The Michigan Trauma Quality Improvement Program

Ypsilanti, MI
October 11, 2016

Disclosures

- Salary Support for MTQIP from BCBSM/BCN
  - Mark Hemmila
  - Judy Mikhail
  - Jill Jakubus
  - Anne Cain-Nielsen

Welcome/Introductions

- University of Michigan Orthopedic Surgery
  - Bryant Oliphant, MD
- Henry Ford Quality Department
  - Jennifer Ritz
  - Lauren Henrikson-Warzynski
- New Centers
  - None
  - Two potential

Welcome/Introductions

- Guest Speakers
- Matthew Delano, MD PhD
  - University of Michigan, Acute Care Surgery
  - Diabetes and Trauma

Data Submission

- Automated
  - DI
  - CDM
  - June 2016, October 2016
- Problems
  - DI?
  - CDM?
- Lancet
  - PO, BM, ML

Future Meetings

- Winter
  - Tuesday February 14, 2016
  - Ypsilanti, EMU Marriott
- Spring with MCOT
  - Wednesday May 17, 2016
  - Boyne Falls, Boyne Mountain Resort
- Spring (Registrars and MCR's)
  - Tuesday June 6, 2016
  - Ann Arbor, NCRC

MTQIP/MANS

- Summary of Evaluation Results
  - Average Speaker and Content scores in excellent range
  - Neurosurgeon, Trauma surgeon, Trauma RN
- Future meeting
  - Neurosurgeons 20/20 yes
  - Trauma surgeon 16/16 yes
  - Nurse 17/17 yes
- Location
  - MANS Neurosurgeons
  - TS and RN more flexible

Mortality Log

Jill Jakubus, PA-C
Mark Hemmila, MD

Objective

Examine trauma patient sampling consistency across centers

Done 51

Question:

Can you say with 100% certainty that you capture 100% trauma patients per the inclusion criteria?

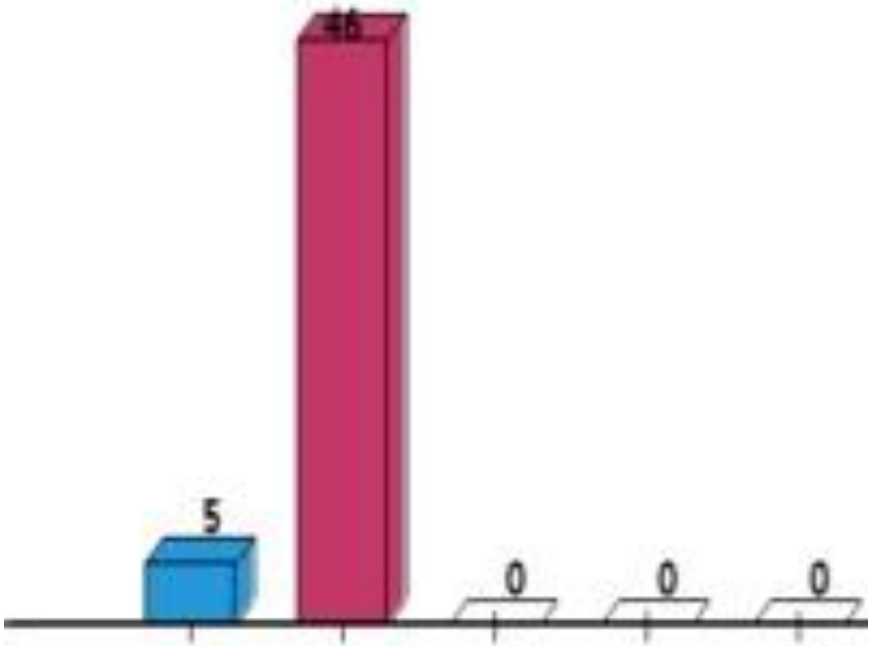
A. Yes
B. No

Done 51

Question:

Can you say with 100% certainty that you capture 100% trauma patients per the inclusion criteria?

A. Yes
B. No



Done 53

Question:

How many different sources do you use to capture trauma patients at your center?

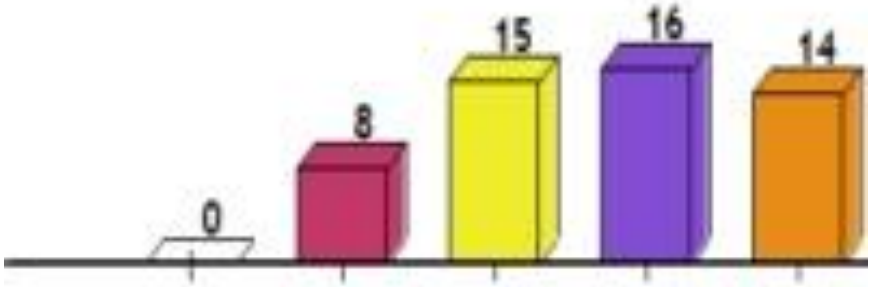
A. 1
B. 2
C. 3
D. 4
E. ≥ 5

Done 53

Question:

How many different sources do you use to capture trauma patients at your center?

A. 1
B. 2
C. 3
D. 4
E. ≥ 5



Done 52

Question:

For the mortality log submission, did you review the list provided my medical records?

A. Yes
B. No

Done 52

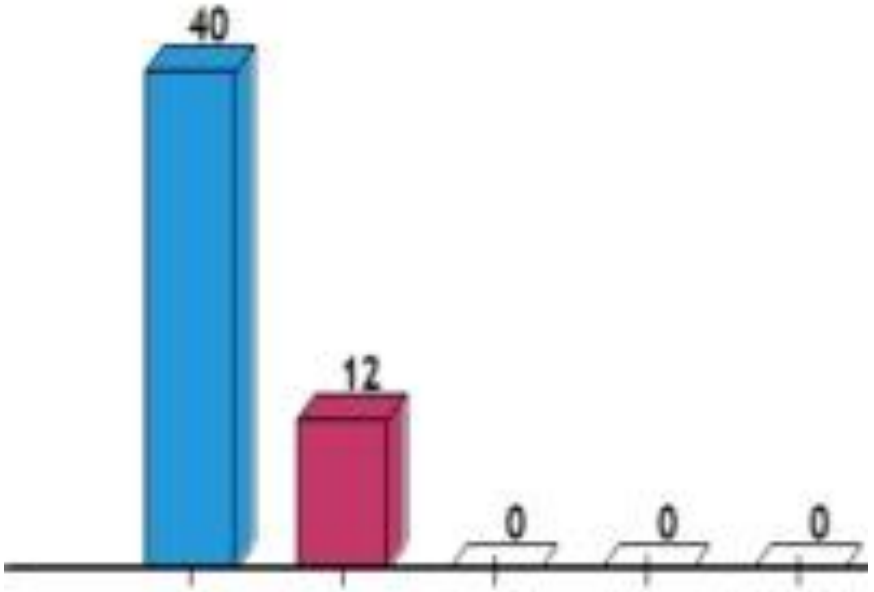
[redacted]

Question:

For the mortality log submission, did you review the list provided my medical records?

A. Yes
B. No

[redacted]



Done 42

Question:

If you reviewed the list, how many additional patients did you find?

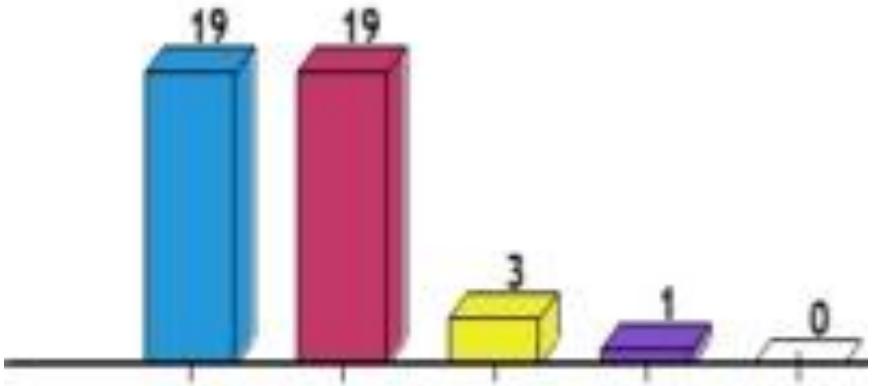
A. 0
B. 1-5
C. 6-10
D. 11-15

Done 42

Question:

If you reviewed the list, how many additional patients did you find?

A. 0
B. 1-5
C. 6-10
D. 11-15



Done 49

Question:

Do you plan on continuing this practice of reviewing the medical record mortality list?

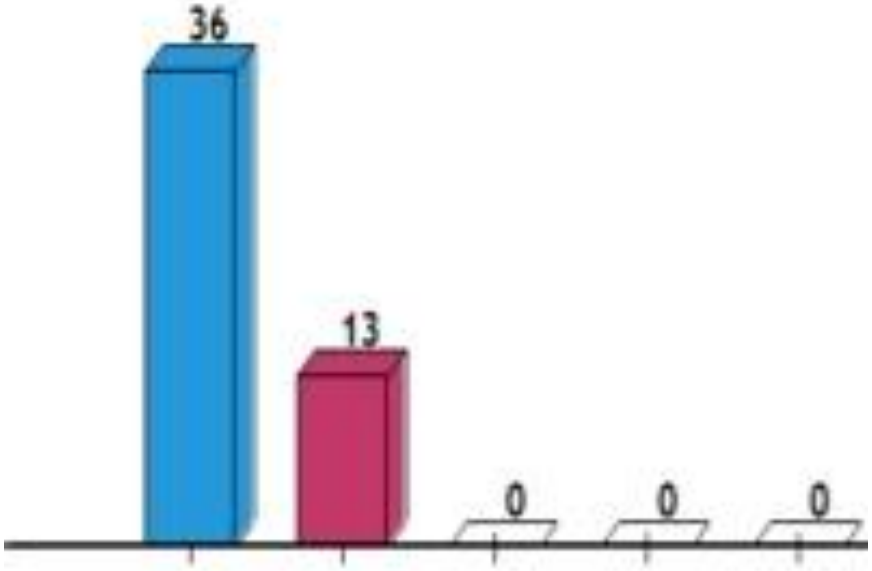
A. Yes
B. No

Done 49

Question:

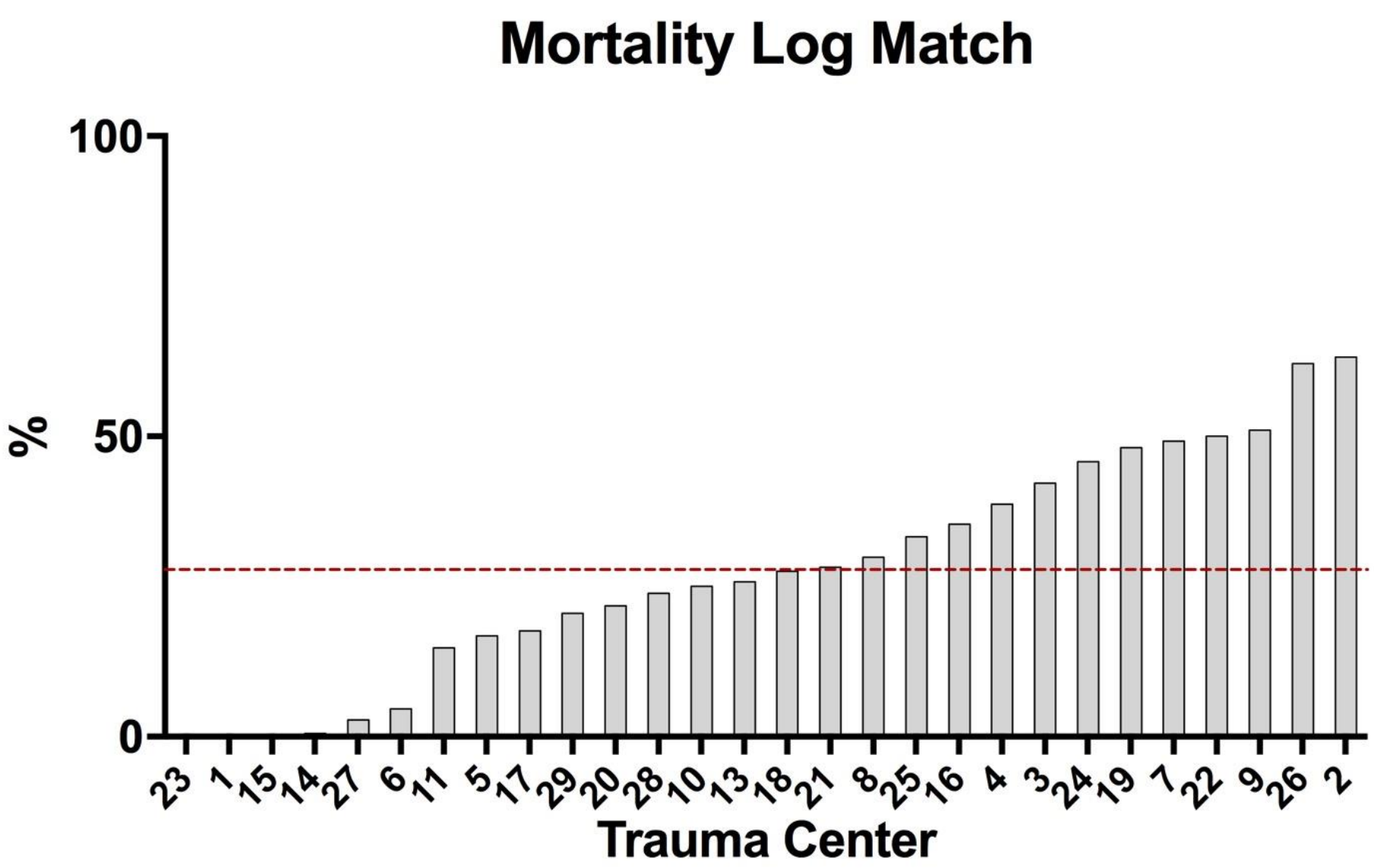
Do you plan on continuing this practice of reviewing the medical record mortality list?

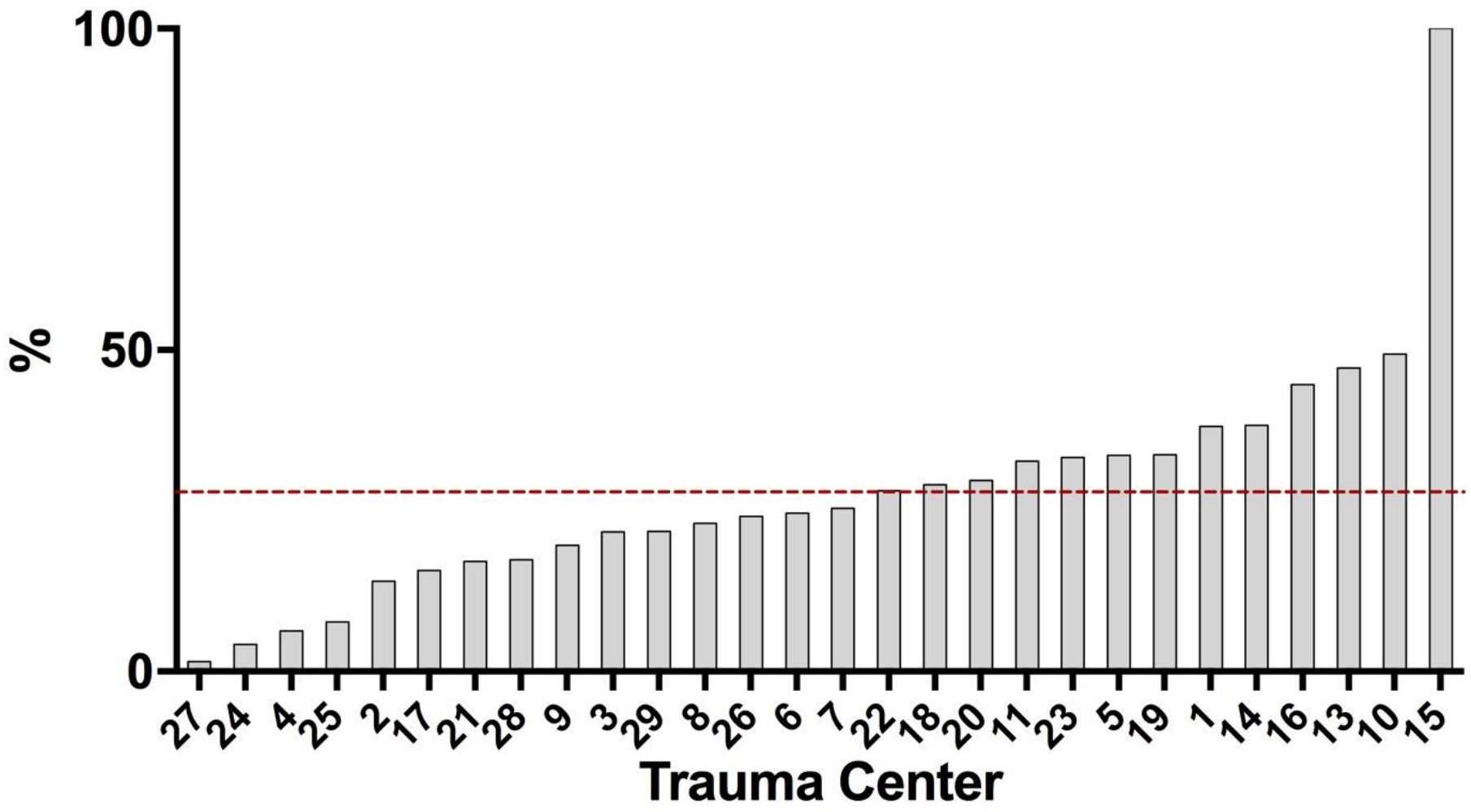
A. Yes
B. No

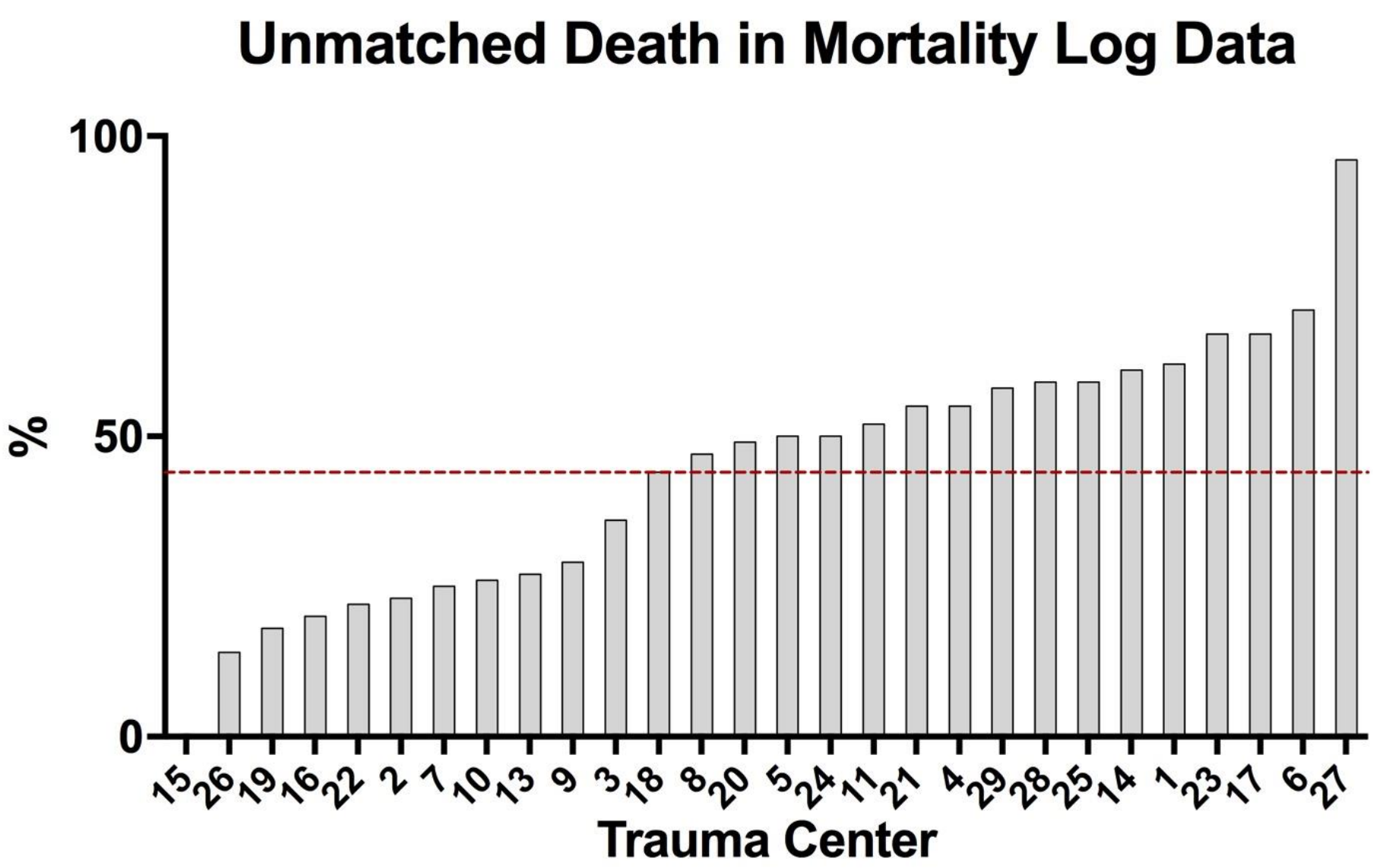


Unique Identifiers

- Center
- Age
- Date of admission
- Date of death


Mortality Log Match
100
50
0
%
23 1 15 14 27 6 11 5 17 29 20 28 10 13 18 21 8 25 16 4 3 24 19 7 22 9 26 2
Trauma Center


Unmatched Death in MTQIP Data
100
50
0
%
27 24 4 25 2 17 21 28 9 3 29 8 26 6 7 22 18 20 11 23 5 19 1 14 16 13 10 15
Trauma Center


Unmatched Death in Mortality Log Data
100
50
0
%
15 26 19 16 22 2 7 10 13 9 3 18 8 20 5 24 11 21 4 29 28 25 14 1 23 17 6 27
Trauma Center

Done 53

Question:

Does your center have an automatic case list feed run out of your EMR?

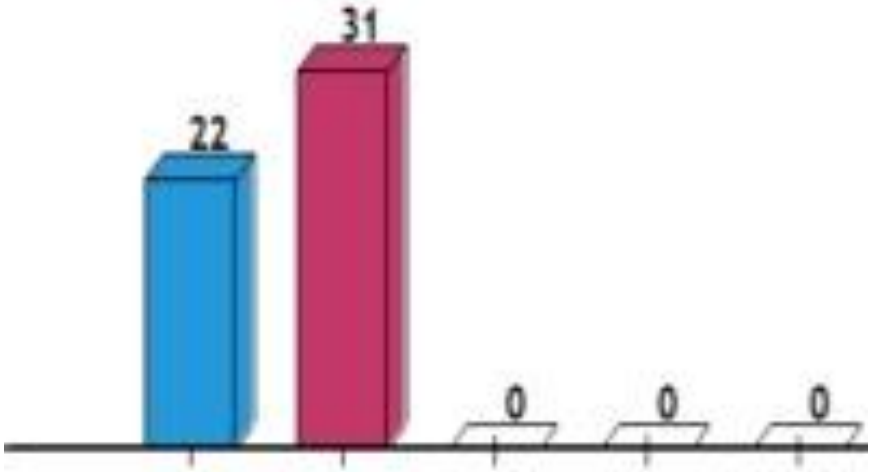
A. Yes
B. No

Done 53

Question:

Does your center have an automatic case list feed run out of your EMR?

A. Yes
B. No



Options and Discussion

MTQIP/ACS-TQIP

Judy Mikhail, PhD

M·TQIP Value Survey

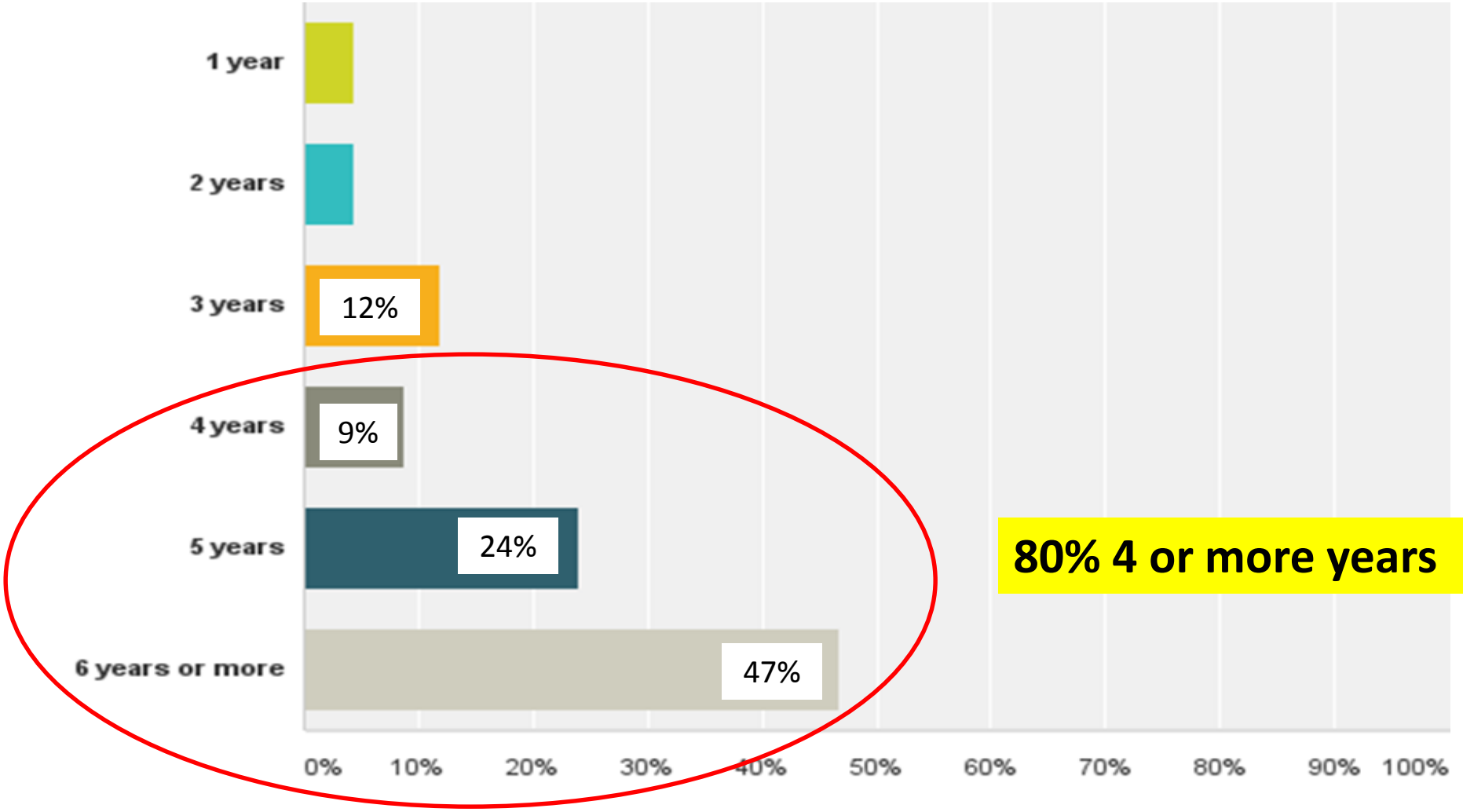
5th Anniversary Value Survey

- Electronic survey performed April 2016
- Sent to all MTQIP members
  - Surgeons, TPMs, MCRs, Registrars
- 94 Surveys Completed (76% Response Rate)

Value Survey 2016

Q1 Discipline	# Responses Received	% Received by Discipline	Response Rate 27 Centers
Trauma Surgeon	24	26%	24/27 **89%**
Trauma Program Manager	18	19%	18/27 **67%**
Clinical Reviewer	21	22%	21/28 **75%**
Registrars	31	33%	31/41 **76%**
Total	94	100%	94/124 **76%**

Q2 Years Participating in MTQIP




shift is good
shifthappens

ACS-TQIP Payment Changes

Judy Mikhail, PhD

MTQIP Trauma Center
TQIP Payments

- Currently paid through April 30, 2017
- New ACS invoicing cycle begins May 1, 2017

TQIP Payment Changes

After May 1st

- As each center's re-verification visit approaches
- The ACS will send a pro-rated TQIP invoice
- To shift their invoicing cycle to align with their Verification invoicing anniversary
- Questions can be directed to:
  - tqip@facs.org
  - Holly Michaels (hmichaels@facs.org)

