The Michigan Trauma Quality Improvement Program

Lyon Meadows

October 12, 2010

Introductions

- David Share, MD, MPH
  - Executive Medical Director, Healthcare Quality, BCBSM
- Tom Leyden
  - Manager, Clinical Program Development, BCBSM
- Wendy Wahl, MD
  - Professor of Surgery, Director TBICU, UMHS
- Jill Jakubus, PA
  - Program Manager, MTQIP
- Jennifer Conatser
  - Administrative Assistant, MTQIP

Agenda

- MTQIP overview (Hemmila)
- BCBSM CQI overview (Share, Leyden)
- Questions
- Reports (Hemmila)
- External data validation (Jakubus)
- Infectious outcomes and interventions (Wahl)
- Other data (Hemmila)
- Web-site, data submission, meetings

MTQIP Objective

- To monitor and improve the quality of care for trauma patients.
- Regional collaboration within the State of Michigan.
- Open to all ACS verified trauma centers in Michigan.

Transition

- Expand initial MTQIP pilot program to 12-14 trauma centers.
- Rolling expansion to all interested centers by 1/2012.
- Utilize existing trauma registry system.
- Enroll each participant in ACS-TQIP.
- Collaborate with centers to indentify and promulgate “best practices”.

Participant Expectations

- Commit to active participation.
- Tri-annual submission of accurate and complete data in a timely manner.
- Clinical champion.
- Administrative lead/site coordinator.
- Trauma registrar.
- Enroll in ACS-TQIP.
- Use MTQIP and TQIP data elements and definitions.

Participant Expectations

- AIS 2005.
- Site visits.
- Quality Improvement agenda.
  - Global
  - Site-specific
- Active participation.
  - Complete DUA/IRB and maintain active IRB
  - Data submission 3x year
  - Attendance
  - Share information

Confidentiality and Collegiality

- MTQIP will provide anonymity within the program.
- BCBSM will only have access to de-identified data.
- Centers may not use MTQIP or ACS-TQIP data for competitive advantage or marketing.
- Strive for a friendly and collegial atmosphere.

Data

- NTRACS (Registry) plus additional data
- Adults (≥ 18 yo)
- ISS ≥ 5
- LOS > 24 hours
- All deaths
- Data submission
  - Time period, example 3/1/09 to 2/28/10
  - Do not filter data

Data Elements and Definitions

- National Trauma Data Standard
- ACS-NSQIP

MICHIGAN TQIP VARIABLES & DEFINITIONS

Case Number: Registry # from NTRACS. Six digit number automatically assigned in NTRACS program. We will use only the initial admission (xxxxxx.000) record. A prefix will be added for each center at the data coordinating center so that the final case number will be in the following format XXX-xxxxxx.000.

Def. Source: NTRACS

Data Base Column Name: RECORDNO
Type of Field: Numeric
Length: 10

Report: #1

Trauma Registry Data and Standardization

“The Customizer”

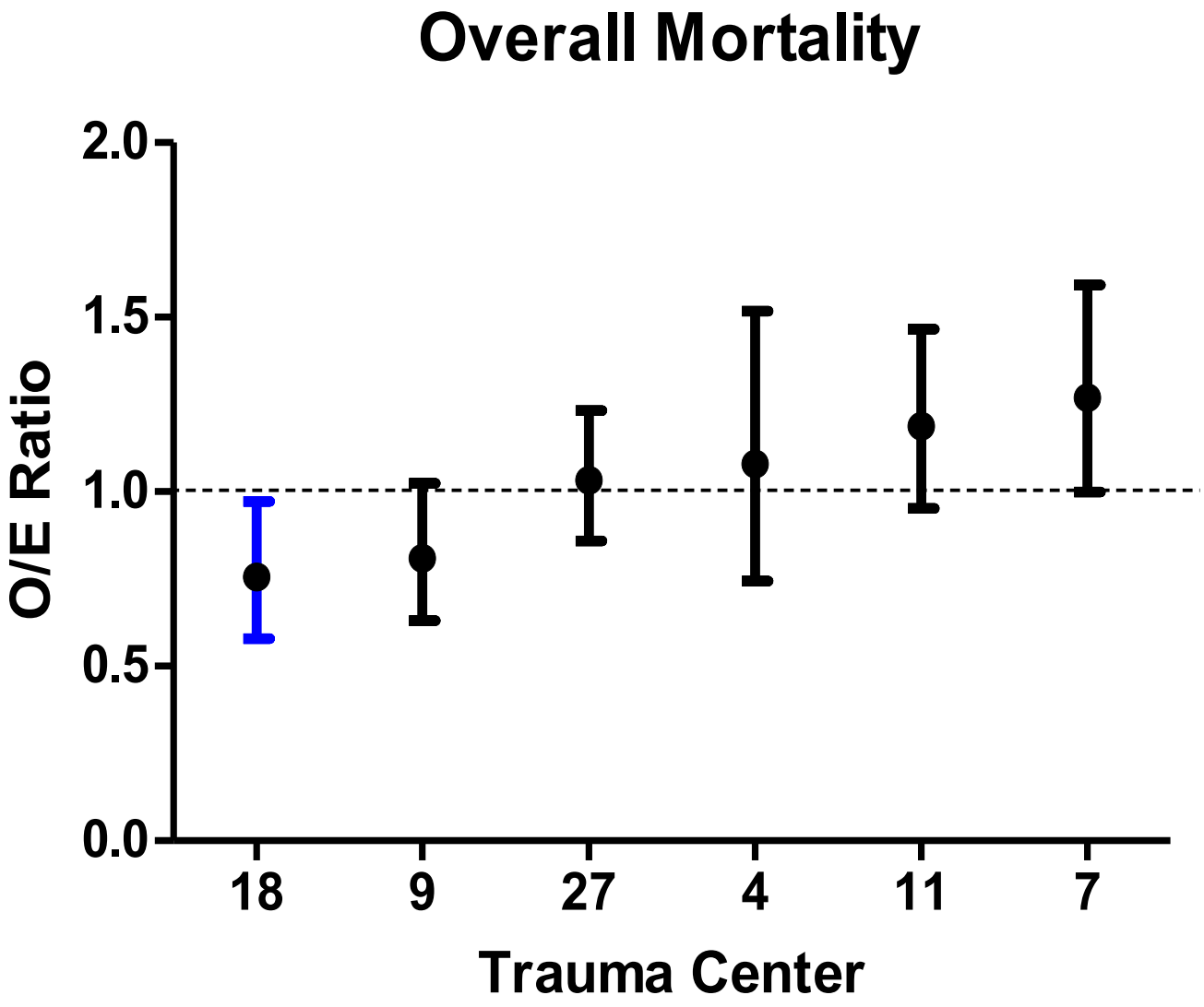
Modeling

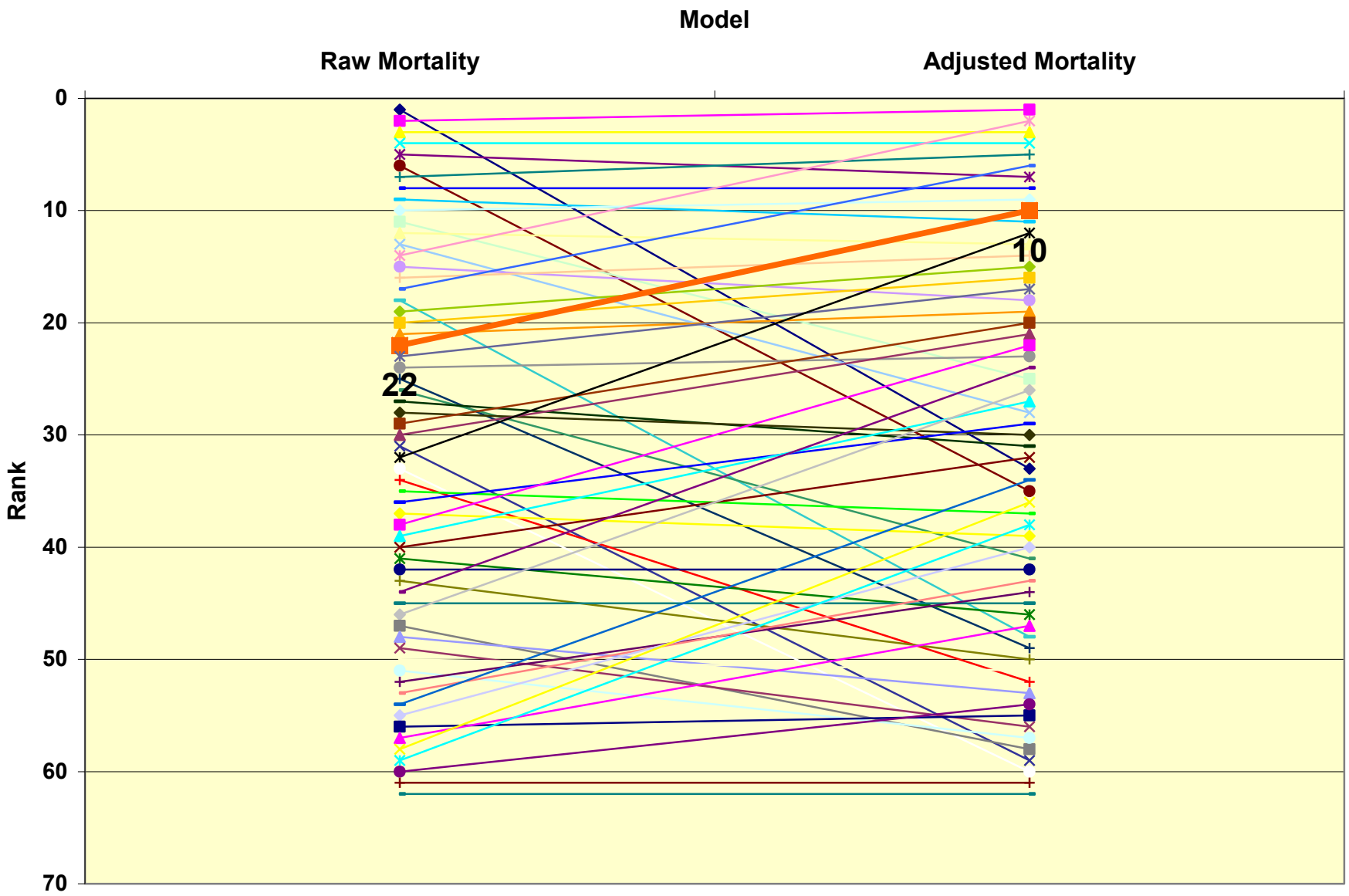
- Developed based on MTQIP data.
- Mortality
  - ISS, Age, GCS, Mechanism, Co-Morbids, Transfer, etc.
  - Overall, w/o DOA, Blunt Multi-system, Blunt Single system
- Morbidity
  - Groupings
  - Individual

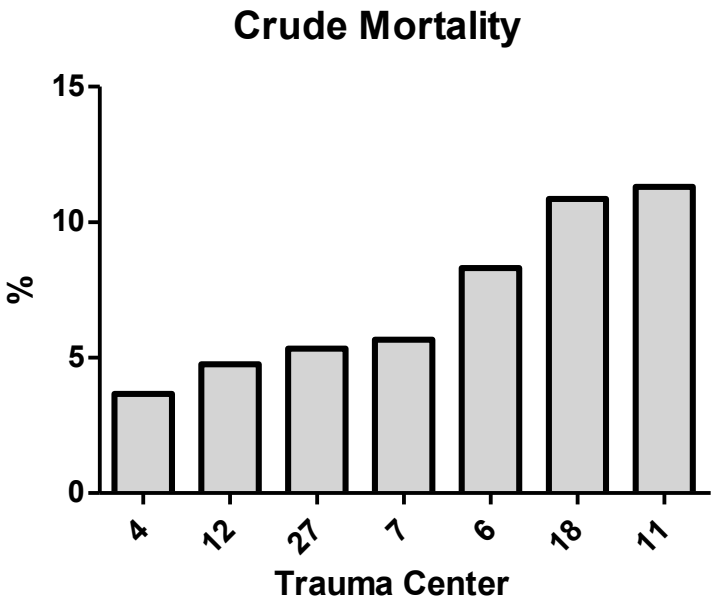
Models

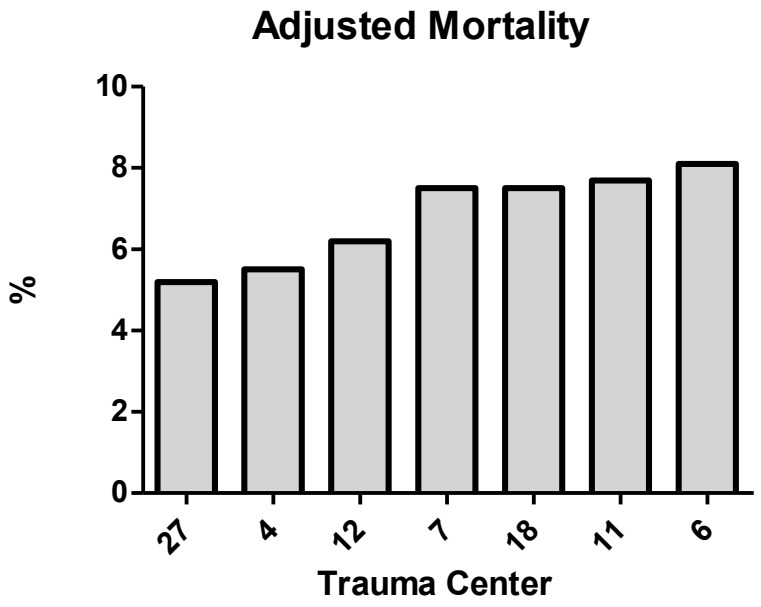
"Essentially, all models are wrong, but some are useful."

