

IMPROVING ICU QUALITY OF CARE AND REDUCING LENGTH OF STAY IN THE ED

Bela Patel M.D.

Associate Professor of Medicine

Division Director of Critical Care Medicine

UT Health Science Center at Houston

Assistant Chief Medical Officer

Executive Medical Director of Critical Care

Memorial Hermann Hospital - TMC

Memorial Hermann Hospital Texas Medical Center

1050 Bed Level 1 Trauma Center

65,000 Emergency Department visits per year

- 37% admitted to hospital
- 10% of admitted patients admitted to ICU
 - 150 ICU Beds
 - 16 MICU Beds
 - 1100 admissions/year
 - > 95% capacity winter months

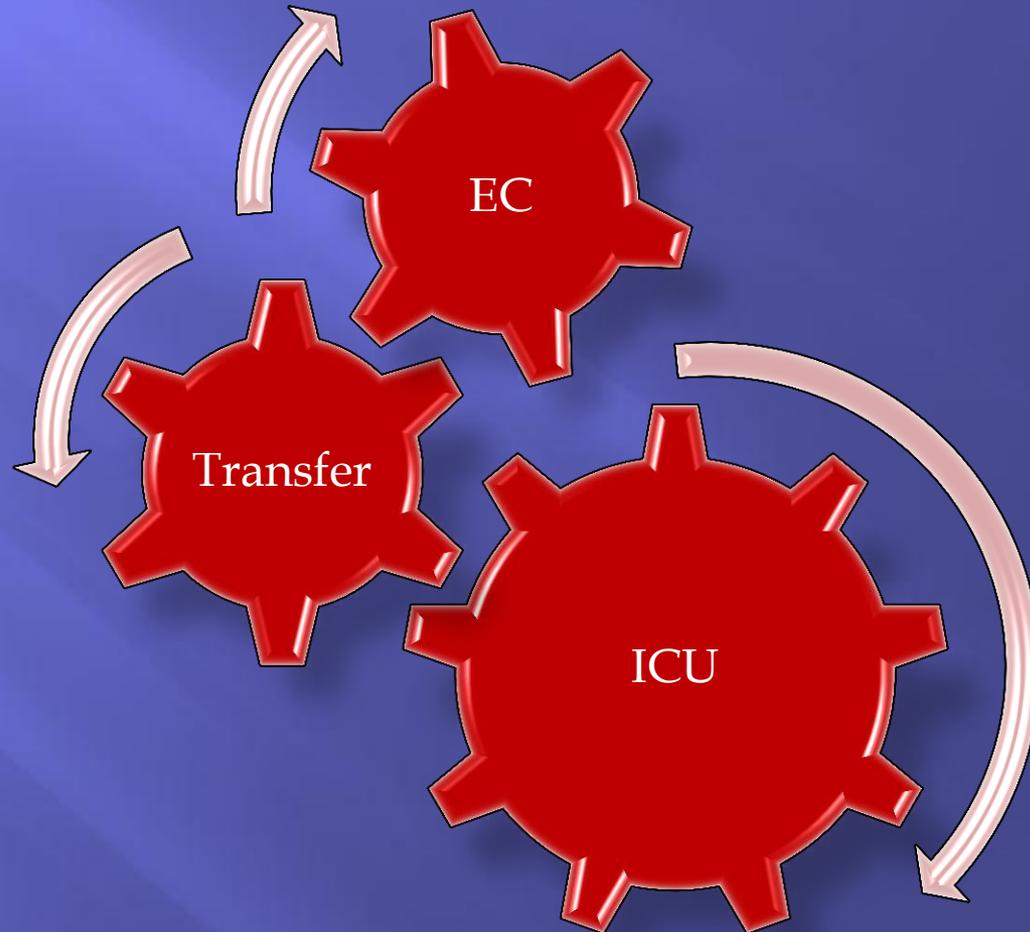


Admission Delays to the ICU

Delayed ICU transfer (>4 hours from care complete to ICU arrival)

- Increased hospital mortality
- Increased hospital LOS
- Increased ICU LOS

Decreasing Admission Delays Spin Faster



Improving ICU Quality, Length of Stay and Mortality

- ▣ Reducing EC to ICU time < 4 hours
 - ▣ Integrating Sepsis Care from EC to ICU
 - ▣ Hospital Acquired Infections to Zero
 - ▣ Standardize Ventilator Weaning Process
 - ▣ Improve End of Life Communication
 - ▣ Use Waste Tool to Identify Opportunities
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- ▣ UT Clinical Safety and Effectiveness program graduates

Baseline Data

March 08- February 09

Pratik Doshi MD

Care Complete to Depart MICU Admits

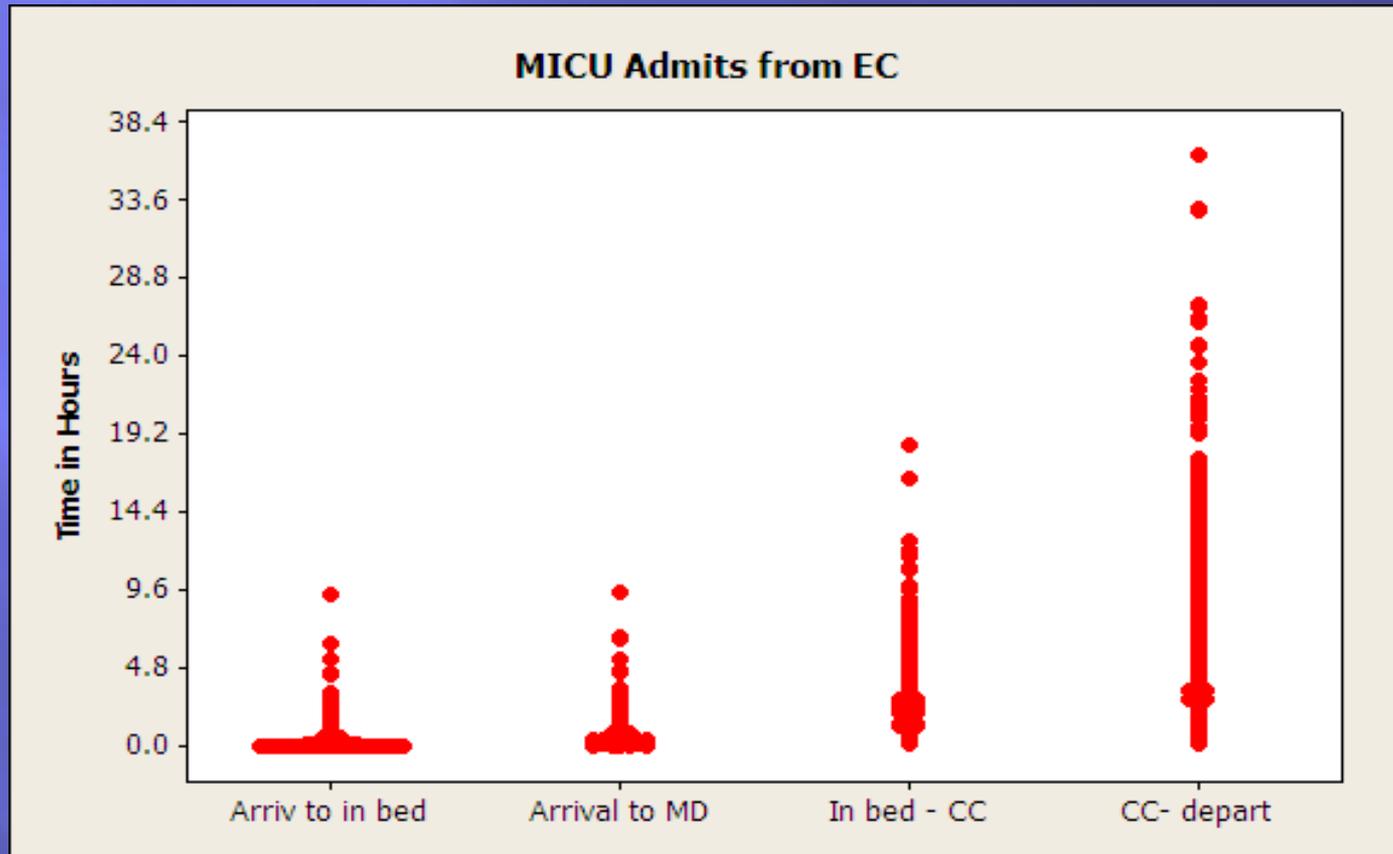
	<4 hours	>4 hours
Patients	345	314
% of total patients	52%	48%
Mortality Rate	14%	17%
Hospital LOS	9.10	10.30
CMI	2.33	2.60
Age	55	58
% Male	52%	48%
% Female	48%	52%
30 day readmits	40	32
30 day readmits-- Same DRG	12	7



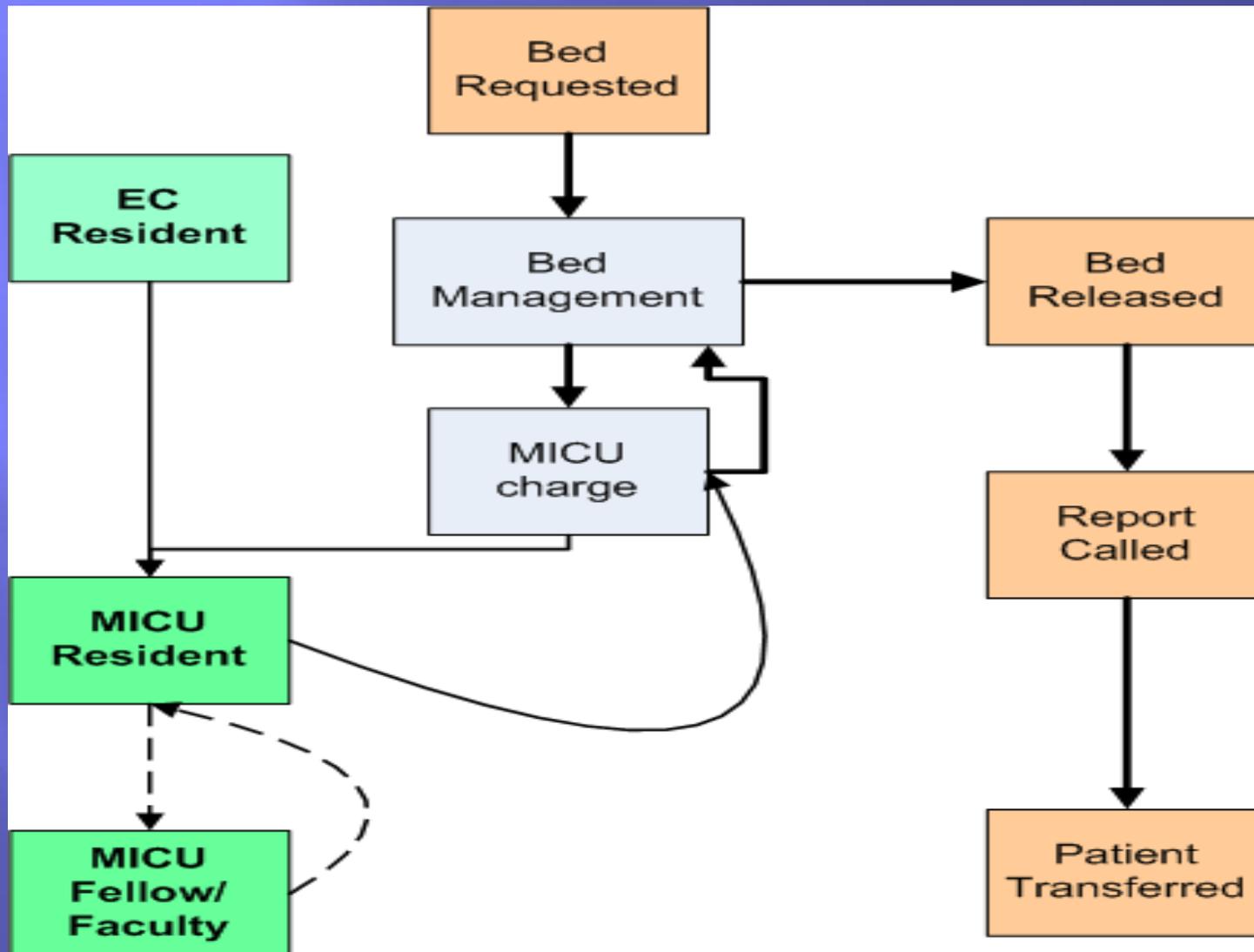
Mortality
18% higher
Length of stay
11% higher