MTQIP Data

Mark Hemmila, MD
Jill Jakubus, PA-C

VTE Prophylaxis Study

- MTQIP Data
- Heparin vs. LMWH
  - DVT
  - PE
  - VTE
  - Mortality
- Drug
- Dose

VTE Prophylaxis Study

- Date range: 1/1/2012 to 12/31/2014
- Inclusion:
  - MTQIP patient
  - VTE prophylaxis with heparin or LMWH
- Exclusion:
  - Direct admit
  - Transfer out
  - Dead and hospital days <=1
  - Trauma centers who joined after 1/1/2012

Unadjusted Outcomes

Outcome	Heparin	LMWH	p-value
Patients, N	7,786	10,224	--
Mortality, % (N)	2.1 (166)	1.4 (139)	<0.001
DVT, % (N)	2.1 (161)	1.5 (153)	0.004
Pulmonary Embolism, % (N)	0.8 (66)	0.5 (52)	0.005
VTE, % (N)	2.7 (207)	1.9 (190)	<0.001

Risk Adjustment

- Patient Characteristics
- Insurance status
- Physiology
- Injuries
- Comorbidities
- Intubation status
- Transfer status
- Timing of initiation of VTE prophylaxis

Adjusted Outcomes

	Outcome	N	OR	95% CI
★	VTE Event, w/o Hospital Effect	17,953	0.65	0.53-0.81
★	VTE Event, with Hospital Effect	17,838	0.67	0.51-0.88
	VTE Event by ISS categories			
★	5-15	13,145	0.51	0.32-0.80
★	16-24	2,919	0.45	0.27-0.76
	≥ 25	1,560	1.23	0.77-1.97

Adjusted Outcomes

	Outcome	N	OR	95% CI
★	PE, w/o Hospital Effect	17,645	0.52	0.35-0.76
★	PE, with Hospital Effect	17,535	0.40	0.25-0.67
	PE by ISS categories			
★	5-15	11,515	0.24	0.11-0.50
	16-24	1,771	0.41	0.15-1.11
	≥ 25	1,211	0.76	0.28-2.09

Adjusted Outcomes

Outcome	N	OR	95% CI
★ DVT, w/o Hospital Effect	17,953	0.70	0.55-0.90
DVT, with Hospital Effect	17,838	0.78	0.58-1.06
DVT by ISS categories			
5-15	12,779	0.61	0.36-1.04
★ 16-24	2,919	0.48	0.27-0.86
≥ 25	1,505	1.45	0.87-2.40

Adjusted Outcomes

	Outcome	N	OR	95% CI
★	Mortality, w/o Hospital Effect	18,010	0.64	0.50-0.82
★	Mortality, with Hospital Effect	18,010	0.56	0.40-0.78
	Mortality by ISS categories			
	5-15	13,328	0.77	0.52-1.14
	16-24	2,957	0.63	0.35-1.14
★	≥ 25	1,629	0.62	0.41-0.94

Drug type and dose

- Heparin 5000u TID
- Enoxaparin 30mg BID
- Enoxaparin 40mg QD
- Generalized estimating equation model

Adjusted Outcomes

	VTE	N	OR	95% CI
	Heparin, 5000 units TID	7,207	1.0	--
★	Enoxaparin, 30 mg BID	6,357	0.77	0.60-0.99
★	Enoxaparin, 40 mg QD	3,867	0.47	0.31-0.70

Adjusted Outcomes

	PE	N	OR	95% CI
	Heparin, 5000 units TID	7,207	1.0	--
★	Enoxaparin, 30 mg BID	6,357	0.56	0.36-0.86
★	Enoxaparin, 40 mg QD	3,867	0.37	0.19-0.72

Adjusted Outcomes

DVT	N	OR	95% CI
Heparin, 5000 units TID	7,207	1.0	--
Enoxaparin, 30 mg BID	6,357	0.88	0.66-1.16
★ Enoxaparin, 40 mg QD	3,867	0.51	0.32-0.80

Adjusted Outcomes

	Mortality	N	OR	95% CI
	Heparin, 5000 units TID	7,207	1.0	--
★	Enoxaparin, 30 mg BID	6,357	0.62	0.45-0.85
★	Enoxaparin, 40 mg QD	3,867	0.68	0.48-0.98

AAST

- Heparin vs. LMWH
- ISS 9 or greater
- LMWH 74%
- Results
  - PE
  - OR 0.70 for LMWH
  - Centers with highest utilization of LMWH had lower rates of PE

Session: I: Plenary Papers 1-9
Paper 5: 9:10 - 9:30 AM

EFFICACY OF LOW MOLECULAR WEIGHT HEPARIN VS UNFRACTIONATED HEPARIN TO PREVENT PULMONARY EMBOLISM FOLLOWING MAJOR TRAUMA: RESULTS FROM THE AMERICAN COLLEGE OF SURGEONS TRAUMA QUALITY IMPROVEMENT PROGRAM

James P. Byrne MD, Stephanie Mason MD, David Gomez MD,Ph.D., Christopher Hoeft MA, Melanie Neal Avery B. Nathens* MD,Ph.D., Sunnybrook Health Science Centre

Invited Discussant: Steven Shackford, MD

Introduction: Pulmonary embolism (PE) is a leading cause of mortality following major trauma. While low molecular weight heparin (LMWH) is often favored over unfractionated heparin (UH) as prophylaxis against venous thromboembolism (VTE), there is limited level 1 evidence demonstrating superiority over UH to justify its higher cost. This study determined efficacy of LMWH compared to UH to prevent PE in patients admitted to trauma centers participating in the ACS Trauma Quality Improvement Program (ACSTQIP).

Methods: Data for adults with severe injury who received VTE prophylaxis with LMWH or UH were derived from ACSTQIP (2012-2014). Two analytic approaches were used. First, the incidence of PE was compared between propensity score (PS)-matched LMWH and UH groups, balanced for patient baseline and injury characteristics, early surgical interventions, and timing of initiation of pharmacologic prophylaxis. Subgroup analyses included: patients with shock, blunt multisystem injury, penetrating truncal injuries, isolated orthopedic trauma and severe traumatic brain injury. Odds ratios (ORs) for PE and 95% confidence intervals (CIs) were estimated using multilevel mixed models, accounting for matched pairs and clustering of patients within centers. Second, a center-level analysis was performed to determine the risk of PE at centers with increasing utilization of LMWH, while accounting for patient case mix. This analysis answered the question of whether trauma centers with a predilection for using LMWH have lower rates of VTE than centers with a greater preference for UH.

Results: We identified 112,031 patients at 214 trauma centers who received LMWH or UH. LMWH was the most common agent used (74%). Patients with older age, greater comorbidity, fall-related and severe head injuries, intracranial hemorrhage, low GCS scores, and early intracranial interventions were more likely to receive UH. PS-matching yielded a well-balanced cohort of 55,212 patients. LMWH was associated with a significantly lower rate of PE rate compared to UH (1.8% vs. 2.4%; OR 0.70; 95%CI 0.62 – 0.79). This finding was consistent across injury subgroups (Table 1). Our center-level analysis demonstrated that centers with greater utilization of LMWH had lower rates of PE than centers with a greater preference for UH. Specifically, centers in the highest quartile of LMWH utilization (where average 95% of patients received LMWH) had lower rates of PE compared to centers in the lowest quartile of LMWH utilization (where average 42% of patients received LMWH): 1.2% vs. 1.8%; p = 0.02.

Conclusion: Based on these data, VTE prophylaxis with LMWH is associated with lower rates of PE, with a potential to reduce PE rates by more than 25%, compared to prophylaxis with UH. Trauma centers with the greatest utilization of LMWH have lower rates of PE, even after accounting for patient case mix. LMWH should be the preferred agent for VTE prophylaxis after major trauma.

Table 1. Odds of Pulmonary Embolism for Propensity Matched Cohorts

	Crude PE Rate (%)		
Matched Cohort	**LMWH**	**UH**	**OR (95% CI)**
All Patients (n = 55,212)	1.8	2.4	0.70 (0.62 – 0.79)
Shock (n = 3,472)	3.1	4.2	0.67 (0.49 – 0.92)
Blunt Multisystem Injury (n = 16,886)	2.7	3.3	0.75 (0.63 – 0.90)
Penetrating Truncal Injury (n = 3,966)	1.7	2.6	0.49 (0.33 – 0.72)
Isolated Orthopedic Trauma (n = 7,138)	1.0	2.6	0.35 (0.25 – 0.49)
Severe Traumatic Brain Injury (n = 2,732)	0.9	2.1	0.42 (0.21 – 0.84)

Outcome	Base Rate	2014 Rate	Relative Change (%)	Unadjusted p-value	Adjusted p-value	Annual Patient Impact
Mortality (%)	5.40	5.09	- 5.7	0.3	0.3	35 fewer
Serious Complication (%)	8.51	7.27	- 14.6	0.001	<0.001	141 fewer
Pneumonia (%)	4.30	3.41	- 20.7	0.001	<0.001	101 fewer
Severe Sepsis (%)	0.93	0.58	- 37.6	0.003	<0.001	40 fewer
Venous Thromboembolism (%)	1.87	1.26	- 32.6	<0.001	<0.001	69 fewer
Urinary Tract Infection (%)	3.48	1.69	- 51.4	<0.001	<0.001	204 fewer

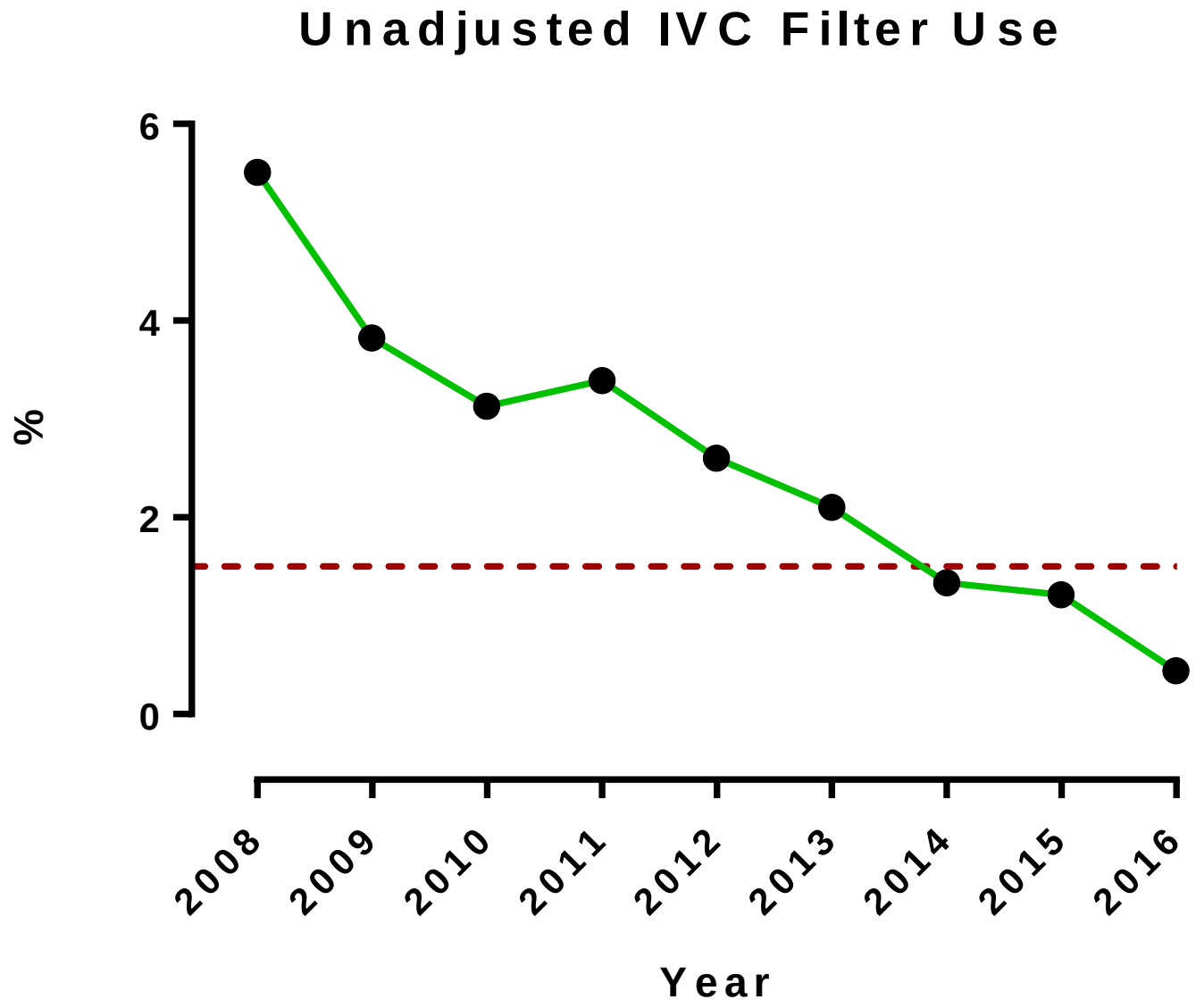
Utilization or Process Measure	Base Rate	2014 Rate	Relative Change (%)	Unadjusted p-value	Adjusted p-value	Annual Patient Impact
Mechanical Ventilator Days	7.7 ± 10.2	6.6 ± 8.0	- 13.3	0.001	0.003	1,697 fewer days
ICU Days	6.0 ± 9.1	5.5 ± 7.0	- 7.6	0.009	<0.001	2,042 fewer days
Hospital Days	6.1 ± 8.3	5.7 ± 7.0	- 6.6	<0.001	<0.001	4,553 fewer days
VTE Prophylaxis Initiated ≤ 48 hrs (%)	41.6	50.8	+ 22.1	<0.001	<0.001	1,047 more
VTE Prophylaxis with LMWH (%)	33.3	38.3	+ 15.0	<0.001	<0.001	569 more
Prophylactic IVC Filter Placement (%)	2.49	1.08	- 56.6	<0.001	<0.001	160 fewer

Heparin
Barriers ?

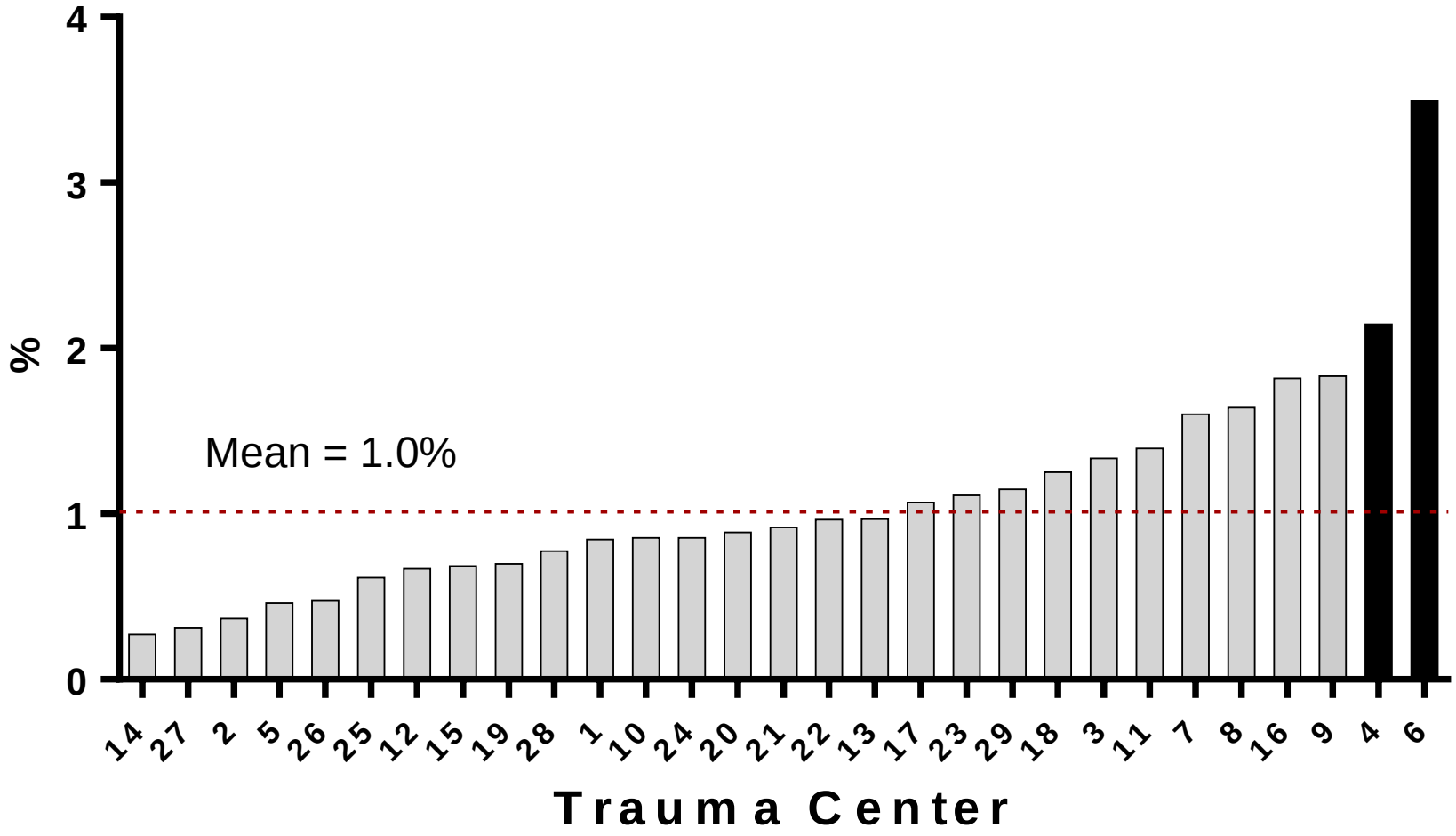
Collaborative-Wide Metric
IVC Filter Placement

2016 Group Project

- Target is 1.5% for 2016 reporting
- If collaborative mean is ≤ 1.5% every center gets 10 points.
- If collaborative mean is > 1.5% every center gets 0 points.
- At or near target – maintain performance
- Above target
  - Educate providers
  - Assistance from collaborative members


Unadjusted IVC Filter Use
6
4
2
0
%
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year

Risk and Reliability Adjusted IVC Filter Use



3/1/14 – 5/31/16

Hospital Metrics

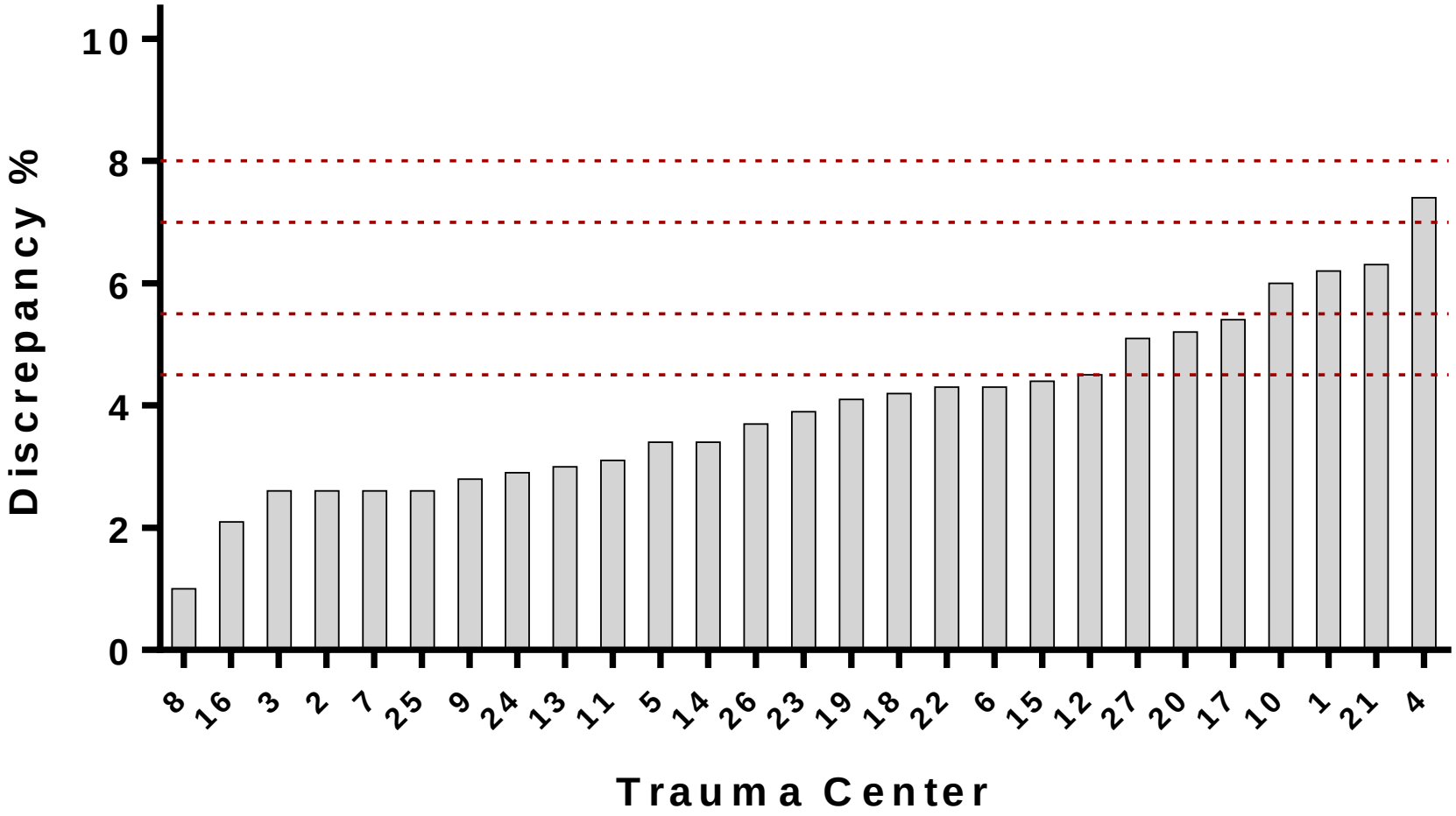
MTQIP 2016 Hospital Metrics

- Participation 50%
- Performance 50%
  - Data Validation
  - Massive Transfusion Protocol
  - VTE Prophylaxis
  - Site-specific QI project
  - IVC Filter usage

Performance

PERFORMANCE (30%)					
#6	10	**Accuracy of Data**			
			Visit #1	**Visit #2 or More**	
		5 star validation	0-4.5%	0-4.5%	10
		4 star validation	4.6-5.5%	4.6-5.5%	8
		3 star validation	5.6-8.0%	5.6-7.0%	5
		2 star validation	8.1-9.0%	7.1-8.0%	3
		1 star validation	> 9%	> 8.0%	0
#7	10	**Massive Transfusion (defined as ≥ 5 u PRBC in first 4 hours): Mean PRBC to Plasma Ratio for first 4 hours of admission**			
		≤ 1.5			10
		1.6 - 2.0			10
		2.1 - 2.5			5
		> 2.5			0
#8	10	**Timely VTE Prophylaxis (< 48 hours of admission)**			
		> 50%			10
		≥ 40%			5
		< 40%			0

Validation


Discrepancy %
10
8
6
4
2
0
8 16 3 2 7 25 9 24 13 11 5 14 26 23 19 18 22 6 15 12 27 20 17 10 1 21 4
Trauma Center

Massive Transfusion Ratio

- Massive Transfusion
  - ≥ 5 units PRBC's in first 4 hrs
  - Average of tier points score for each patient
  - 0 units FFP places patient in tier 4
  - 3/1/14 – 5/31/16

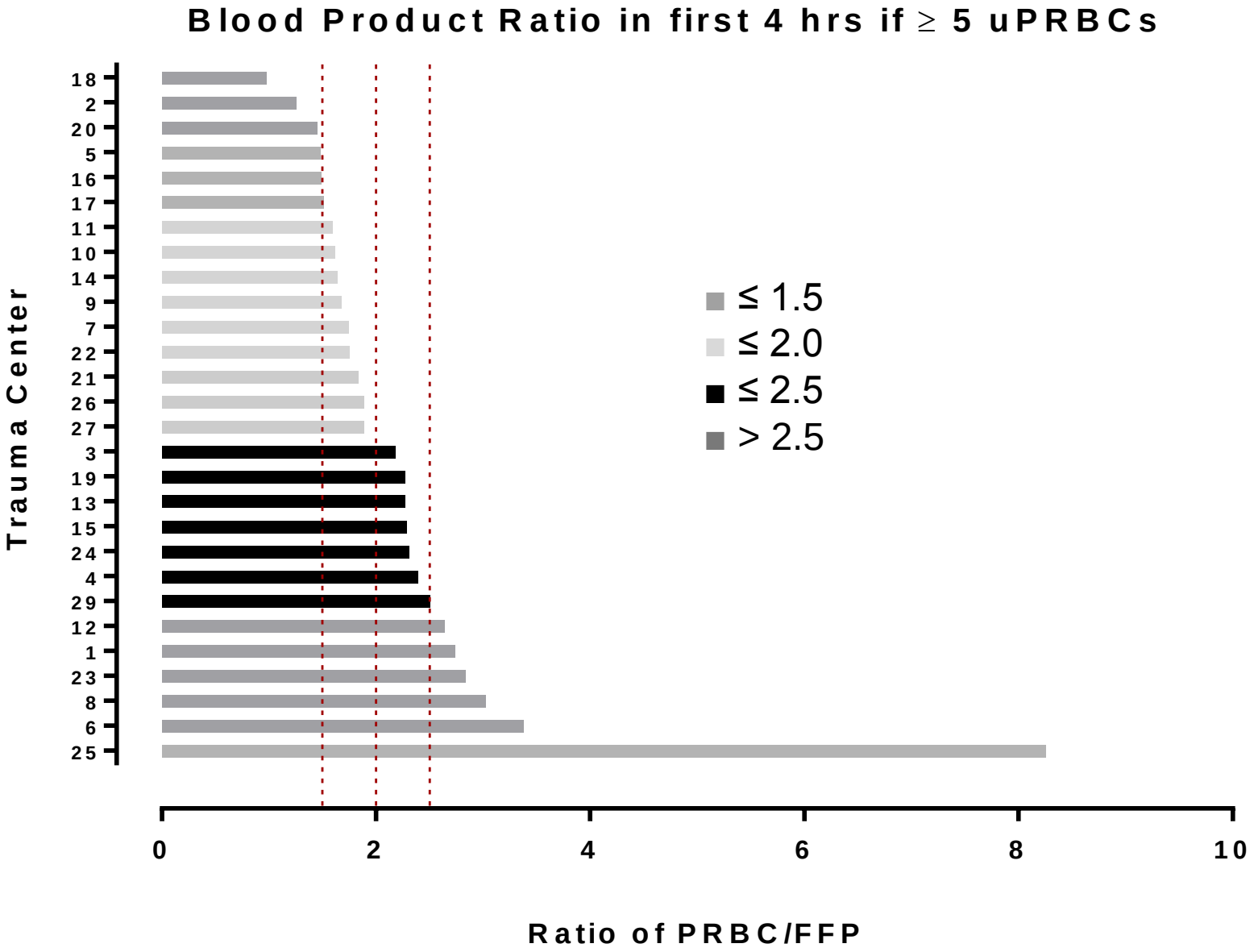
Ratio PRBC/FFP	Tier	Points
< 1.5	1	10
1.6 – 2.0	2	10
2.1 – 2.5	3	5
> 2.5	4	0