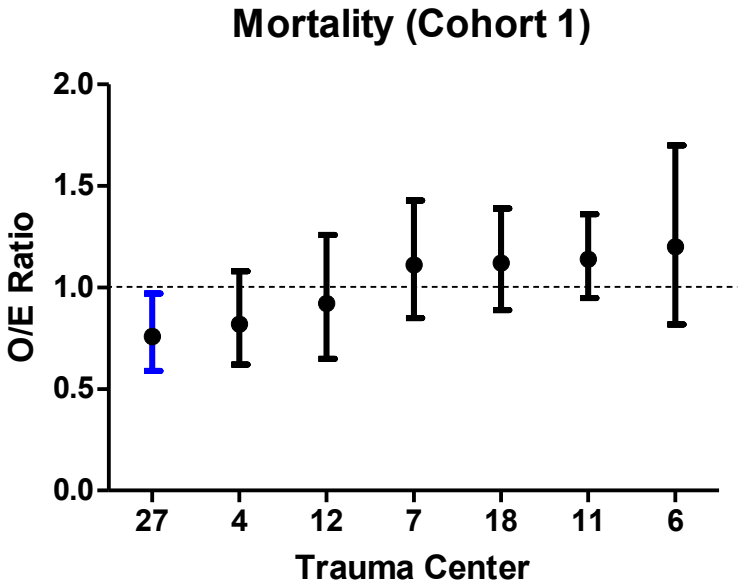
George Box


Overall Mortality
O/E Ratio
2.0
1.5
1.0
0.5
0.0
18
9
27
4
11
7
Trauma Center


Model
Raw Mortality
Adjusted Mortality
Rank
0
10
20
30
40
50
60
70
22
10


Crude Mortality
15
10
5
0
%
4
12
27
7
6
18
11
Trauma Center


Adjusted Mortality
10
8
6
4
2
0
%
27
4
12
7
18
11
6
Trauma Center


Mortality (Cohort 1)
2.0
1.5
1.0
0.5
0.0
O/E Ratio
27
4
12
7
18
11
6
Trauma Center

Values

- Friendly
- Collegial
- Non-competitive
- Evidence-based
- Actionable data
- Focus on effectiveness
- Make a contribution
  - QI Projects, center experiences, protocols

Principles

- We will not use the data for competitive advantage.
- Information shared in working group meetings is confidential.
- There are no secrets among our group.

Meetings

- Three per year
- 2 at Lyon Meadows
- 1 in conjunction with Michigan COT
- Attendance
  - CQI index measures and scoring

Measure	Weight	Measure Descrption	Points earned
#1	20	**Timeliness of data**	
		On time 3 of 3 times	20
		On time 2 of 3 times	10
		On time < 2 of 3 times	0
#2	15	**Site visit/audit**	
		Completed	15
		Not completed	0
#3	15	**Timely completion of DUA and IRB***	
		By 1/1/11	15
		By 2/1/11	10
		By 3/1/11	5
		After 3/1/11	0
#4	25	**Meeting participation - clinician lead**	
		All meetings	25
		2 of 3 meetings	10
		1 of 3 meetings	5
		Did not participate	0
#5	25	**Meeting participation - program manager and registrar (average)**	
		All meetings	25
		2 of 3 meetings	10
		1 of 3 meetings	5
		Did not participate	0

M·TQIP

MICHIGAN TRAUMA QUALITY IMPROVEMENT PROGRAM

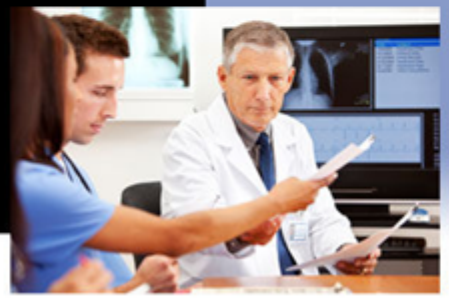
- HOME
- About M•TQIP
- Program Specifics
- Getting Started
- Resources
- Contact Information
- Downloads
- Data and Reports

Measuring trauma center outcomes with:

- data standardization
- complete and accurate data collection
- data validation
- risk-adjusted benchmarking

and correlation with processes of care.

That's M·TQIP



User Login

Username:

Password:

Submit

BCBSM FOUNDATION
Blue Cross Blue Shield of Michigan Foundation

Michigan Trauma Quality Improvement Program

Program Overview

The objective of MTQIP is to measure and improve the quality of care administered to trauma patients in Michigan. This is a voluntary collaboration between verified trauma centers in the State of Michigan, funded by the Blue Cross Blue Shield of Michigan Foundation. The consortium seeks to support a collaborative quality improvement initiative for trauma providers. Hallmarks of the program are complete and accurate data collection, data validation, risk-adjusted feedback on outcomes, and implementation of mechanisms to measure and correlate processes of care with outcomes.

MTQIP was created in 2008 as the performance improvement arm of the Michigan Trauma Surgery Collaborative (MTSC). The MTQIP registry contains data on 5000 patients from 9 participating trauma centers. The University of Michigan serves as the coordinating center for MTQIP.

MTQIP Summary

- Expanding from 7 to 20+ centers
- BCBSM/BCN Funding
  - Hospital P4P program
  - Offsets costs of participation
  - Coordinating center
- Enroll in ACS-TQIP
- Tri-annual meetings, reports
- External validation/site visits
- Center-to-center collaboration
- Web-site (www.mtqip.org)
  - Information, Data submission, On-line report and query tool

TQIP and MTQIP Caveats

- There is no “perfect” model.
- We will strive to be credible and reliable.
- Collect only essential data.
- Feedback does not always correlate with performance.
  - Warning light.
  - Delve into data.

Blue Cross Blue Shield of Michigan/Blue Care Network Collaborative Quality Improvement Programs

David Share
Tom Leyden

Questions

Reports

- 11/1/08 to 10/31/09
- Data quality
- Cohort selection
- Summaries
- Stratified mortality
- Risk adjusted mortality
- Risk adjusted complications
- Risk adjusted LOS (75^{th} %)

Cohort Formation

- Cohort 1
  - Blunt or penetrating
  - Age ≥ 18
  - ISS ≥ 5
  - Hospital LOS ≥ 1 or dead
- Cohort 2 (admit trauma service)
- Cohort 3 (blunt multi-system)
- Cohort 4 (blunt single-system)

Cohort Formation

- Complications
  - Cohort 2 w/o DOA's
  - Group 1 (All)
  - Group 2 (Subset)
  - Specific
- Length of Stay
  - Hospital, ICU, Mechanical Ventilator Days)
  - Cohort 2
  - Exclude deaths

Quality of Data

- Data submitted
- Incomplete data
  - Not Available
  - Not Recorded
  - Blank
- Your center vs. aggregate

Quality of Data

- Raw
- Dropped patients to form cohort 1 & 2
- Cohort 1
- Mean and Median # of records
  - Trauma Diagnosis Codes
  - ICD-9 Procedure Codes
  - Co-morbid conditions
  - Complications

Summary

- Your center vs. aggregate
- Summary
- LOS
  - Exclude deaths
  - ICU (ICU admits only)
  - Mechanical Ventilator (MV only)
- Co-morbidities
- Complications

Stratified Mortality

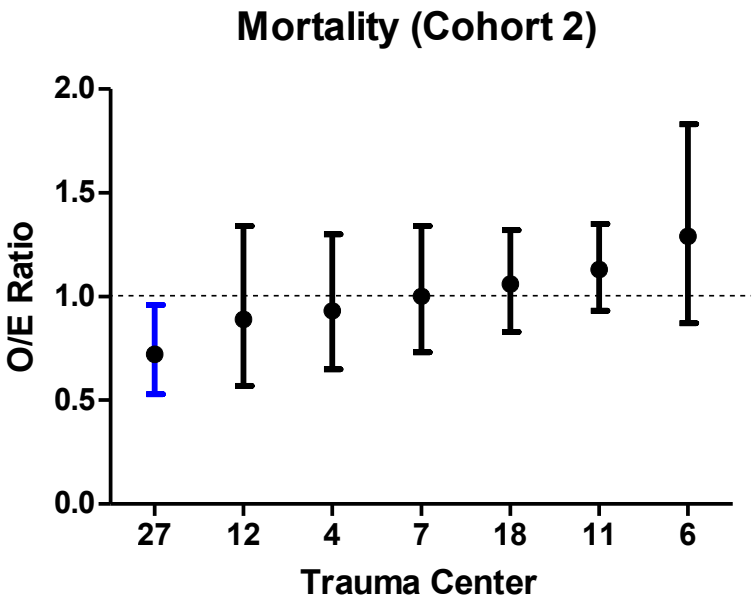
- Age
- ED GCS
- ED Motor GCS
- ISS
- Mechanism
- AIS ≥ 3

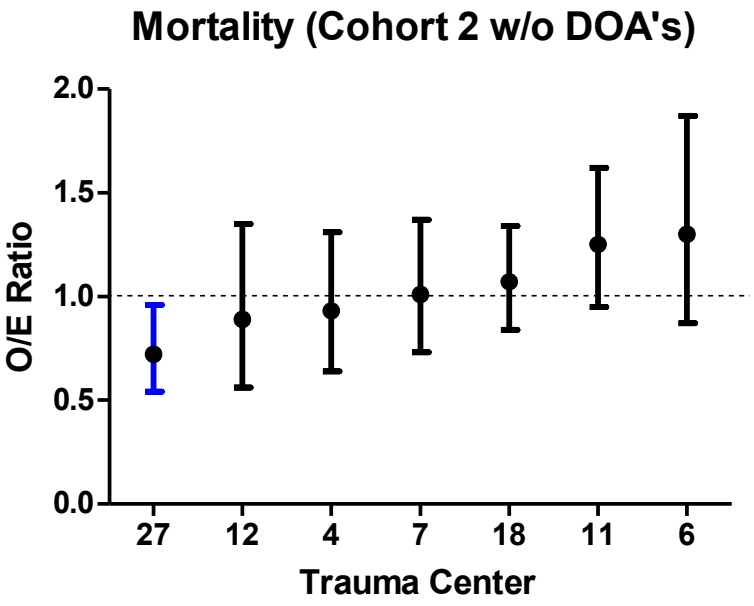
Risk Adjustment

- Univariate
- Imputed BP, Pulse, mGCS if missing
- Step-wise Multivariate Logistic Regression
  - Identify predictor variables, $p \leq 0.2$
- Logit Equation
- Expected Mortality
- O/E Ratios
  - 90% Confidence Interval, Mortality
  - 95% Confidence Interval, Complications
  - 95% Confidence Interval, LOS

Mortality

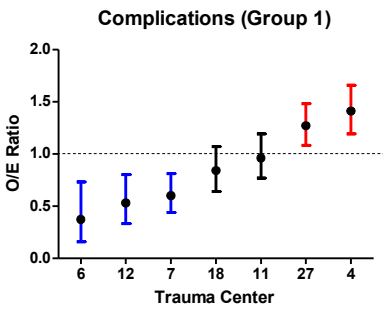
- Cohort 1 (Overall Mortality - All Admissions)
- Cohort 1 (w/o DOA's)
- Cohort 2 (Admit to Trauma Service)
- Cohort 2 (w/o DOA's)
- Cohort 3 (Blunt Multi-System Mortality)
  - Trauma type classified as blunt with injuries of AIS ≥ 3 in at least two of the following AIS body regions: head/neck, face, chest, abdomen, extremities or external.
- Cohort 4 (Blunt Single-System Mortality)
  - Trauma type classified as blunt with injuries of AIS ≥ 3 limited to only one AIS body region with all other body regions having a maximum AIS ≤ 2.

