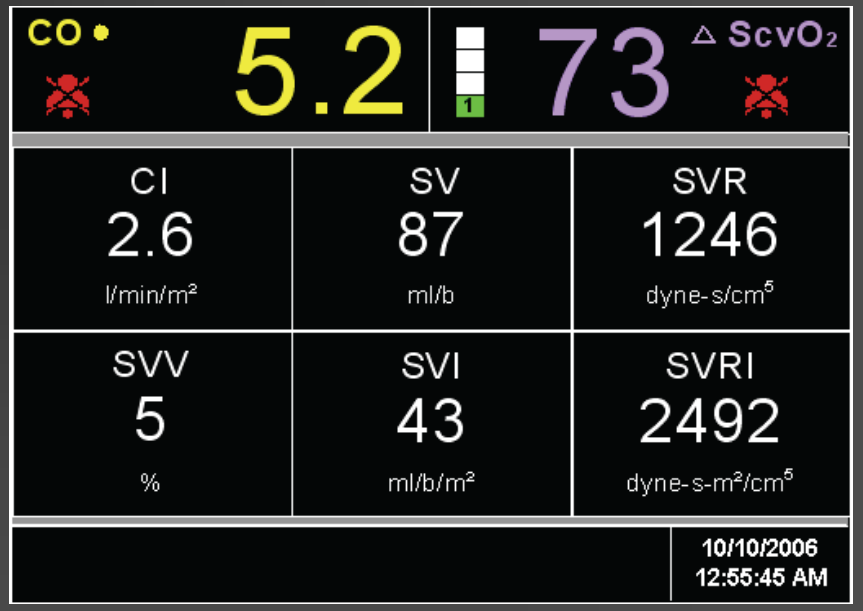
Ventilator Management

- Low Tidal Volume Ventilation per ARDS net recommendations
  - Start when identified with ALI (PF ratio<300)
- Open Lung Ventilation
  - APRV
- Proning
  - Early and often

Ventilator Management

Aggressive Hemodynamic Monitoring

- Non-invasive technology
- Minimal risk
- Physiology based decisions
  - Fluid management
  - When to start vasoactive agents



Keeping Up the Pace……

- Constant vigilance
- It takes a “bundle” of tools

END