Massive Transfusion Metric Calculation Example

Patient	PRBC	FFP	PRBC/FFP	Tier	Points
1	10	10	1.0	1	10
2	5	4	1.3	1	10
3	7	4	1.8	2	10
4	8	5	1.6	2	10
5	5	2	2.5	3	5
6	7	3	2.3	3	5
7	9	2	4.5	4	0
8	5	1	5.0	4	0
9	11	0		4	0
10	6	0		4	0
					50

$$\frac{\text{Total Points}}{\text{Total Patients}} = \text{Metric Points}$$

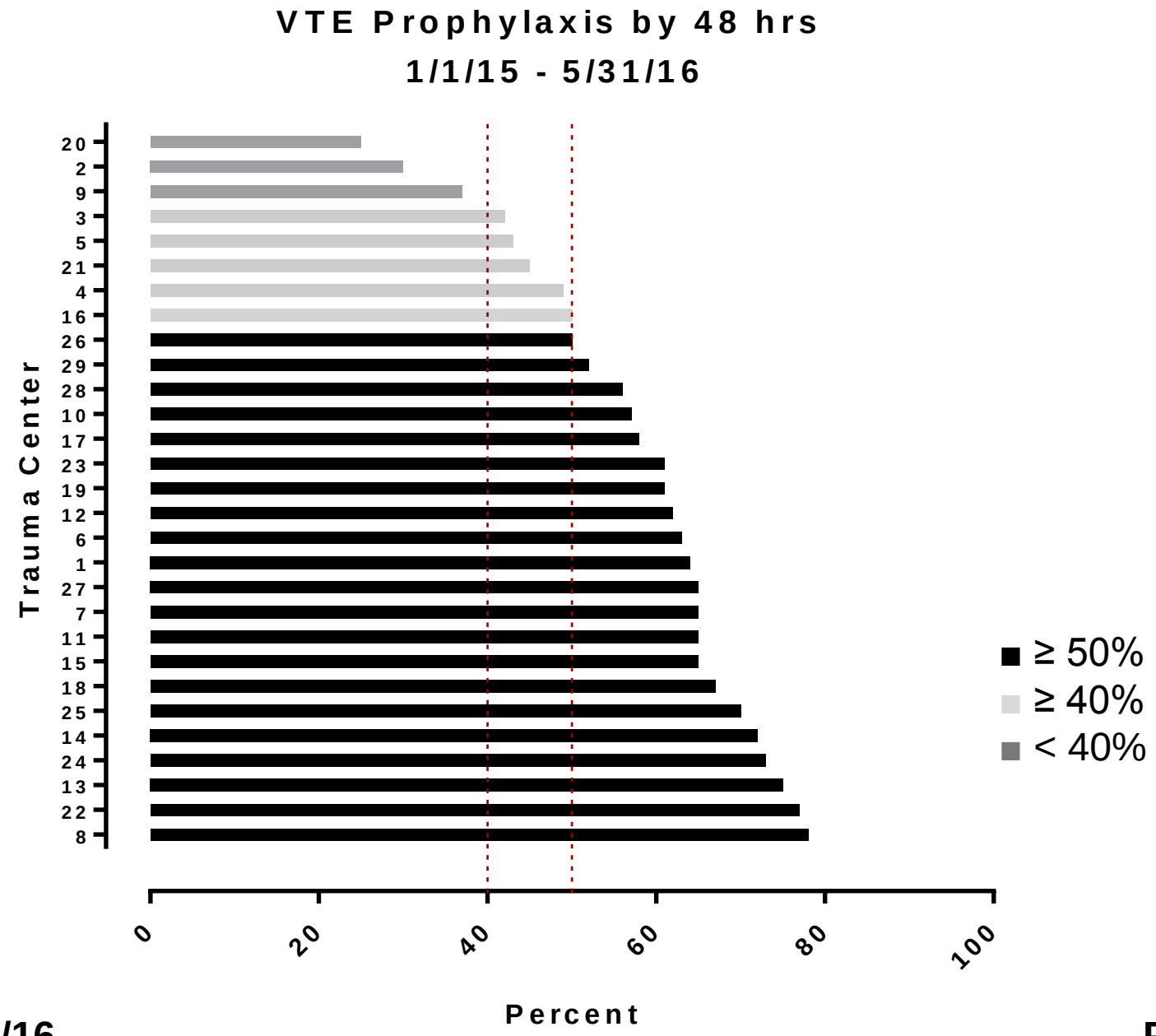
$$\frac{50}{10} = 5$$


Blood Product Ratio in first 4 hrs if ≥ 5 uPRBCs
Trauma Center
18
2
20
5
16
17
11
10
14
9
7
22
21
26
27
3
19
13
15
24
4
29
12
1
23
8
6
25
≤ 1.5
≤ 2.0
≤ 2.5
> 2.5
0
2
4
6
8
10
Ratio of PRBC/FFP

3/1/14 – 5/31/16

VTE Prophylaxis

- Admit Trauma Service
  - Exclude - Discharge Home in 48 hrs
  - VTE Prophylaxis in 48 hrs
  - 1/1/15 – 5/31/16
- Rate
  - ≥ 50% (10 points)
  - ≥ 40% (5 points)
  - 0 – 39% (0 points)


VTE Prophylaxis by 48 hrs
1/1/15 - 5/31/16
Trauma Center
20
2
9
3
5
21
4
16
26
29
28
10
17
23
19
12
6
1
27
7
11
15
18
25
14
24
13
22
8
0
20
40
60
80
100
Percent
≥ 50%
≥ 40%
< 40%

VTE Prophylaxis

- Website
  - Practices > VTE Prophylaxis Metric
  - Cohort = Cohort 2 (admit to Trauma)
  - No Signs of Life = Exclude DOAs
  - Transfers Out = Exclude Transfers Out
  - Default Period = Set for CQI Index time period
- Heparin, LMWH <= 48 Hours
  - Hospital - Unadj %

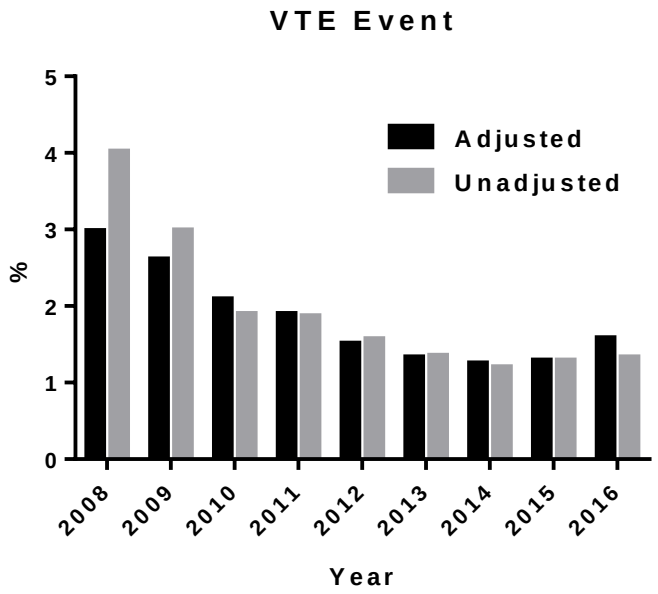
Collaborative-Wide PI Projects

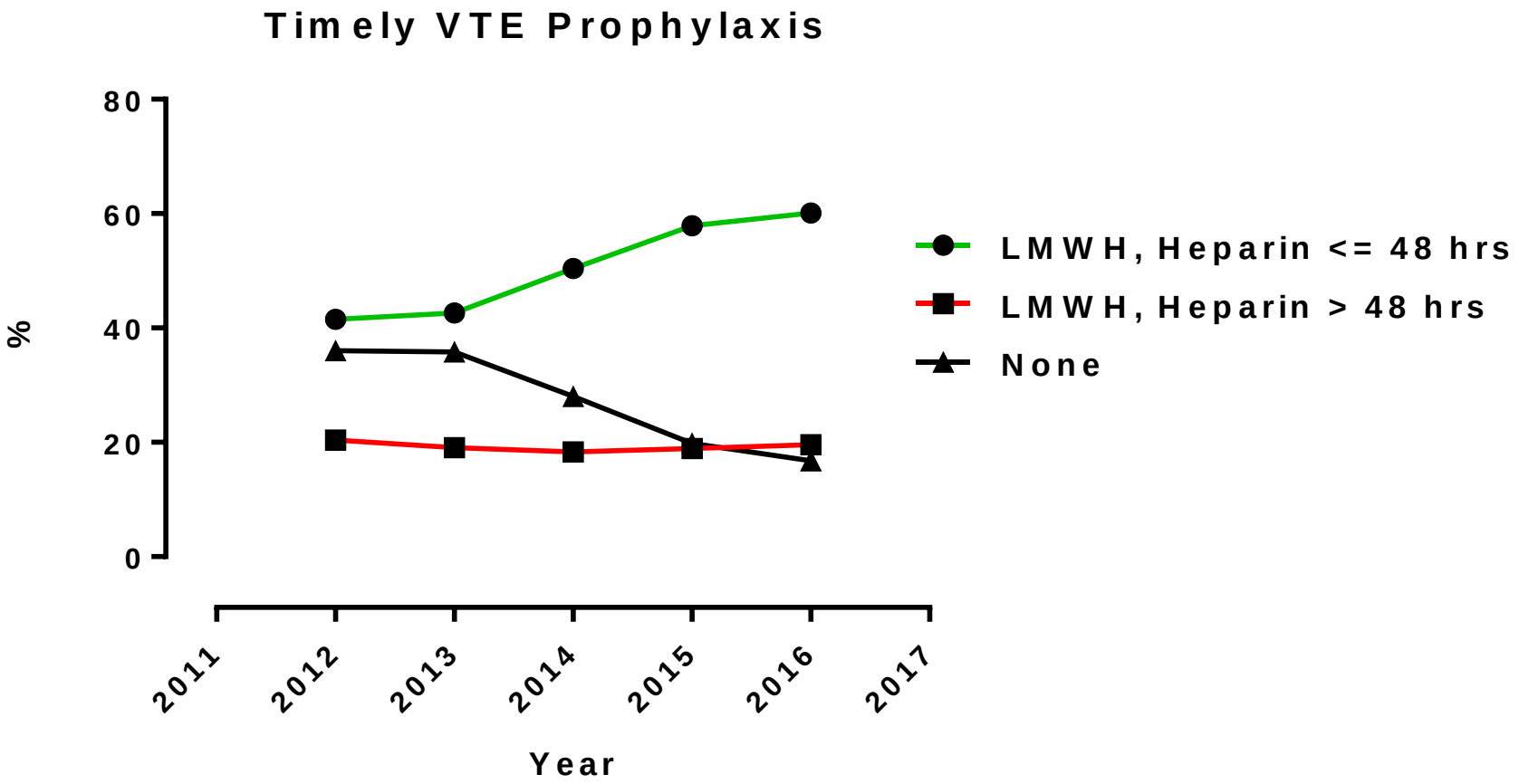
MTQIP 2016 Collaborative-Wide PI Projects

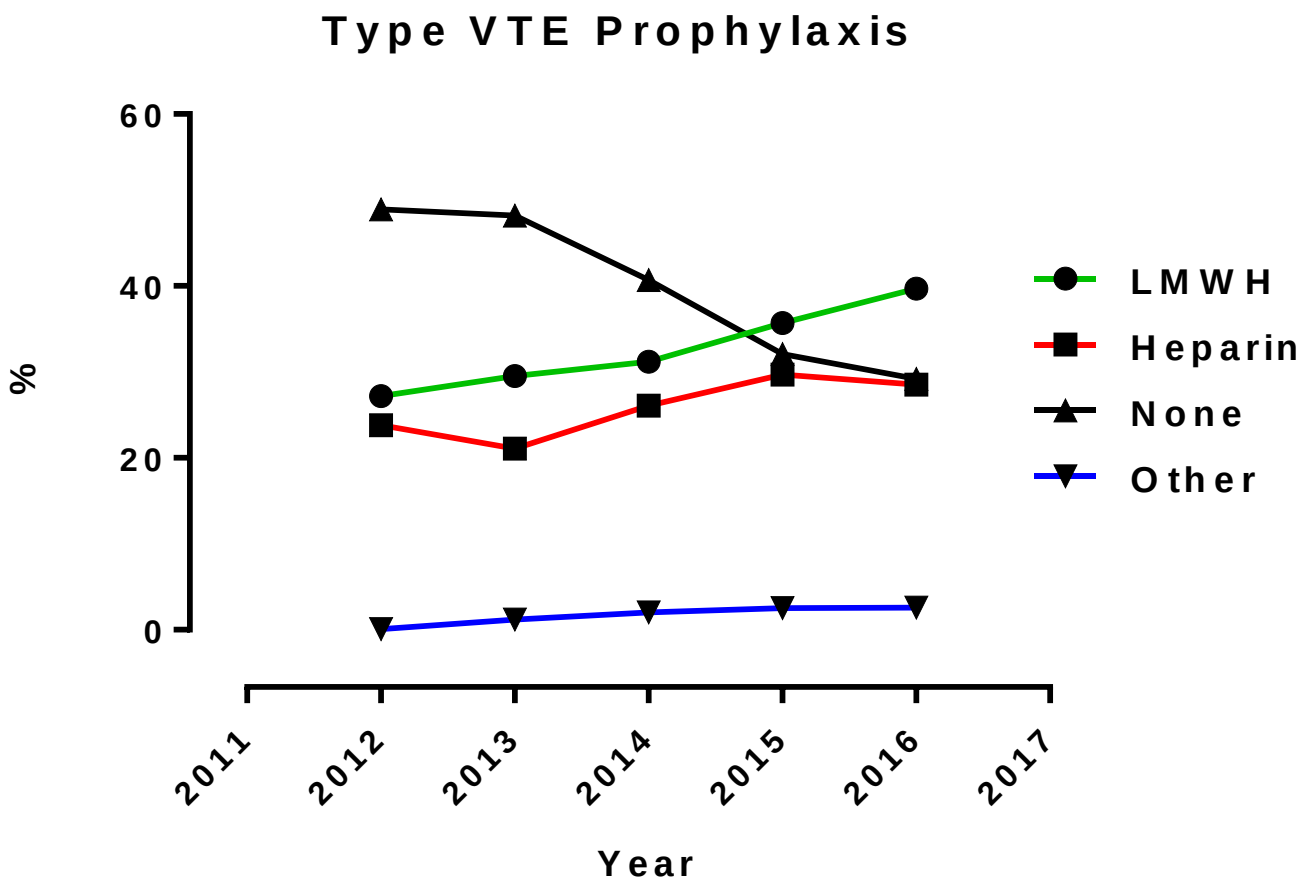
- Hemorrhage (≥ 5 u PRBC's first 4 hrs)
  - 3/1/15 to 5/31/16
  - % of patients with 4hr PRBC/FFP ratio ≤ 2.5
    - Begin = 34 %
    - Previous = 64 %
    - Current = **78 %** (197/253)
    - Target = 80 %

MTQIP 2015 Collaborative-Wide PI Projects

- VTE
  - VTE Rate
    - Begin = 2.5 %
    - Previous = 1.3 %
    - Current = **1.3 %**
    - Target = 1.5 %
  - 48 hr VTE Prophylaxis Rate
    - Begin = 38 %
    - Previous = 50 %
    - Current = **57 %**
    - Target = 50 %

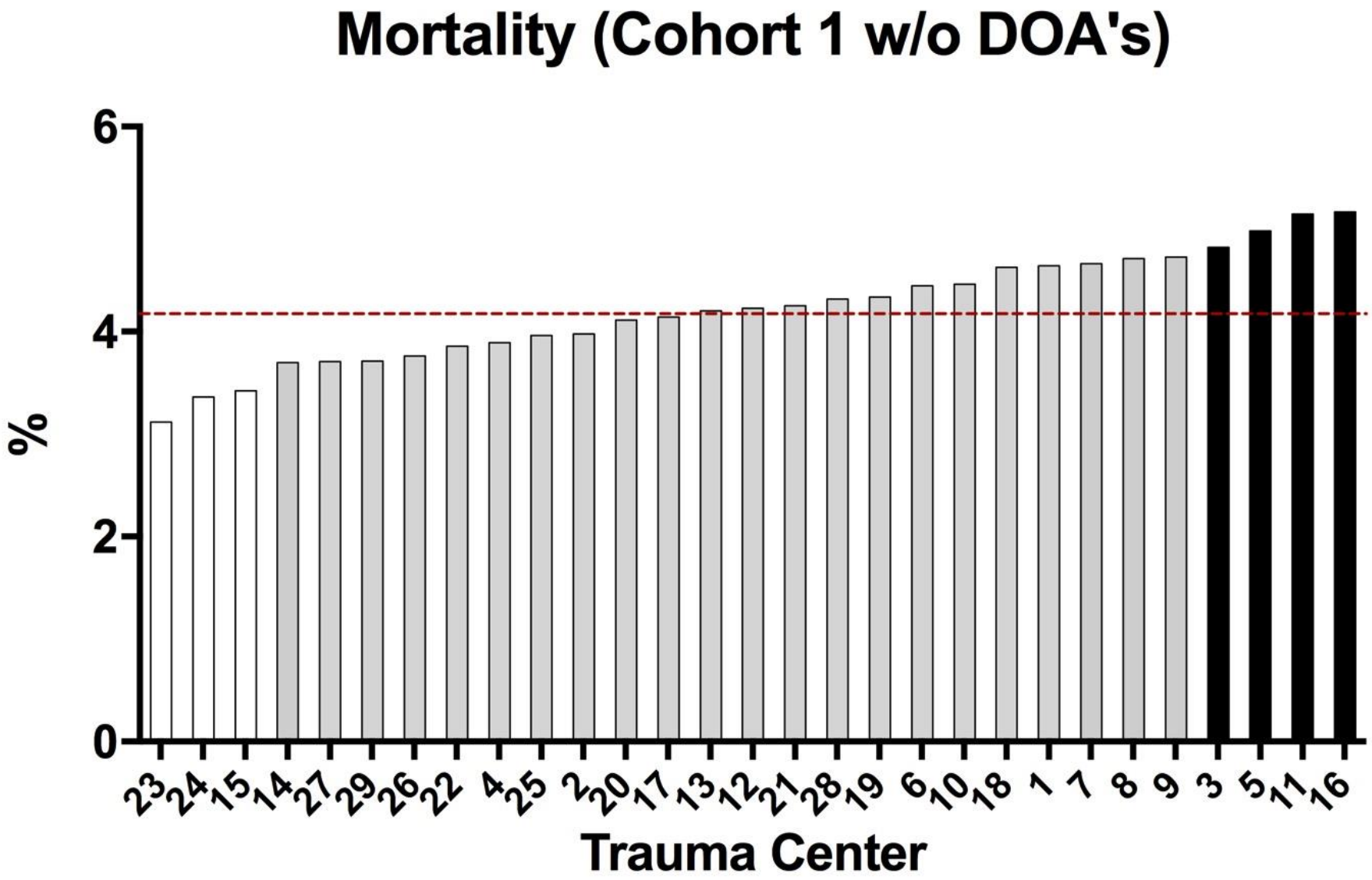


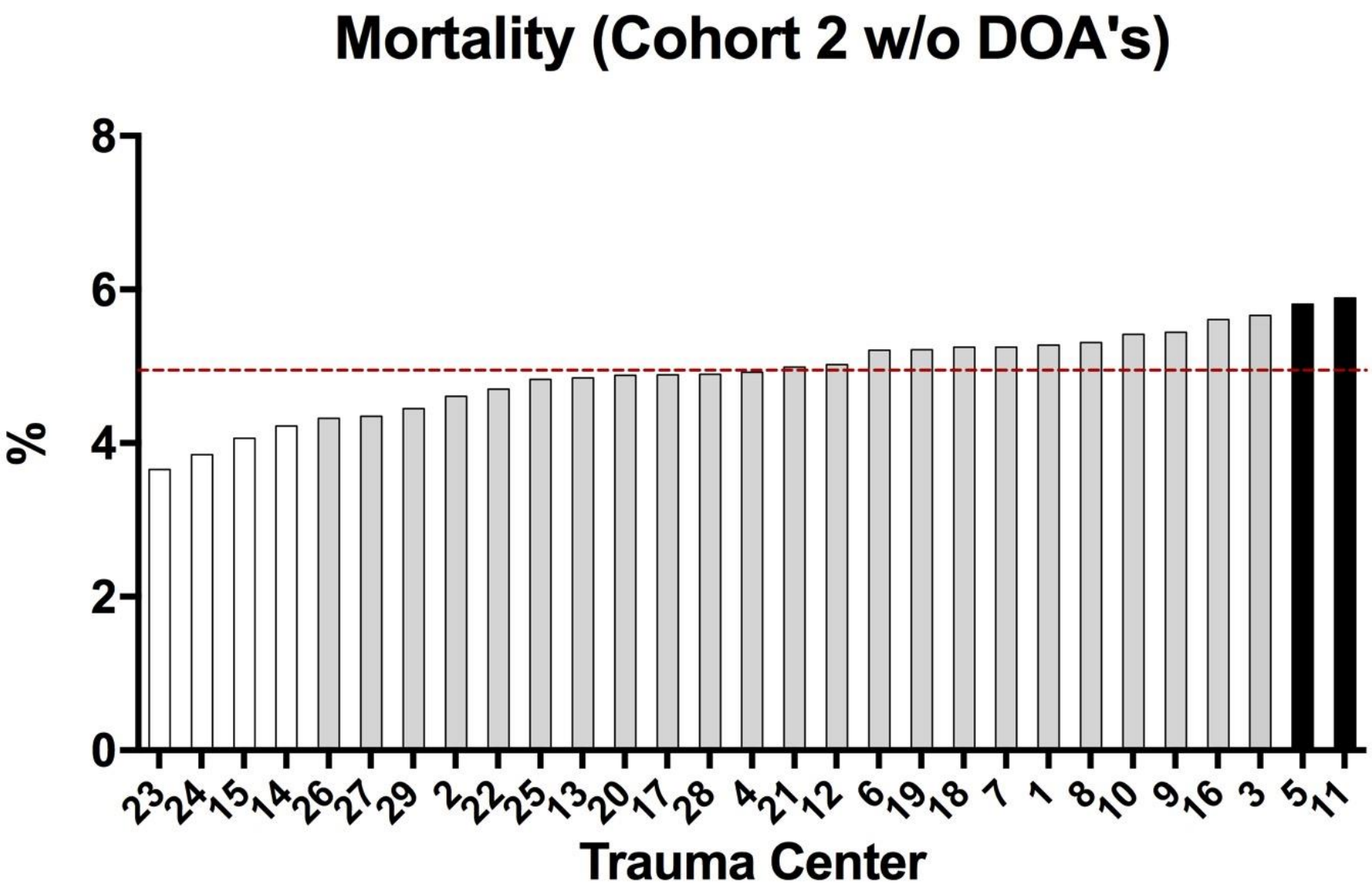

Timely VTE Prophylaxis
80
60
40
20
0
%
2011
2012
2013
2014
2015
2016
2017
Year
LMWH, Heparin <= 48 hrs
LMWH, Heparin > 48 hrs
None

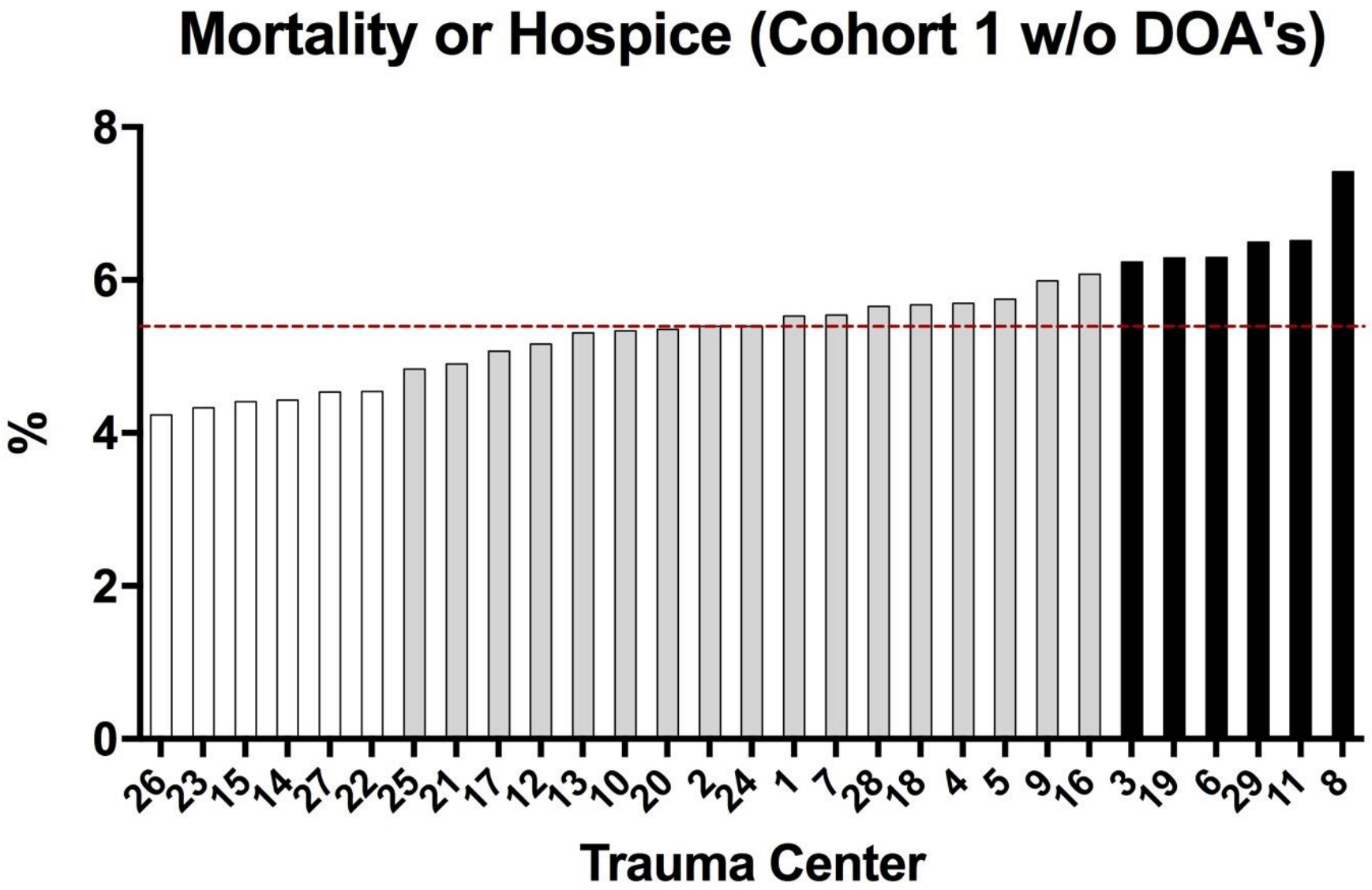

Type VTE Prophylaxis
60
40
20
0
%
2011
2012
2013
2014
2015
2016
2017
Year
LMWH
Heparin
None
Other