Overview

Largest Variation : Care complete to departure

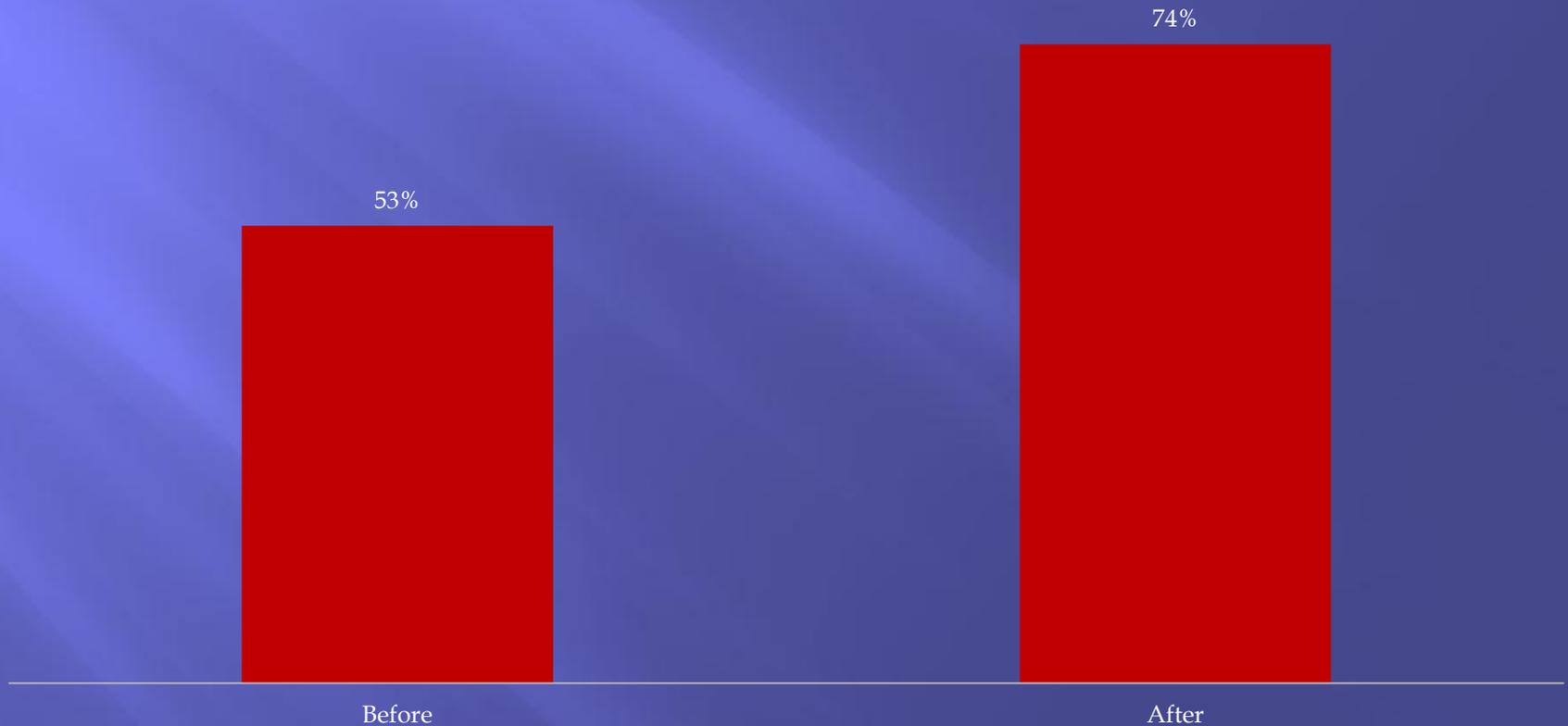


Streamlined Process



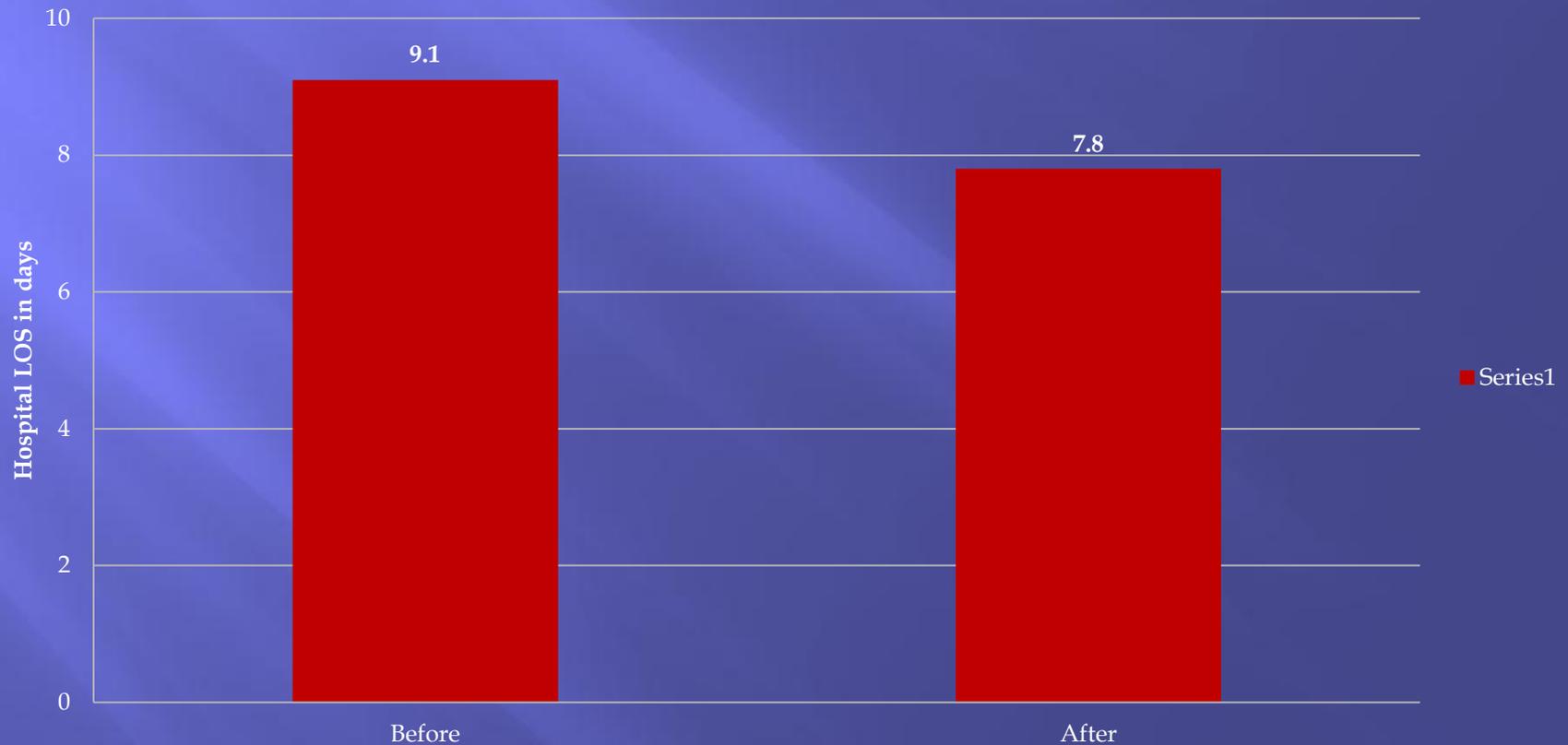
Reducing EC – ICU transfer times

Patients to MICU
Care Complete to depart <4 hours



Reduced LOS by Reducing Admission Delays

Patients to MICU
Arrival to Depart <4 hours



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Incidence of Severe Sepsis/Septic Shock



Leading cause of death in the ICU

10th most common cause of death in the US

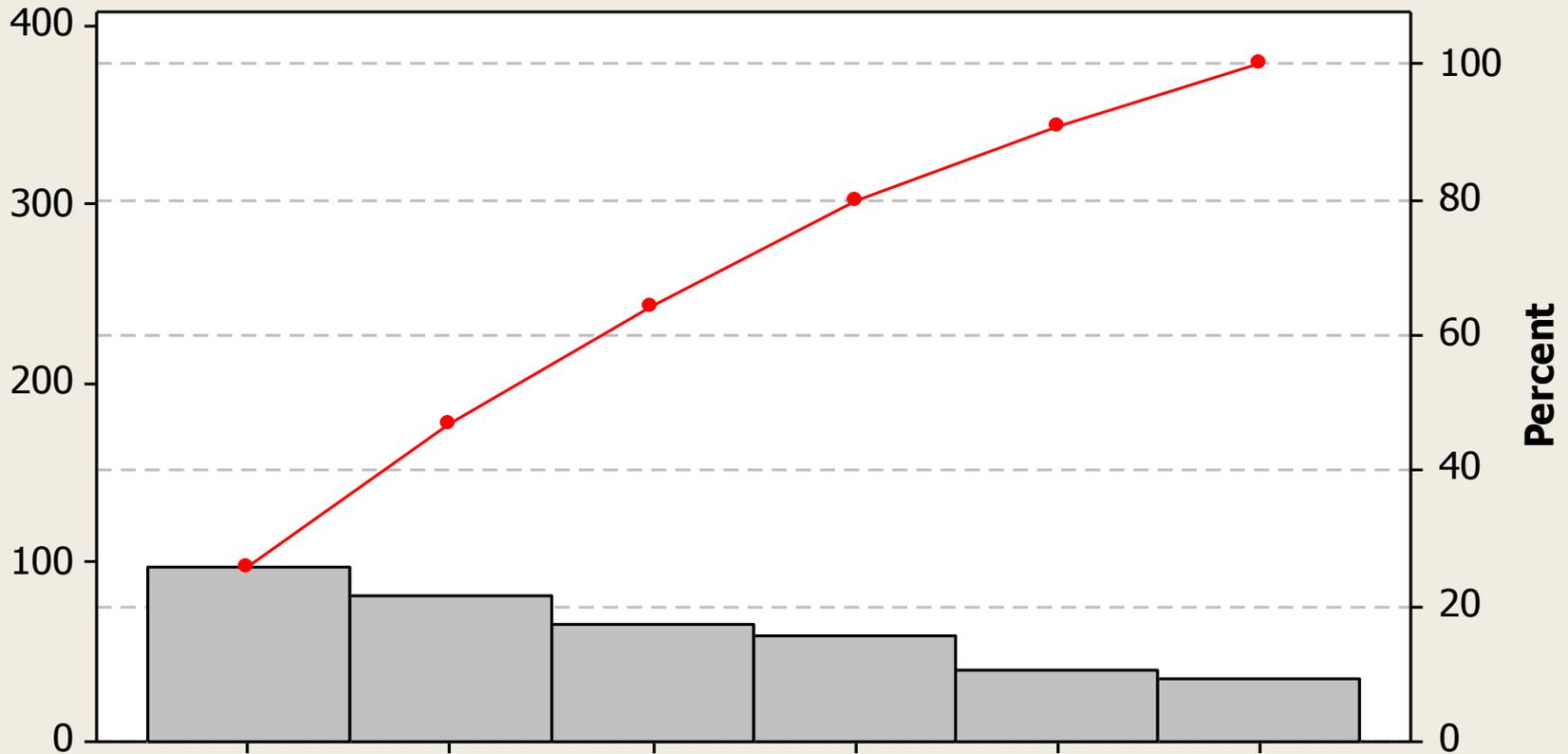
Increasing by 1.5% per year (additional million by 2020)