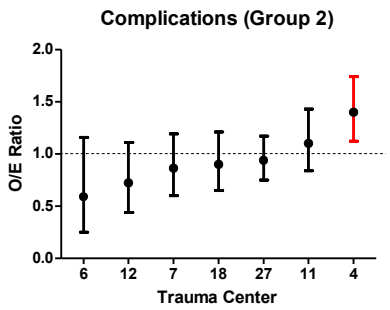

Mortality (Cohort 2)
O/E Ratio
2.0
1.5
1.0
0.5
0.0
27
12
4
7
18
11
6
Trauma Center

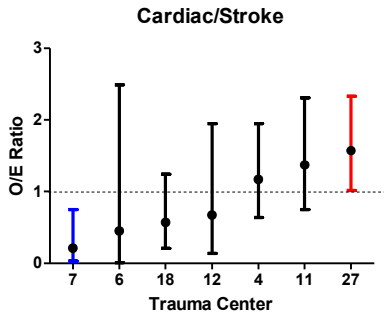

Mortality (Cohort 2 w/o DOA's)
O/E Ratio
2.0
1.5
1.0
0.5
0.0
27
12
4
7
18
11
6
Trauma Center

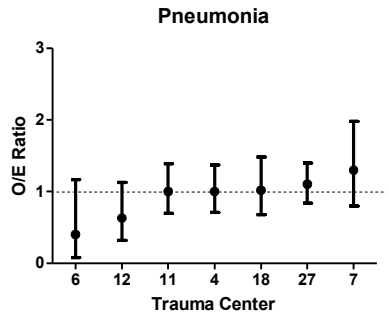
Complications

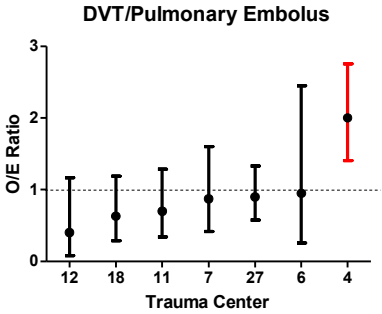
- Cohort 2 w/o DOA's
- Group 1
  - Superficial SSI, Deep SSI, Organ space SSI, Wound disruption, ARDS, Pneumonia, Unplanned intubation, PE, Acute renal failure, UTI, Stroke/cva, Cardiac arrest requiring cpr, MI, New onset arrhythmia, DVT LE , DVT UE, Systemic sepsis, Decubitus ulcer,C. difficle colitis.
- Group 1
  - Organ space SSI, Wound disruption, ARDS, Pneumonia, PE, Acute renal failure, MI, DVT LE , DVT UE, Systemic sepsis.
- Specific
  - Cardiac/Stroke, Pneumonia, DVT/PE, UTI, Renal Failure, Sepisis

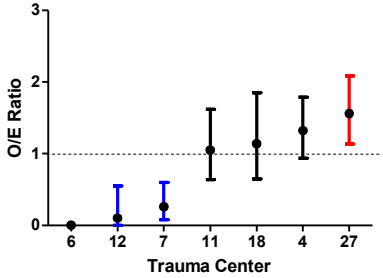

Complications (Group 1)
O/E Ratio
2.0
1.5
1.0
0.5
0.0
6 12 7 18 11 27 4
Trauma Center

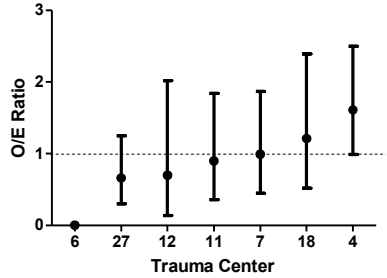

Complications (Group 2)
O/E Ratio
2.0
1.5
1.0
0.5
0.0
6 12 7 18 27 11 4
Trauma Center

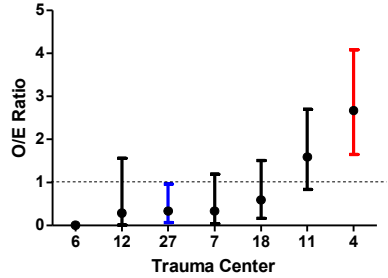

Cardiac/Stroke
O/E Ratio
3
2
1
0
7 6 18 12 4 11 27
Trauma Center


Pneumonia
O/E Ratio
3
2
1
0
6 12 11 4 18 27 7
Trauma Center


DVT/Pulmonary Embolus
O/E Ratio
3
2
1
0
12 18 11 7 27 6 4
Trauma Center

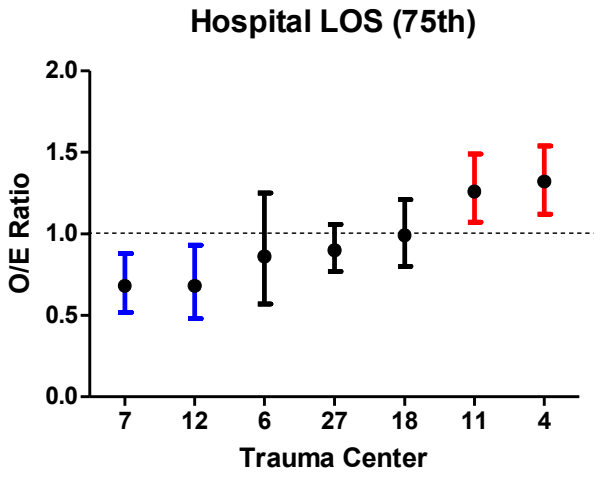

UTI
O/E Ratio
3
2
1
0
6 12 7 11 18 4 27
Trauma Center

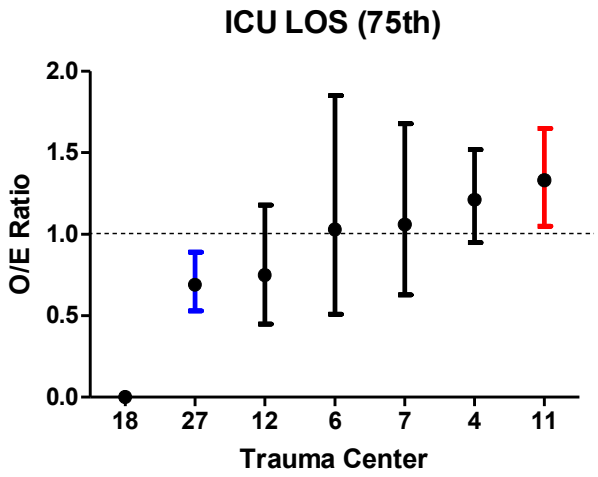

Renal Failure
O/E Ratio
3
2
1
0
6 27 12 11 7 18 4
Trauma Center

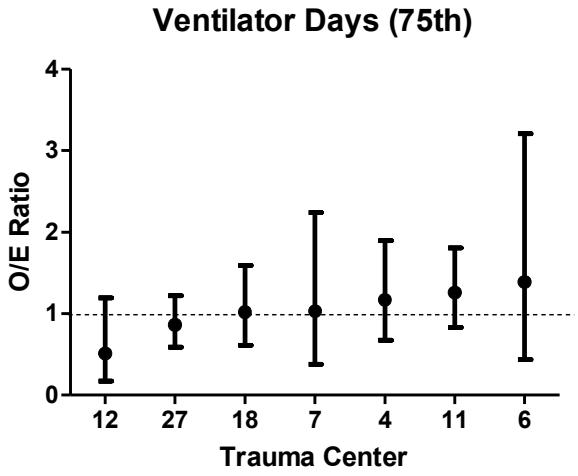

Sepsis
O/E Ratio
5
4
3
2
1
0
6 12 27 7 18 11 4
Trauma Center

Length of Stay

- Cohort 2
- Exclude deaths
- Create two groups based on 75th percentile cut-off
- Risk-adjusted analysis for O/E > 75th percentile
- Hospital LOS, ICU LOS, MV Days

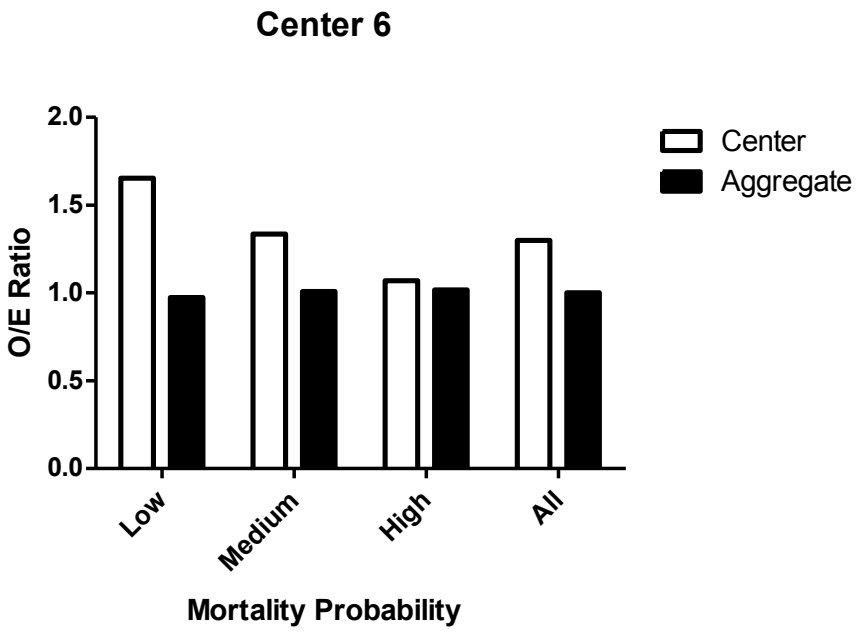

Hospital LOS (75th)
O/E Ratio
2.0
1.5
1.0
0.5
0.0
7
12
6
27
18
11
4
Trauma Center

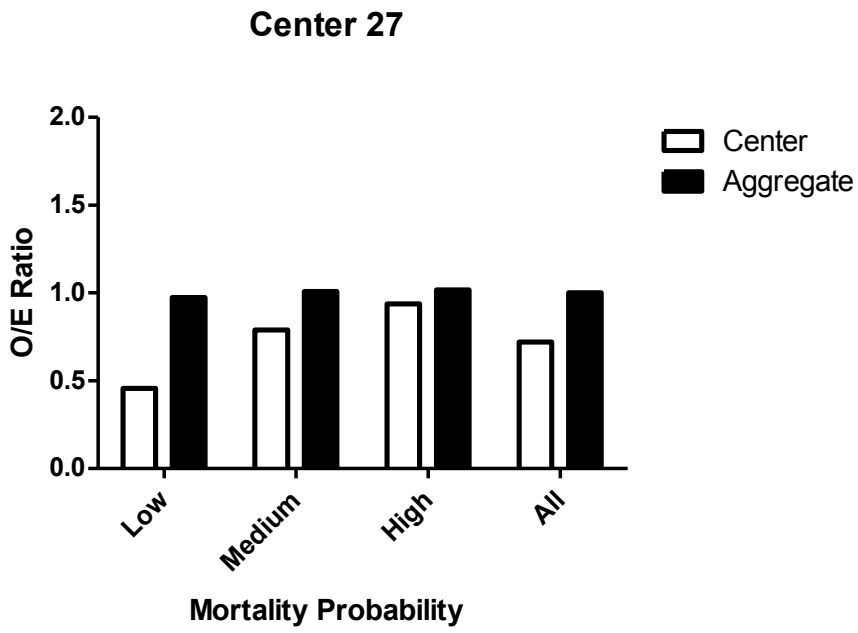

ICU LOS (75th)
O/E Ratio
2.0
1.5
1.0
0.5
0.0
18
27
12
6
7
4
11
Trauma Center


Ventilator Days (75th)
O/E Ratio
4
3
2
1
0
12
27
18
7
4
11
6
Trauma Center

O/E Breakout

- Cohort 1 w/o DOA's
- Sort by expected mortality
- Create three groups with equal total observed mortality
  - Low, Medium, High, All
- Calculate O/E's
  - Center vs. Aggregate


Center 6
2.0
1.5
1.0
0.5
0.0
O/E Ratio
Low
Medium
High
All
Mortality Probability
Center
Aggregate


Center 27
2.0
1.5
1.0
0.5
0.0
O/E Ratio
Low
Medium
High
All
Mortality Probability
Center
Aggregate