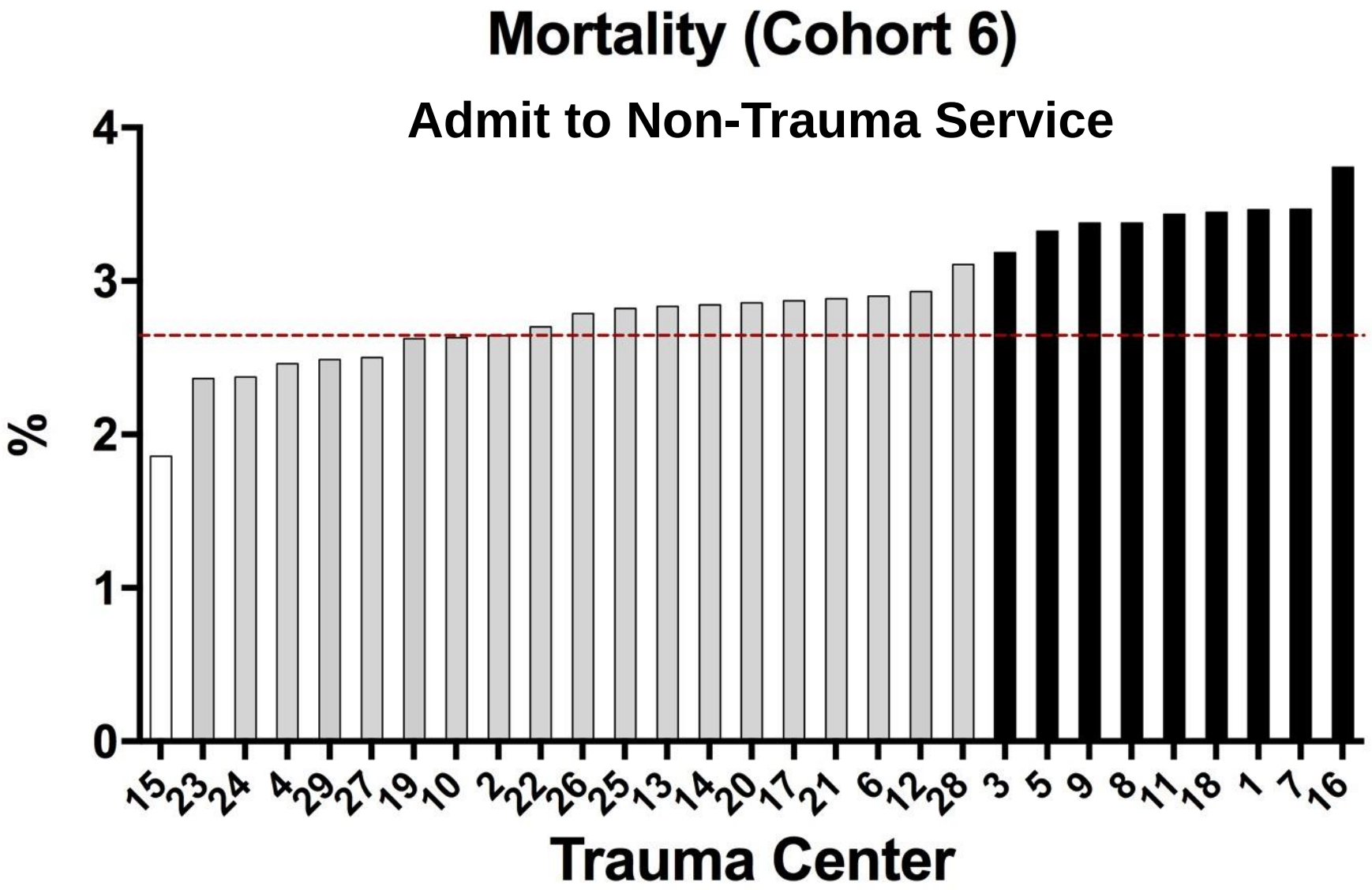
MTQIP Outcomes

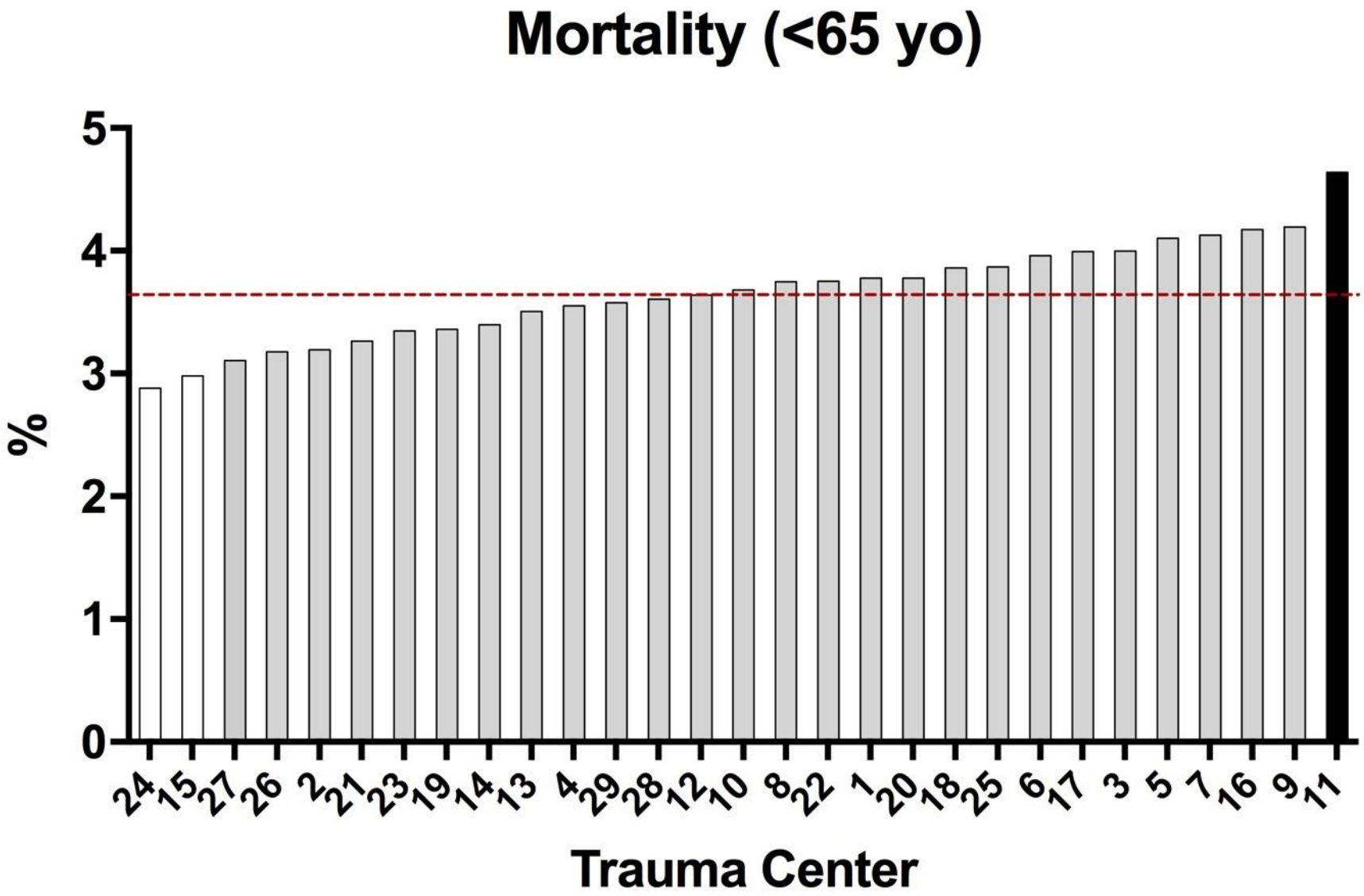
- ArborMetrix Report
  - 3/1/2014 to 5/31/2016
- Rates
  - Risk and Reliability-adjusted
  - Red dash line is collaborative mean
- Legend
  - ☐ Low-outlier status (better performance)
  - ▒ Non-outlier status (average performance)
  - ■ High-outlier status (worse performance)

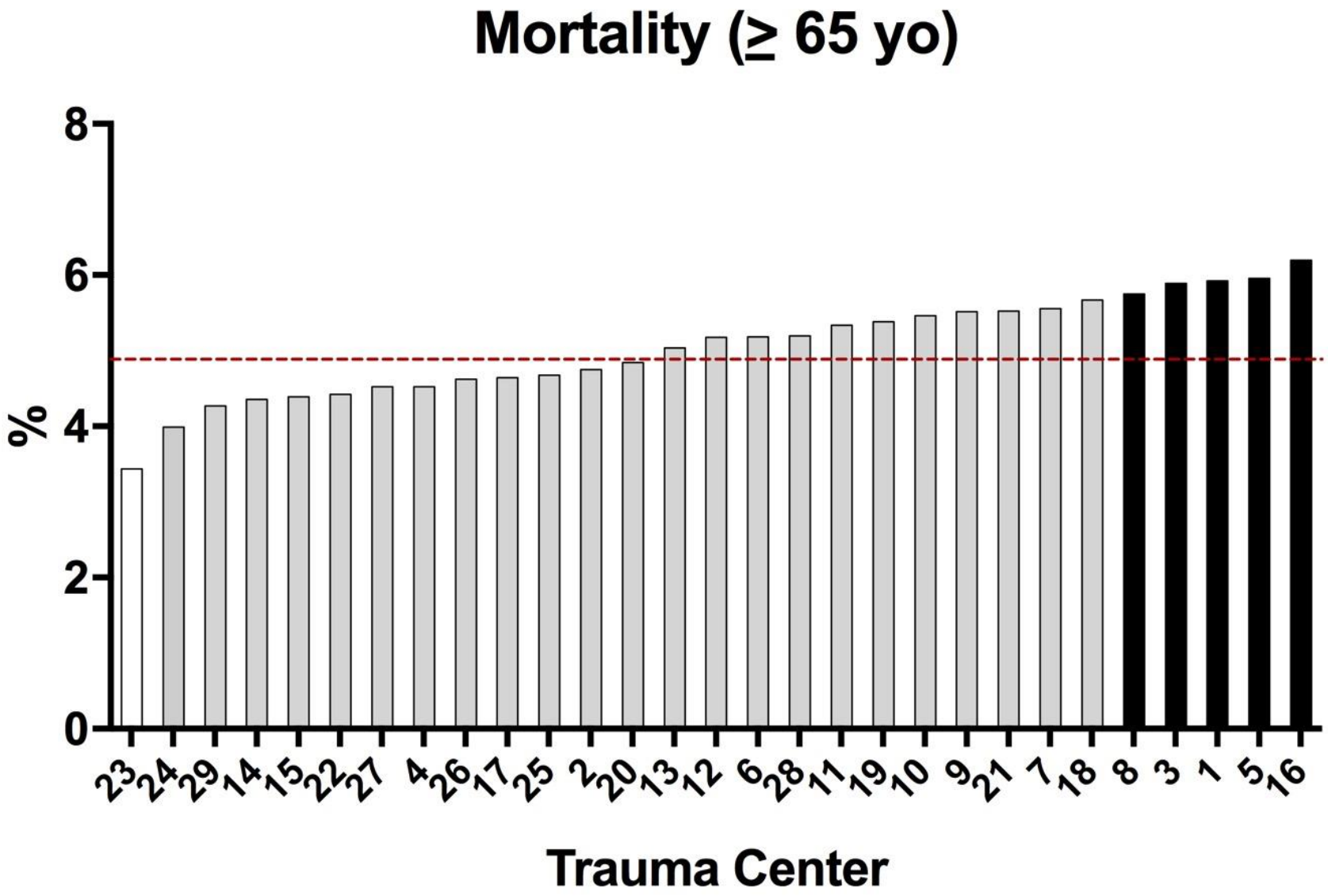

Mortality (Cohort 1 w/o DOA's)
6
4
2
0
%
23 24 15 14 27 29 26 22 4 25 2 20 17 13 12 21 28 19 6 10 18 1 7 8 9 3 5 11 16
Trauma Center

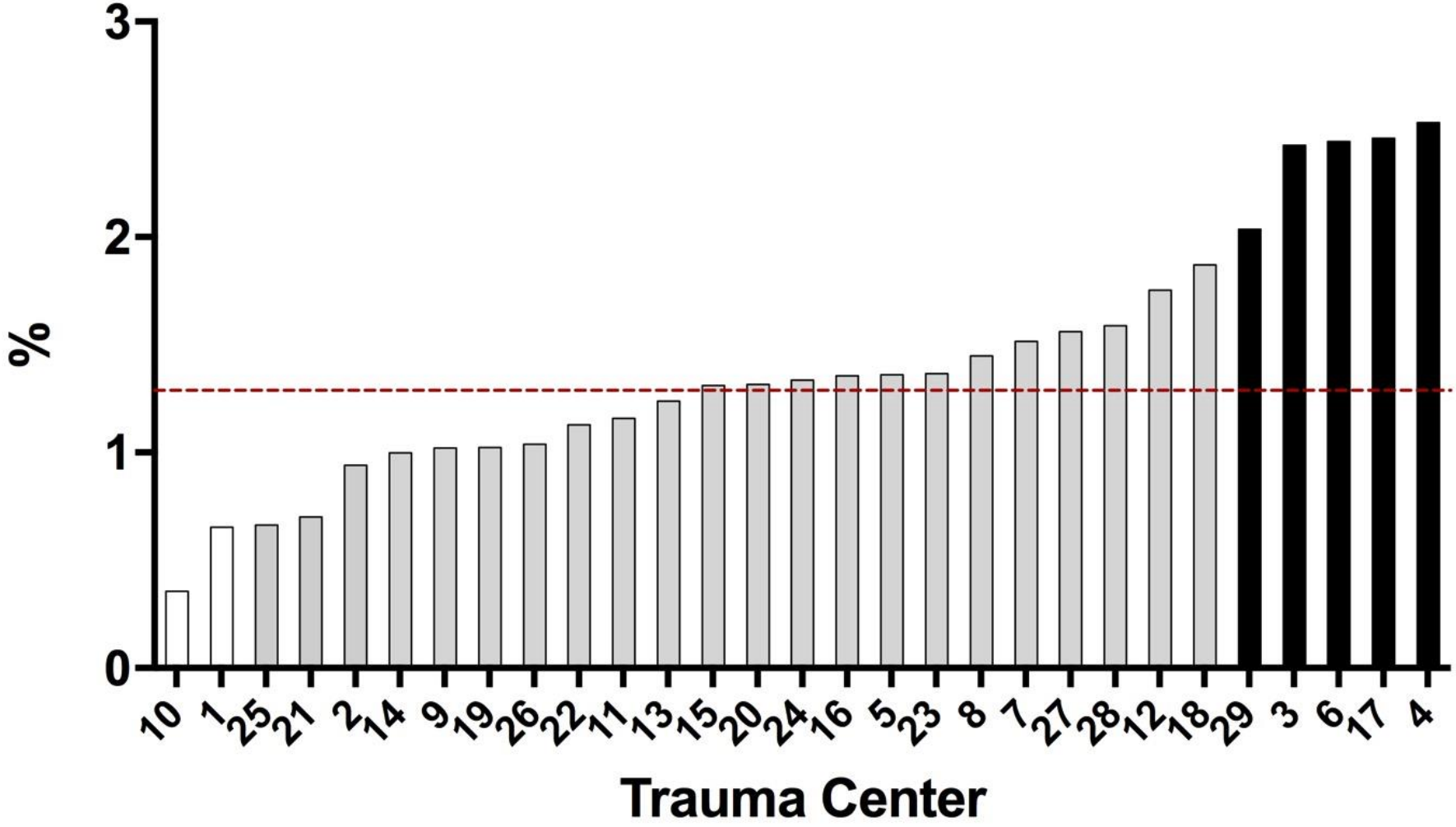

Mortality (Cohort 2 w/o DOA's)
%
8
6
4
2
0
23 24 15 14 26 27 29 2 22 25 13 20 17 28 4 21 12 6 19 18 7 1 8 10 9 16 3 5 11
Trauma Center

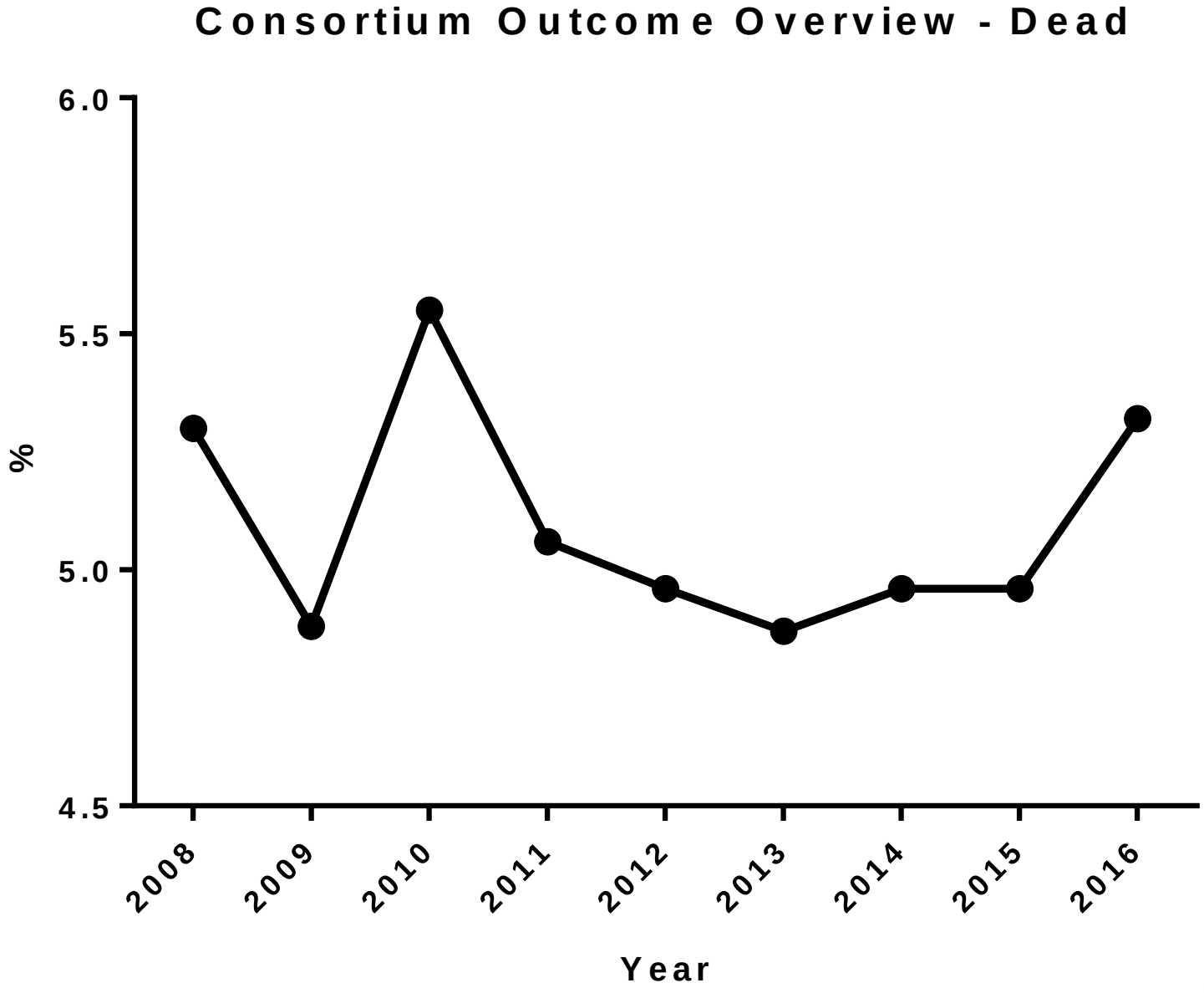

Mortality or Hospice (Cohort 1 w/o DOA's)
%
8
6
4
2
0
26 23 15 14 27 22 25 21 17 12 13 10 20 2 24 1 7 28 18 4 5 9 16 3 19 6 29 11 8
Trauma Center

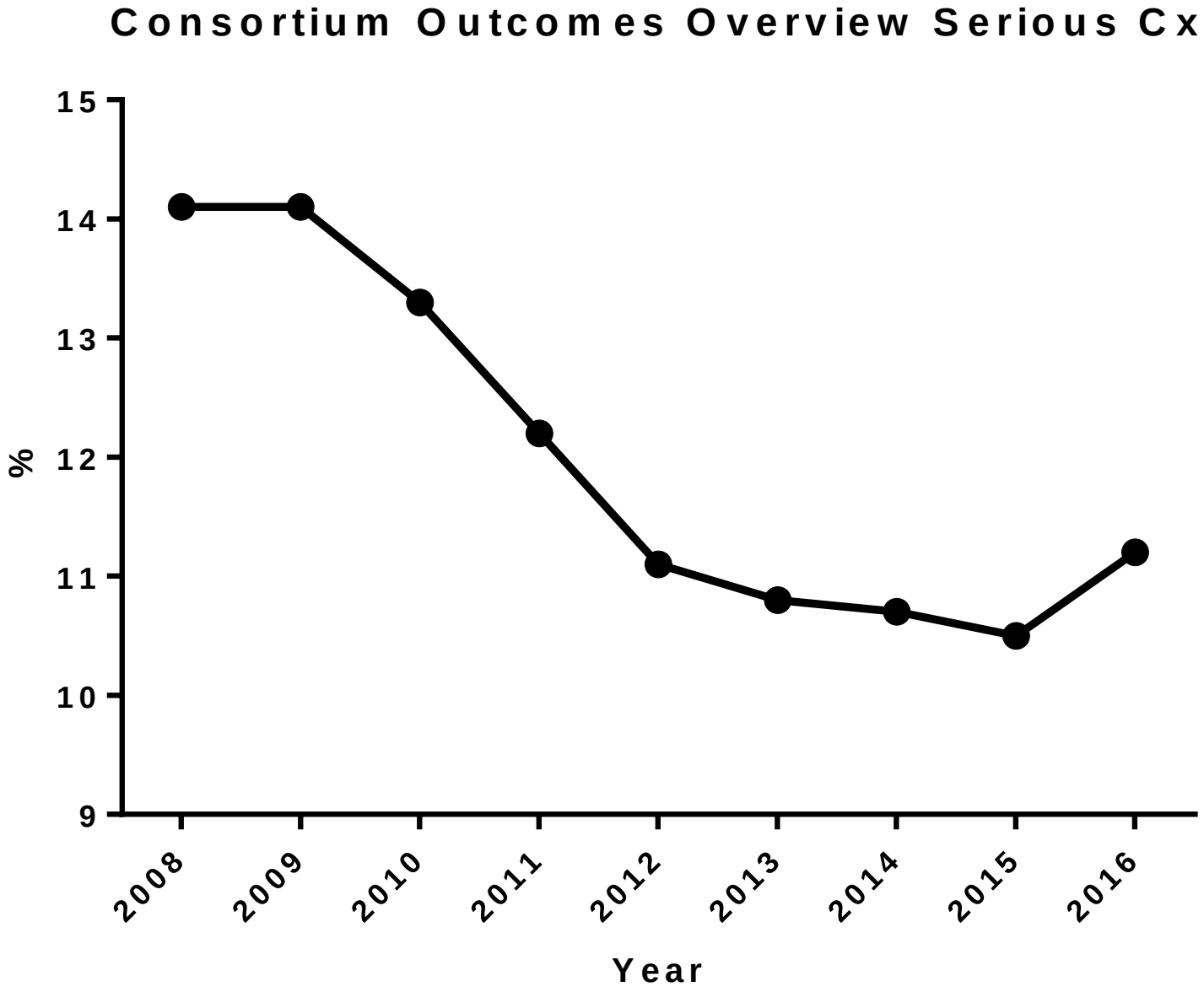

Mortality (Cohort 6)
Admit to Non-Trauma Service
%
4
3
2
1
0
15 23 24 4 29 27 19 10 2 22 26 25 13 14 20 17 21 6 12 28 3 5 9 8 11 18 1 7 16
Trauma Center


Mortality (<65 yo)
%
0
1
2
3
4
5
24 15 27 26 2 21 23 19 14 13 4 29 28 12 10 8 22 1 20 18 25 6 17 3 5 7 16 9 11
Trauma Center

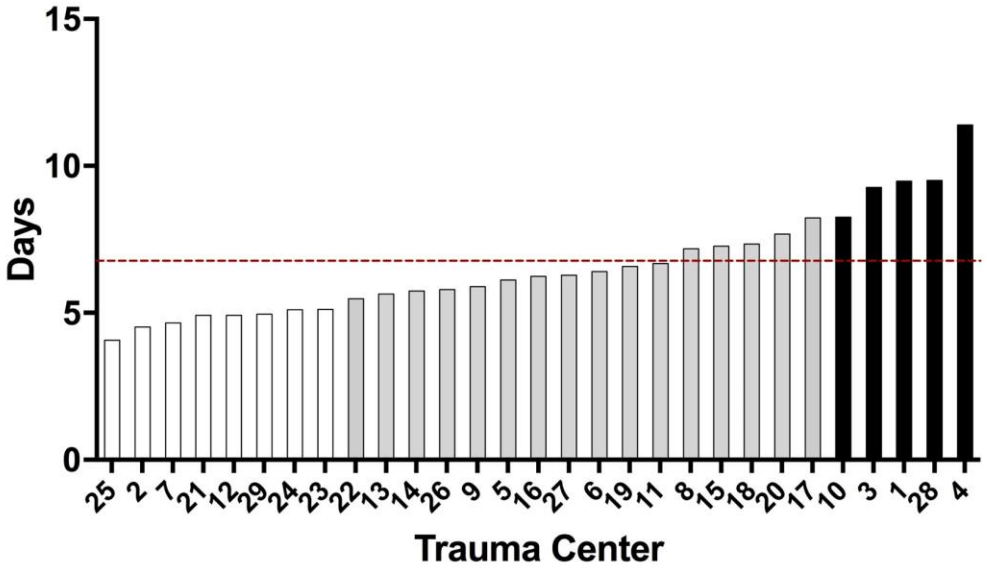

Mortality (≥ 65 yo)
8
6
4
2
0
%
23 24 29 14 15 22 27 4 26 17 25 2 20 13 12 6 28 11 19 10 9 21 7 18 8 3 1 5 16
Trauma Center


DVT/Pulmonary Embolus
3
2
1
0
%
10 1 25 21 2 14 9 19 26 22 11 13 15 20 24 16 5 23 8 7 27 28 12 18 29 3 6 17 4
Trauma Center


Consortium Outcome Overview - Dead
6.0
5.5
5.0
4.5
%
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year

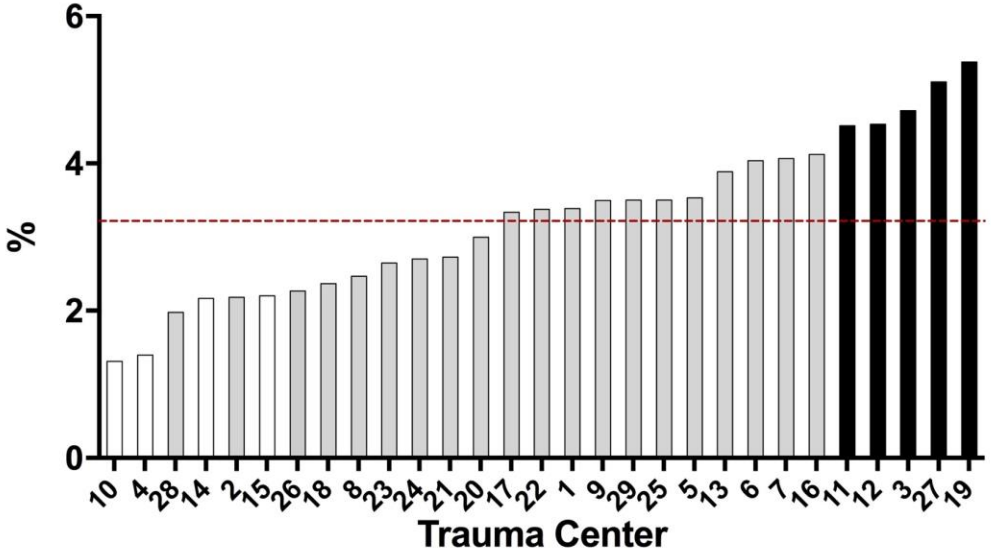

Consortium Outcomes Overview Serious Cx
15
14
13
12
11
10
9
%
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year