Sepsis Resuscitation Bundle

1. Serum lactate measured
2. Blood cultures prior to antibiotic administration
3. Broad-spectrum antibiotics administered
 - Within 3 hours of ED arrival or 1 hour non-ED admission
4. Treat hypotension with fluids +/- vasopressors
 - Initial minimum of 20 mL/kg of crystalloid
 - Vasopressors to keep MAP \geq 65 mm Hg
5. Persistent hypotension
 - Maintain central venous pressure $>$ 8 mm Hg
 - Central venous O₂ saturation (Scvo₂) $>$ 70%

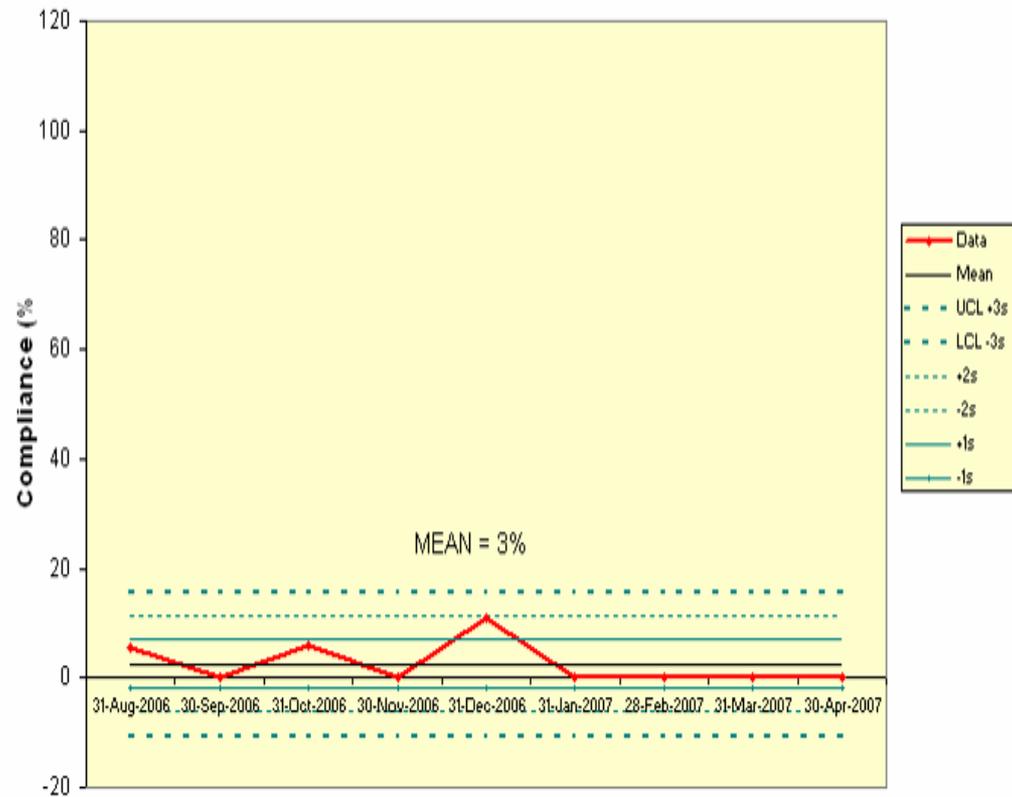


Percent Incorrect per Bundle Item

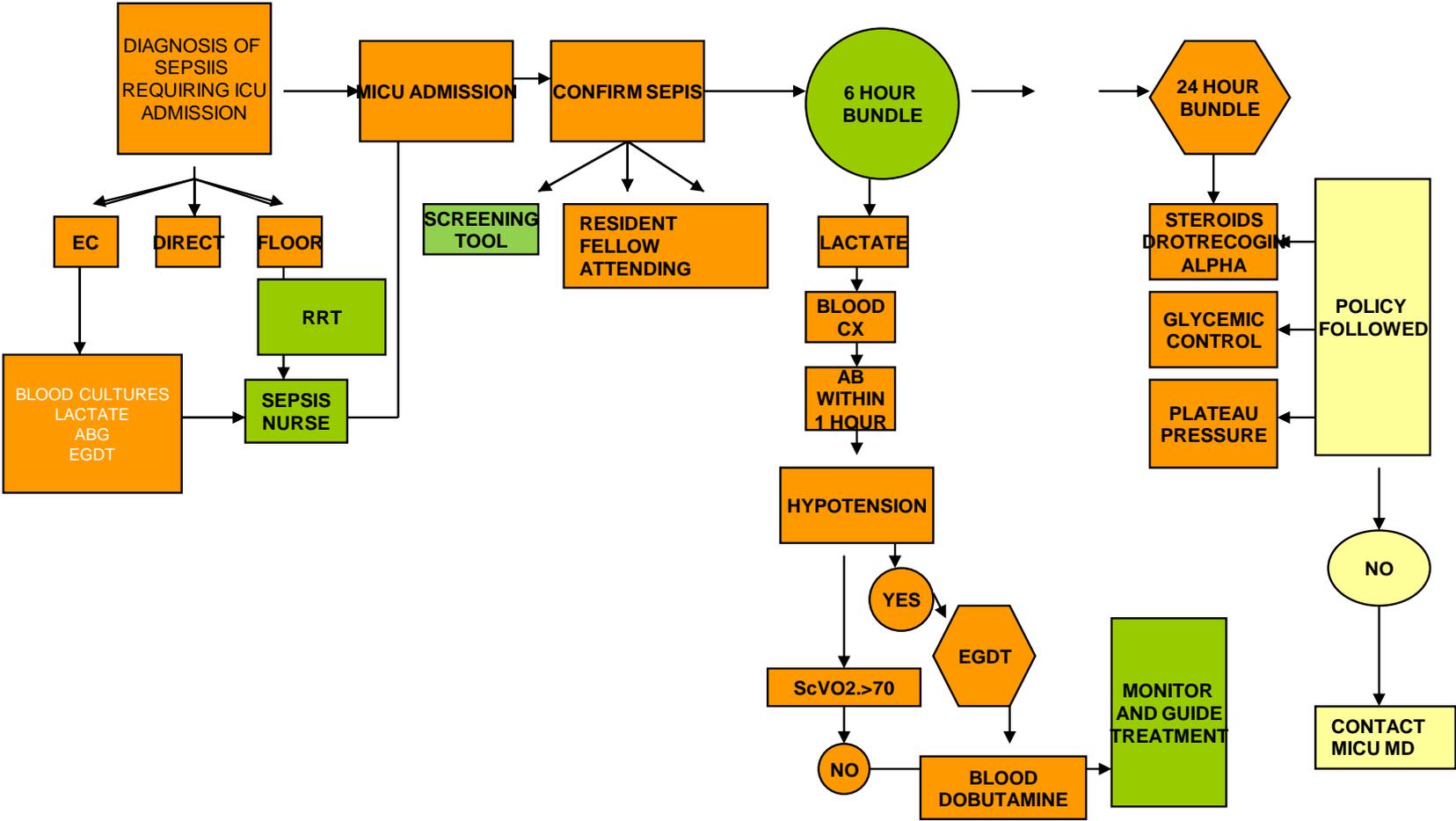


	C2	ScVO2	CVP >8	Antibiotics	Fluids/Vaso	Lactate	Blood Cultures
C2							
C3		97.2	81.0	65.4	59.0	40.4	35.2
Percent		25.7	21.4	17.3	15.6	10.7	9.3
Cum %		25.7	47.1	64.4	80.0	90.7	100.0

Sepsis Resuscitation Bundle OVERALL:
Pre-Intervention
Xbar chart



Process Map



Evaluation for Severe Sepsis Screening Tool

Instructions: Use this optional tool to screen patients for severe sepsis in the emergency department, on the wards, or in the ICU.

1. Is the patient's history suggestive of a new infection?

- | | | |
|---|---|---|
| <input type="checkbox"/> Pneumonia, empyema | <input type="checkbox"/> Bone/joint infection | <input type="checkbox"/> Implantable device infection |
| <input type="checkbox"/> Urinary tract infection | <input type="checkbox"/> Wound infection | |
| <input type="checkbox"/> Acute abdominal infection | <input type="checkbox"/> Bloodstream catheter infection | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Meningitis | <input type="checkbox"/> Endocarditis | |
| <input type="checkbox"/> Skin/soft tissue infection | | |

___ Yes ___ No

2. Are any two of following signs & symptoms of infection both present and new to the patient? **Note:** laboratory values may have been obtained for inpatients but may not be available for outpatients.

- | | | |
|--|--|---|
| <input type="checkbox"/> Hyperthermia > 38.3 °C (101.0 °F) | <input type="checkbox"/> Tachypnea > 20 bpm | <input type="checkbox"/> Leukopenia (WBC count < 4000 μ L ⁻¹) |
| <input type="checkbox"/> Hypothermia < 36 °C (96.8°F) | <input type="checkbox"/> Acutely altered mental status | <input type="checkbox"/> Hyperglycemia (plasma glucose >120 mg/dL) in the absence of diabetes |
| <input type="checkbox"/> Tachycardia > 90 bpm | <input type="checkbox"/> Leukocytosis (WBC count >12,000 μ L ⁻¹) | |

___ Yes ___ No

If the answer is yes to both either question 1 and 2, *suspicion of infection* is present:

- ✓ Obtain: lactic acid, blood cultures, CBC with differential, basic chemistry labs, bilirubin.
- ✓ At the physician's discretion obtain: UA, chest x-ray, amylase, lipase, ABG, CRP, CT scan.

3. Are any of the following organ dysfunction criteria present at a site remote from the site of the infection that are not considered to be chronic conditions? **Note:** the remote site stipulation is waived in the case of bilateral pulmonary infiltrates.

- SBP < 90 mmHg or MAP < 65 mmHg
- SBP decrease > 40 mm Hg from baseline
- Bilateral pulmonary infiltrates with a new (or increased) oxygen requirement to maintain SpO₂ > 90%
- Bilateral pulmonary infiltrates with PaO₂/FIO₂ ratio < 300
- Creatinine > 2.0 mg/dl (176.8 μ mol/L) or Urine Output < 0.5 ml/kg/hour for > 2 hours
- Bilirubin > 2 mg/dl (34.2 μ mol/L)
- Platelet count < 100,000
- Coagulopathy (INR >1.5 or aPTT >60 secs)
- Lactate > 2 mmol/L (18.0 mg/dl)

___ Yes ___ No

If *suspicion of infection* is present AND *organ dysfunction* is present, the patient meets the criteria for **SEVERE SEPSIS** and should be entered into the severe sepsis protocol.