Questions

Lunch

Site Visits/External Data Validation

Jill Jakubus

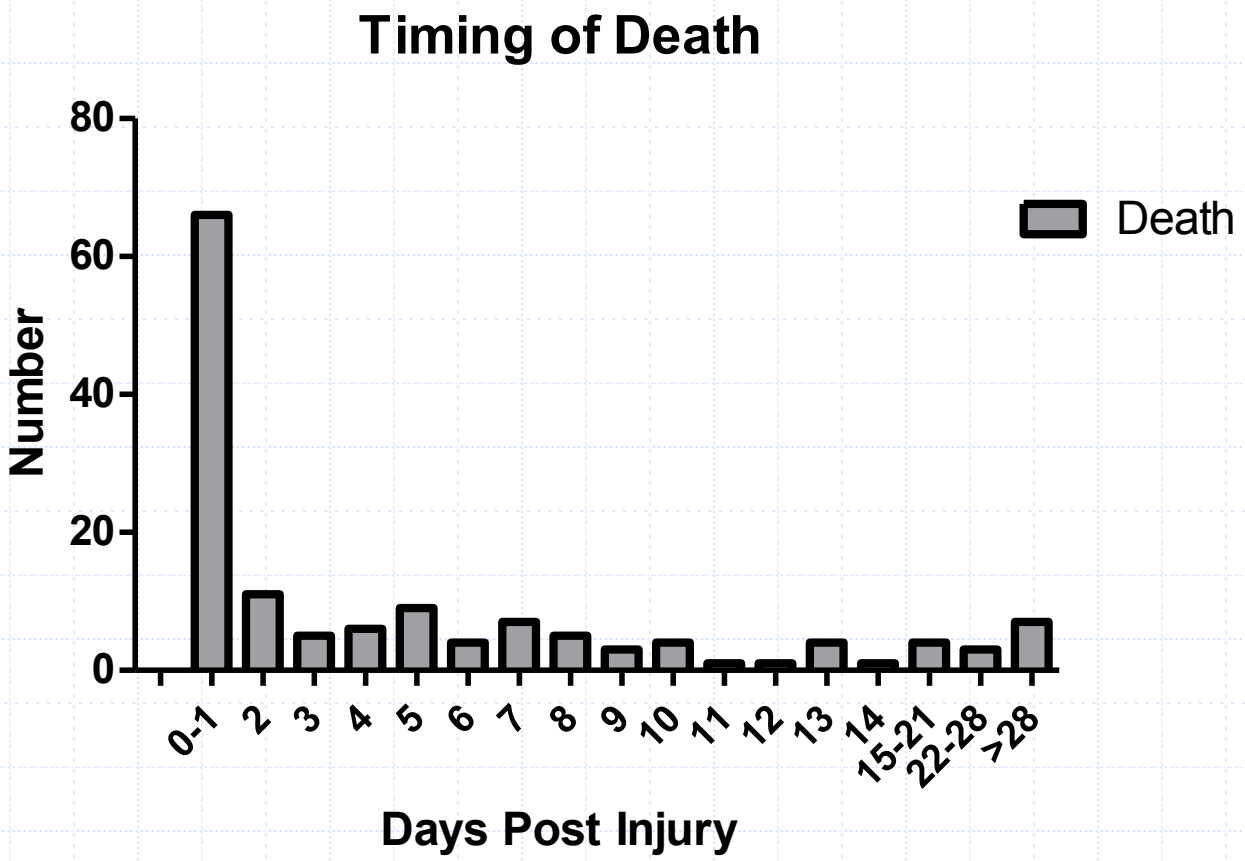
Infectious Outcomes and Interventions

Wendy Wahl

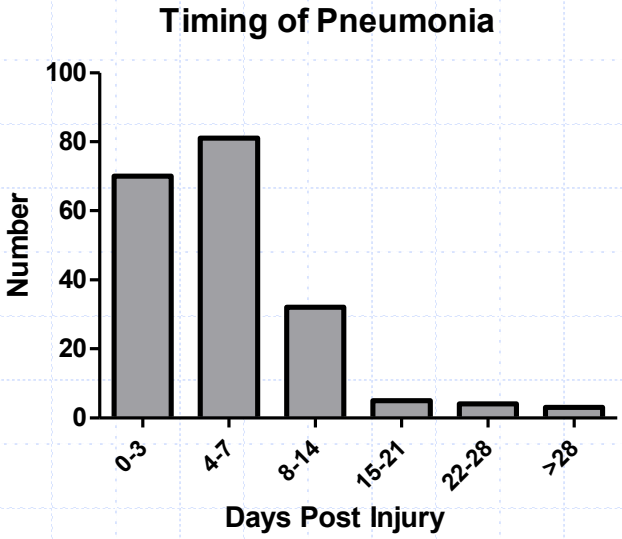
Complications Data

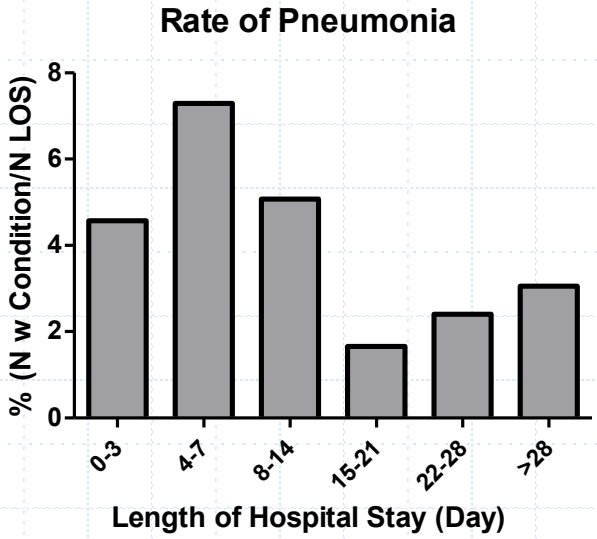
Mark Hemmila

Quality Improvement

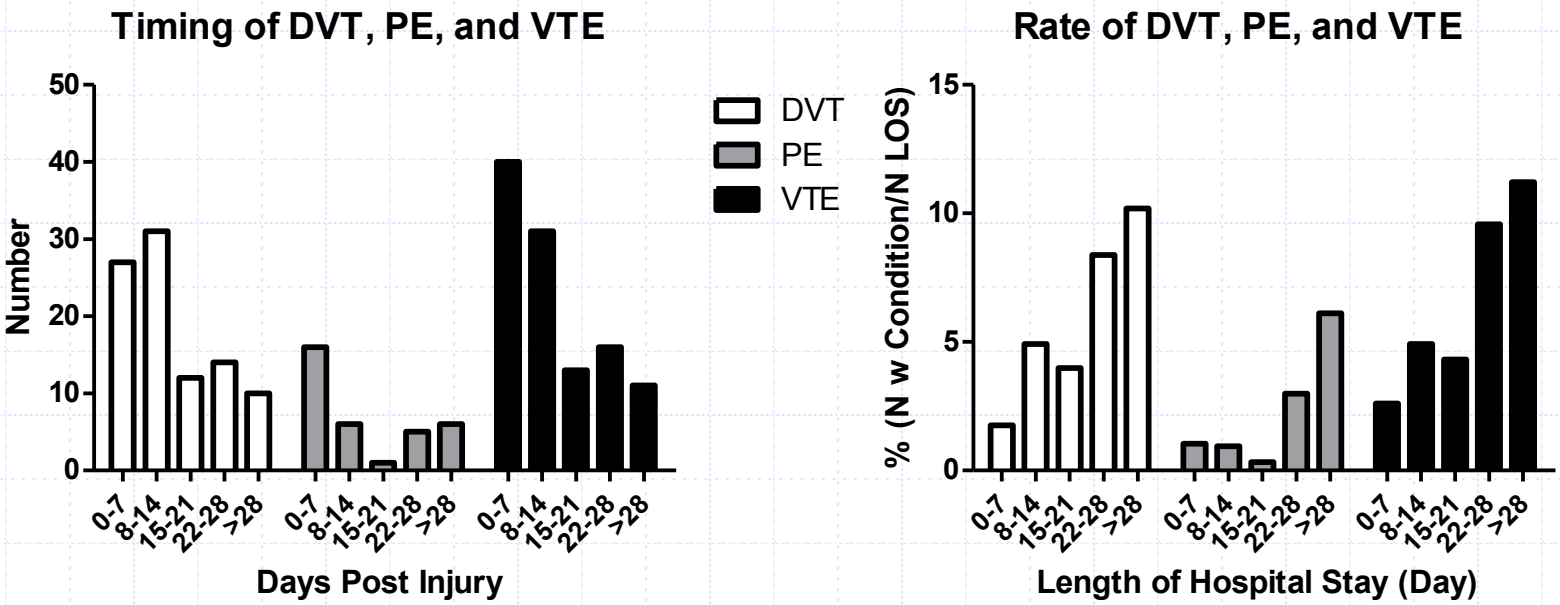


Pneumonia

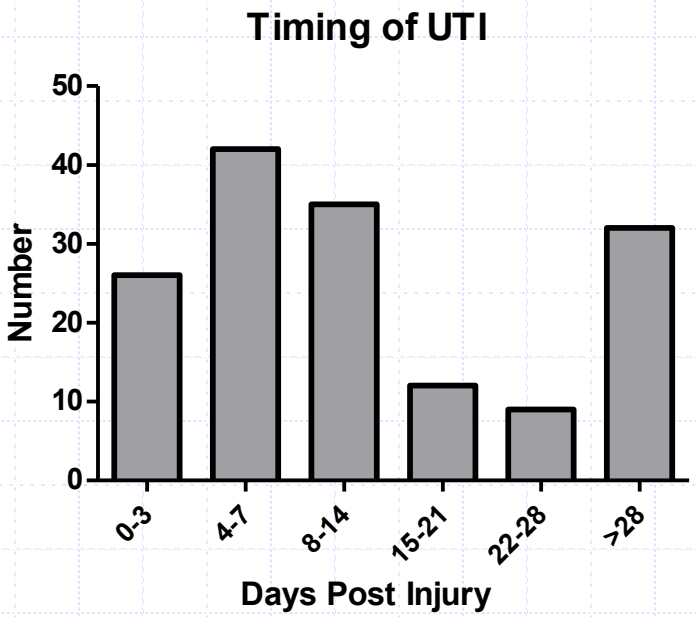

Timing of Pneumonia
Number
100
80
60
40
20
0
0-3
4-7
8-14
15-21
22-28
>28
Days Post Injury

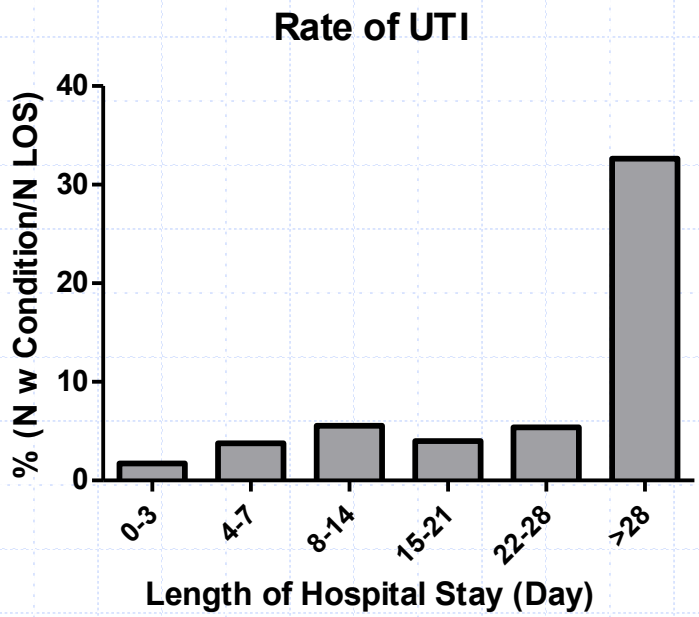

Rate of Pneumonia
% (N w Condition/N LOS)
8
6
4
2
0
0-3
4-7
8-14
15-21
22-28
>28
Length of Hospital Stay (Day)