Adjusted Ventilator Days

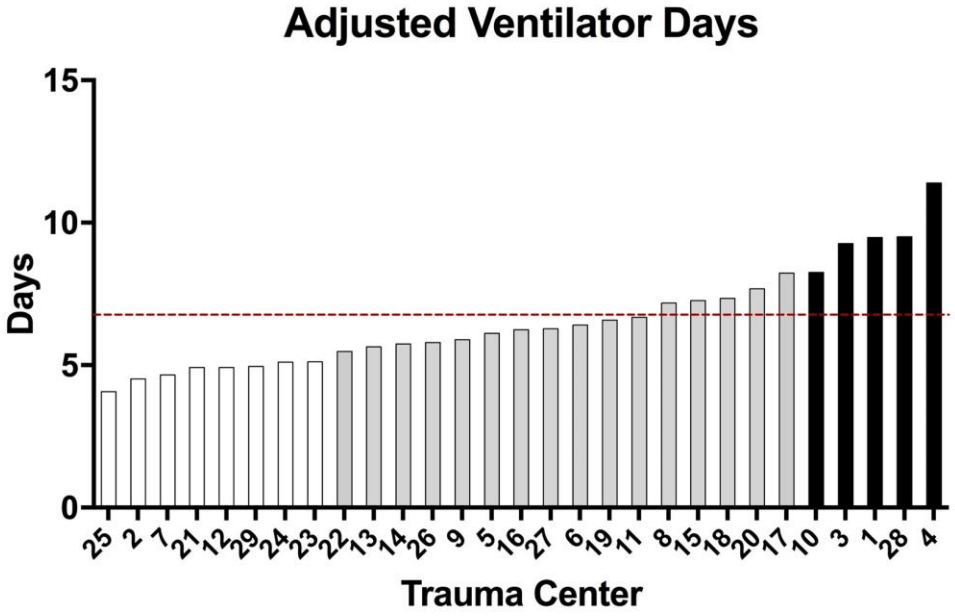


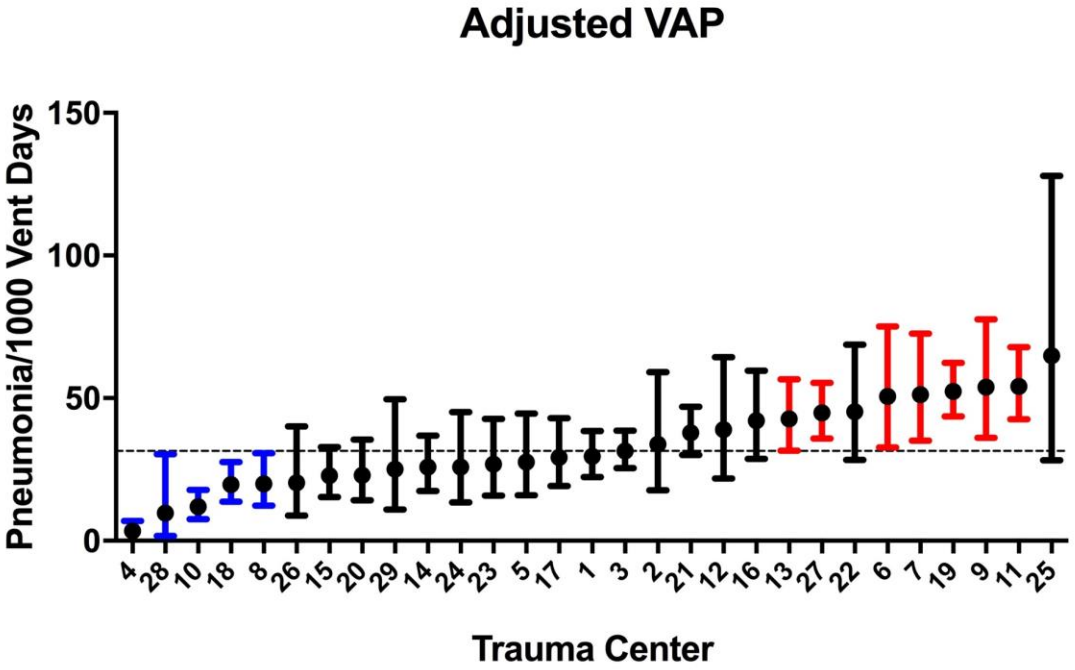
Pg. 29

Pneumonia

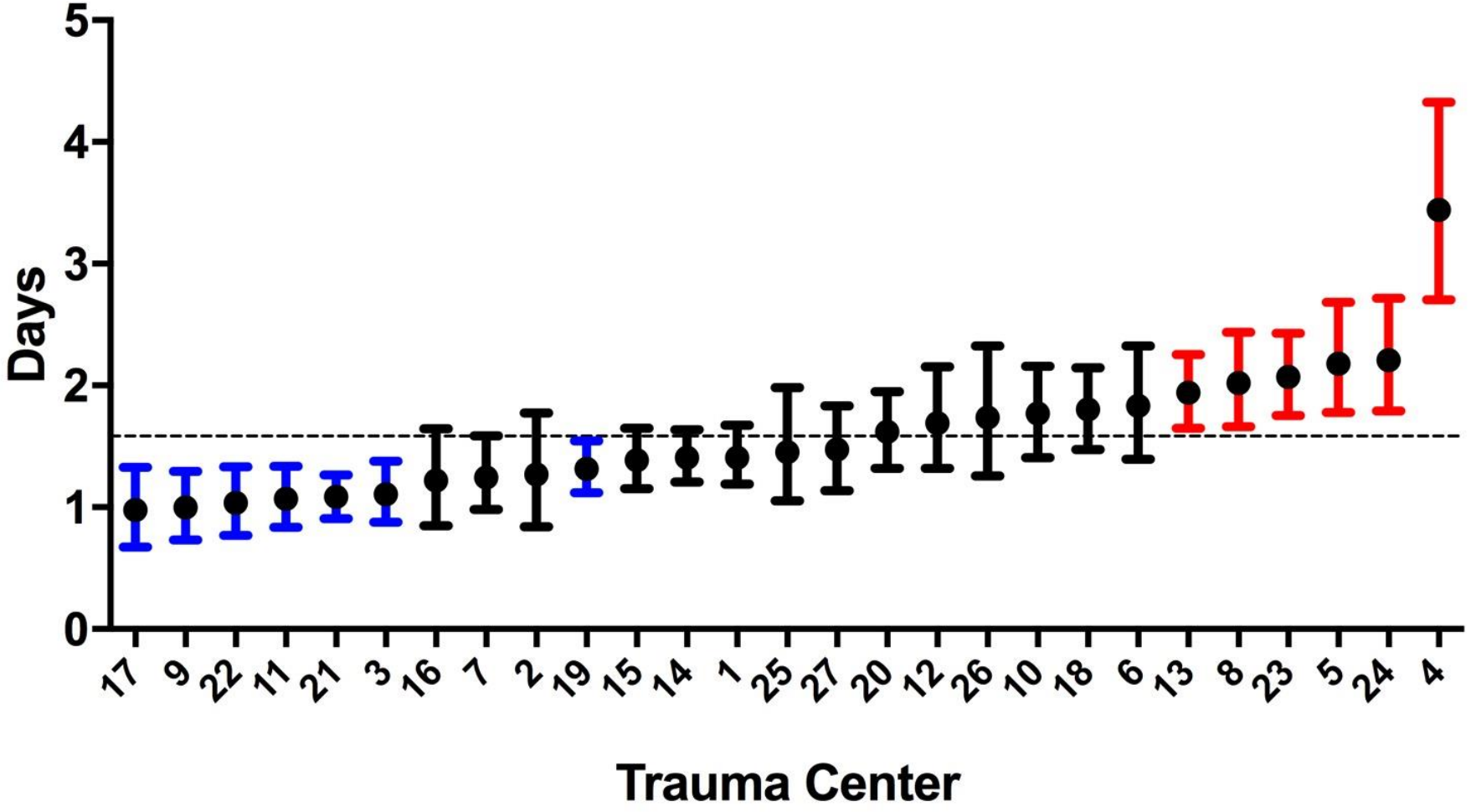


Pg. 29

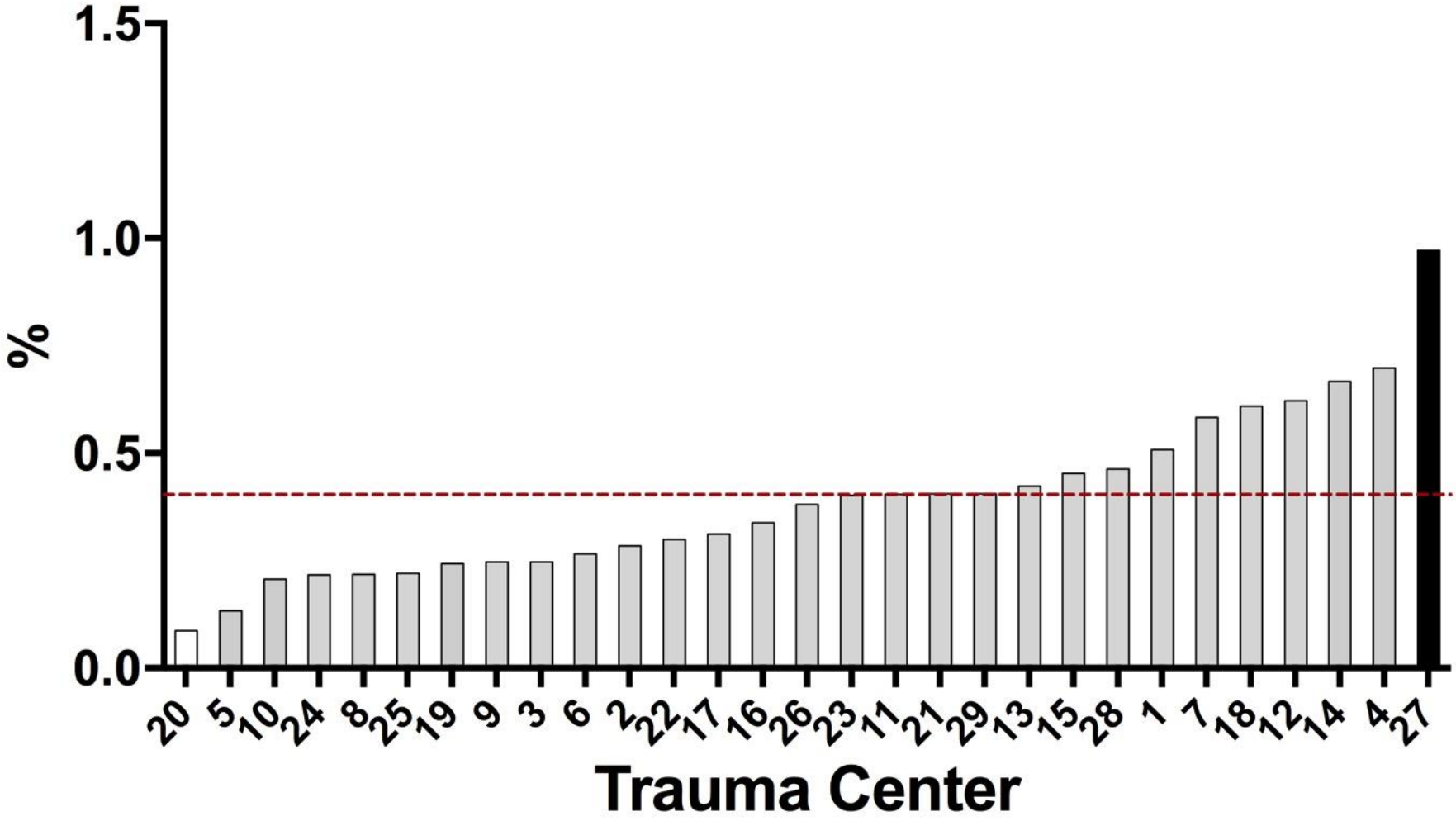

Adjusted Ventilator Days
Days
15
10
5
0
25 2 7 21 12 29 24 23 22 13 14 26 9 5 16 27 6 19 11 8 15 18 20 17 10 3 1 28 4
Trauma Center


Adjusted VAP
Pneumonia/1000 Vent Days
150
100
50
0
4 28 10 18 8 26 15 20 29 14 24 23 5 17 1 3 2 21 12 16 13 27 22 6 7 19 9 11 25
Trauma Center

Adjusted Antibiotic Days



C. Difficile Colitis



U-M Health System ranked among worst in controlling C. diff infections

By Benjamin Raven | braven@mlive.com
Email the author | Follow on Twitter
on October 03, 2016 at 1:30 PM, updated October 03, 2016 at 2:17 PM

Print
Email

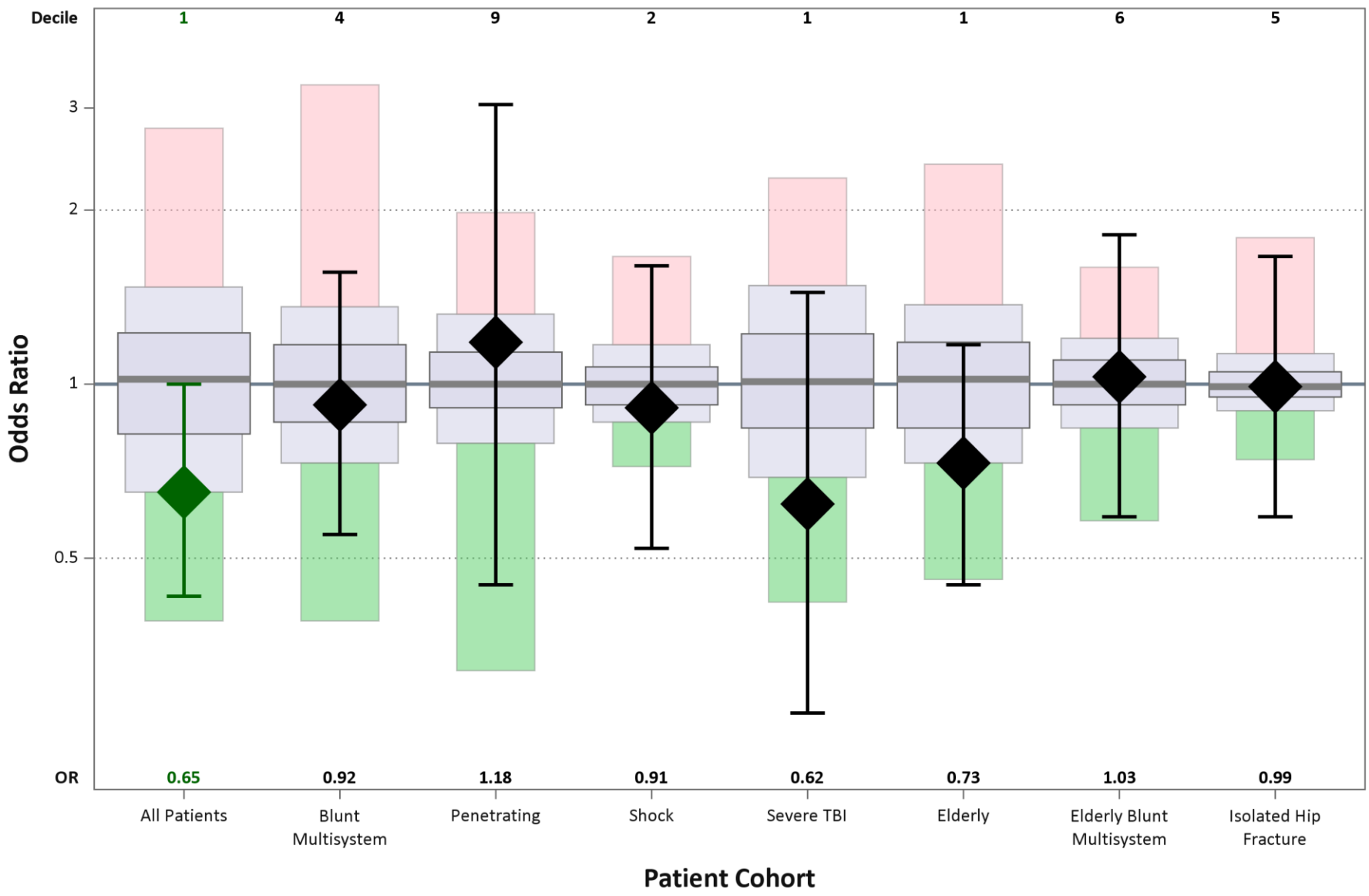
Consumer Reports listed University of Michigan Hospitals and Health Centers the worst teaching hospitals when it comes to containing a dangerous infection.

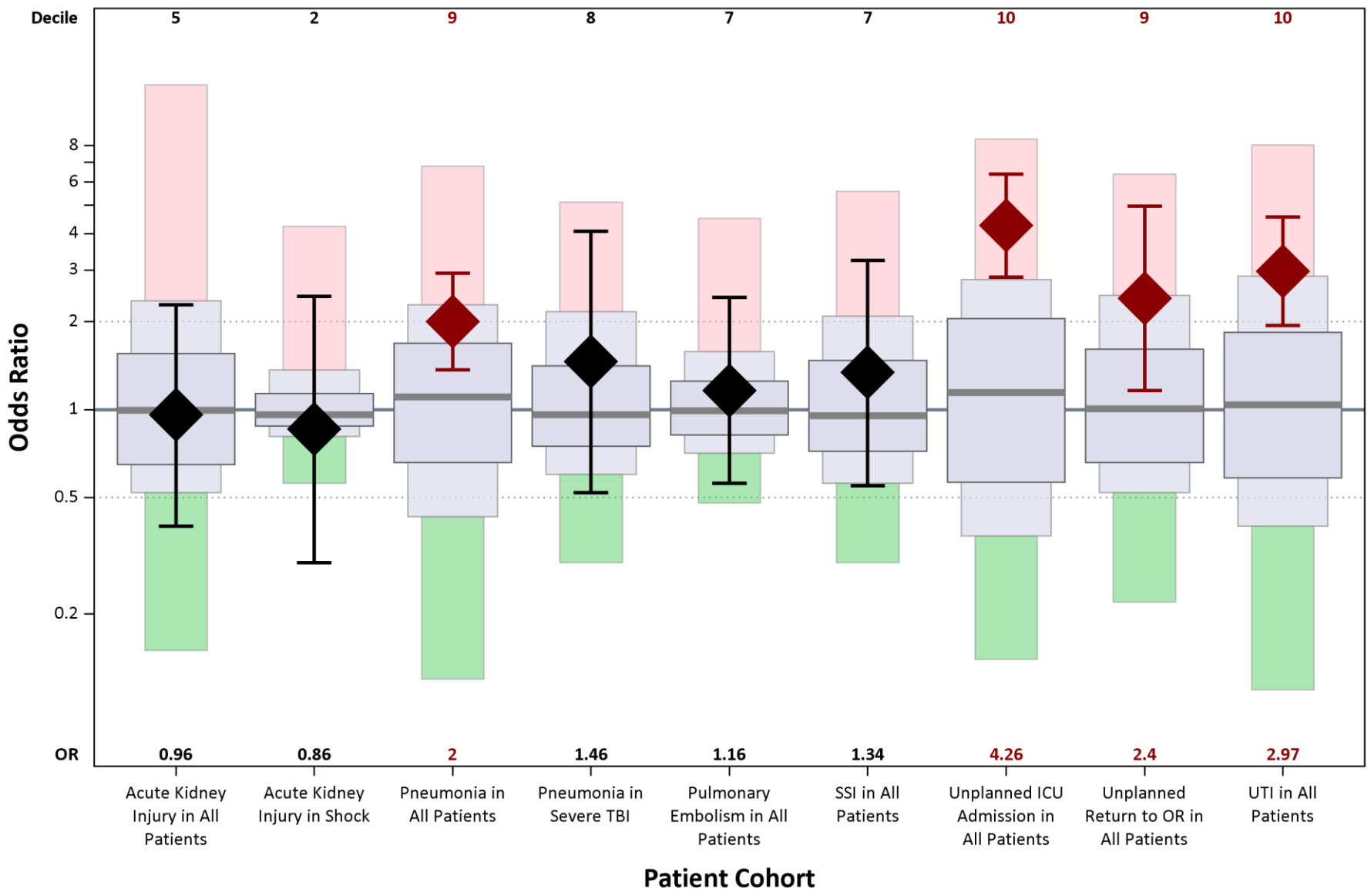
U-M Health System was among "19 of the nation's largest teaching hospitals" to received a low evaluation rating in controlling C. diff infections.

MICHIGAN'S BEST

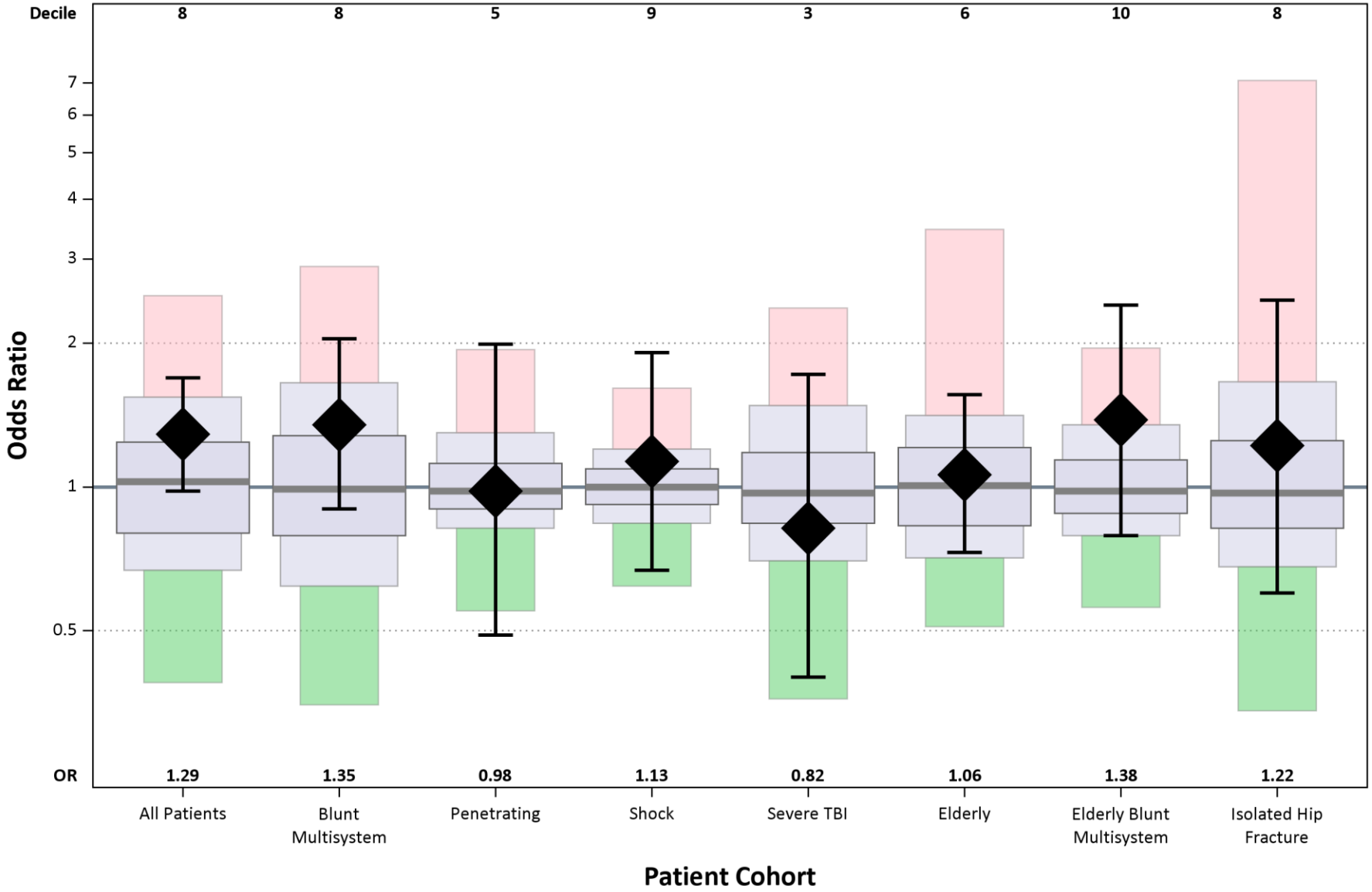
Michigan's Best Pi winners by region

- All the pizzas we trie Muskegon and Grand
- Four hot spots in the Peninsula


Risk-Adjusted Mortality by Cohort
TQIP Report ID:
Decile
1
4
9
2
1
1
6
5
3
2
1
0.5
Odds Ratio
OR
0.65
0.92
1.18
0.91
0.62
0.73
1.03
0.99
All Patients
Blunt Multisystem
Penetrating
Shock
Severe TBI
Elderly
Elderly Blunt Multisystem
Isolated Hip Fracture
Patient Cohort


Risk-Adjusted Specific Complications by Cohort
TQIP Report ID:
Decile
5
2
9
8
7
7
10
9
10
Odds Ratio
8
6
4
3
2
1
0.5
0.2
OR
0.96
0.86
2
1.46
1.16
1.34
4.26
2.4
2.97
Acute Kidney Injury in All Patients
Acute Kidney Injury in Shock
Pneumonia in All Patients
Pneumonia in Severe TBI
Pulmonary Embolism in All Patients
SSI in All Patients
Unplanned ICU Admission in All Patients
Unplanned Return to OR in All Patients
UTI in All Patients
Patient Cohort

Risk-Adjusted Major Complications Including Death by Cohort
TQIP Report ID:

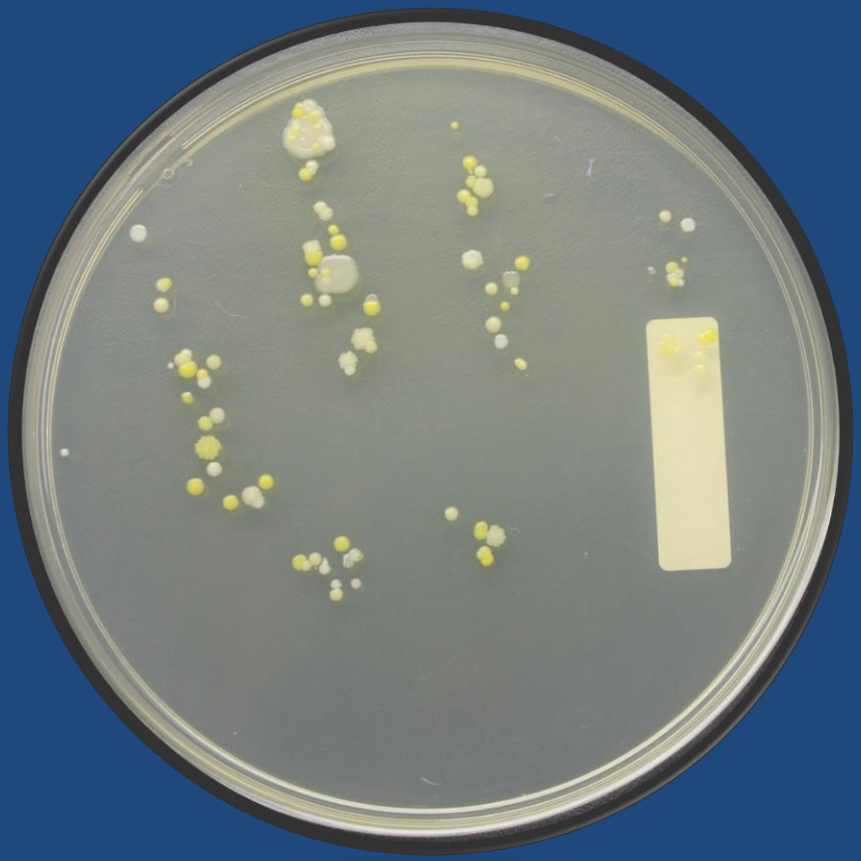



EXIT

PURELL

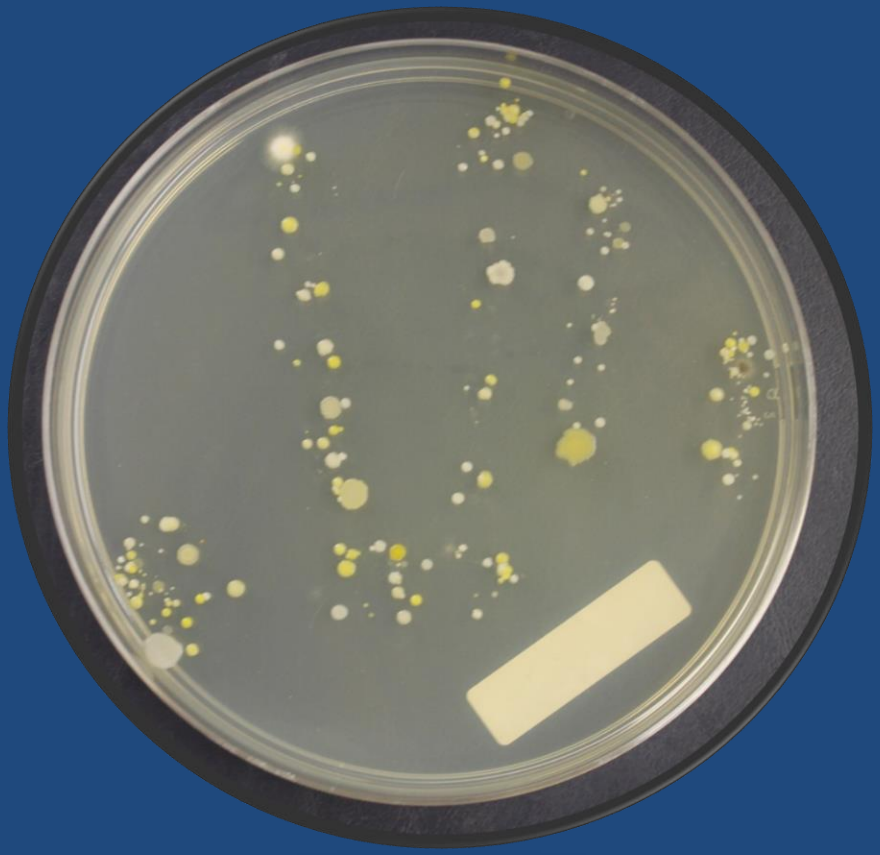
BEFORE Handwashing

AFTER Handwashing

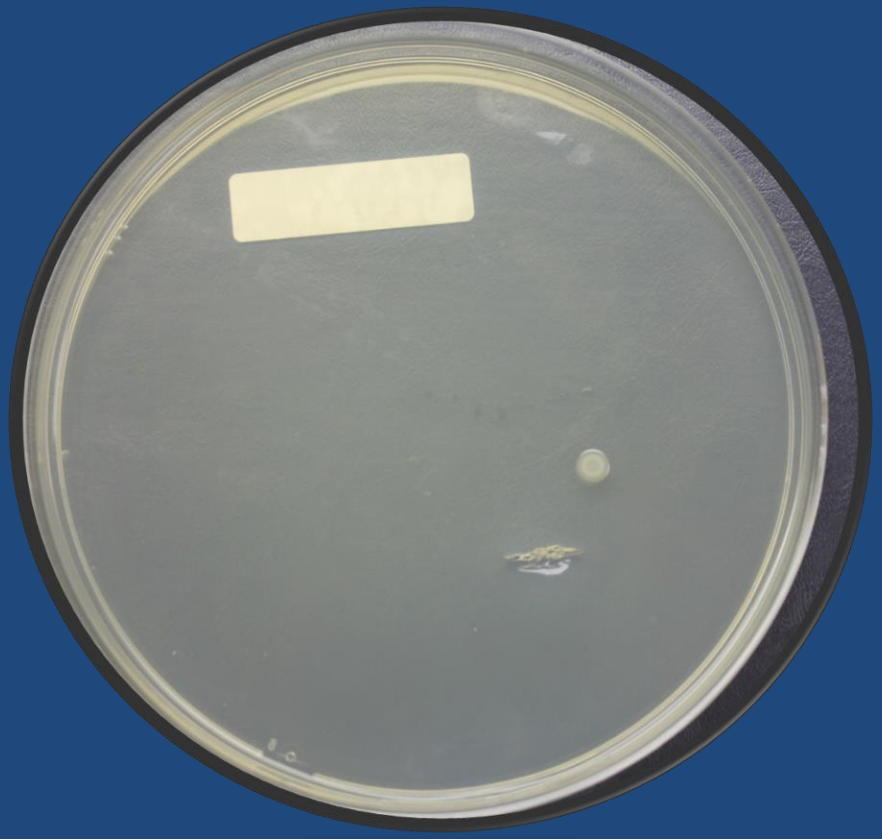


PURELL

BEFORE Handwashing



AFTER Handwashing



- Education
- Unit observations
- Weekly feedback
- Wall of shame?