Date: ___/___/___ (circle: dd/mm/yy or mm/dd/yy)

Time: ___: ___ (24 hr. clock)

Version 7.12.2005

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MICU 6 HOUR SEPSIS COUNTDOWN

Start time _____ (EC arrival or ICU admission if from floor)

FINISH TIME _____

Bundle Element 1:

Serum Lactate Measured

Bundle Element 2:

Blood Cultures Obtained Prior to Antibiotic Administration

Bundle Element 3:

Administer broad-spectrum antibiotic within 3 hours of ED and within 1 hour of non-ED admission

Broad-Spectrum Antibiotics Administered

Bundle Element 4: Hypotension and/or serum lactate >4 mmol/L:

I.V. FLUIDS: Delivered an initial minimum of 20 mL/kg of crystalloid

MICU 24 HOUR SEPSIS MANAGEMENT

Bundle Element 1: Steroids in Septic Shock (Hydrocortisone 100 mg IV every 8 hours)

- Not indicated
- Cortisol level adequate
- Administered with refractory shock awaiting results
- Administered/Continued: Corticotropin stimulation test using 250 μ g ACTH with > 9 μ g/dL increase 30-60 minutes post administration

Bundle Element 2: Administer Drotrecogin Alfa (Activated) by a Standard Policy

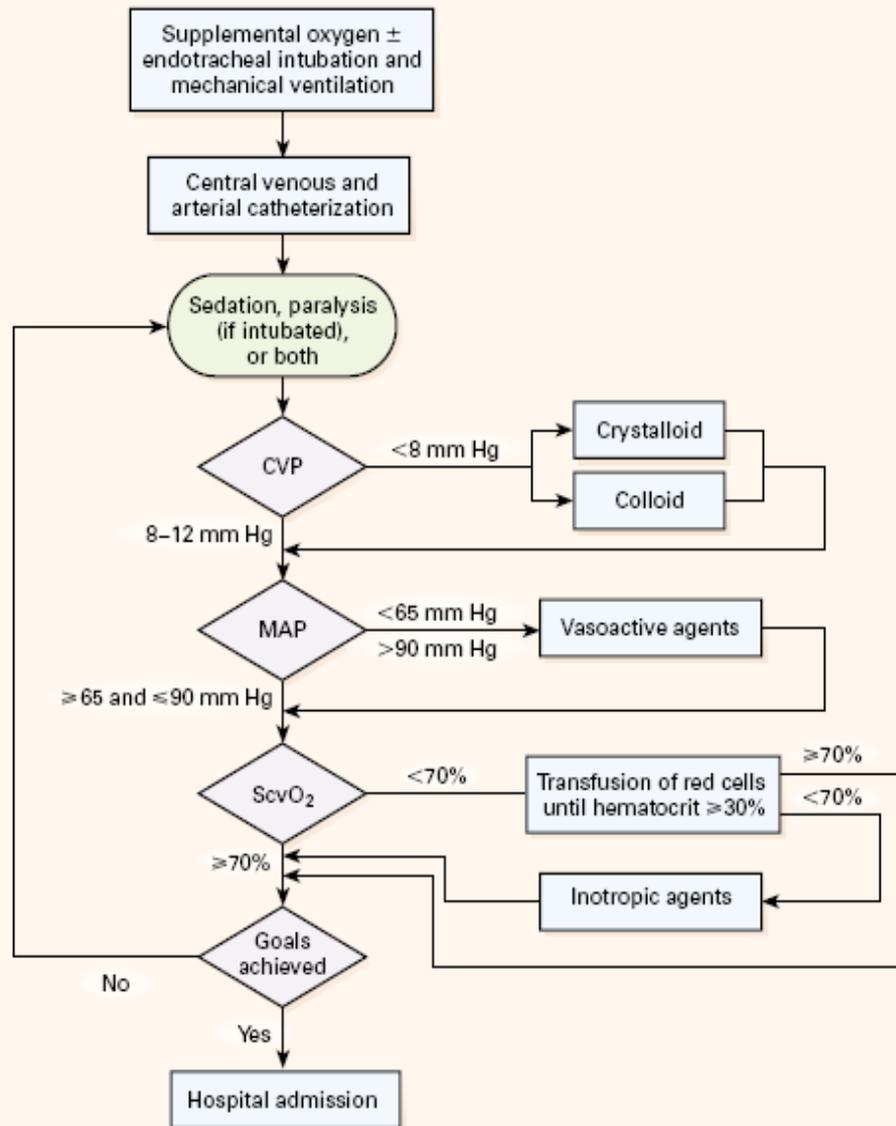
- Administered meeting MHH ICU criteria
- Did not meet MHH ICU criteria

Bundle Element 3: Maintain glucose control \geq 70, but \leq 150 mg/dL

Maintained Adequate Glycemic Control (Insulin drip if glucose > 150 mg/dL)

Bundle Element 4: Inspiratory plateau pressure

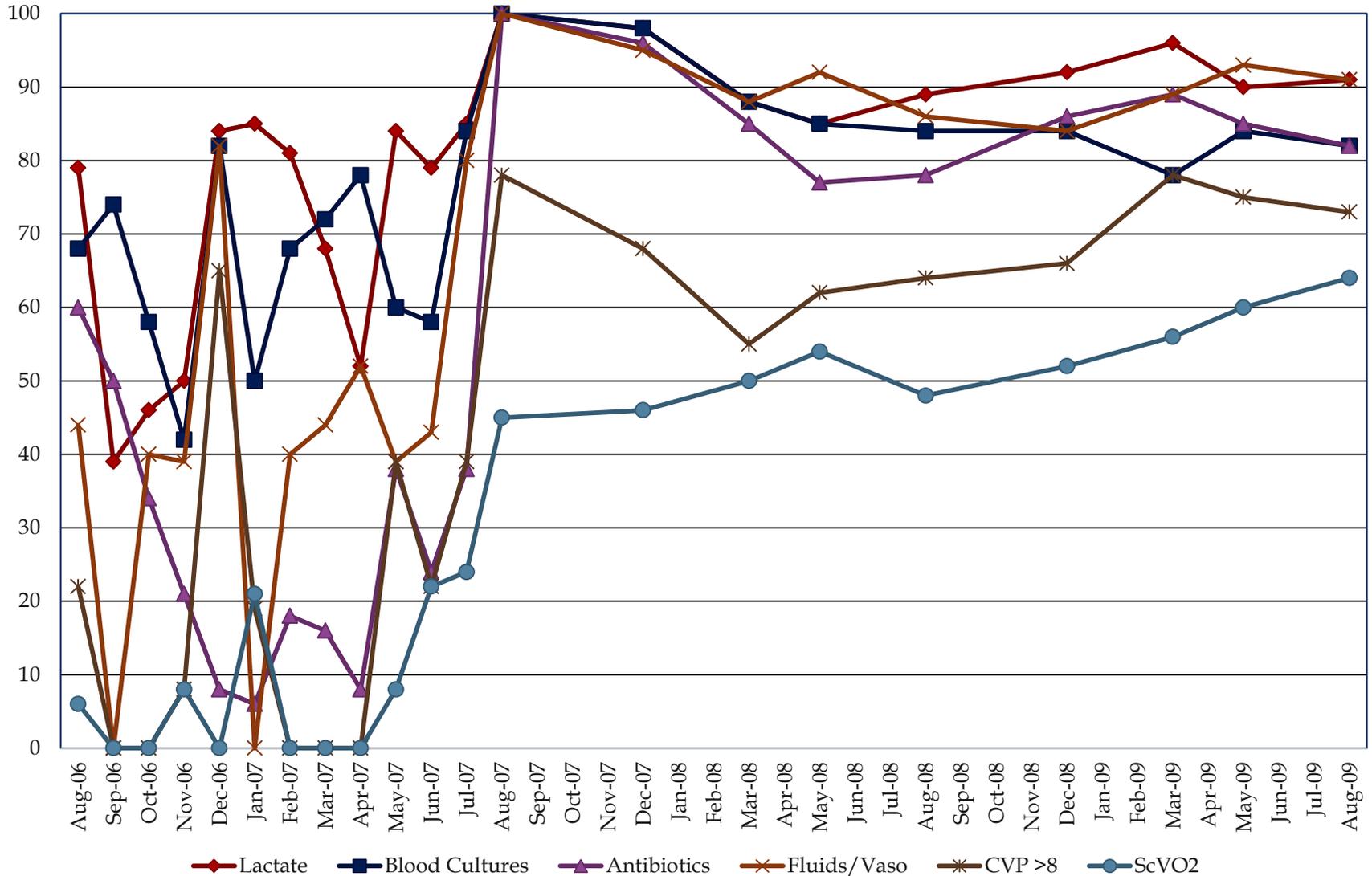
Maintained Inspiratory Plateau Pressures (IPP) <30 cm H₂O for mechanically ventilated patients



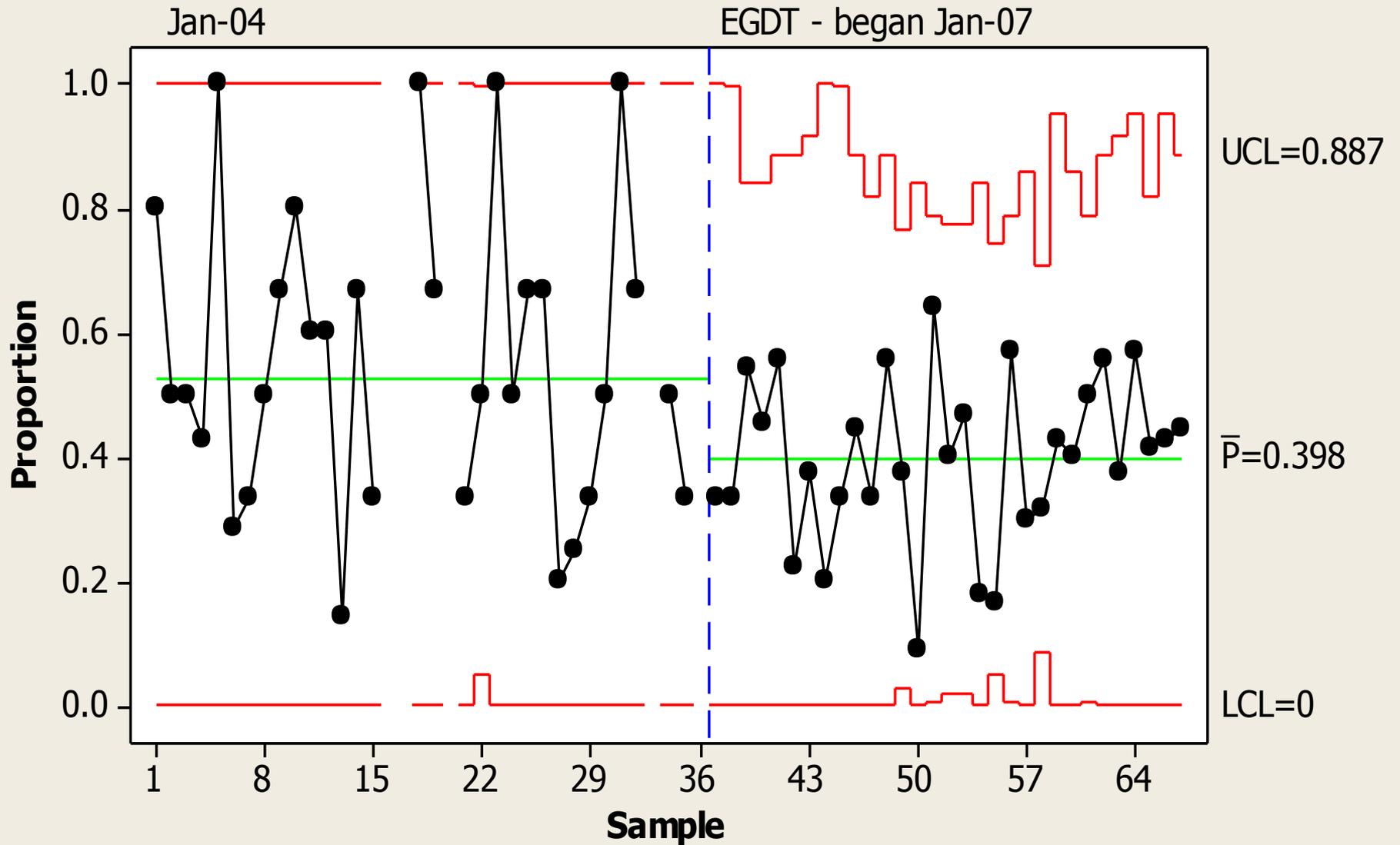
Interventions: Education

- ❑ Education of multidisciplinary staff including nurses, physicians, nutritionists, respiratory therapists on the resuscitation bundle
- ❑ National experts invited to provide optimal dialogue for change
- ❑ Interdepartmental meetings for **team building**
- ❑ Sepsis screen checklist placed in each chart for physician screening
- ❑ Appointed unit champions to assure education was available 24/7 in the ICU and EC
- ❑ Implemented **standardized Sepsis Order Sets** to improve compliance
- ❑ **Posted compliance rates** in the unit for staff and MDs to see
- ❑ Posted posters explaining process in ICUs for staff reference