DVT, PE, and VTE

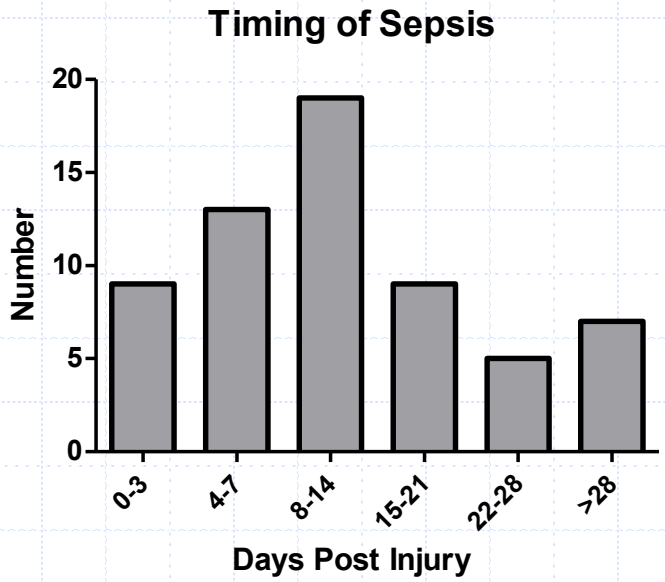


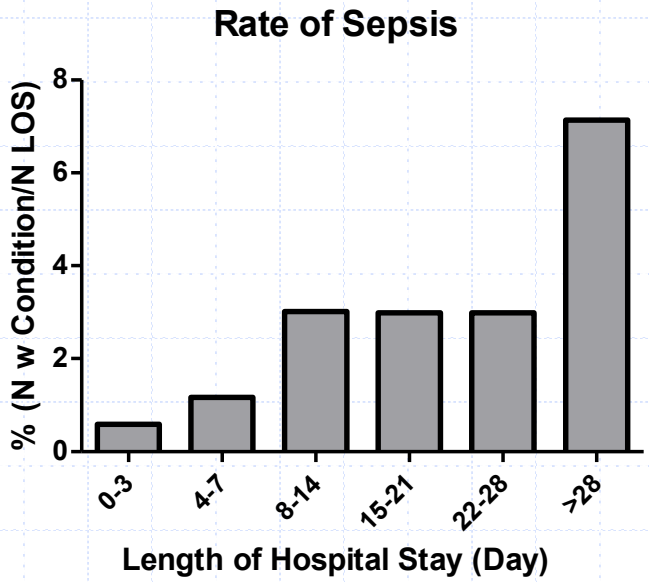
Urinary Tract Infection





Sepsis


Timing of Sepsis
Number
20
15
10
5
0
0-3
4-7
8-14
15-21
22-28
>28
Days Post Injury


Rate of Sepsis
% (N w Condition/N LOS)
8
6
4
2
0
0-3
4-7
8-14
15-21
22-28
>28
Length of Hospital Stay (Day)

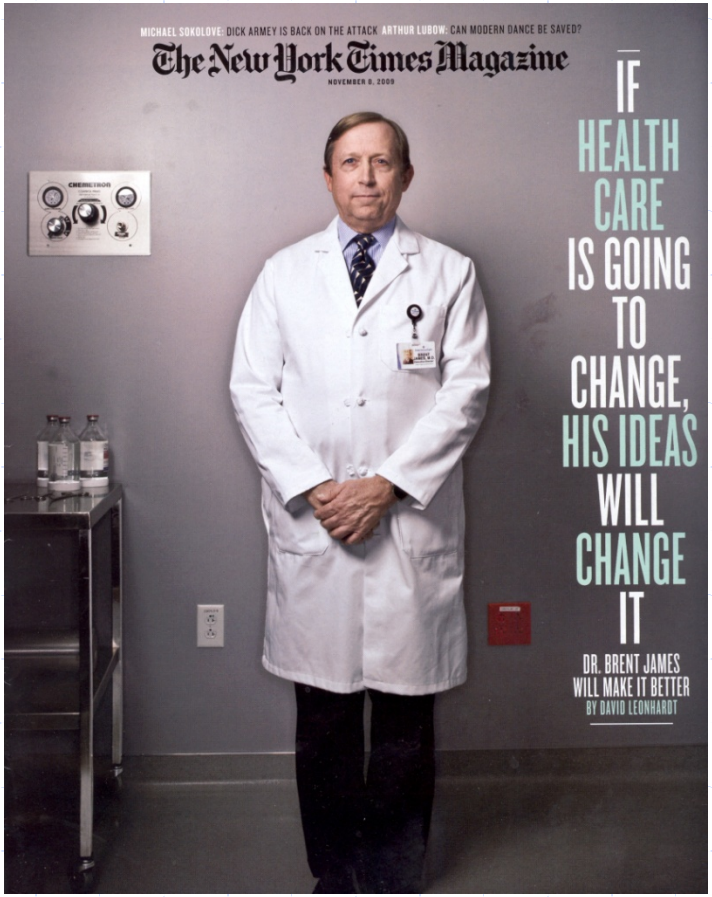
Quality Improvement

- Group
  - 1-2 Projects
  - Pneumonia
  - Mortality review
  - ICP Monitoring
  - VTE Prophylaxis
- Each Center
  - 1 Project
  - You choose – area and target
  - Feedback

	Indicator	Measure
Traumatic brain injury	ICP monitoring in severe TBI within 8 hrs of ED arrival	% of cohort with ICP monitoring w/in 8 hrs of arrival
Hemorrhage control	Time to hemorrhage control	% of patients in whom hemorrhage control initiated within 2 hrs of arrival
VTE prophylaxis	Pharmacologic VTE prophylaxis on or before day 3	% with pharmacologic prophylaxis by day 3
Fracture Rx	Time to operative fixation Time to irrigation and debridement of long bone fractures (open only)	Time to 1st/last definitive fixation Time to first I&D

Intermountain Healthcare

- Protocols
  - Evidence
  - Educated guesses
- Set of defaults
  - Can depart if necessary
- Reduce variation
- Isolate aspects of treatment that make a difference
- Rewrite based on measurement



Reality regarding variation

It may be more important to do something the same way rather than what you think is the “right” way.

Brent James, MD

Sites

- Notification
- 1/3 now
- 1/3 6 months
- 1/3 12 months
- After notification
  - ACS-TQIP
  - DUA
  - IRB
  - Meeting with Program manager/registrar

Call for Data and Meetings

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
CALL FOR DATA					X					X		
DATES	7/1/08 to 6/30/09			11/1/08 to 10/31/09					3/1/09 to 2/28/10			
REPORT					X					X		
MEETING					X					X		
CALL FOR DATA		X			X				X			
DATES	7/1/09 to 6/30/10			11/1/09 to 10/31/10				3/1/10 to 2/28/11				
REPORT		X			X				X			
MEETING		X			X				X			

- Submit data from 3/1/09 to 2/28/10
- Use web-site for data submission
- Next Meeting – February 8, 2011
- Future Meeting – May 18, 2011 w/MCOT

Can We Ever Get To Never? Reducing Infections in a Surgical ICU

Wendy L. Wahl, MD, FACS, FCCM

October 12, 2010

Michigan TQIP

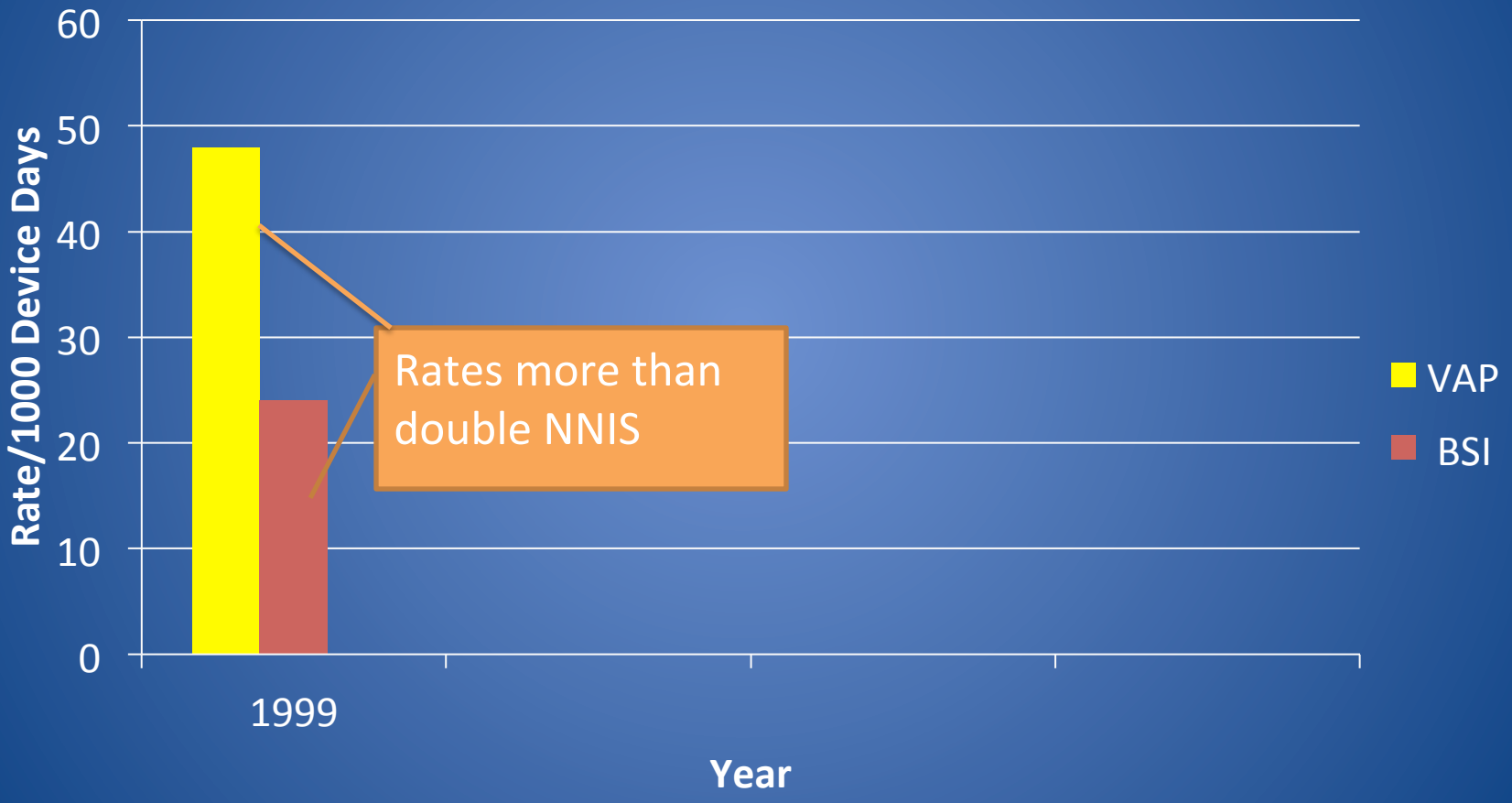
“The Unit”

- 10 ICU beds, 6 floor status beds
  - Trauma, Burns, Emergent General Surgery patients
  - Dedicated surgical intensivists
  - Protocols for patient care since ~1996

The Problem-State of the Unit in October 1999

- Infection rates high compared to NNIS
  - Ventilator associated pneumonia
  - Catheter associated (related) blood stream infections
- No routine reporting of infection rates to medical director/nurse manager
- No routine discussion between unit director and nursing leadership/staff about rates

BSI and VAP Rates in 1999



Rates at Least Two Times > NNIS!

- How did this make me feel?
  - Disbelief
  - Anger
  - Sadness
  - Acceptance
  - Desire to improve (surgeon's competitiveness!)

- What was "I" going to do about it?

The Plan

- Decision to form a multidisciplinary team
  - ICU medical director
  - Nurse manager
  - Bedside nursing
  - Respiratory therapy
  - Infection control liaison

Multidisciplinary Team

- Review rates
  - Compared to unit's own data
  - Compared to NNIS (National Nosocomial Infection Surveillance) rates
    - What type of centers are these?
- Review current policies for the ICU
  - How did these compare to hospital-wide policies?
  - How was the information disseminated?

The Team's Approach

- Review of best practices available in literature and CDC recommendations for infection control practices
  - Plan to comply with at least the minimum CDC recommendations
  - Plan to add other best practices from literature review
- Regular meetings with the "shareholders"

What Happened?