Data & Website Updates

Jill Jakubus, PA-C

Time to First Antibiotic Open Fx - Intro

E. Orthopaedic surgery.

- Number of pelvis and acetabular cases performed annually.
- Number of pelvis and acetabular cases transferred out.
- Time to open reduction, internal fixation for femur fractures.
- Time to washout for all open fractures.
- Appropriateness and timing of intravenous antibiotics for all open fractures.

(pg. 125)

Time to First Antibiotic Open Fx - Intro

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- Time to washout for all open fractures.
- Appropriateness and timing of intravenous antibiotics for all open fractures.

(pg. 125)

- Identify current practice
- Explore capture options
- Elicit user preference

Time to First Antibiotic Open Fx - Feedback

Time to First Antibiotic Open Fx - Feedback

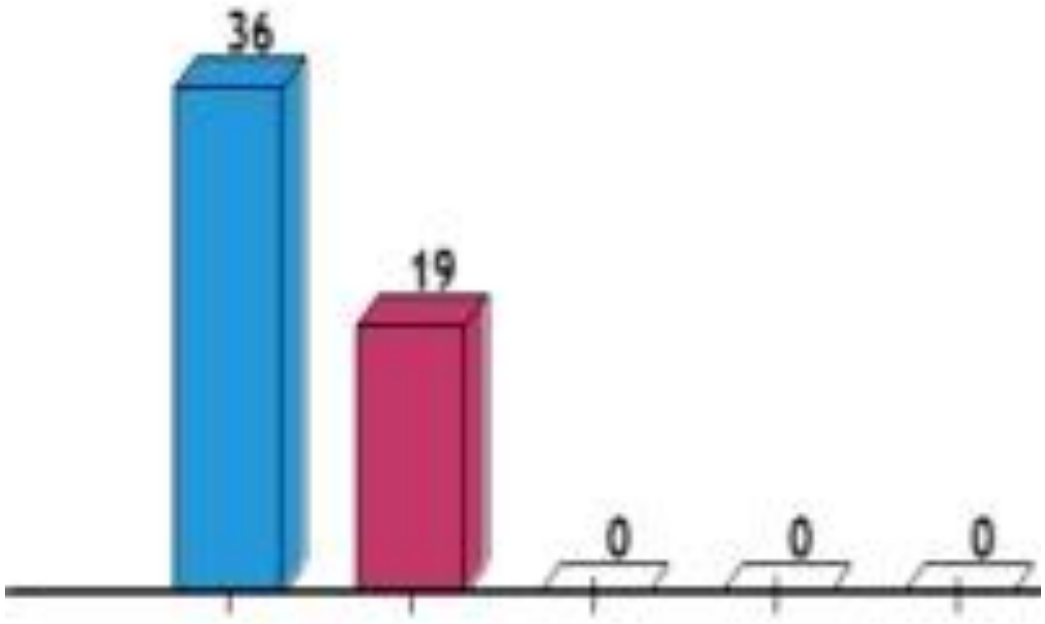
[redacted]

Done 55

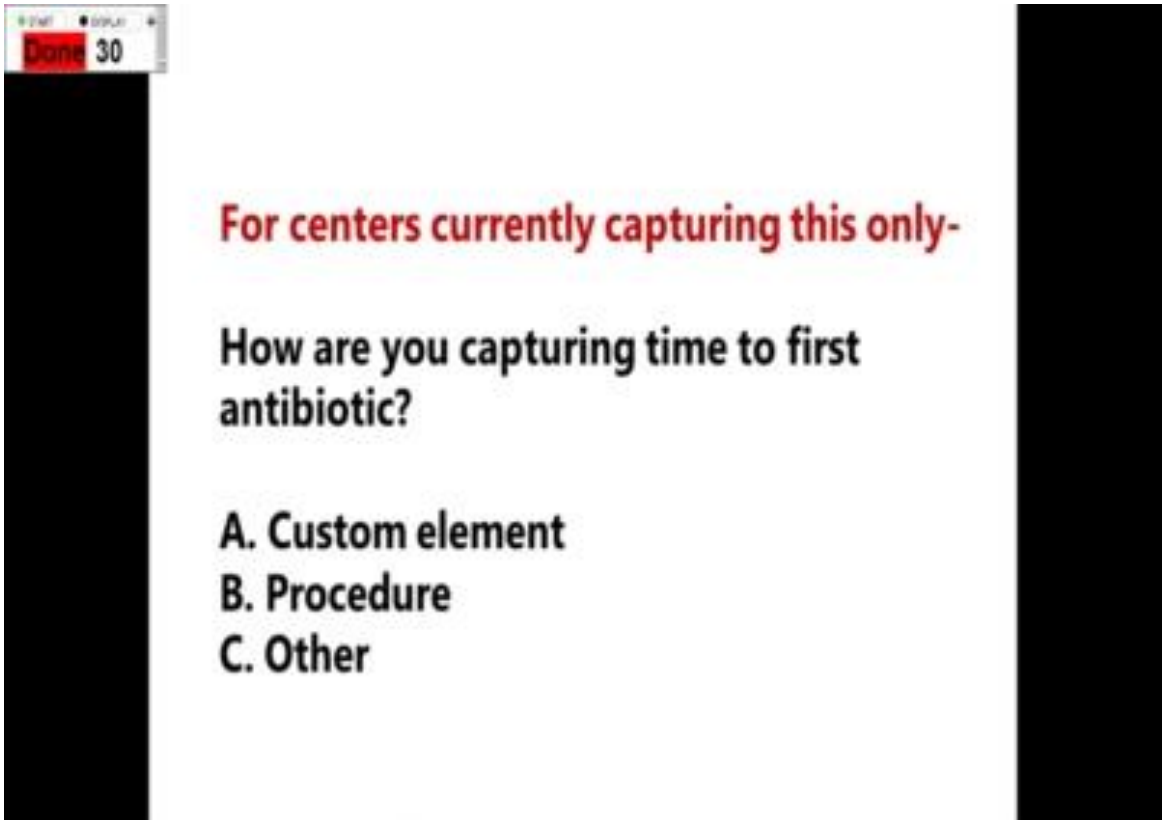
[redacted]

Are you currently capturing time to first antibiotic?

A. Yes
B. No



Time to First Antibiotic Open Fx - Feedback



Time to First Antibiotic Open Fx - Feedback

[redacted]

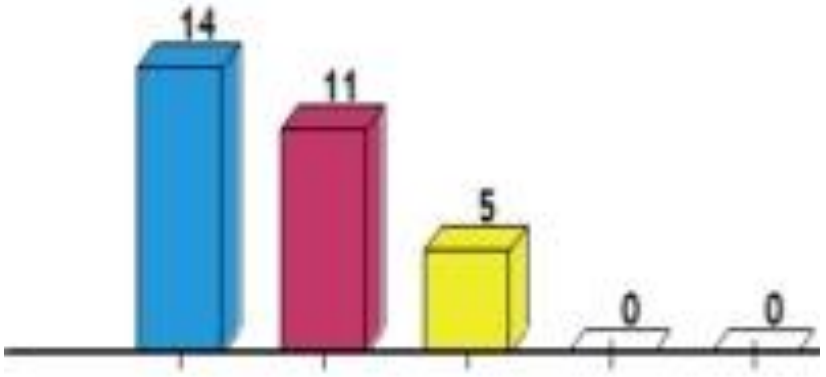
Done 30

For centers currently capturing this only-

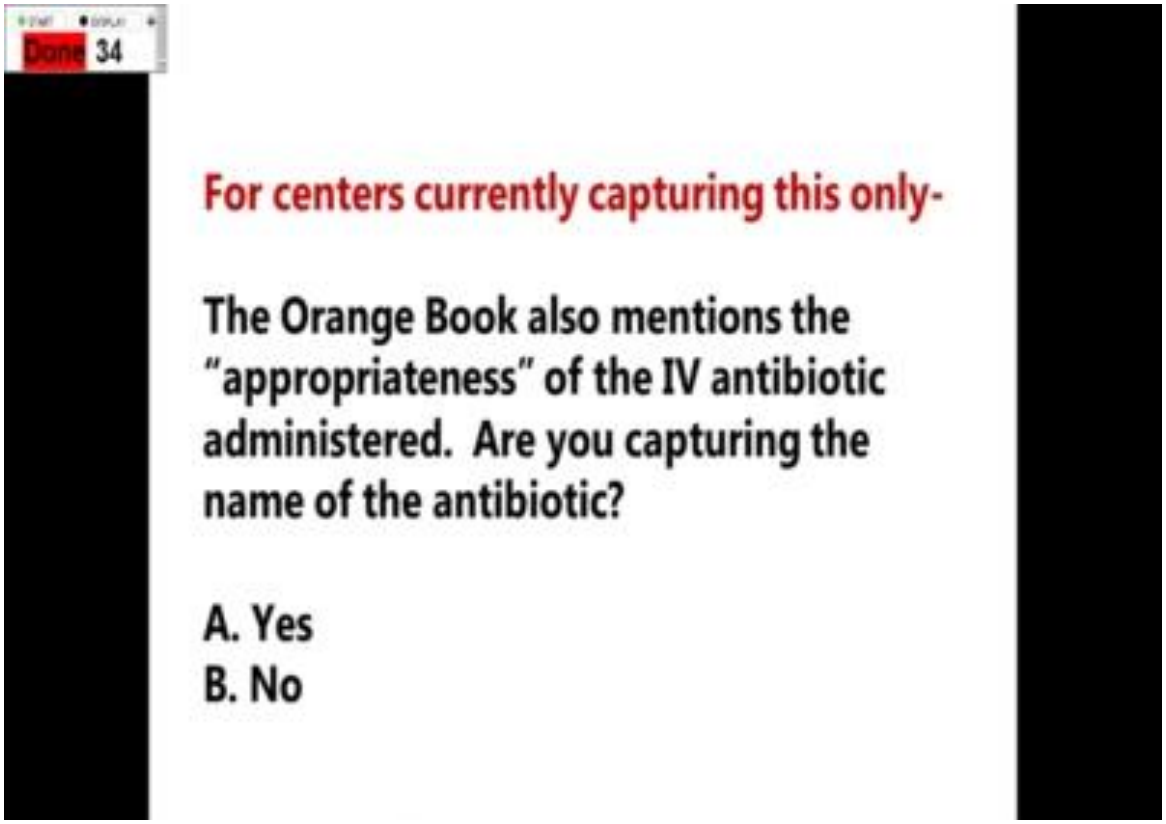
How are you capturing time to first antibiotic?

A. Custom element
B. Procedure
C. Other

[redacted]



Time to First Antibiotic Open Fx - Feedback



Time to First Antibiotic Open Fx - Feedback

[redacted]

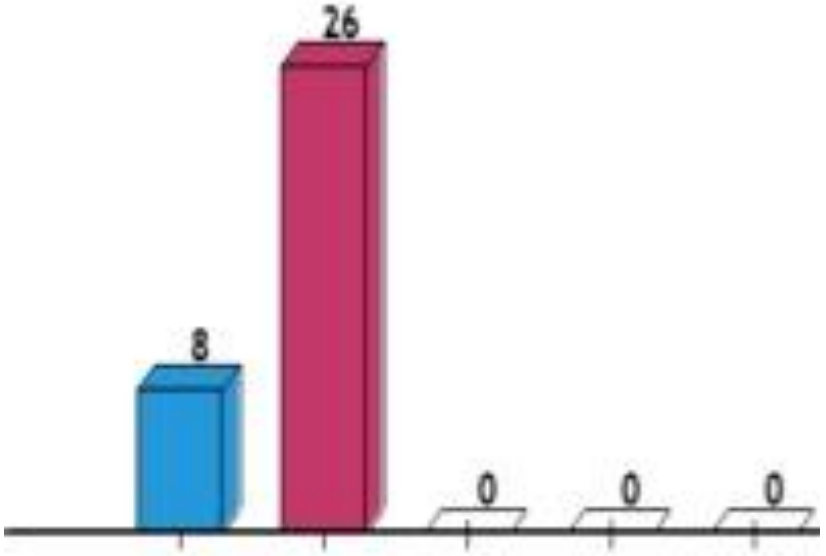
Done 34

For centers currently capturing this only-

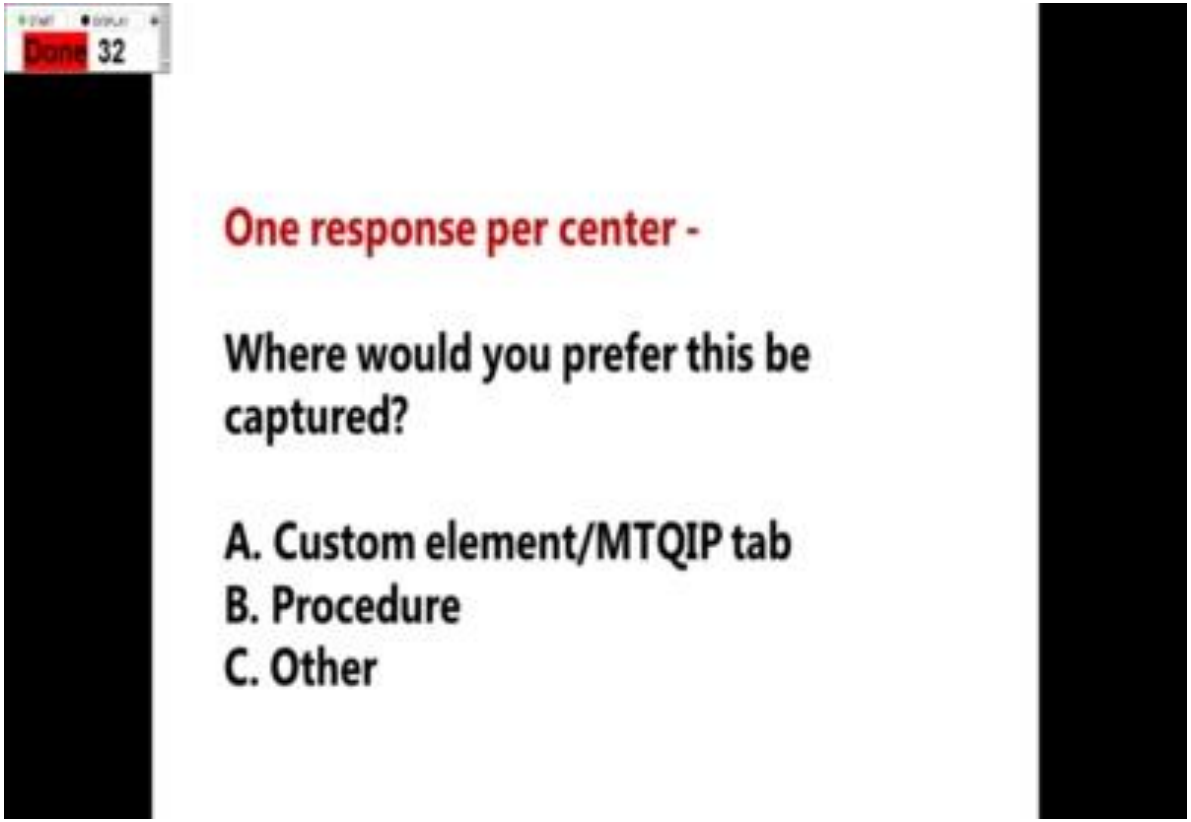
The Orange Book also mentions the "appropriateness" of the IV antibiotic administered. Are you capturing the name of the antibiotic?

A. Yes
B. No

[redacted]



Time to First Antibiotic Open Fx - Feedback



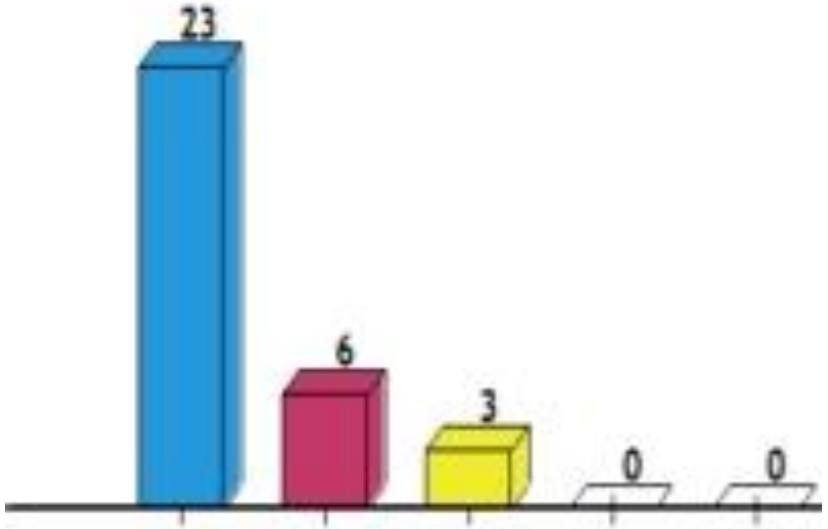
Time to First Antibiotic Open Fx - Feedback

Done 32

One response per center -

Where would you prefer this be captured?

A. Custom element/MTQIP tab
B. Procedure
C. Other



Time to First Antibiotic Open Fx - Plan

ANTIBIOTIC 1 TYPE

- Enter the first antibiotic class administered to patient at your hospital.
- Must be given, not just ordered.
- Antibiotic reference available at www.mtqip.org > Resources > Education > Antibiotic Reference

0. None
1. Penicillin
2. Monobactam
3. Carbapenem
4. Macrolide
5. Lincosamide
6. Aminoglycoside
7. Quinolone
8. Sulfonamide
9. Tetracycline
10. Cephalosporin
11. Other

Collection Criterion: Collect on all patients with open fractures.

Time to First Antibiotic Open Fx - Plan

ANTIBIOTIC 2 TYPE

- Enter the second antibiotic class administered to patient at your hospital for patient's receiving combination therapy.
- Must be given, not just ordered.
- Antibiotic reference available at www.mtqip.org > Resources > Education > Antibiotic Reference

0. None
1. Penicillin
2. Monobactam
3. Carbapenem
4. Macrolide
5. Lincosamide
6. Aminoglycoside
7. Quinolone
8. Sulfonamide
9. Tetracycline
10. Cephalosporin
11. Other

Collection Criterion: Collect on all patients with open fractures.

Time to First Antibiotic Open Fx - Plan

ANTIBIOTIC DATE

- Date of administration to patient of first dose of antibiotic administered to patient at your hospital.
- Collected as MM/DD/YYYY.

Collection Criterion: Collect on all patients with open fractures.

Def. Source: Orange Book

Time to First Antibiotic Open Fx - Plan

ANTIBIOTIC TIME

- Time of administration to patient of first dose of antibiotic administered to patient at your hospital.
- Collected as HH:MM.
- HH:MM should be collected as military time.

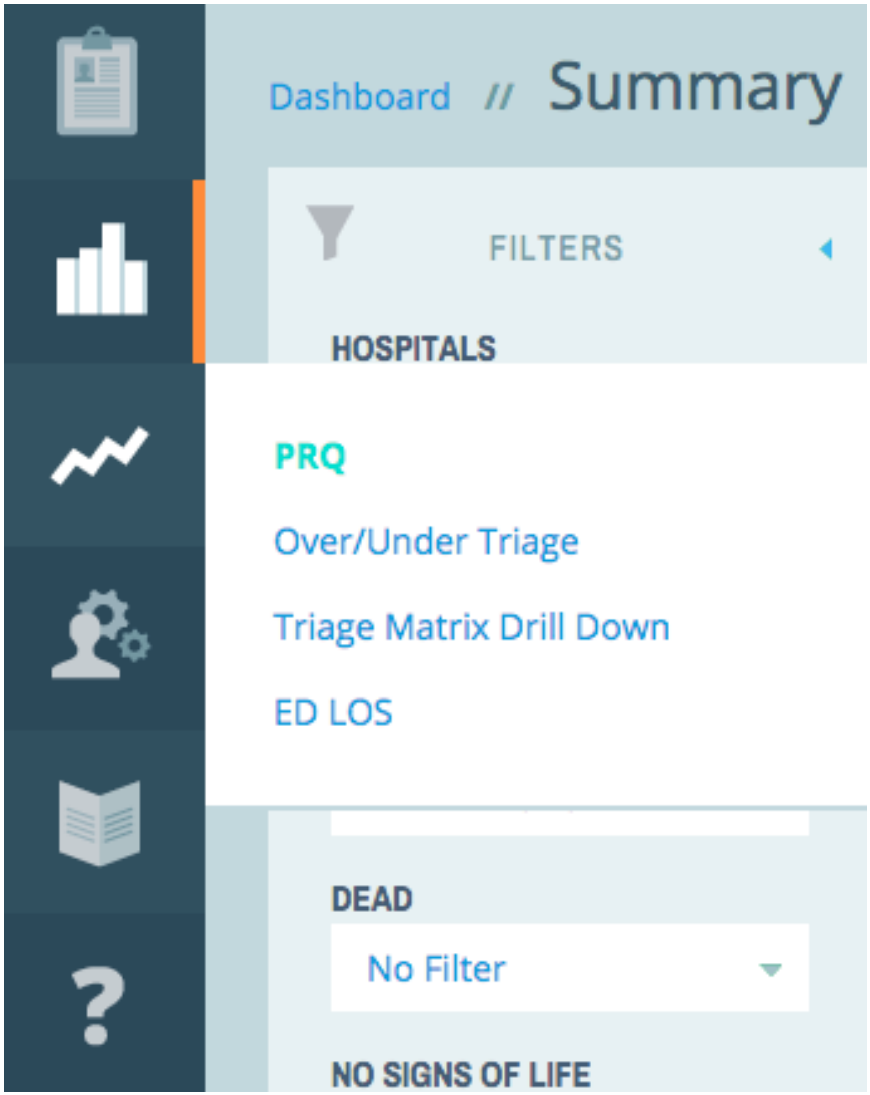
Collection Criterion: Collect on all patients with open fractures.