Compliance with Bundle Elements



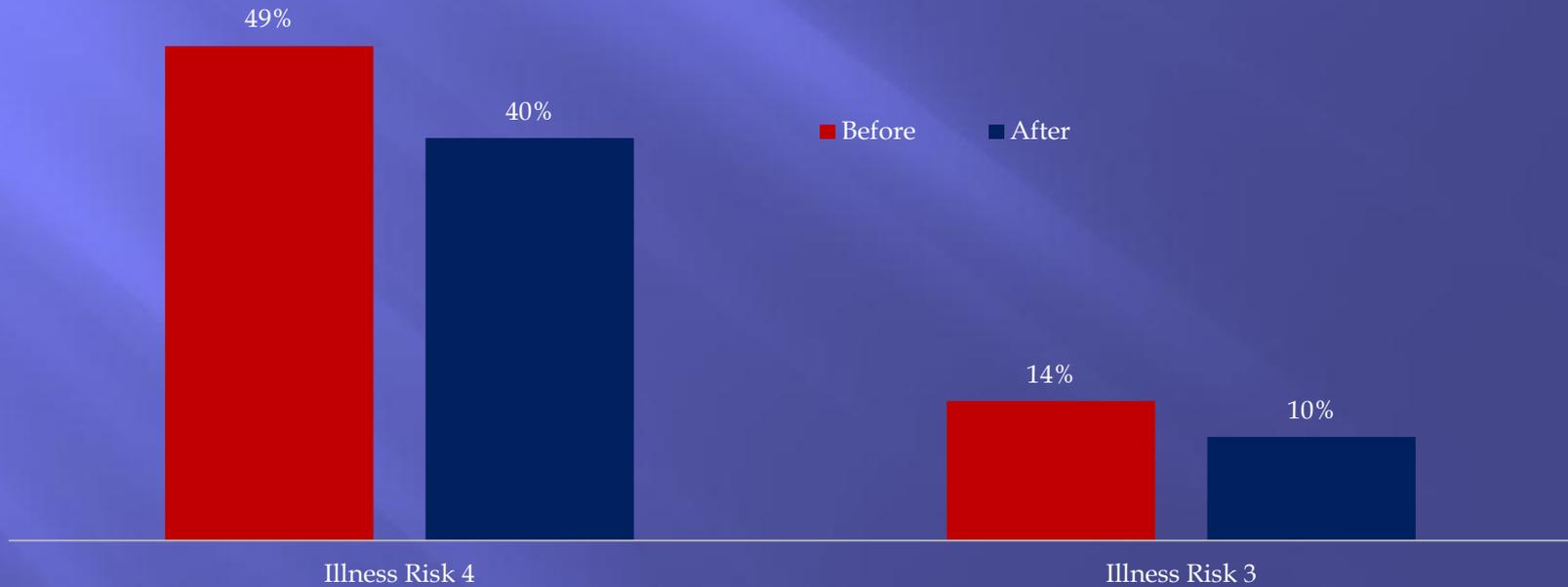
Sepsis -Illness Risk 4- Mortality Rate Reduction



Tests performed with unequal sample sizes

Mortality Rates

Mortality Rates APR-DRG 720 Septicemia



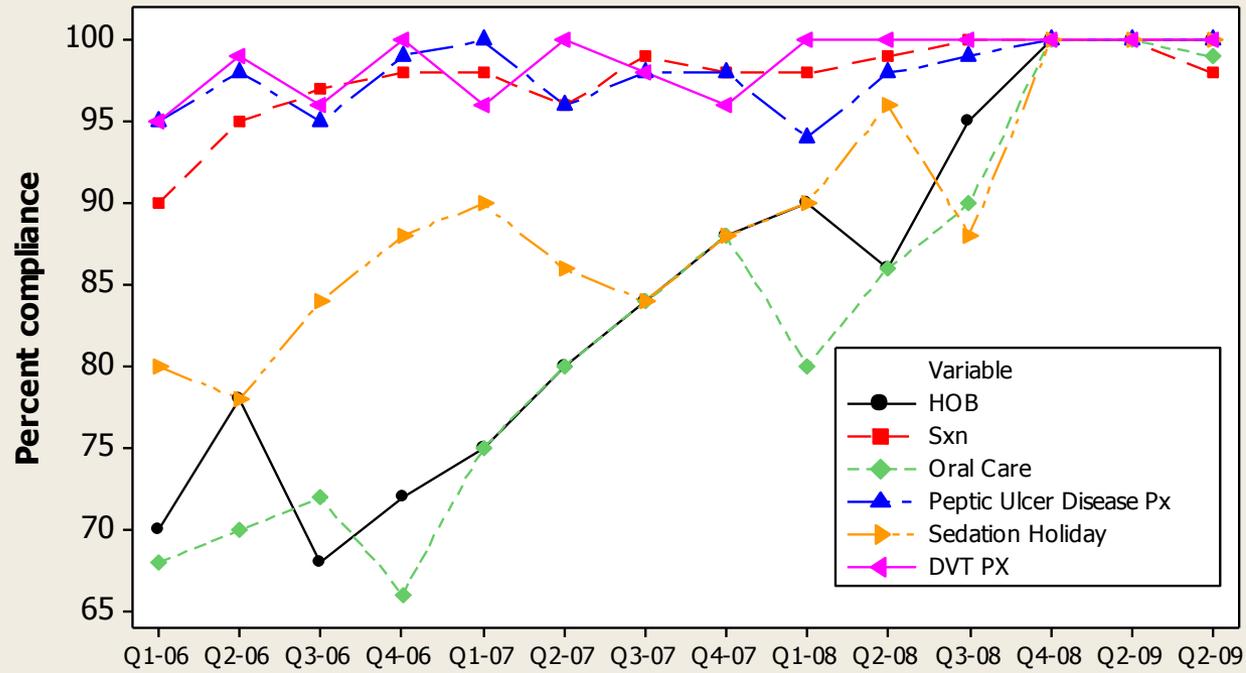
Length of Stay

Length of Stay in Days				
	<i>APR-DRG Illness Risk</i>			
	1-Mild	2-Mod	3-Major	4-Extreme
Before	4.7	7.1	7.7	12.0
After	3.5	5.5	6.8	10.6
Decrease	1.2	1.5	0.9	1.4
% Decrease	25%	22%	12%	11%

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VAP Bundle Compliance - Jan06-Jul09



Failure Mode and Effects Analysis

Data Source: Review of VAPs in MICU that occur in spite of high compliance rates with Ventilator Bundles

Completed: March 2005

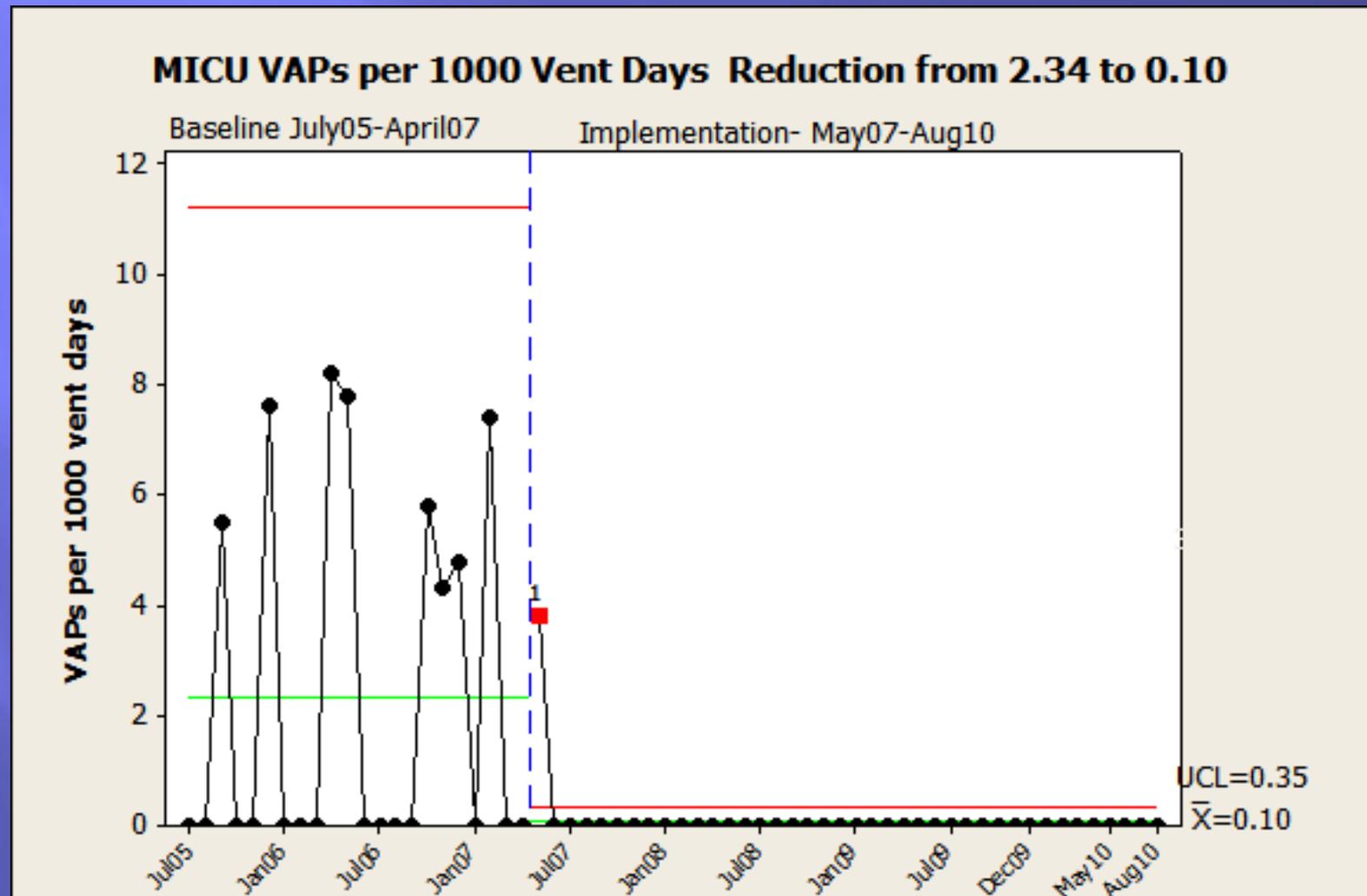
RCAs of VAP showed three major causes of remaining VAPs:

Team: Bela Patel, MD
 Tammy Campos, RN, MSN
 Michael Hewitt, RT
 Ruthie Siska, RN