- Almost no change in rates for most of 2000
  - Reviewed education
  - Ensured most up to date recommendations
- Had not “looked” at the process
  - For successful change must see the process in practice

Walked the Walk and Stopped the Talk

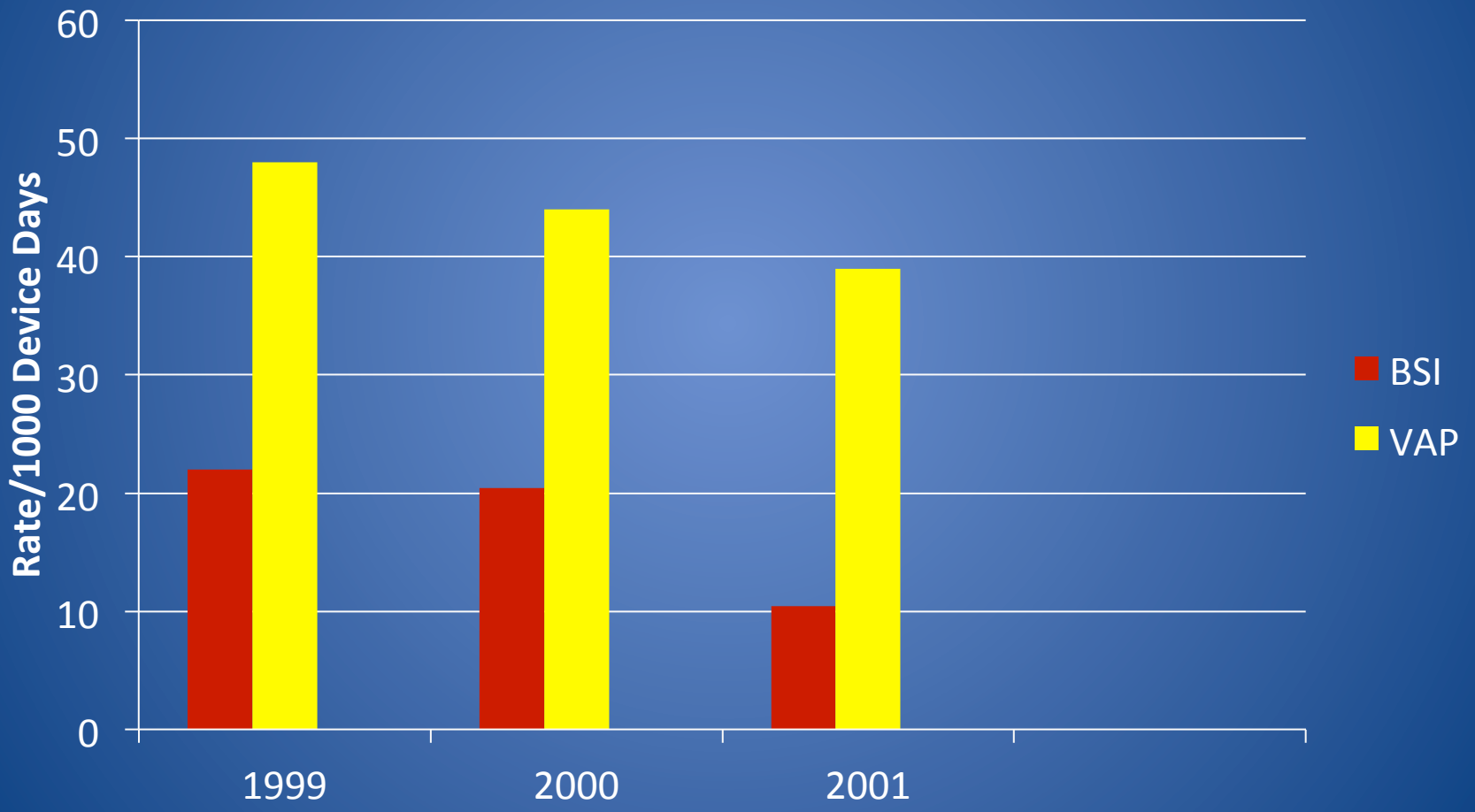
- Observed care of central venous catheters
  - During routine catheter care
  - During complex dressings changes
  - During patient “baths”
- Observed oral care and routine ventilator care
  - Frequency of care
  - How suctioning was performed

New Developments

- 2000-switch to central venous catheters (CVC)-coated with silver-chlorhexidine
  - Hospital chose silver-chlorhexidine rather than Rifampin-minocycline
  - CDC recommendation only to use coated catheters if rates > benchmark

- Reviewed data about ventilator tubing changes, in-line suctioning….

2001-Are we there yet?

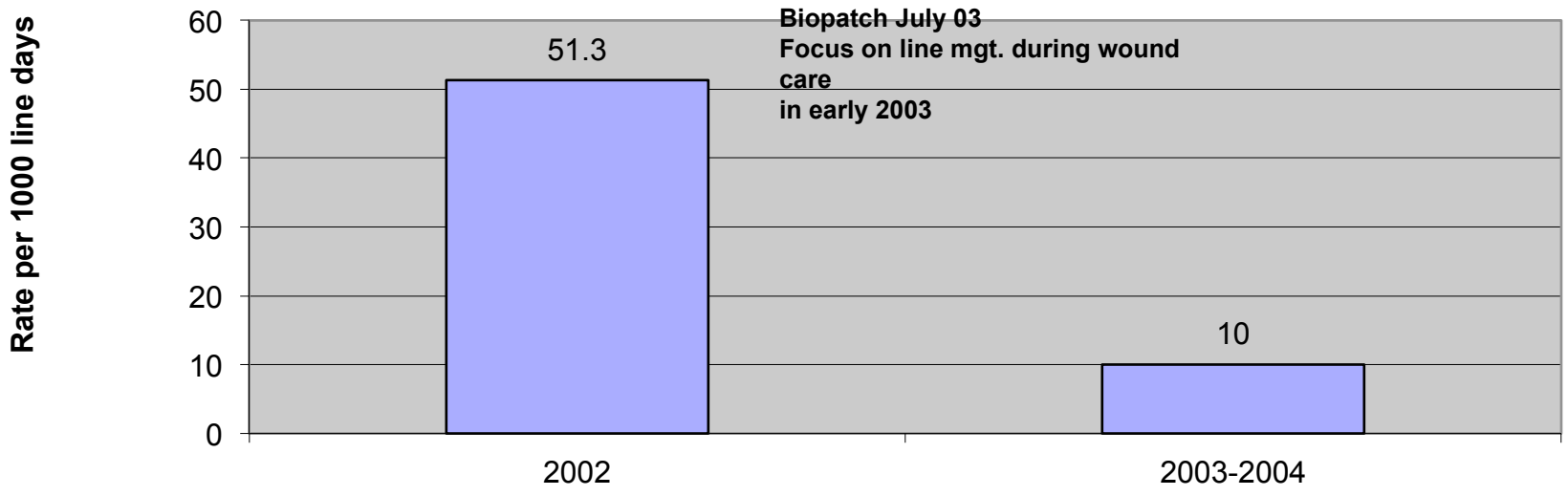


BSI 2001-2003

Encouraged after drop from 1999 to 2001

- 7/2001-Second generation CVC used
- 2002-All non-burn line changes performed as clinically indicated rather than routinely
- 7/2002-Chloraprep used for skin site preparation and line carts available for supplies
- 2003 Use of insulin drips recommended but not mandatory for goal of glucose <150 mg/dL (after visit to friend's hospital who was a cardiothoracic surgeon)
- 7/2003 Biopatch® trial for patients with wounds and central venous catheters

Burn Only BSI Rates Before and After Biopatch Use



CDC benchmark Burn-8.8

*Aug03-Jul04
p=<0.01

VAP 2001-2003

- 2003-changed unit protocol to bronchoalveolar lavage (BAL) for primary mode of VAP diagnosis
- Trials of various mouth care products throughout the hospital and in our ICU
- Use of insulin drips start, not mandatory

Interest Waning

- Despite focused efforts and modest improvements, interest waning UNTIL:
  - Change in nurse manager
  - Change in infection control liaison
  - Change in respiratory therapist manager
  - Changes in bedside nursing representation

Keystone in Michigan 2005

- Apply what was thought to be best practices to reduce mortality and infectious complications in ICU's
  - Targeted VAP and BSI due to incidence and costs in ventilated patients
    - DVT prophylaxis
    - Stress ulcer prophylaxis (SUP)
    - 8 am glucose <110 mg/dL
    - Head of bed at 30°
    - Daily weaning parameters
    - Daily wake up
    - Sedation holiday

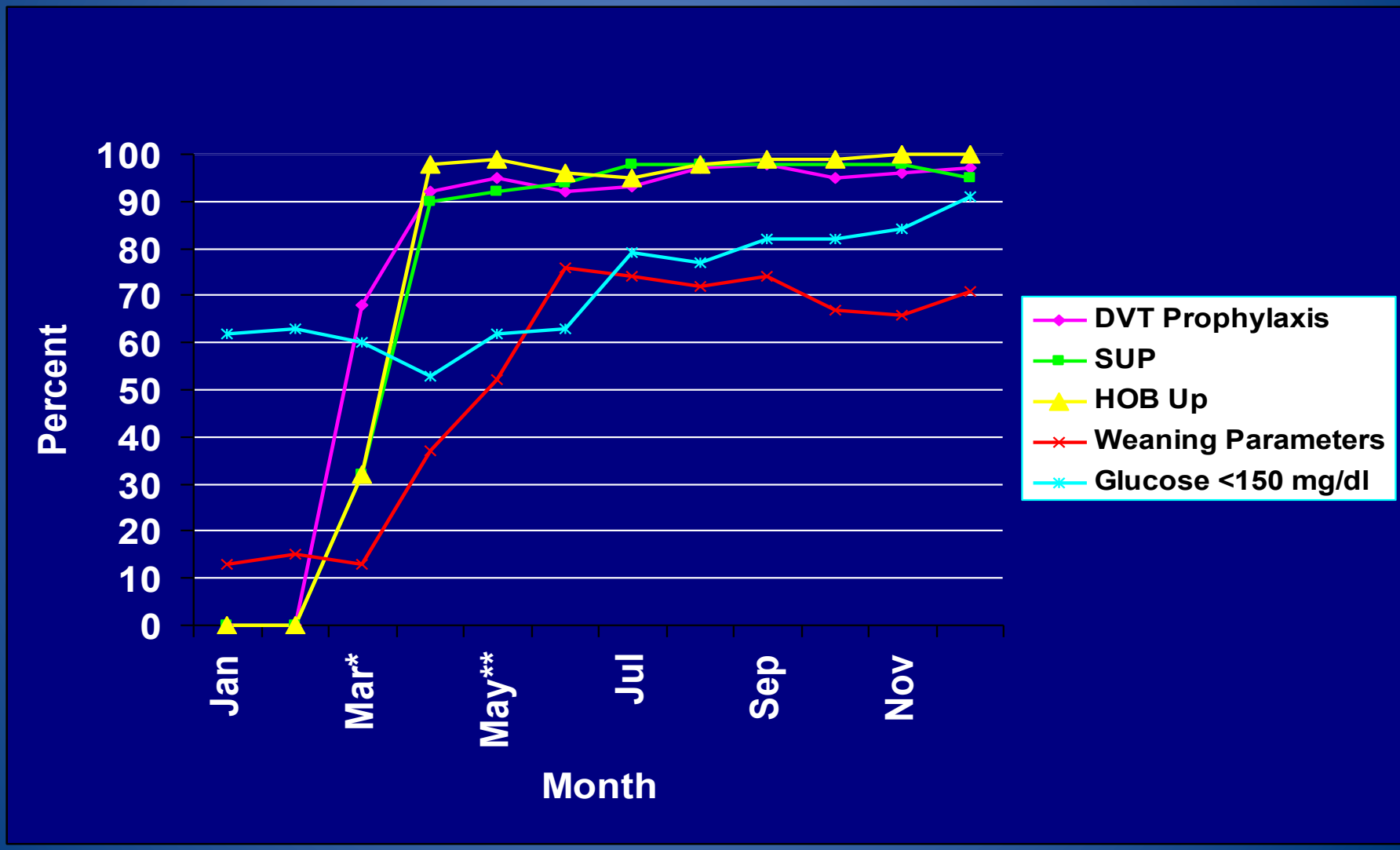
Keystone in our ICU

- Elective decision to submit data (CCMU was the target ICU submitting data)
  - Electronic data capture
  - Daily print out of compliance
- Protocols already in place for stress ulcer prophylaxis, DVT prophylaxis, weaning parameters
    - Head of bed at 30° (HOB up) and glucose compliance added
    - DID NOT KNOW compliance with existing measures