Def. Source: Orange Book

Analytics – PRQ Tables

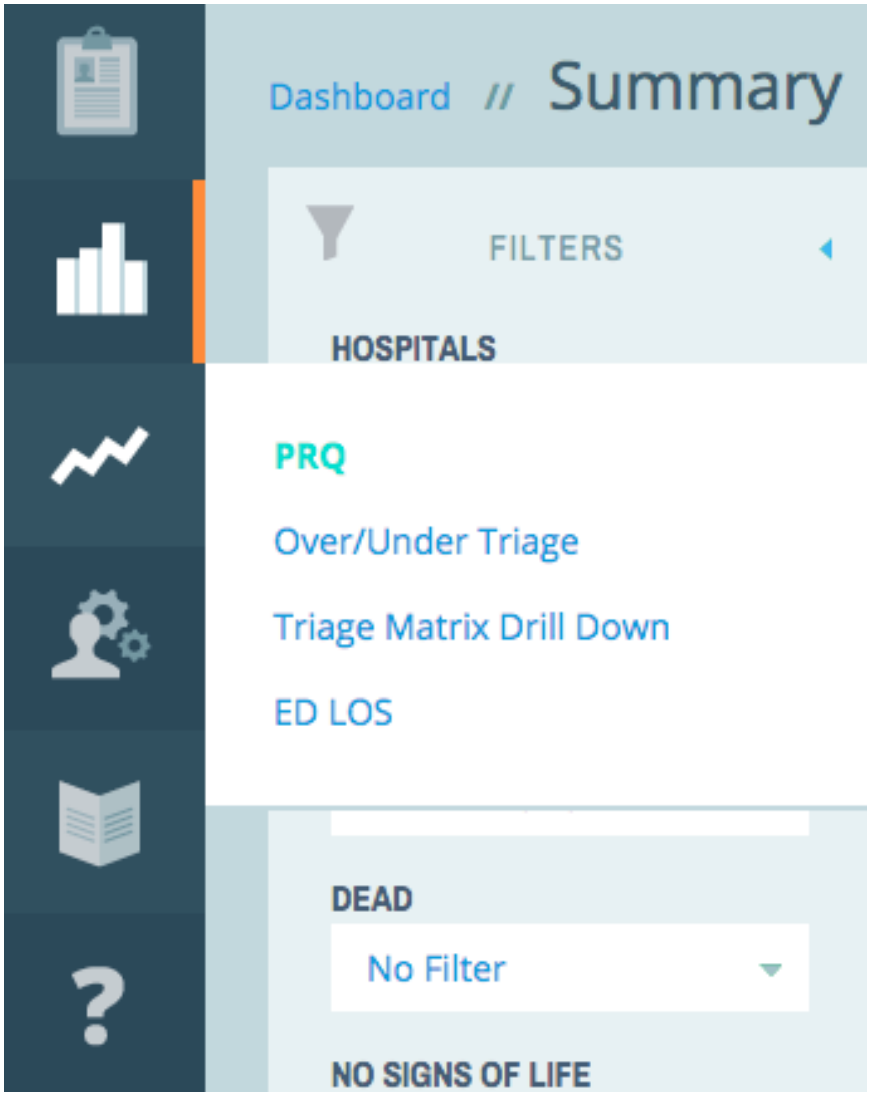
Available Now

Analytics – PRQ Tables



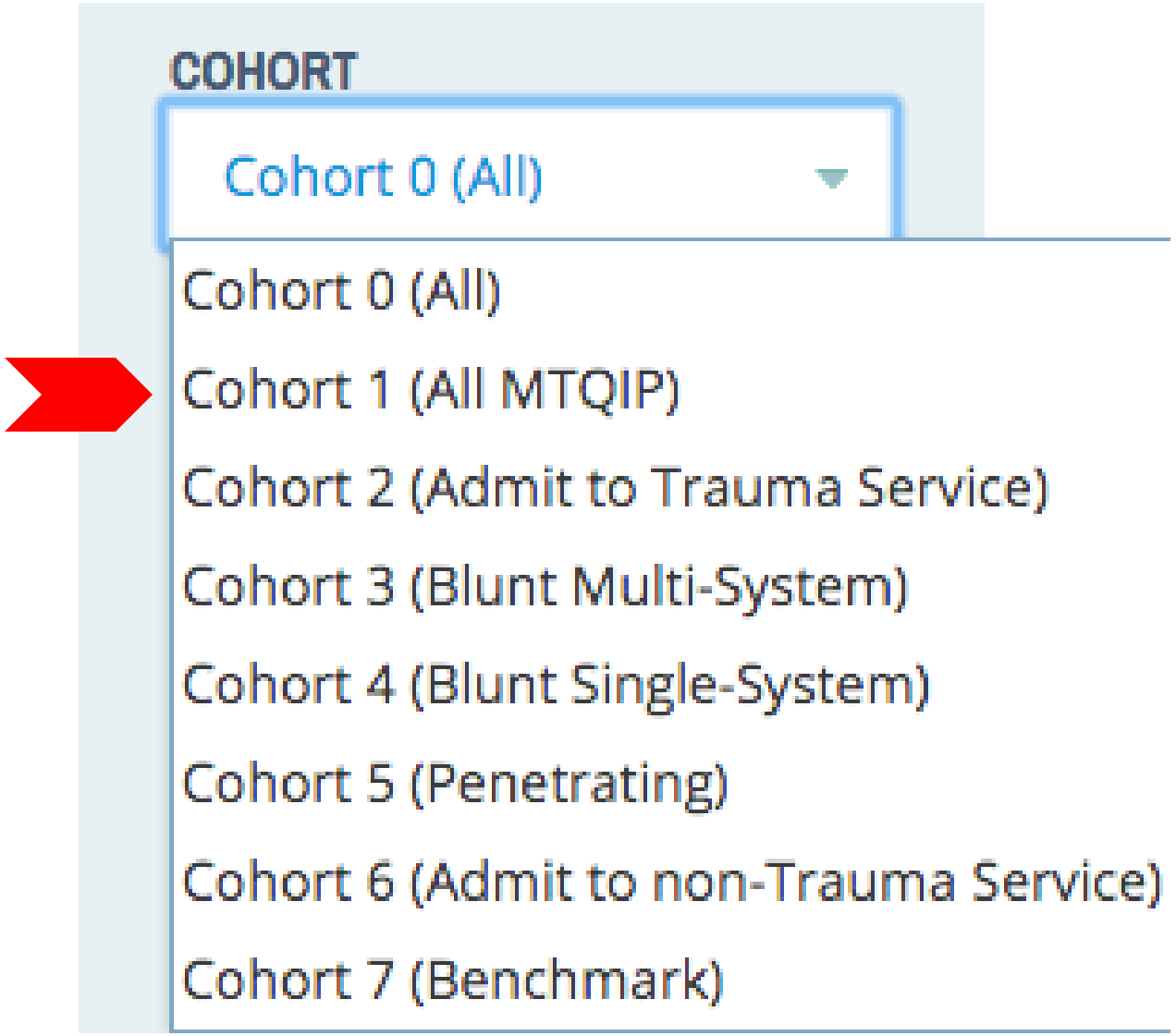
Available Now

Analytics – PRQ Tables



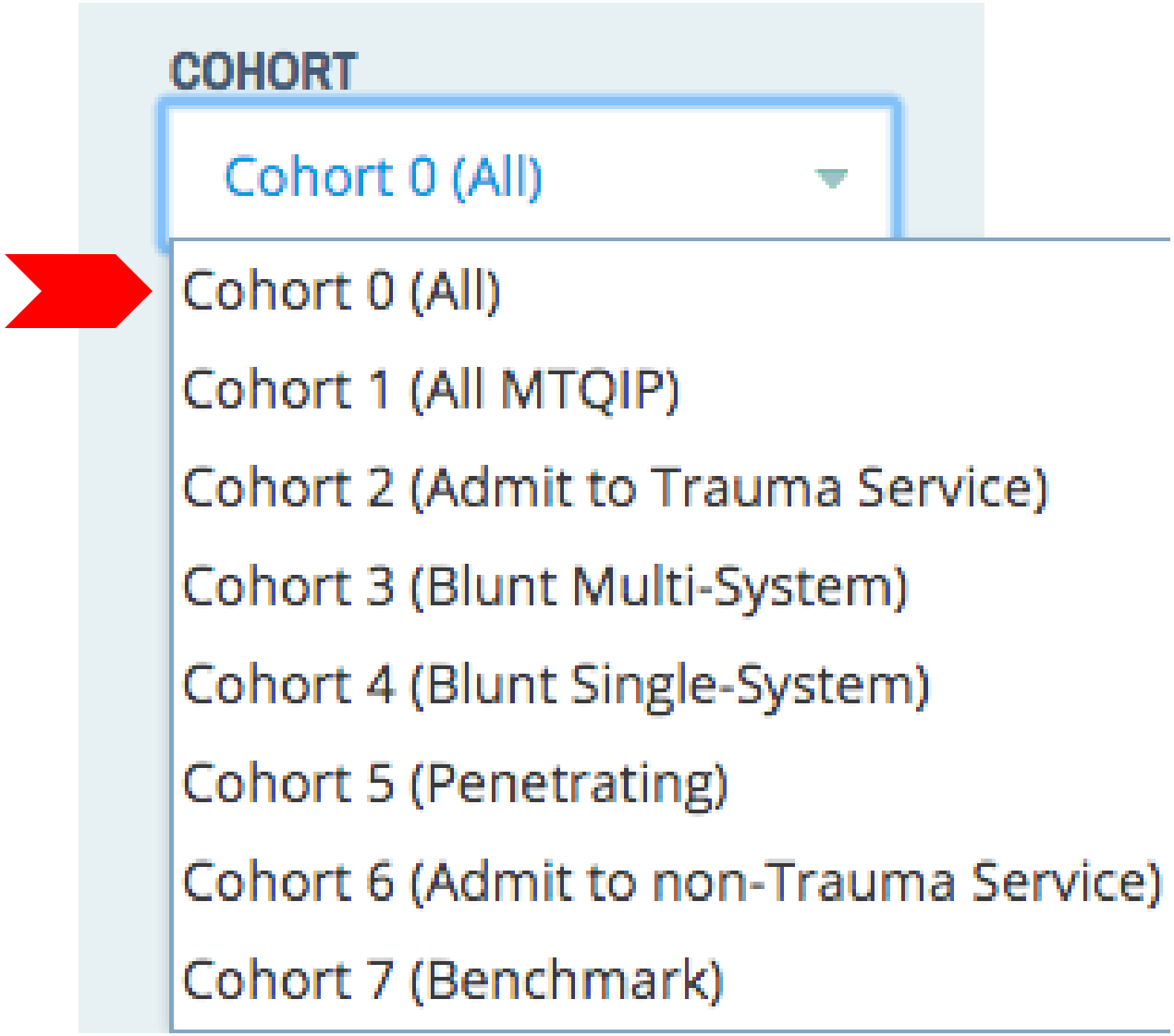
Available Now

Analytics – PRQ Tables



Available Now

Analytics – PRQ Tables



Available Now

Analytics – ED LOS

ED LOS
ED LOS Mean (hrs)
ED LOS Median (hrs)

Available Now

Analytics – ED LOS

ED LOS
ED LOS Mean (hrs)
ED LOS Median (hrs)

Available Now

Analytics – ED LOS

ED LOS
ED LOS Mean Full Activation (hrs)
ED LOS Median Full Activation (hrs)
0 - 0.5 Hr Full Activation (n)
0.51 - 1 Hr Full Activation (n)
1.1 - 2 Hr Full Activation (n)
2.1 - 3 Hr Full Activation (n)
3.1 - 4 Hr Full Activation (n)
> 4 Hr Full Activation (n)

Available Now

Analytics – ED LOS

ED LOS
ED LOS Mean Full Activation (hrs)
ED LOS Median Full Activation (hrs)
0 - 0.5 Hr Full Activation (n)
0.51 - 1 Hr Full Activation (n)
1.1 - 2 Hr Full Activation (n)
2.1 - 3 Hr Full Activation (n)
3.1 - 4 Hr Full Activation (n)
> 4 Hr Full Activation (n)

Available Now

Analytics – ED LOS

ED LOS
ED LOS Mean Full Activation (hrs)
ED LOS Median Full Activation (hrs)
0 - 0.5 Hr Full Activation (n)
0.51 - 1 Hr Full Activation (n)
1.1 - 2 Hr Full Activation (n)
2.1 - 3 Hr Full Activation (n)
3.1 - 4 Hr Full Activation (n)
> 4 Hr Full Activation (n)

Available Now

Analytics – ED LOS

ED LOS
ED to OR (hrs)
ED to ICU (hrs)
ED to Telemetry/Step-Down (hrs)
ED to Floor (hrs)
ED to Observation Unit (hrs)

Available Now

Analytics – ED LOS

ED LOS
ED to OR (hrs)
ED to ICU (hrs)
ED to Telemetry/Step-Down (hrs)
ED to Floor (hrs)
ED to Observation Unit (hrs)

Available Now

Analytics – ED LOS

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Available Now

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Available Now

Analytics – ED LOS

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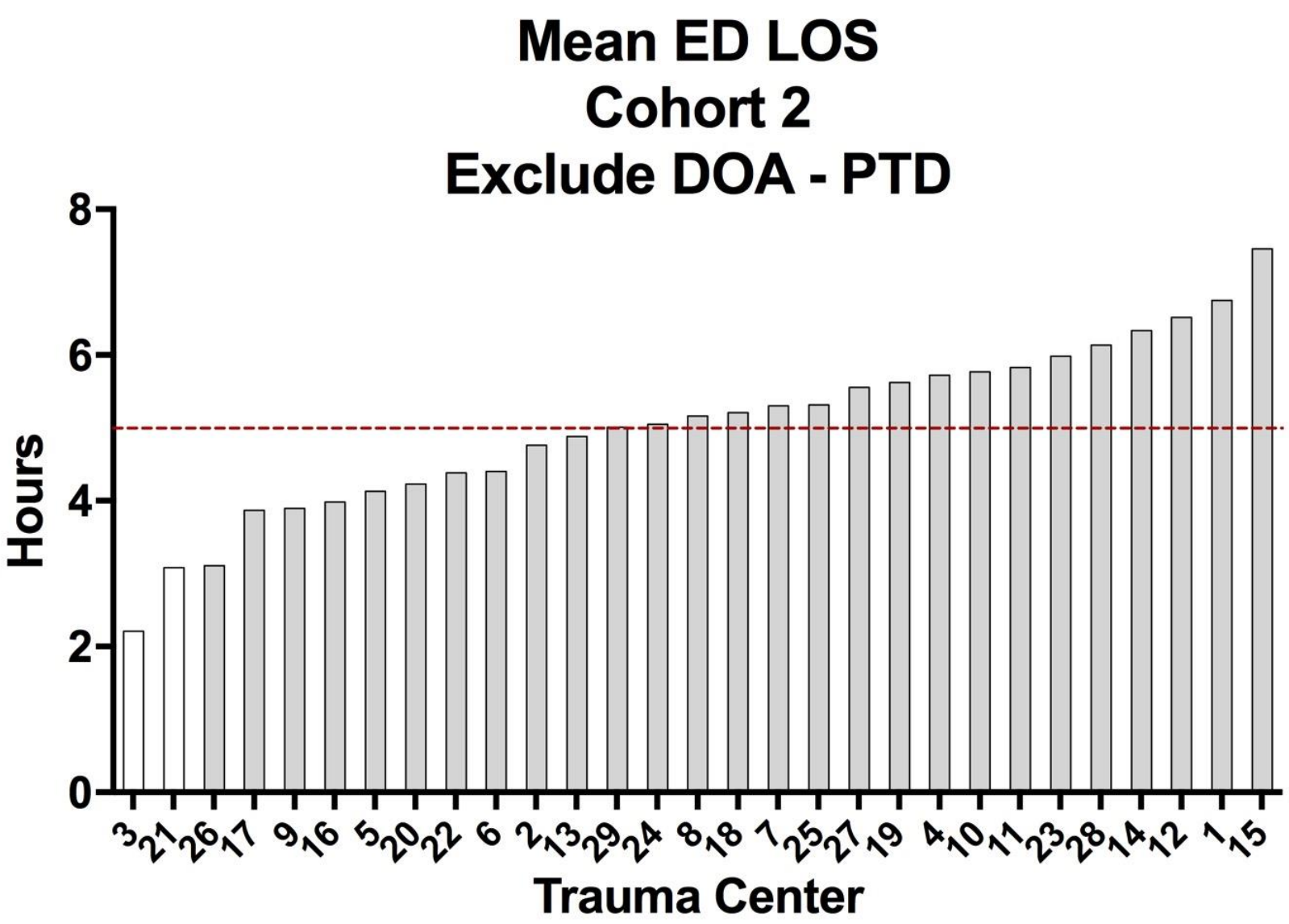
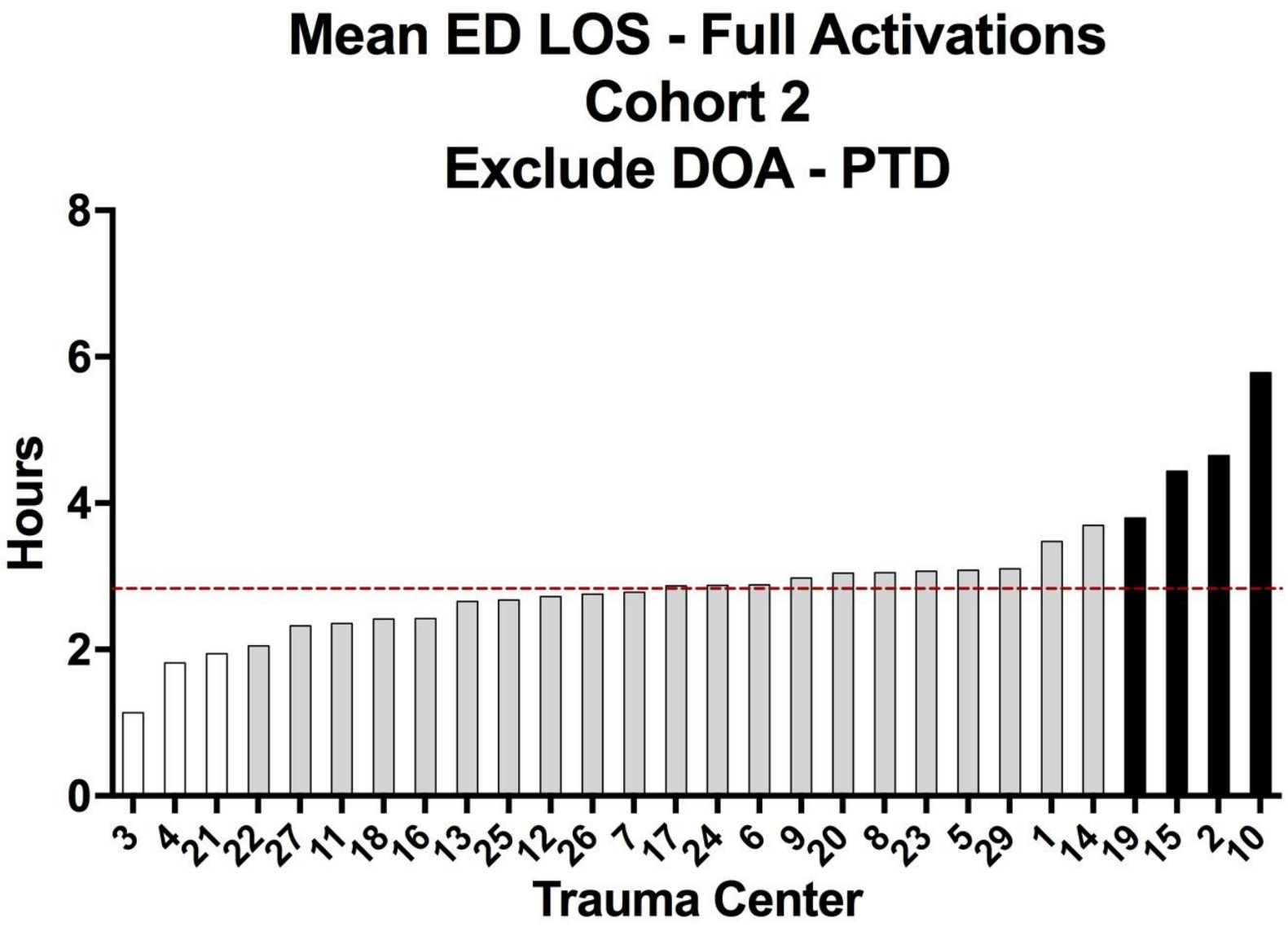
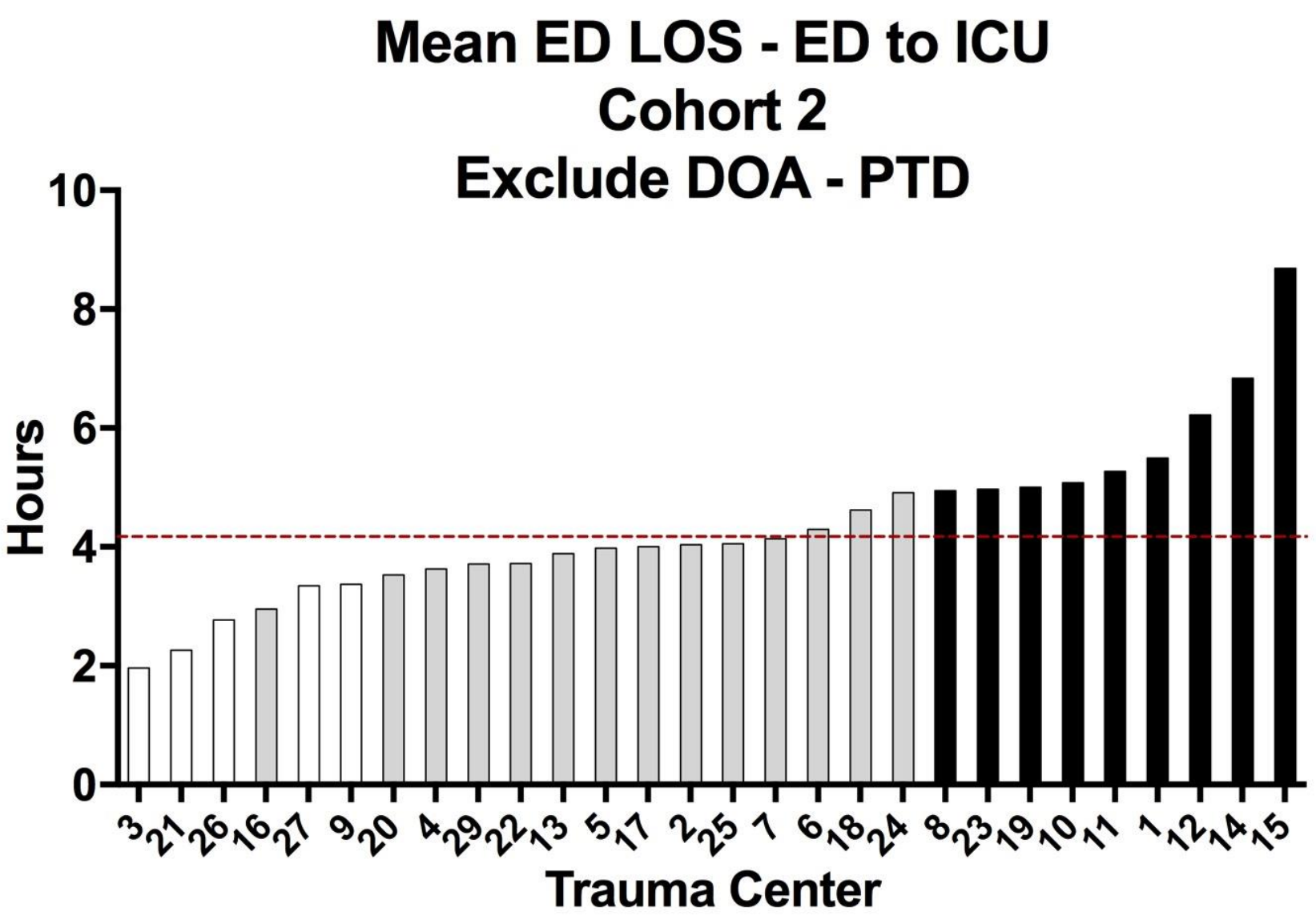
ED to Observation Unit (hrs)

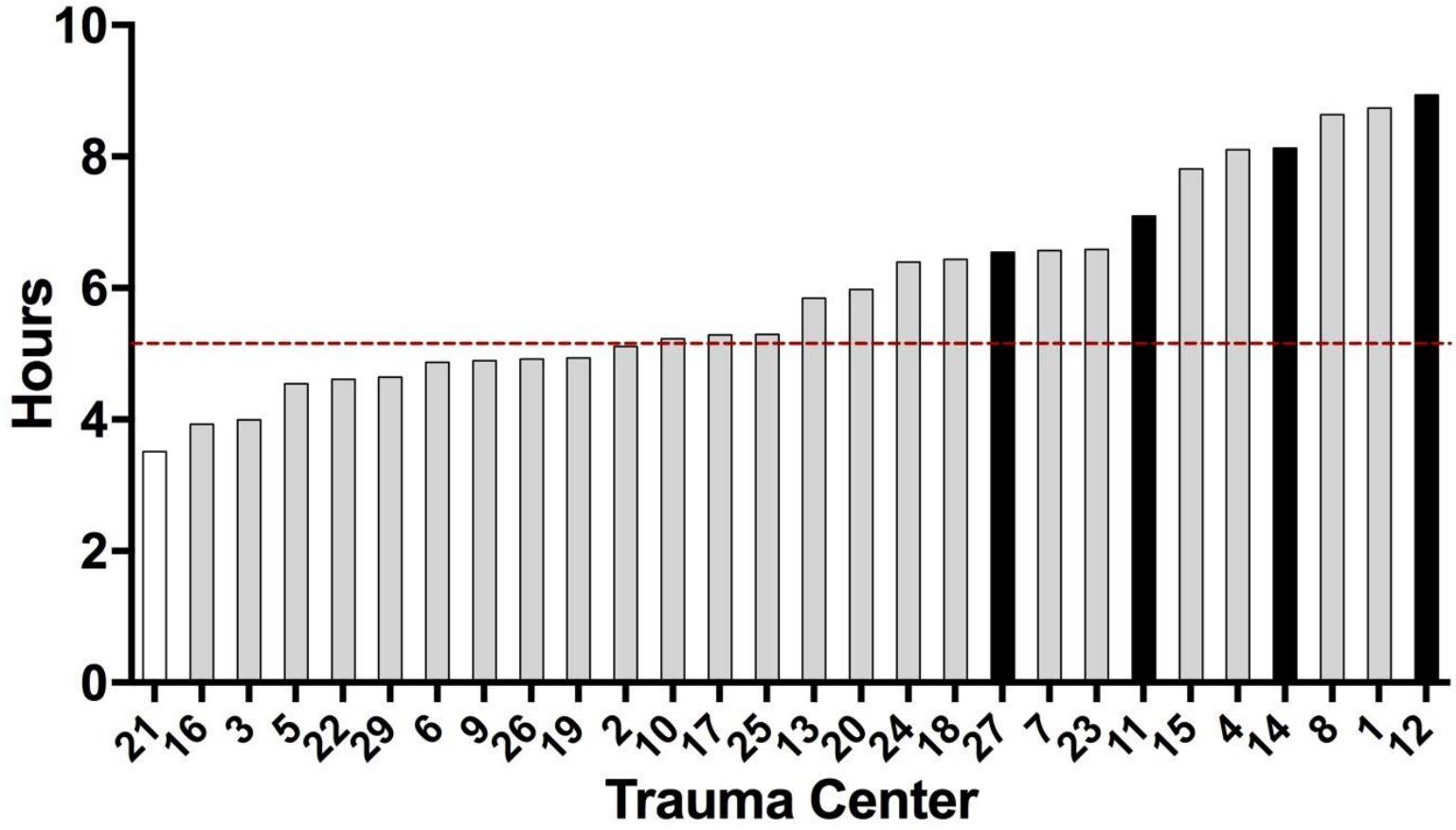
Available Now


Mean ED LOS
Cohort 2
Exclude DOA - PTD
Hours
0
2
4
6
8
3 21 26 17 9 16 5 20 22 6 2 13 29 24 8 18 7 25 27 19 4 10 11 23 28 14 12 1 15
Trauma Center

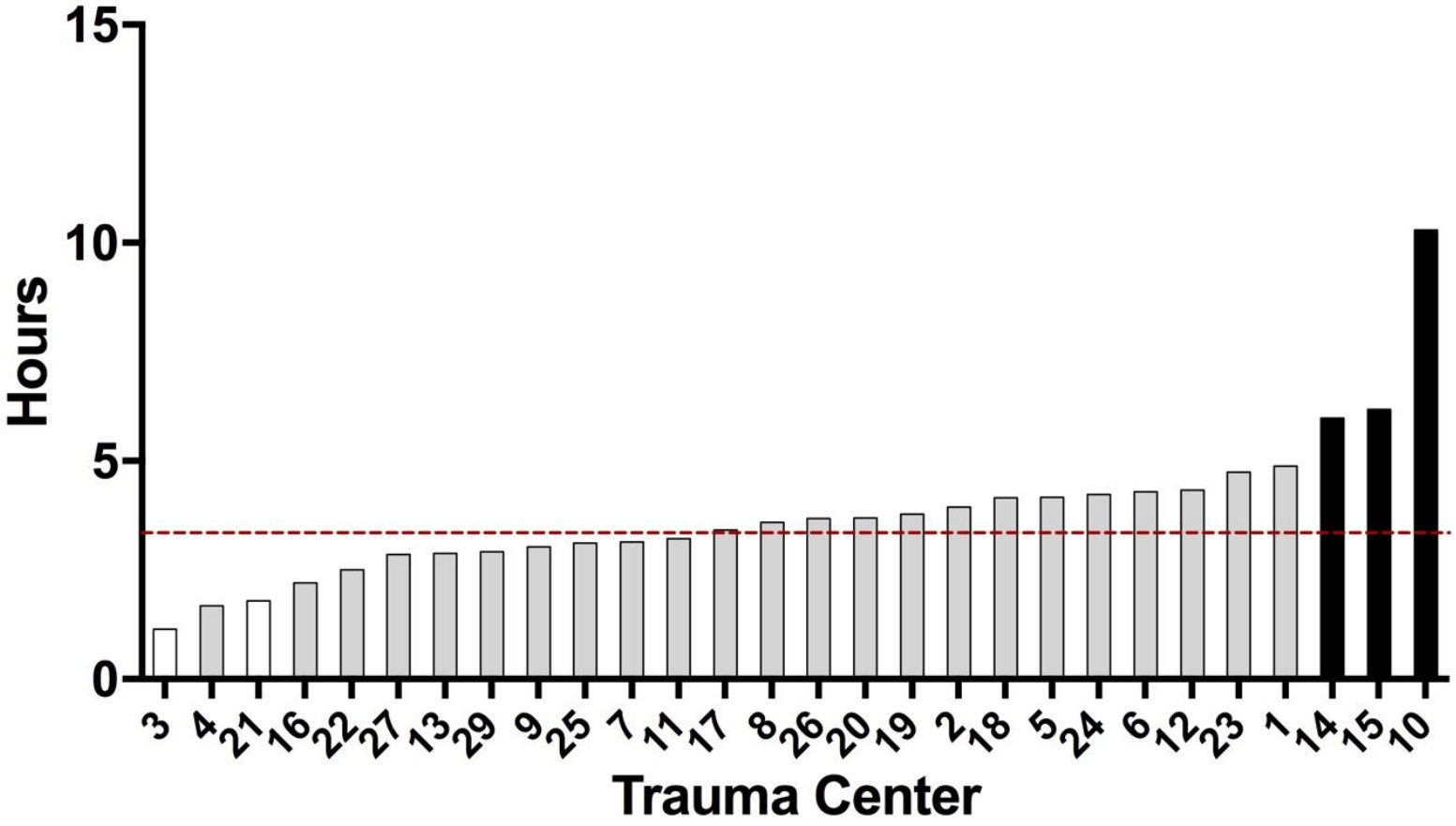

Mean ED LOS - Full Activations
Cohort 2
Exclude DOA - PTD
Hours
0
2
4
6
8
3 4 21 22 27 11 18 16 13 25 12 26 7 17 24 6 9 20 8 23 5 29 1 14 19 15 2 10
Trauma Center


Mean ED LOS - ED to ICU
Cohort 2
Exclude DOA - PTD
Hours
10
8
6
4
2
0
3 21 26 16 27 9 20 4 29 22 13 5 17 2 25 7 6 18 24 8 23 19 10 11 1 12 14 15
Trauma Center

Mean ED LOS - ED to ICU
Cohort 6
Exclude DOA - PTD



Mean ED LOS - ED to ICU
Cohort 1 - ISS > 25
Exclude DOA - PTD



Break

Back at 1:00 pm

Diabetes Mellitus Significantly Increases Trauma Associated Complications and Utilization of Resources

Mathew J. Delano, MD PhD
University of Michigan

Diabetes Mellitus Significantly Increases Trauma Associated Complications and Utilization of Resources

Matthew J. Delano, M.D., Ph.D.

Assistant Professor of Surgery
University of Michigan

October 11th, 2016

M·TQIP

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Disclosures

- No Conflicts of Interest
- No Financial Disclosures

“To give anything less than your best is to sacrifice the gift.”