1. Aspiration during transport
2. Endotrachial cuff leaks
3. Unplanned extubations requiring reintubation

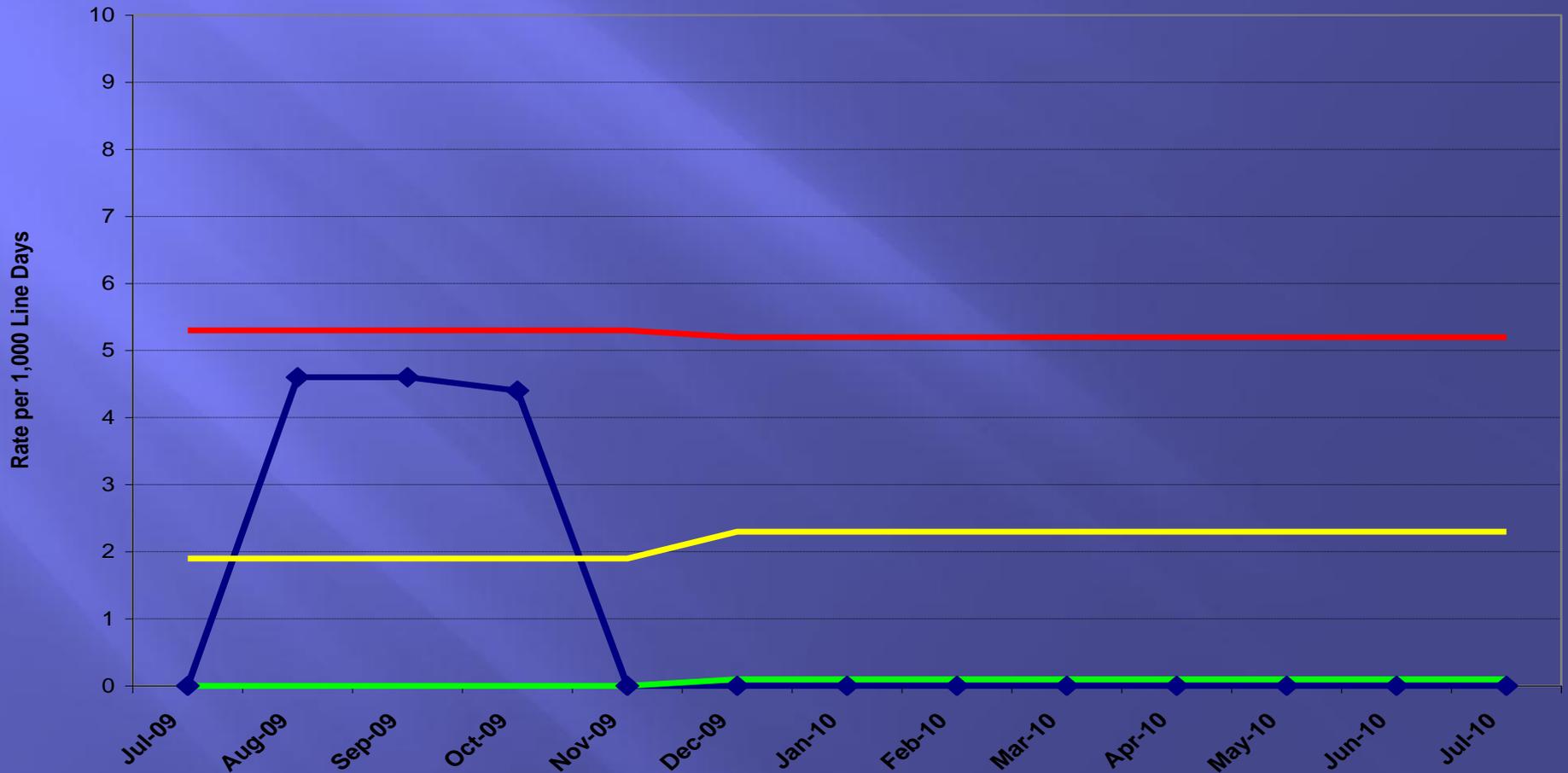
Failure Mode for MICU VAP	Occurance	Detection	Severity	Total	Action taken	Occurance	Detection	Severity	Total
	Likely to Occur	Likely to detect	Potential to cause VAP			Likely to Occur	Likely to detect	Potential to cause VAP	
Aspiration during transport	8	5	5	200	All high risk patients transported with HOB elevated; Feeding stopped two (2) hours prior to transport	2	5	5	50
Endotrachial cuff leak	7	5	8	280	Changed how cuff pressures are measured and increased pressure	2	2	8	32
Umplanned extubations requiring reintubation	6	8	5	240	Risk Factors: PRN nurses working in unit & Shift Change PRN nurses are closely supervised by charge nurse. Surveillance increased during shift change.	2	8	5	80
Total Risk Priority Score				720		"After" Risk Priority Score			162

VAPs to Zero for 39 months



Central Line Blood Stream Infections

MICU CVC- Related BSI Rates





STAT "PLACE X IN BOX IF STAT"

ALLERGIES: NKA YES
 DRUG: _____
 OTHER: _____
 WT: _____ kg. HT: _____ cm.

"Authorization is hereby given to dispense the Generic equivalent or Medical Staff approved therapeutic equivalent unless otherwise indicated by the words - DO NOT SUBSTITUTE - MEDICAL NECESSITY"

PROVIDER'S ORDERS

1. **SEDATION:** Continue Current Sedation No Sedation Required
 Goal RASS 0 -1 -2 -3 -4 -5 (*RASS on reverse*)
 Continue daily sedation interruption per routine or at _____
 NO daily interruption: Paralysis ICP Control Oxygenation difficulty Unstable surgical site Other
 Discontinue all continuous sedation
 Start sedation - see provider orders OR "Adult ICU Sedation/Analgesia Orders for Intubated Patients"

2. **ASPIRATION PRECAUTIONS:** Elevate HOB to 30°-45°
 Contraindicated: Invasive Device Recent surgery Hemodynamic instability Not intubated

3. **INVASIVE LINES:**

	INSERTION DATE	TYPE	SITE	SIDE	ACTION
<input type="checkbox"/> Line 1	___/___/___	CVC A-line PICC Quinton	IJ SC Rad Brach Fem	Left Right	<input type="checkbox"/> Keep <input type="checkbox"/> Remove
<input type="checkbox"/> Line 2	___/___/___	CVC A-line PICC Quinton	IJ SC Rad Brach Fem	Left Right	<input type="checkbox"/> Keep <input type="checkbox"/> Remove
<input type="checkbox"/> Line 3	___/___/___	CVC A-line PICC Quinton	IJ SC Rad Brach Fem	Left Right	<input type="checkbox"/> Keep <input type="checkbox"/> Remove

Line Indications: IV access/Hemodialysis Medication/TPN Fluid resuscitation Hemodynamic monitoring
 Hold continuous heparin/antithrombotics _____ hours prior to line removal - reinitiate 1 hr after if no sign of bleeding

4. **FOLEY CATHETER:** Continue Foley catheter Change Foley catheter
 Foley Indication: Total bedrest Gynecologic/Urologic/Perineal procedure End of life comfort
 Strict I/O's Healing pressure ulcer
 Discontinue Foley catheter (*Confirm with primary service prior to removal*)

INSERTION DATE: ___/___/___

5. **BLOOD GLUCOSE CONTROL:** Continue current therapy: 24 hr FSBG range: _____ No insulin required
 Insulin drip: Per unit protocol or see "Insulin Infusion Orders". GLUCOSE TARGET: LOW _____ to HIGH _____.
 Discontinue Insulin drip
 Scheduled SubQ insulin - See provider orders OR "Subcutaneous Insulin Orders - Adult"

6. **VTE PROPHYLAXIS:** Continue current therapy TED hose/SCDs No indication Discontinue _____
 Enoxaparin: 40mg SubQ daily 30mg SubQ q12h (*> 100kg/high risk*) 30mg SubQ daily (*CrCl 10-30mL/min*)
 Heparin: 5000 units SubQ q8h 7500 units SubQ q8h (*> 100kg/high risk*) 5000 units SubQ q12h (*< 70kg/bleed risk*)
 Antithrombotics contraindicated: Bleeding Recent surgery Allergic Other _____

7. **PUD PROPHYLAXIS:** Continue current therapy No indication Discontinue _____
 Famotidine 20mg IV/PO/NG q12h Famotidine 20mg IV/PO/NG daily (*CrCl < 50mL/min*) Esomeprazole 40mg IV/PO/NG daily

8. **MOBILIZATION:** Bedrest To chair Consult PT Consult OT Wound care consult Specialty Bed _____

9. **FLUIDS/NUTRITION:** Continue current fluids Continue current nutrition
 IV Fluids: Initiate IV fluids (*See orders*) Discontinue IV fluids Concentrate drips (*See orders*) Total IV Fluid Rate _____ cc/hr
 Nutrition: NPO - Reason: _____ Tube Feeds (*See orders*) TPN (*See orders*) PO Diet _____

10. **PROPHYLACTIC ANTIBIOTICS:** SURGERY/PROCEDURE DATE: ___/___/___

Provider's Signature _____ Print Name _____ MSID # _____ Date _____ Time _____

MEMORIAL HERMANN
 Texas Medical Center

Daily Critical Care Management



Impact

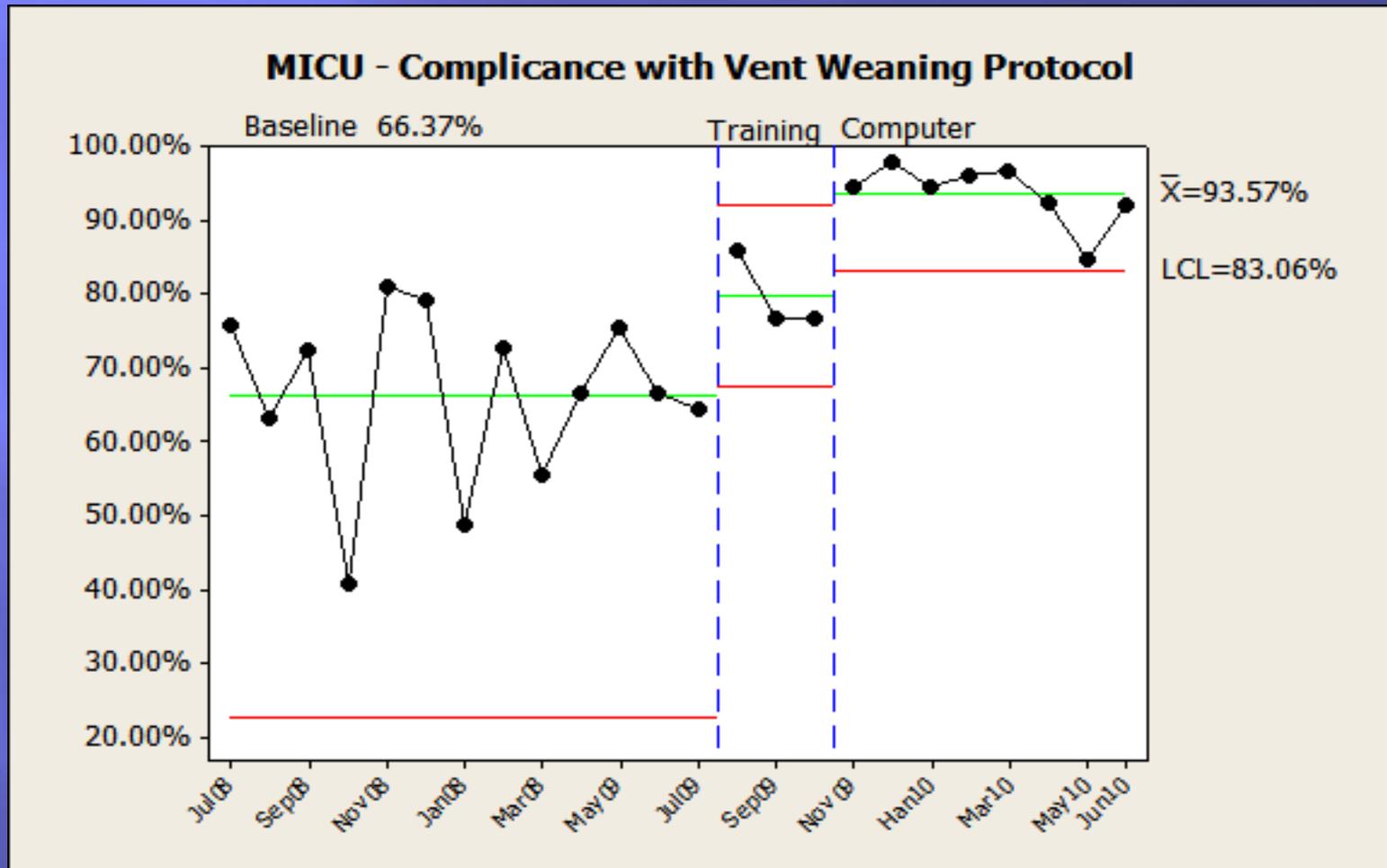
Infection	Increased LOS	Added cost
Pneumonia	6	\$57,000
Bacteremia	7	\$63,000
Wound	7	\$3,100
UTI	1	\$700