Keystone-Non-Scientific Side

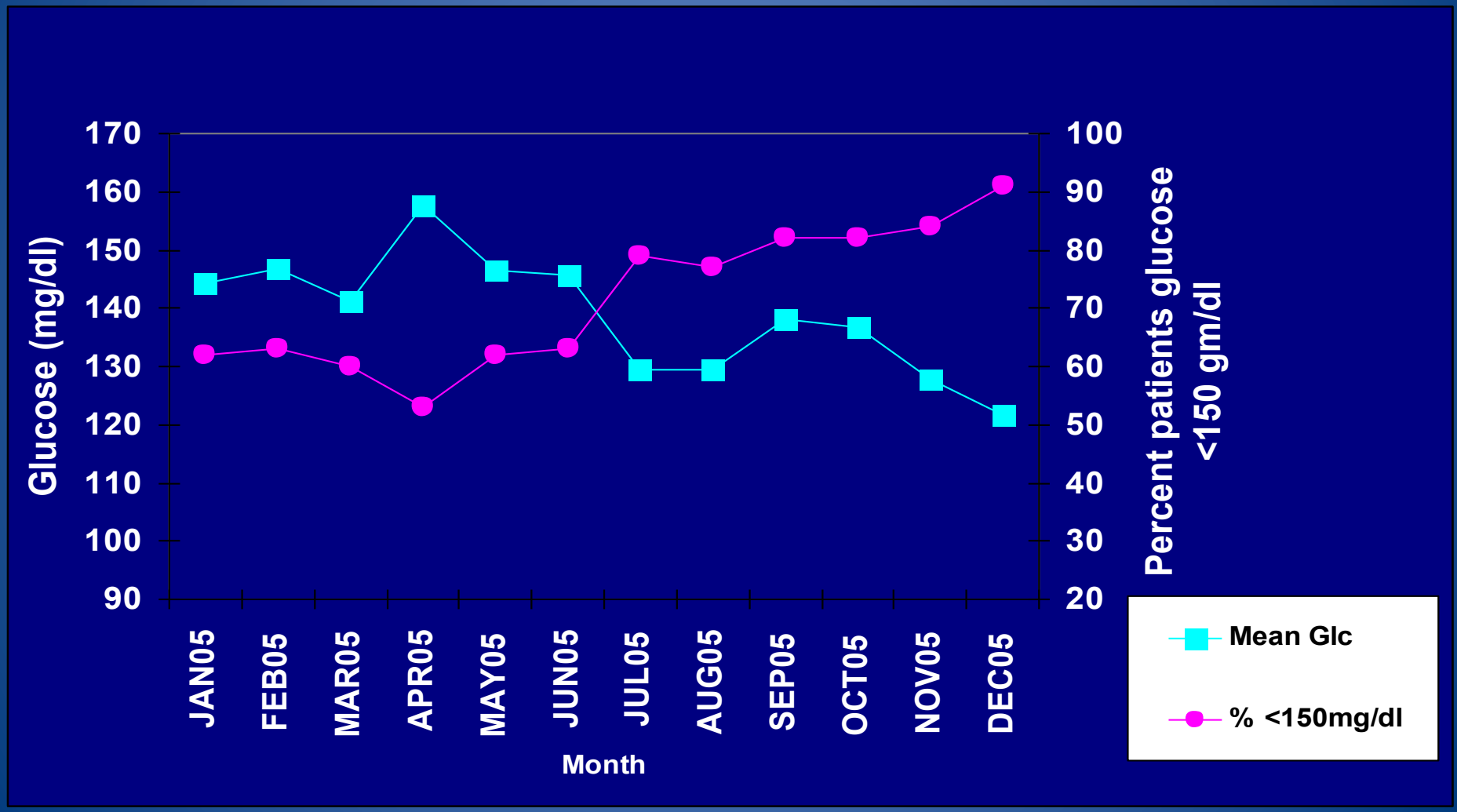
- Brought together the “team” again
  - New leaders
  - New ideas
  - New goals
- Sense of teamwork-”It takes a village”
- Reinvigorated past efforts

ICU Core Measure Compliance 2005



Wahl, et al. Surgery 2006

Mean Glucose Over Time Compared to Compliance with Glucose <150 mg/dL



Wahl, et al. Surgery 2006

Highlights of Glucose Control

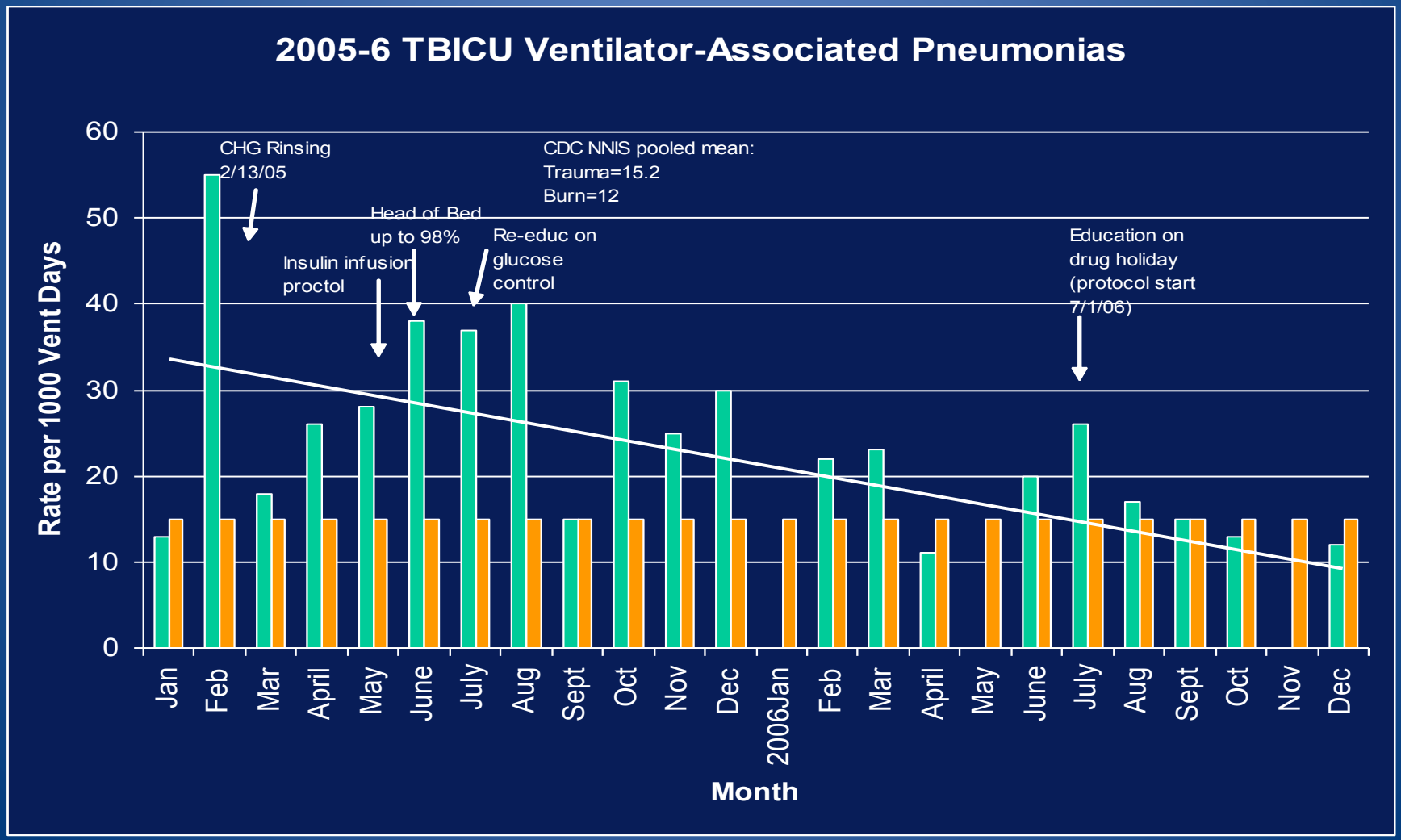
- % of patients with all glucose values <150 mg/dl rose from 62% to 91%
- Mean glucose fell from 144 to 122 mg/dl (all values NOT just am values) $p<0.01$
- Mean number of glucose checks rose from 1.5/patient to a high of 8.2/patient
  - Estimated 19 hours/month (1300 glucose checks/month X 3.8 minutes/check)

Wahl, et al. Surgery 2006

Keystone Study 2005

	Study 2005	Pre-study 2004	NNIS SICU	NNIS Trauma	NNIS Burn
VAP #/1000	31	36	9.3	15.2	12
CRBSI #/days	3.3	5.5	4.6	7.4	7

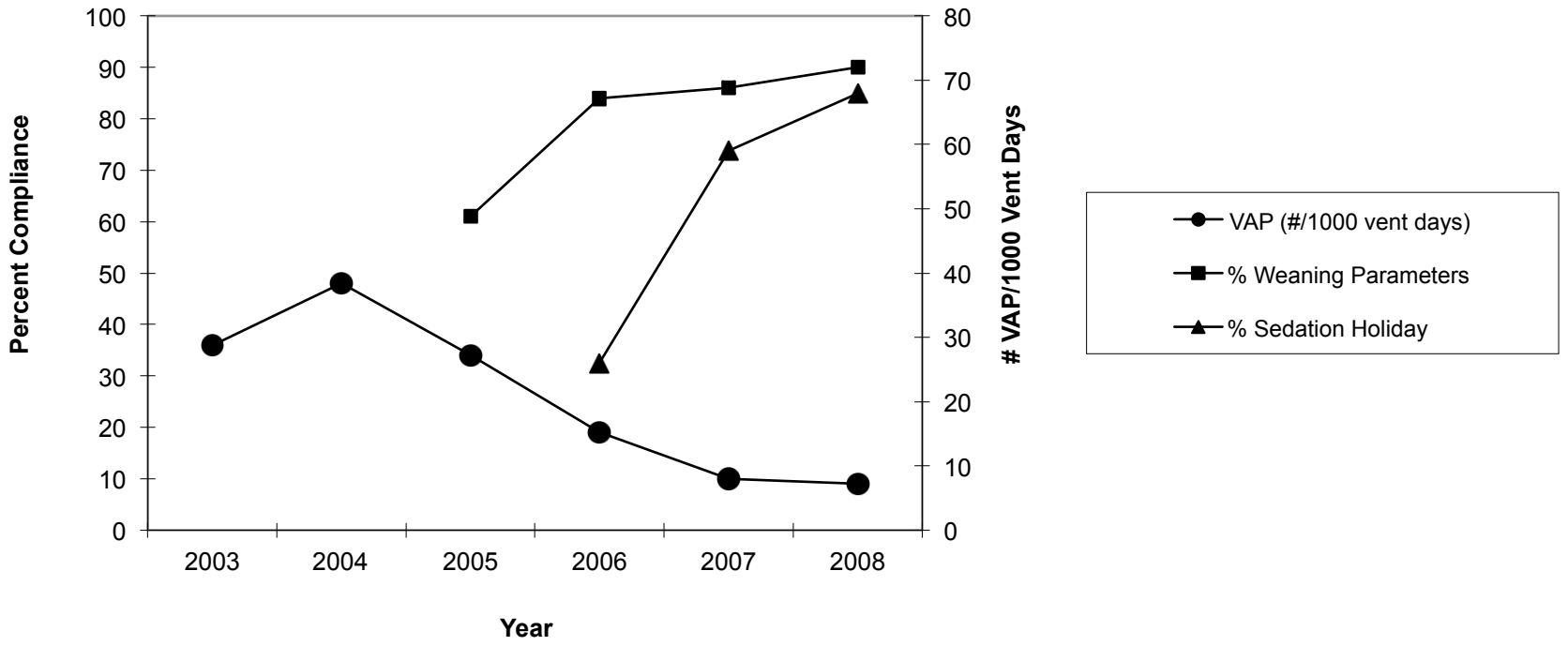
VAP Rates During and First Year after Implementation of Keystone Measures



Since Keystone Inception

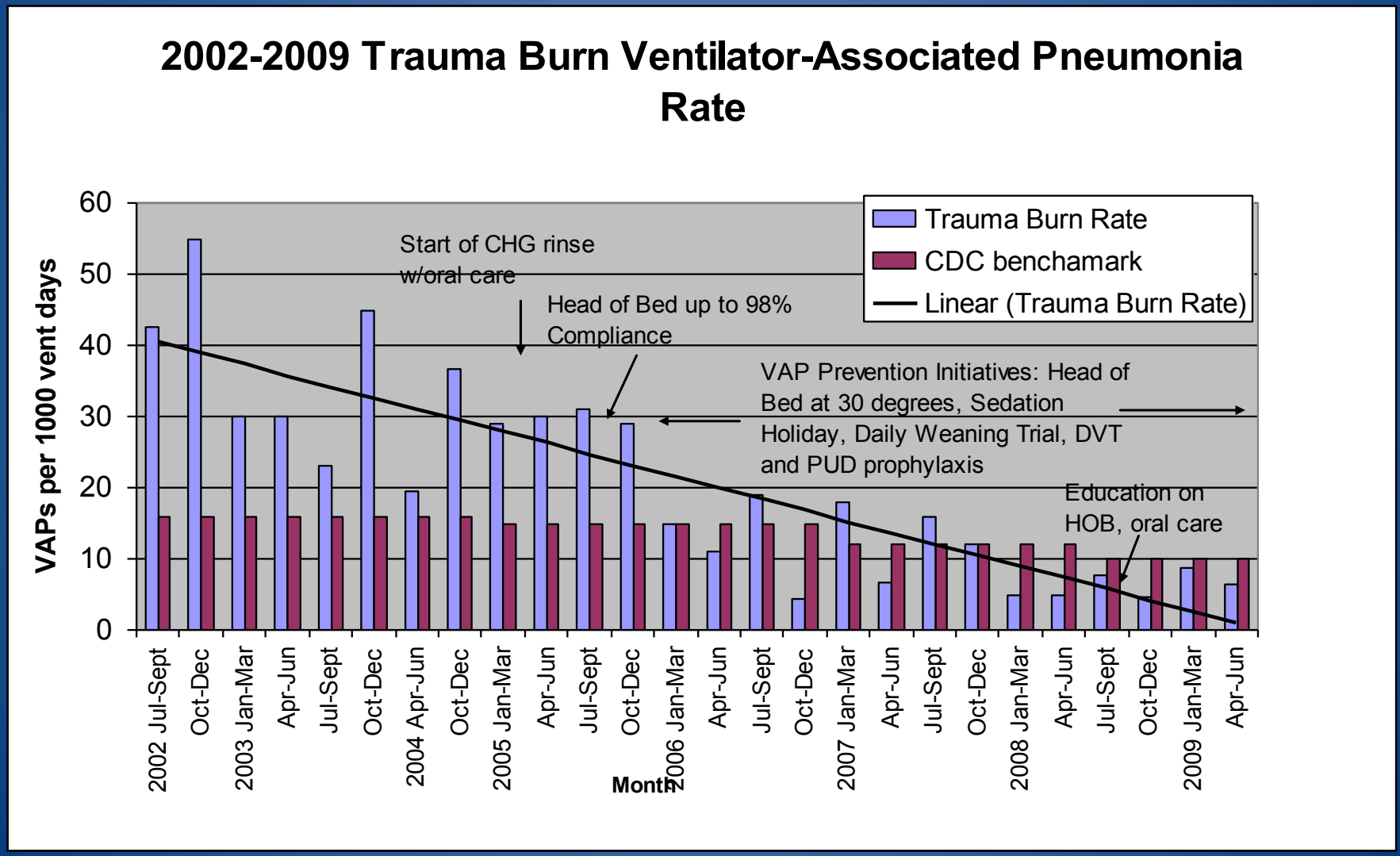
- BSI AND VAP less than benchmarks
- CVC changes PRN
- Periodic education on rates to staff and reinforcement of goals
- Looking at specifics of the infections
  - Timing and organisms in VAP
  - Organisms in BSI