Improving ICU Quality, Length of Stay and Mortality

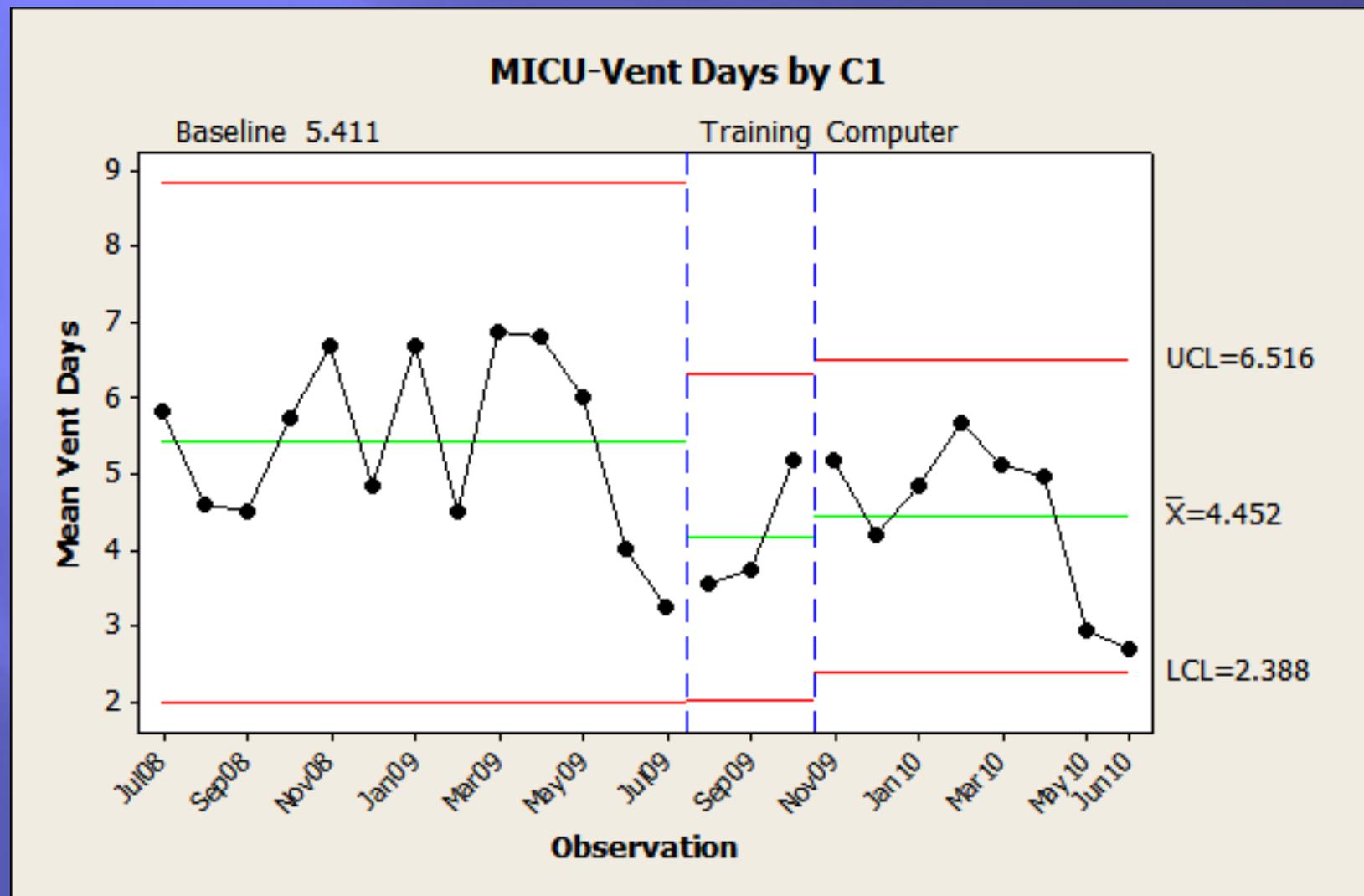
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Increasing Compliance to Ventilator Weaning

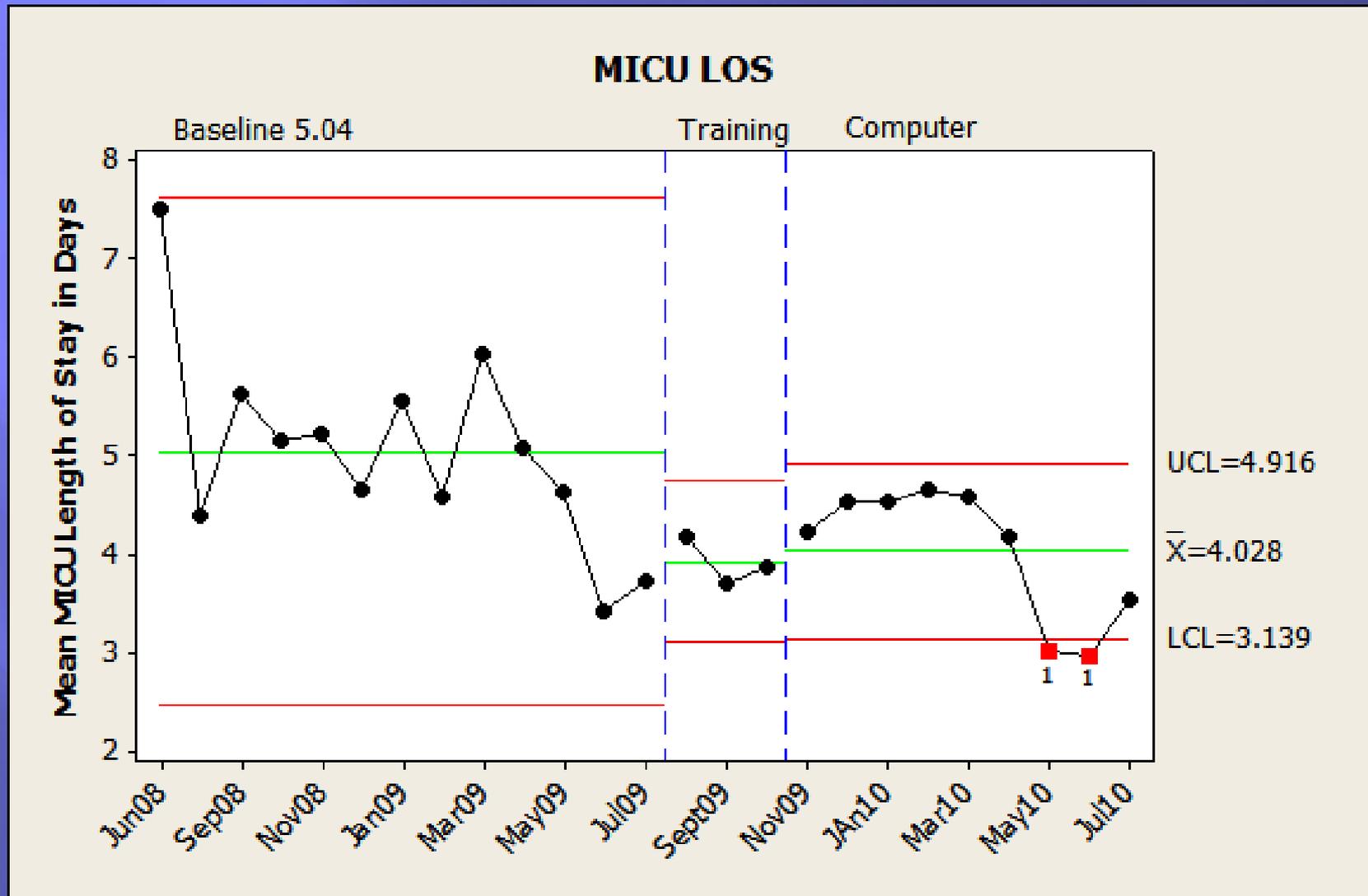
Brandy McKelvy MD



Reduction in Ventilator Days



Reduction in LOS



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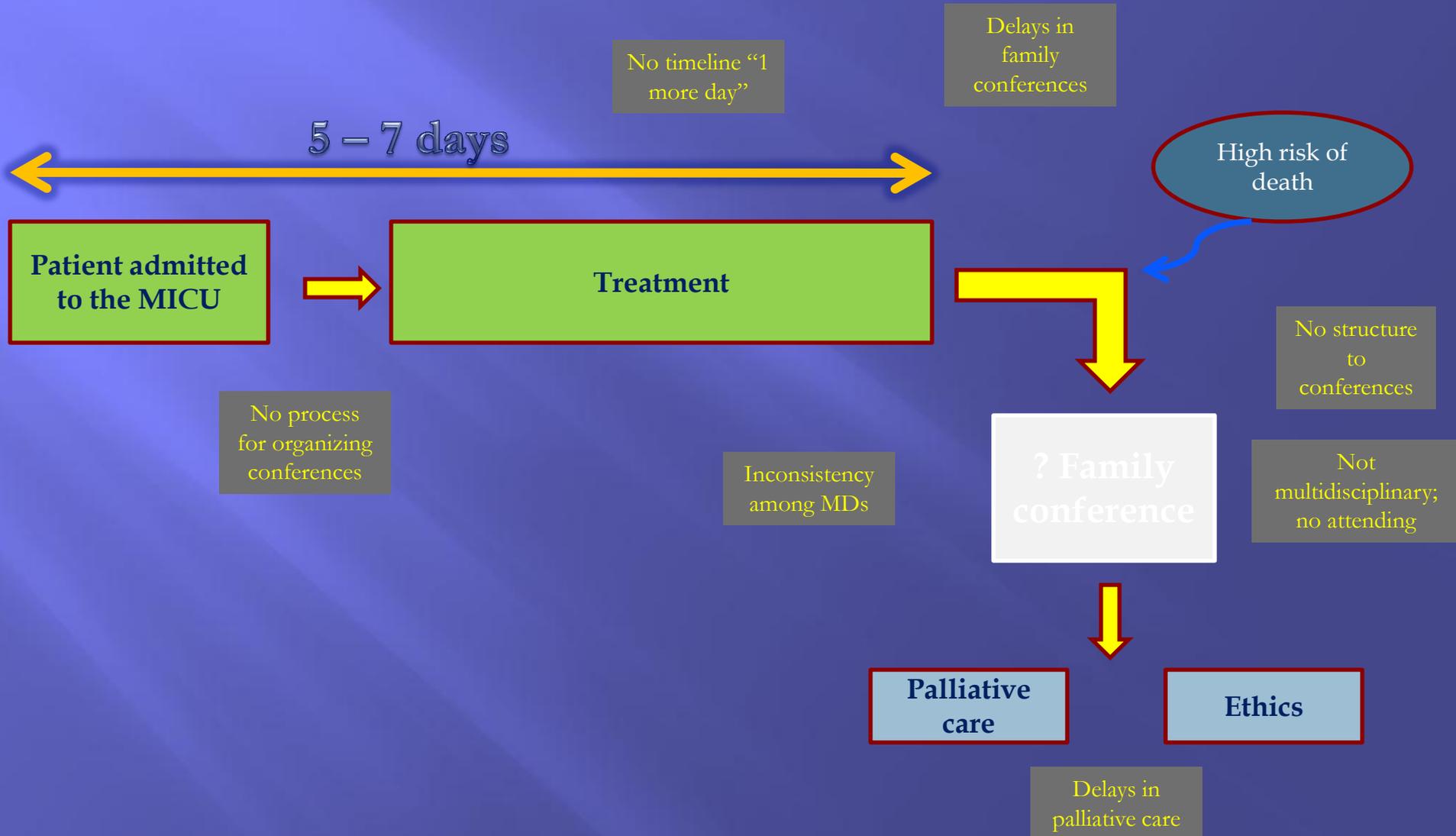


MICU



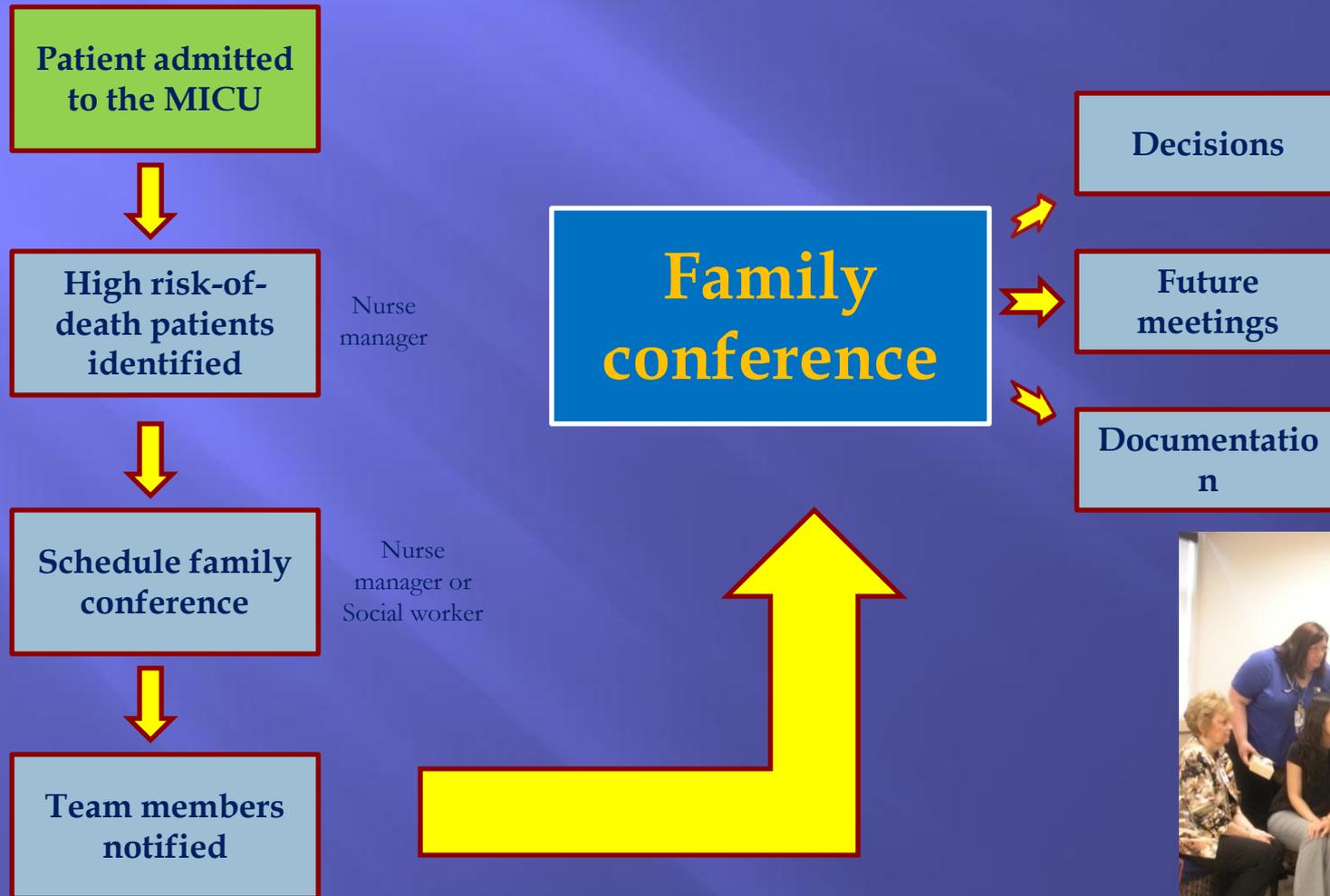
Old Process Map

Khalid Almoosa MD

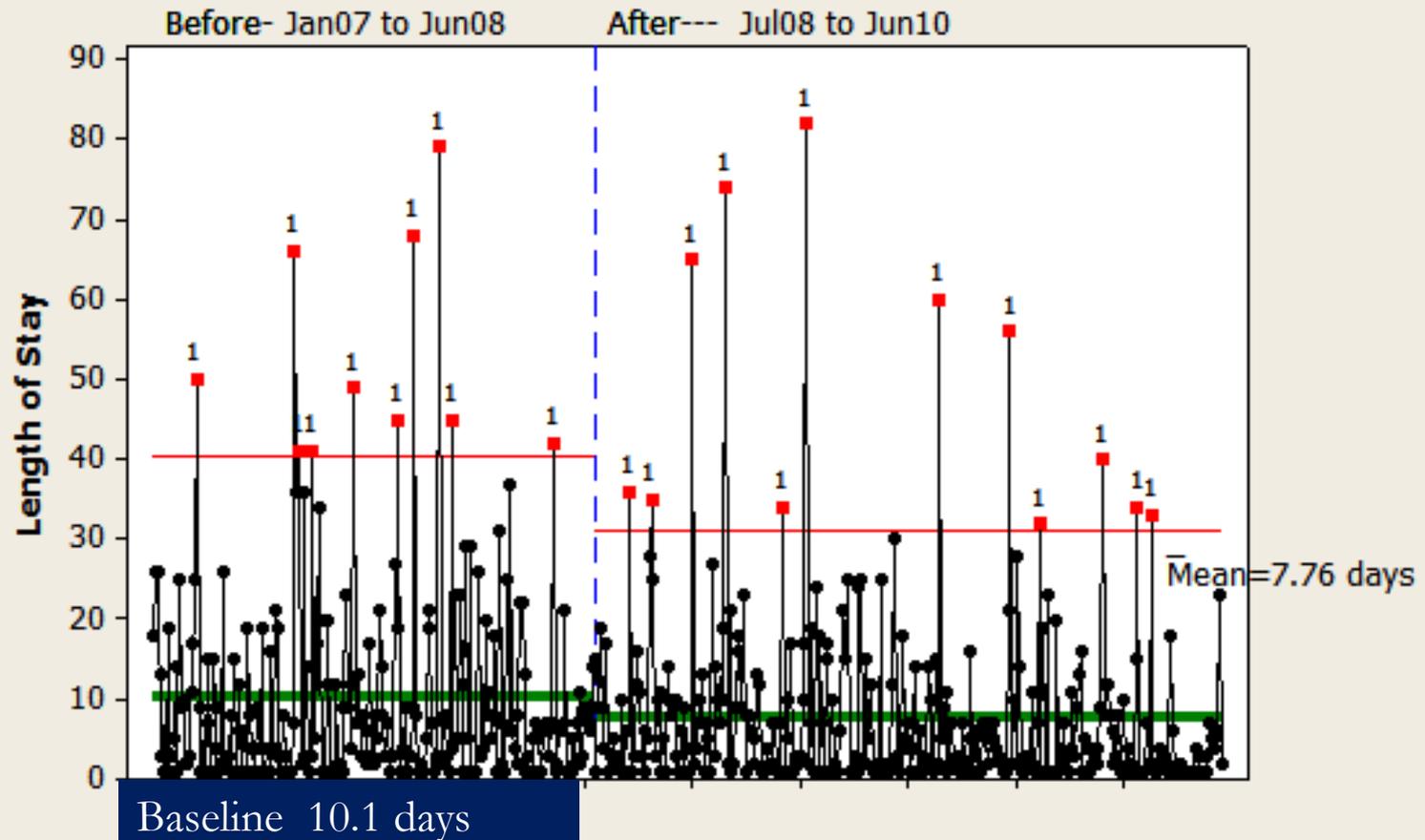


New Process Map

24 hours

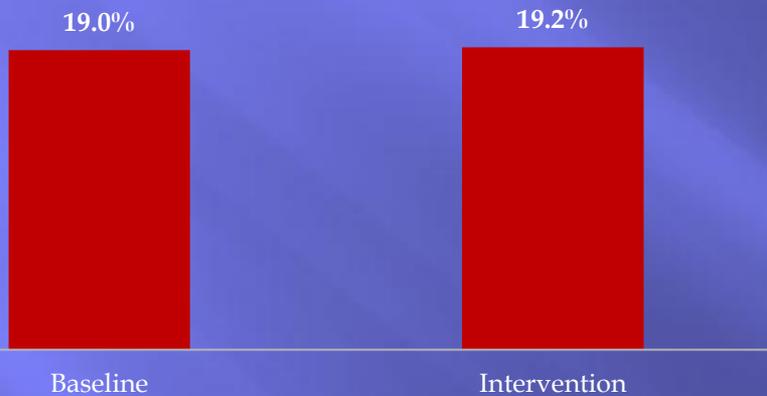


MICU deaths -- Before and After Family Meeting Intervention

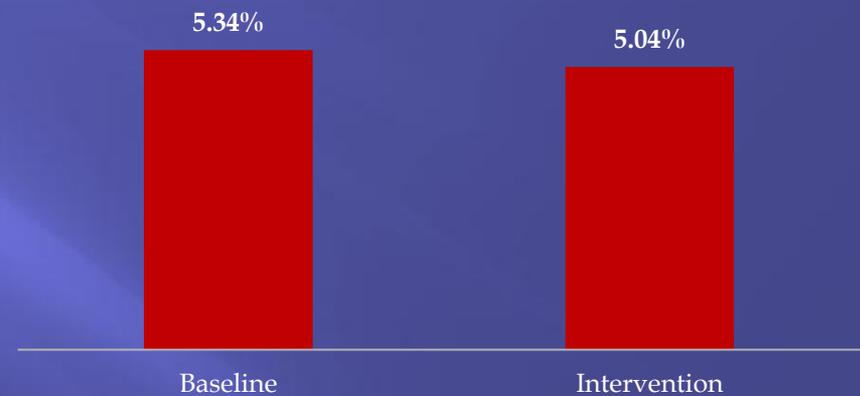


Improved Communication Decreased LOS

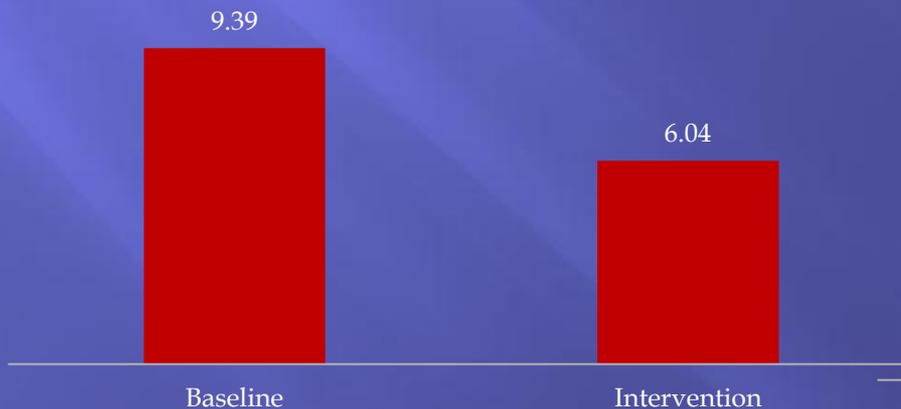
Mortality Rate -MICU Patients



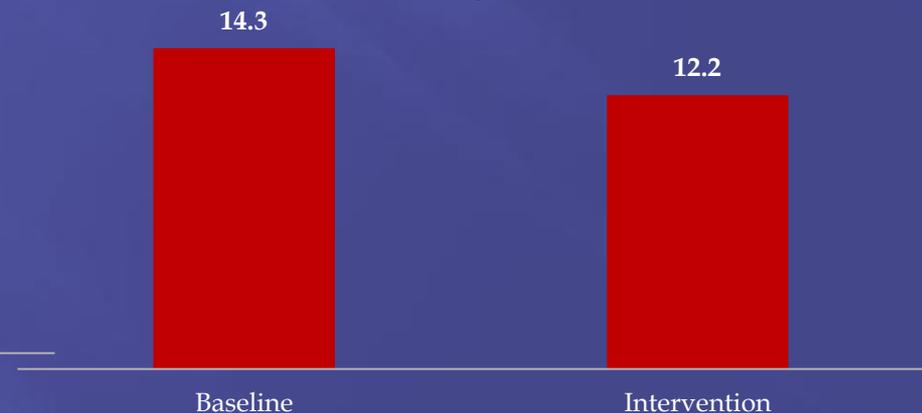
Mortality Rate -- Medicine Patients



Length of Stay MICU deaths - Medicare Only



Length of Stay MICU Deaths >2 days



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Conclusions

- ▣ Improving ICU Quality of care
 - Improves Mortality
 - Reduces Cost
 - Reduces Length of Stay
 - ▣ Improves Admission Delays from the Emergency Department
 - Further Improves Mortality
 - Further Reduces Cost
 - Further Reduces Length of Stay