Sedation Holiday and Weaning Parameter Compliance and VAP Rates

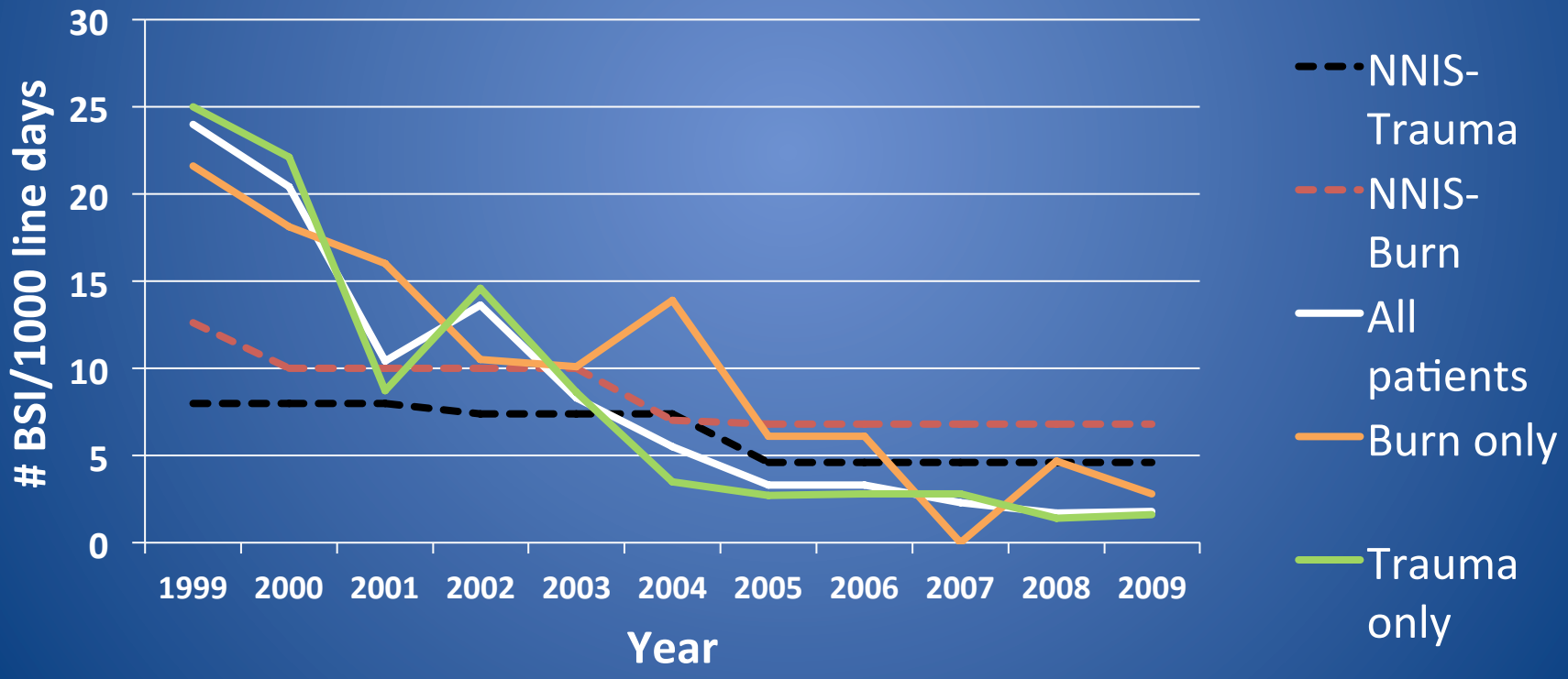


Wahl, et al. J Burn Care Res 2010

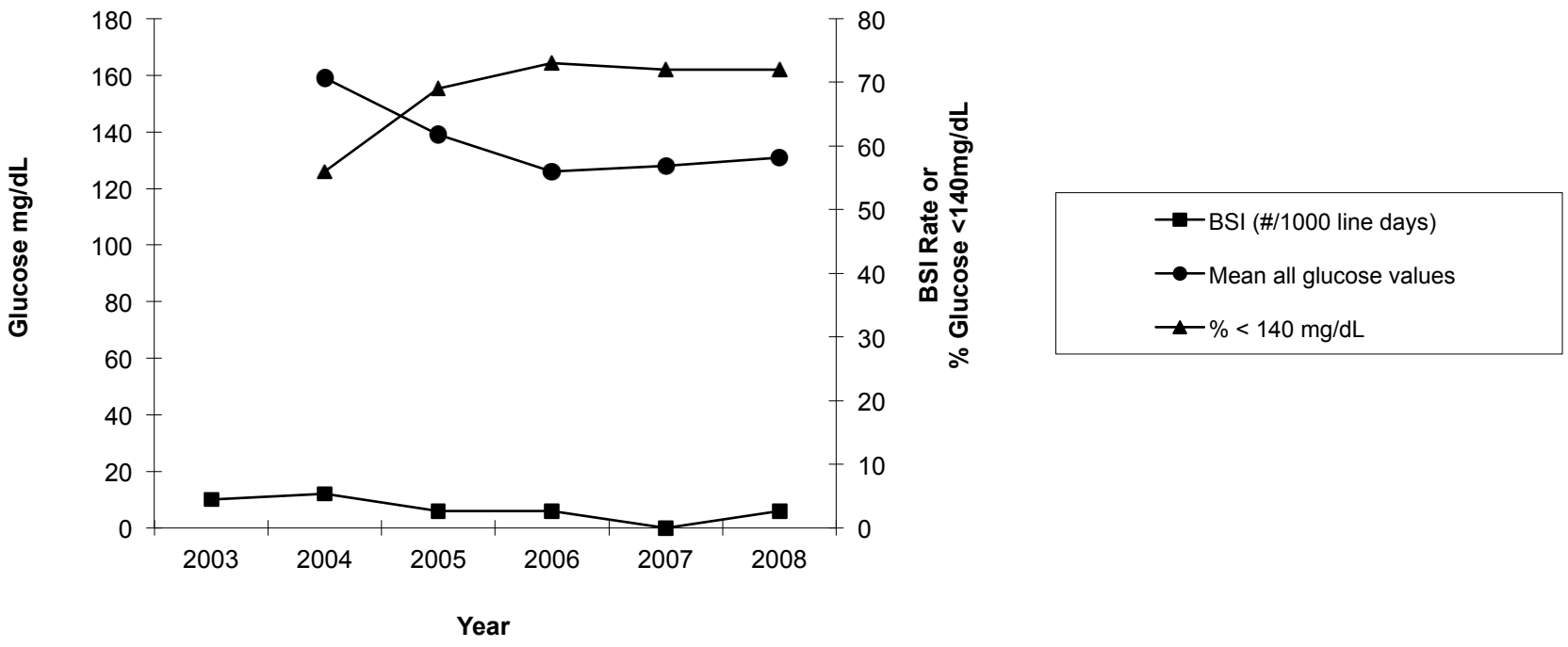
SUCCESS-BUT NOT A NEVER EVENT!



BSI Over Time By Patient Type



Glucose Values Compared to Bloodstream Infection Rates



Wahl, et al. J Burn Care Res 2010

CAN WE GET TO ZERO?

- Have been below NNIS benchmarks for VAP for 10 quarters, BUT NOT ZERO
- Have gone as long as 6 months with no BSI, BUT NOT ZERO
- Have gone an entire year with no Burn BSI, BUT NOT LONGER

- WHY?

New Goals: Understanding if We CAN Get to Never

- Patient/Disease specific factors
  - Emergent intubation
    - Often unprotected airway
    - Often in face of aspiration of blood/oral or gastric contents
    - Often in less than optimal conditions (fields, highways…)
  - Injury to respiratory system
    - Damage to airway epithelium(burns)
    - Pulmonary contusion
    - Hemo or pneumothorax
  - Relatively long period after airway secured spent evaluating patient/stabilizing initial injuries
    - Initial “damage” may not be reversible at time of ICU arrival

The Second Hit: From Injury/ Inflammation to Infection Assessment of our Bronchoalveolar Lavage (BAL) data

- 2006-2008-BAL performed for either fever/ mucous plugs/evaluation of airway after inhalation injury (208 patients):
  - 105 patients studied during first 48 hours in ICU
    - 58% ≥ 10^4 cfu/ml (consistent with pneumonia but not VAP since not on vent 48 hours)
    - 32% ≤ 10^4 cfu/ml
    - **ONLY 10% had no growth!**

Early Bacterial Growth and Resistant Organisms

BAL cfu/ ml	All Patients in first 48 hours N(%)	No Growth N(%)	Aspiration Type N(%)	Resistant GNR/ MRSA N(%)	Other GNR N (%)
$< 10^4$	44 (42)	10 (10)	23 (22)	5 (5)	6 (6)
$\geq 10^4$ =pneumonia	61 (58)	n/a	36 (34)	13 (13)	12 (11)

Use of BAL for Diagnosis of VAP

Group	N (%)	R≠L BAL		R=L BAL	Only One Side
<10,000 cfu/ml	56 (27)	Δquantity	3	26	9
		ΔOrganism	15		
		ΔBoth	3		
≥10,000 cfu/ml, <48 hours on vent (pneumonia)	60 (29)	Δquantity	10	30	10
		ΔOrganism	7		
		ΔBoth	3		
≥10,000 cfu/ml, +VAP	76 (36)	Δquantity	14	33	13
		ΔOrganism	11		
		ΔBoth	5		
No Growth	16 (8)			13	3
TOTAL	208	Δquantity	27	102	35
		ΔOrganism	33		
		ΔBoth	11		

What Does This Mean

- Prior to anything done by the ICU, patients have bad bugs and often an early pneumonia
  - Patient injury definitely has a role
  - Should we treat earlier?
    - Risk of resistance goes up with unnecessary antibiotics
    - Can not predict who will clear and who will worsen
  - Other therapies
    - Need to understand progression of disease (from the nose/oropharynx/lack of ciliary clearance??)

What is the impact of BSI and VAP?

- Increase costs!
- Debate as to whether mortality really goes up with catheter BSI vs just marker for severity of disease (as opposed to bacteremia from other sites which is associated with mortality)
- Many (not all) studies have shown that mortality does appear to go up with VAP-but no randomized, prospective trials!

Failure to rescue

- Recognized in general surgery patients with complications and now trauma patients with complications
  - Mortality not necessarily related to the complication, but the failure to rescue the patient from the complication
    - Better performing centers had lower mortality but not necessarily lower complications
    - Should we be focusing on the complication or the rescue from the event or both?

Ghaferi, Birkmeyer, Dimick NEJM 2009.
Haas, Gomez, Hemmila, Nathens, AAST Oral Presentation 2010.

Will Never Ever Happen?

- Not sure we can get to never or zero for some complications but applying best practices does help for some types of complications
- It takes a team to accomplish meaningful change
- It takes time and constant review of the process (dynamic not static)

Conclusion

- Given the emerging body of work on what happens once a patient develops a complication, we may shift our focus to rescue strategies IN ADDITION to prevention
- Remains to be seen if most infectious complications can be zero other than in a perfect world