-Steve Prefontaine

Trauma Health Care Burden

Trauma accounts for 41 million ED visits and 2.3 million hospitalizations yearly

Life Years Lost[1] (2010, most recent available)

- Trauma injury accounts for 30% of all life years lost in the U.S.
- Cancer accounts for 16%
- Heart disease accounts for 12%

Economic Burden[2]

- $585 billion a year, including both health care costs and lost productivity

Deaths due to injury[3] (2010, most recent available) - 192,000

Ranking as cause of death[3]

- #1 for age group 1-46, or 47% of all deaths in this age range
- #3 as leading cause of death overall, across all age groups

Falls[4] (2009, most recent available)

- 8 million people were treated in the ED for nonfatal injuries related to falls
- 2.2 million were people aged over 65 years with substantial comorbidities
- In 2008 over 19,700 people died of fall-related injuries; over 17,700 > 65 years old

1 Life Years Lost: A measure to account for the age at which deaths occur, giving greater weight to deaths occurring at younger ages and lower weight to deaths occurring at older ages. The LYL (percentage of total) indicator measures the LYL due to a particular cause of death as a proportion of the total LYL lost due to premature mortality in the population. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web–based Injury Statistics Query and Reporting System (WISQARS) [online]. Accessed February 17, 2014.
2 Finkelstein, E.A., Corso, P.S., & Miller, T.R. The Incidence and Economic Burden of Injuries in the United States. USA: Oxford University Press. 2006
3 Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web–based Injury Statistics Query and Reporting System (WISQARS) [online]. Accessed February 17, 2014.
4 http://www.cdc.gov/HomeandRecreationalSafety/Falls/adultfalls.html

Obesity and Severe Injury

- Increased body weight and the risk for human disease is a major health concern
- The National Institutes of Health has classified individuals according to body mass index (BMI) to assess population-wide risks for comorbid diseases

NIH/WHO Body Mass Index Classifications

Class	Body Mass Index (kilogram/meter^2)
Underweight	<18.5
Normal Weight	18.5–24.9
Overweight	25–29.9
Obese	30–39.9
Morbidly Obese	≥ 40

Winfield, R., Delano, MJ., et. al. Crit Care Med. 2010 January ; 38(1): 51–58

Obesity and Severe Injury

- **Outcome differences between obese and nonobese patients following severe injury**

	Normal Weight (n = 173)	Overweight (n = 152)	Obese (n = 101)	Morbid (n = 29)	*p*
Any nosocomial infection	41.0	48.0	42.6	62.1	.150
Pneumonia	26.6	28.1	26.7	31.0	.958
Bloodstream infection	8.1	15.0	19.8	13.8	.043
Urinary tract infection	17.9	12.4	14.9	34.5	.028
Catheter-related bloodstream infection	2.9	3.9	5.0	10.3	.301
Ventilator-associated pneumonia	25.9	23.7	25.7	20.7	.915

Nosocomial Infections (%)

	Normal Weight (n = 173)	Overweight (n = 152)	Obese (n = 101)	Morbid (n = 29)	*p*
Any noninfectious complication	36.4	38.8	46.5	58.6	.078
Acute respiratory distress syndrome	20.2	21.1	27.7	41.4	.053
Cardiac arrest	2.3	2.6	2.0	17.2	<.001
Myocardial infarction	0.0	1.3	1.0	3.4	.253
Cerebral infarction	2.9	2.0	3.0	0.0	.765
Deep vein thrombosis	5.2	5.9	6.9	6.9	.941
Pulmonary embolism	2.3	3.9	3.0	3.4	.868
Rhabdomyolysis	1.2	5.2	4.0	10.3	.053
Acute renal failure	1.2	0.0	2.0	10.3	<.001
Multiple organ failure	43.9	46.7	58.4	72.4	.008

Noninfectious Complications (%)

Winfield, R., Delano, MJ., et. al. Crit Care Med. 2010 January ; 38(1): 51–58

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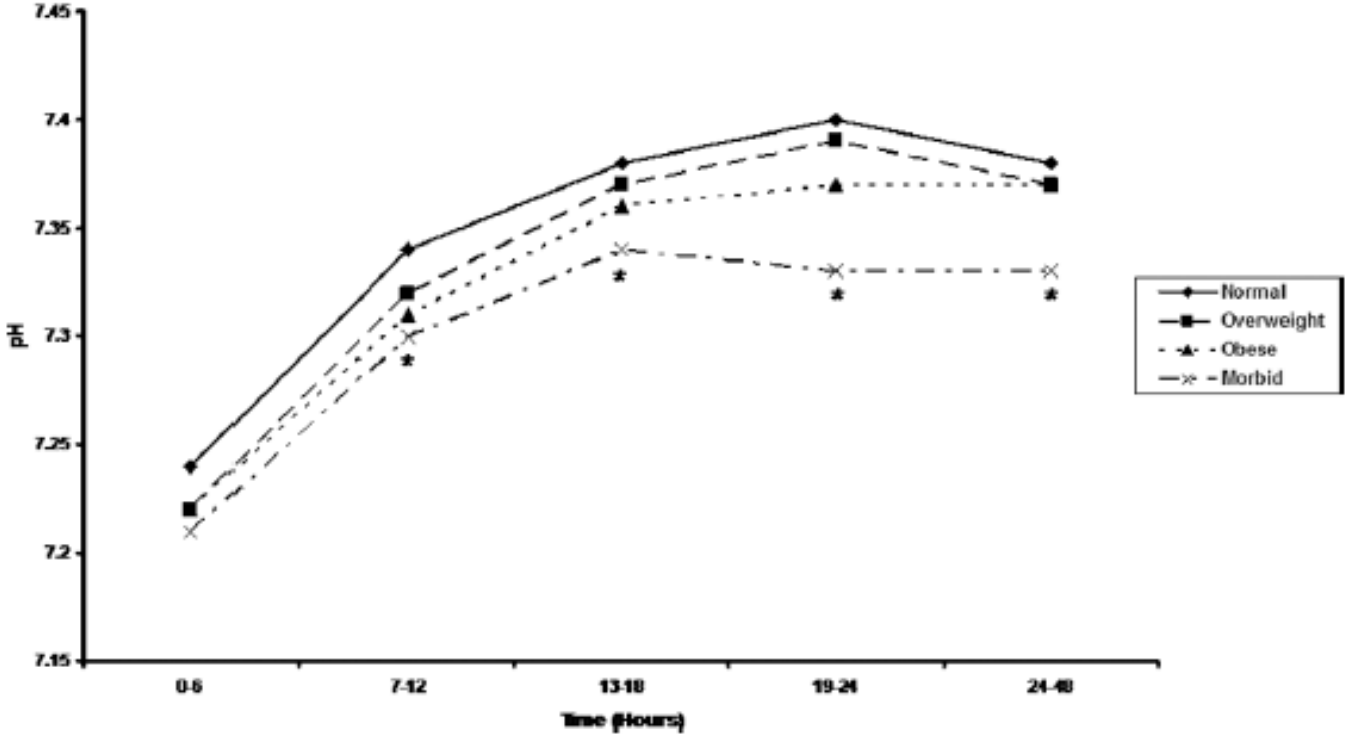
Obesity and Severe Injury

- **Study Conclusions:**
  - Complications increase with increasing BMI
  - Independent associations exist between BMI and morbidity
  - BMI-related increases in MOF including longer intensive care unit stays, greater number of ventilator days, cardiac arrests, and episodes of acute renal failure

Winfield, R., Delano, MJ., et. al. Crit Care Med. 2010 January ; 38(1): 51–58

Obesity and Severe Injury

- **What is/are the underlying mechanism(s) responsible for obesity related elevations in MOF and complicated outcomes?**



Winfield, R., Delano, MJ., et. al. Crit Care Med. 2010 January ; 38(1): 51–58

Obesity and Severe Injury

- Obese patients received greater resuscitation volumes per actual body mass, however this difference abated when volumes were adjusted for lean and ideal body mass

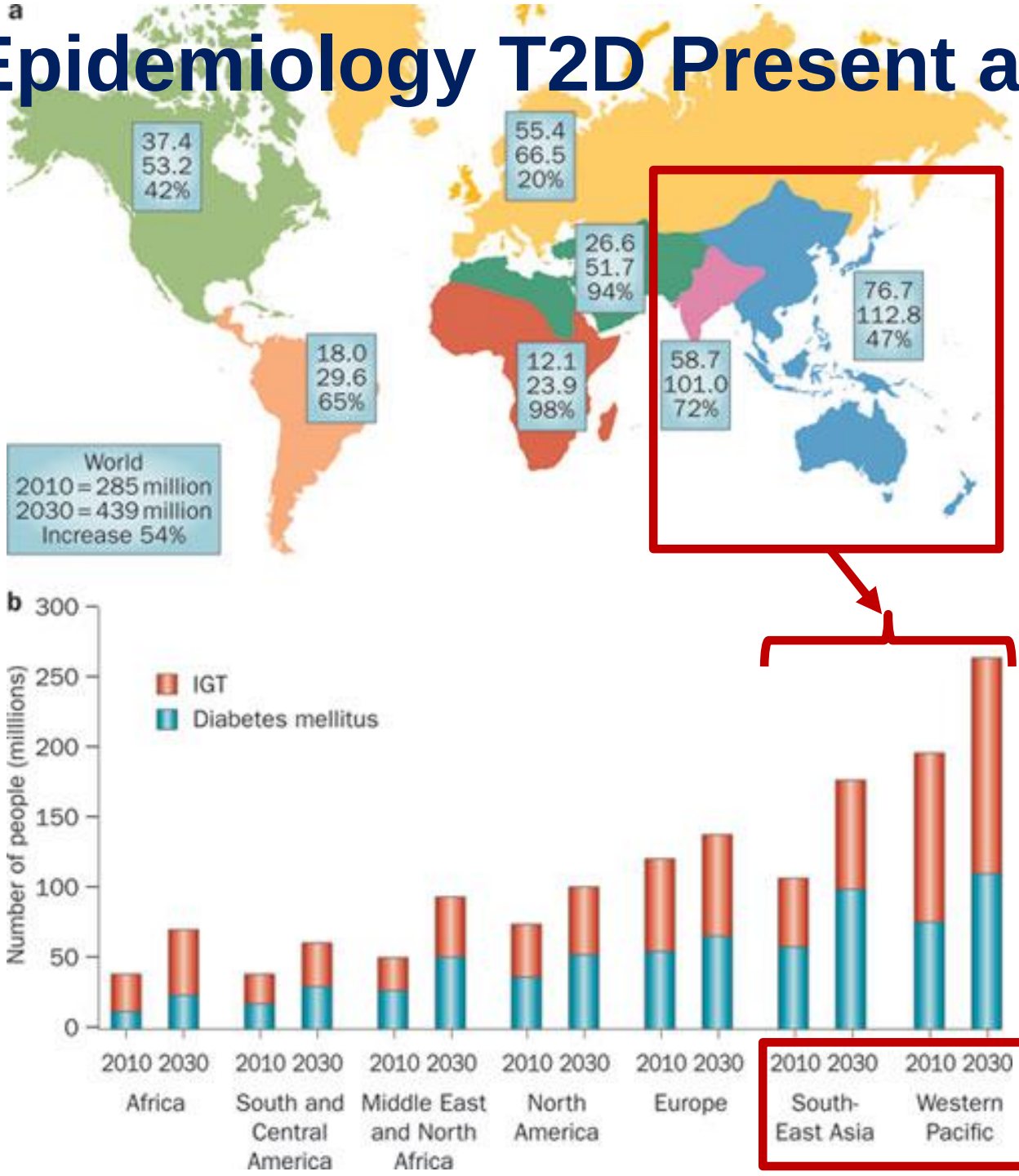
- **Study Conclusions Obese Patients:**
  - Morbidly obese patients show prolonged metabolic acidosis in severe blunt trauma
  - The prolonged metabolic acidosis is attributed to suboptimal resuscitation endpoints combined with underlying metabolic abnormalities

Type 2 Diabetes (T2D)

- 29 million people in the USA have diabetes of all types
- T2D comprises well over 90% of the total diabetic population (over **27 million now in the USA**)
- Over **50 million Indians** have T2D now (over 79 million by year 2030)
- **With increases in the prevalence of advanced age, obesity, poor diet, and inactivity the incidence of T2D is expected to rise dramatically**

Chen, L. *et al.* (2011) *Nat. Rev. Endocrinol.* doi:10.1038/nrendo.2011.183.
Kaveeshwar SA, Cornwall J. The current state of diabetes mellitus in India. *AMJ* 2014, 7, 1, 45-48.

Epidemiology T2D Present and Future



Chen, L. *et al.* (2011) *Nat. Rev. Endocrinol.*
doi:10.1038/nrendo.2011.183

T2D and Trauma

- Hyperglycemia is associated with complications and worsened outcome among trauma victims
- Rapid expansion of the elderly and obese populations has increased the prevalence of T2D in trauma patients
- **<u>Hypothesis:</u> The presence of T2D is associated with poor outcomes among trauma patients**

Kao, LS, Todd, R, Moore, FA, The impact of diabetes on outcome in traumatically injured patients: an analysis of the National Trauma Data BankThe American Journal of Surgery 192 (2006) 710–714

McGwin G Jr, MacLennan PA, Fife JB, et al. Preexisting conditions and mortality in older trauma patients. J Trauma 2004;56:1291– 6.

Laird AM, Miller PR, Kilgo PD, et al. Relationship of early hyperglycemia to mortality in trauma patients. J Trauma 2004;56:1058–62.

Yendamuri S, Fulda GJ, Tinkoff GH. Admission hyperglycemia as a prognostic indicator in trauma. J Trauma 2003;55:33– 8.

Bochicchio GV, Sung J, Joshi M, et al. Persistent hyperglycemia is predictive of outcome in critically ill trauma patients. J Trauma 2005;58:921– 4.

Materials & Methods

- Michigan Trauma Quality Collaborative data analyzed from 2012-2014 (~ 35,000 patients).
- Patients with no signs-of-life, Injury Severity Score < 5, age < 18 years, and hospitalization < 1 day were excluded.
- Multivariable logistic or linear regression was used to compare patients with and without T2D.
- Variables utilized in risk-adjustment include demographics, physiology, comorbidities, and injury scoring.
- Results were confirmed using propensity score matching.

Patient Characteristics

Table 1.

	No Diabetes (n=30,473)	Diabetes (n=4,238)	p-value	
Age	51.4 + 22.8	68.6 + 15.5	<0.001	
Male	64.7%	55.9%	<0.001	
ISS	12.8 + 8.7	12.1 + 7.3	<0.001	
Race (Non-White)	26.2%	17.2%	<0.001	
Congestive Heart Failure	2.3%	8.4%	<0.001	♦
PVD	0.3%	1.3%	<0.001	
Hypertension	28.6%	73.5%	<0.001	♦
Dialysis	0.5%	3.3%	<0.001	♦
Cirrhosis	0.5%	1.2%	<0.001	
Metastasis	0.3%	0.5%	0.0111	
Active chemotherapy	0.2%	0.4%	0.0024	
Acquired coagulopathy	6.9%	18.9%	<0.001	♦
Obesity	10.2%	23.8%	<0.001	♦
Ascites	0.1%	0.3%	0.0005	
Drug use	10.6%	4.1%	<0.001	
Smoker	27.1%	14.8%	<0.001	
Psych	10.0%	9.9%	0.8673	
Anticoagulated	8.7%	23.1%	<0.001	♦
Blunt Mechanism	90.7%	98.0%	<0.001	
Transfer	19.7%	21.0%	0.041	

Selected Outcomes Analyzed

Table 2.

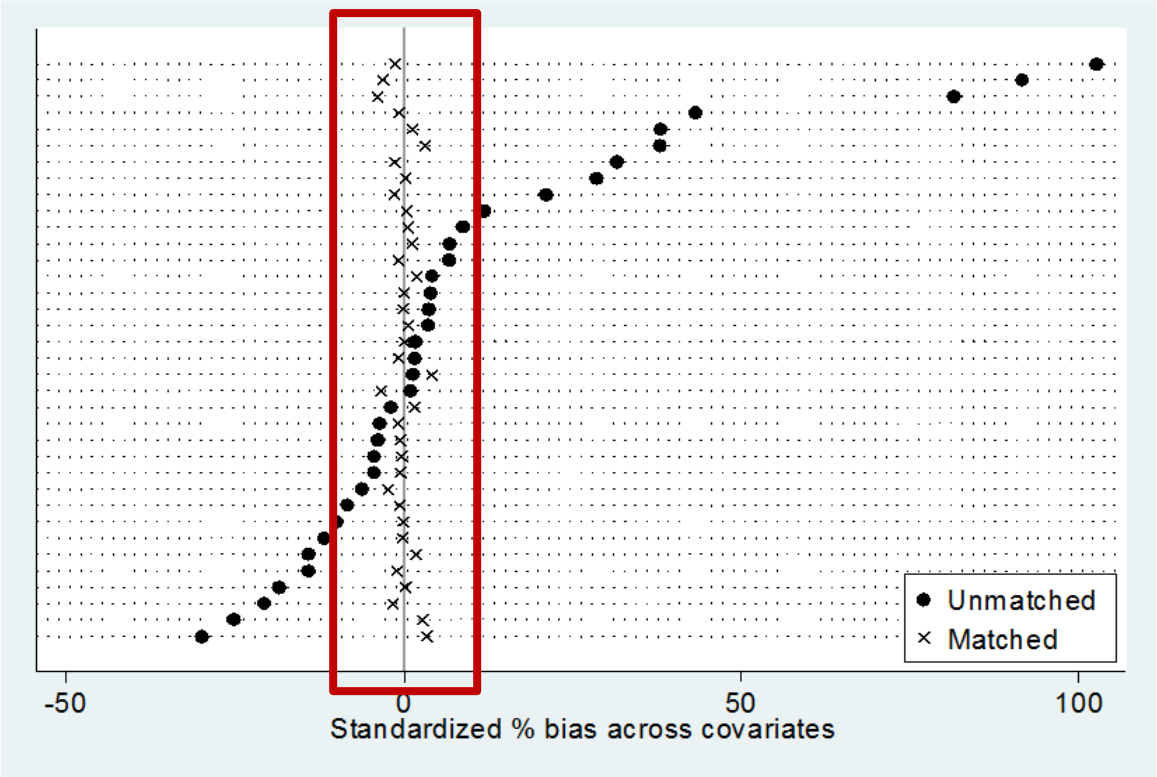
Complications:

Infection	Incisional SSI Organ Space SSI UTI Pneumonia C. Diff Systemic sepsis
Cardiac	Cardiac arrest requiring CPR MI
Renal	Acute renal failure
Venous Throm.	PE DVT - LE DVT - UE
Other	Wound Disruption Abdominal fascia left open ARDS Unplanned intubation Stroke/CVA Abdominal compartment syndrome Extremity compartment syndrome Decubitus ulcer Enterocutaneous fistula

Propensity Score Matching

Matching Variables

Age
Age²
Sex
ISS
ISS²
GCSM (categories)
Pulse (categories)
BP (categories)
Race
Mechanism of injury (Blunt)
Transfer
Congestive Heart Failure
PVD
Hypertension
Dialysis
Cirrhosis
Metastasis
Active chemotherapy
Acquired coagulopathy
Obesity
Ascites
Drug use
Smoker
Psych
Anticoagulated



Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.186	4795.03	0.000	19.5	9.9	125.4*	0.49*	100
Matched	0.002	21.51	0.973	1.2	1.1	10.1	1.10	40

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T2D Negatively Impacts Trauma Outcomes

- Univariate comparison of patients with and without T2D.

Table 3.

	No Diabetes (n=40,801)	Diabetes (n=5,598)	p-value
Complications (Any)	**7.4%**	9.5%	**<0.001**
Infection	**4.9%**	6.3%	**<0.001**
Cardiac	**1.0%**	1.7%	**<0.001**
Acute Renal Failure	**0.4%**	**0.6%**	0.008
VTE	**1.2%**	**1.1%**	0.849

T2D Negatively Impacts Trauma Outcomes

- Logistic regression analysis used to compare patients with and without T2D.

Table 4. **Logistic regression:**

	OR for Diabetes	[95% CI for OR]
Complications (Any)	1.26	[1.13, 1.41]
Complications (Severe)	1.29	[1.15, 1.44]
Infection	1.29	[1.13, 1.48]
SSI	0.89	[0.51, 1.57]
UTI	1.35	[1.10, 1.66]
Cdiff	0.83	[0.51, 1.35]
Systemic sepsis	1.54	[1.07, 2.23]
Pneumonia	1.33	[1.11, 1.59]
Cardiac	1.39	[1.08, 1.8]
Acute Renal Failure	1.3	[0.87, 1.96]
VTE	0.97	[0.73, 1.30]

T2D Associated With Increased Hospital and ICU Days

- Multivariable regression results

Table 4.

	No Diabetes	Diabetes	p-value
Vent Days	6.75	**8.02**	0.002
ICU Days	5.45	**6.40**	<0.001
Length of Stay	5.69	**6.35**	<0.001

T2D and Poor Outcome Not Associated with Advanced Age

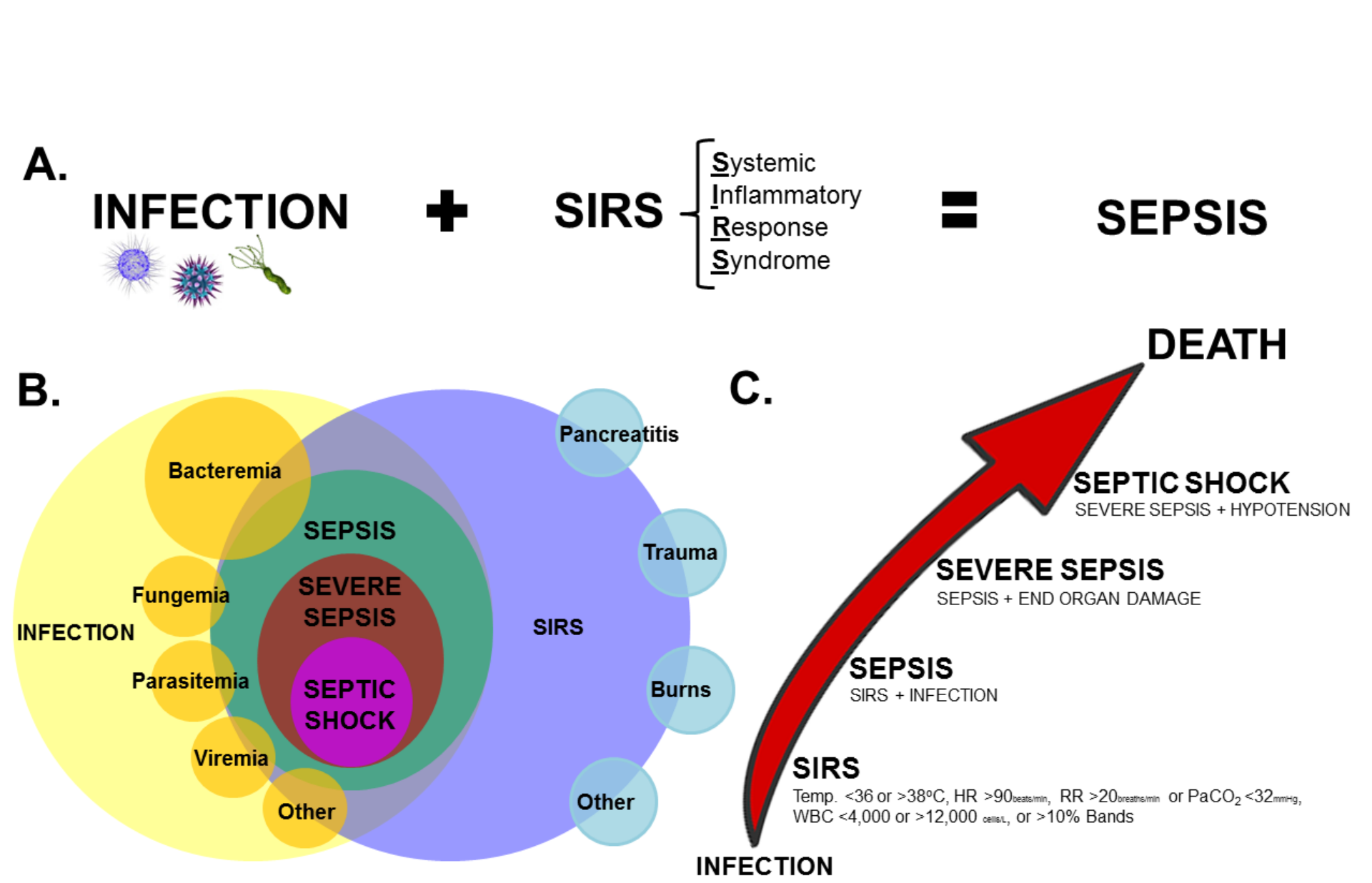
- Logistic regression results - Age >= 65

	OR for Diabetes	[95% CI LB for OR]	[95% CI UB for OR]	p-value
Complications (Any)	1.21	1.04	1.41	0.015
Complications (Severe)	1.18	1	1.4	0.057
Mortality	1	0.8	1.24	0.986
Infection	1.25	1.04	1.5	0.018
SSI	1.73	0.63	4.76	0.291
UTI	1.17	0.89	1.53	0.264
Cdiff	1.07	0.56	2.06	0.835
Systemic sepsis	1.85	1.08	3.17	0.025
Pneumonia	1.27	0.99	1.63	0.061
Cardiac	1.13	0.8	1.58	0.488
Acute Renal Failure	1.65	0.91	2.96	0.096
VTE	0.8	0.52	1.22	0.293

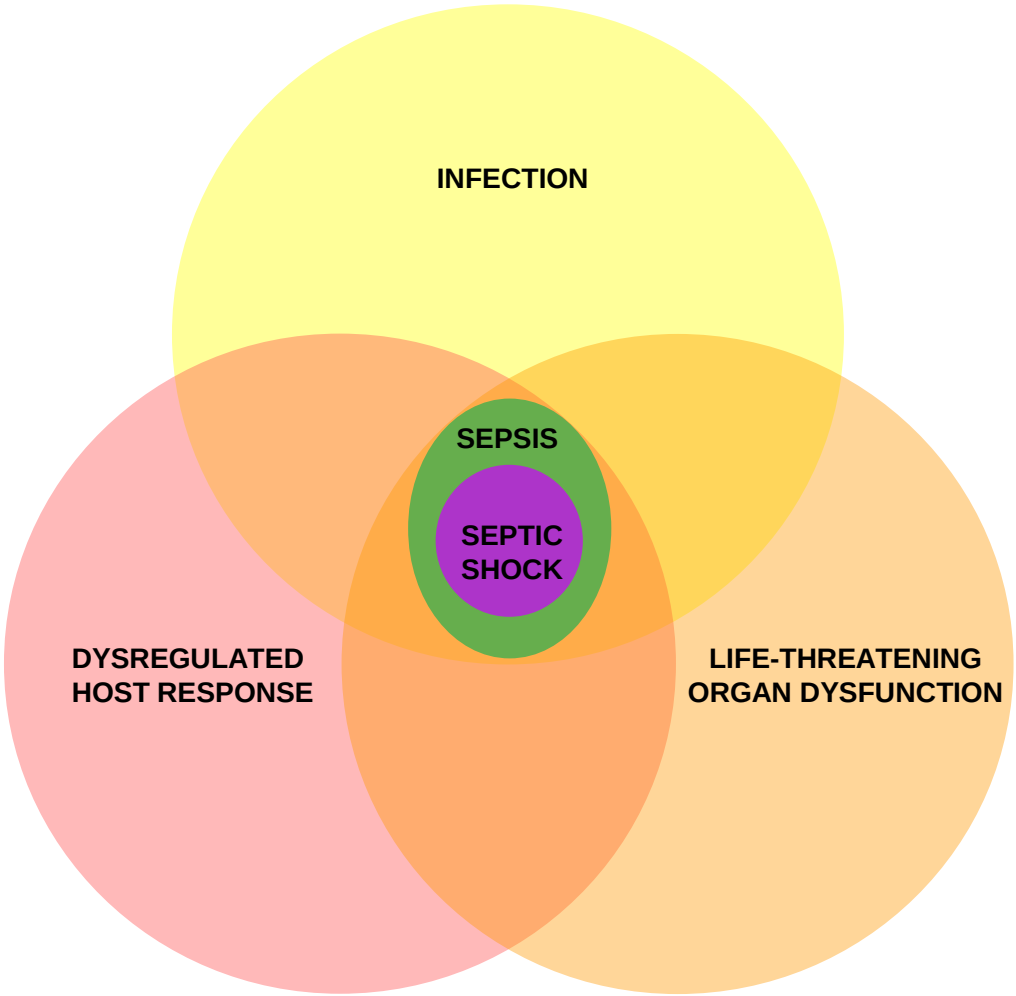
Sepsis:
A Significant HealthCare Challenge

- **Major cause of morbidity and mortality worldwide.**
  - Leading cause of death in non-coronary ICUs
  - 11th leading cause of death overall USA
- **More than 1 million cases annually in the USA.**
- **More than 500 patients die daily from sever sepsis in the USA.**
- **Number of cases of severe sepsis or septic shock among all ICU admissions increased every year**

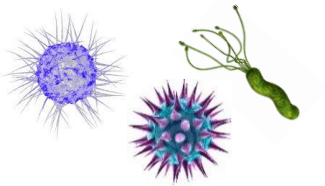
Sands, K.E. *et al. JAMA.* 1997 Jul 16;278(3):234-40.
Miniño AM. et al. Natl Vital Stat Rep. 2011 Dec 7;59(10):1-126
Iwashyna, T.J., Angus, D.C. *JAMA.* 2014;311(13):1295-1297.



Delano, MJ. Ward, PA., *Immunological Reviews* 2106



Delano, MJ. Ward, PA., *Immunological Reviews* 2106



INFECTION

Positive Blood Cultures
Urinary Tract Infection
Pneumonia, Etc…

+

Change in

Sepsis – Related
Organ
Failure
Assessment

≥ 2

Respiration
↓ PaO_2/FiO_2 Ratio

Coagulation
↓ Platelets

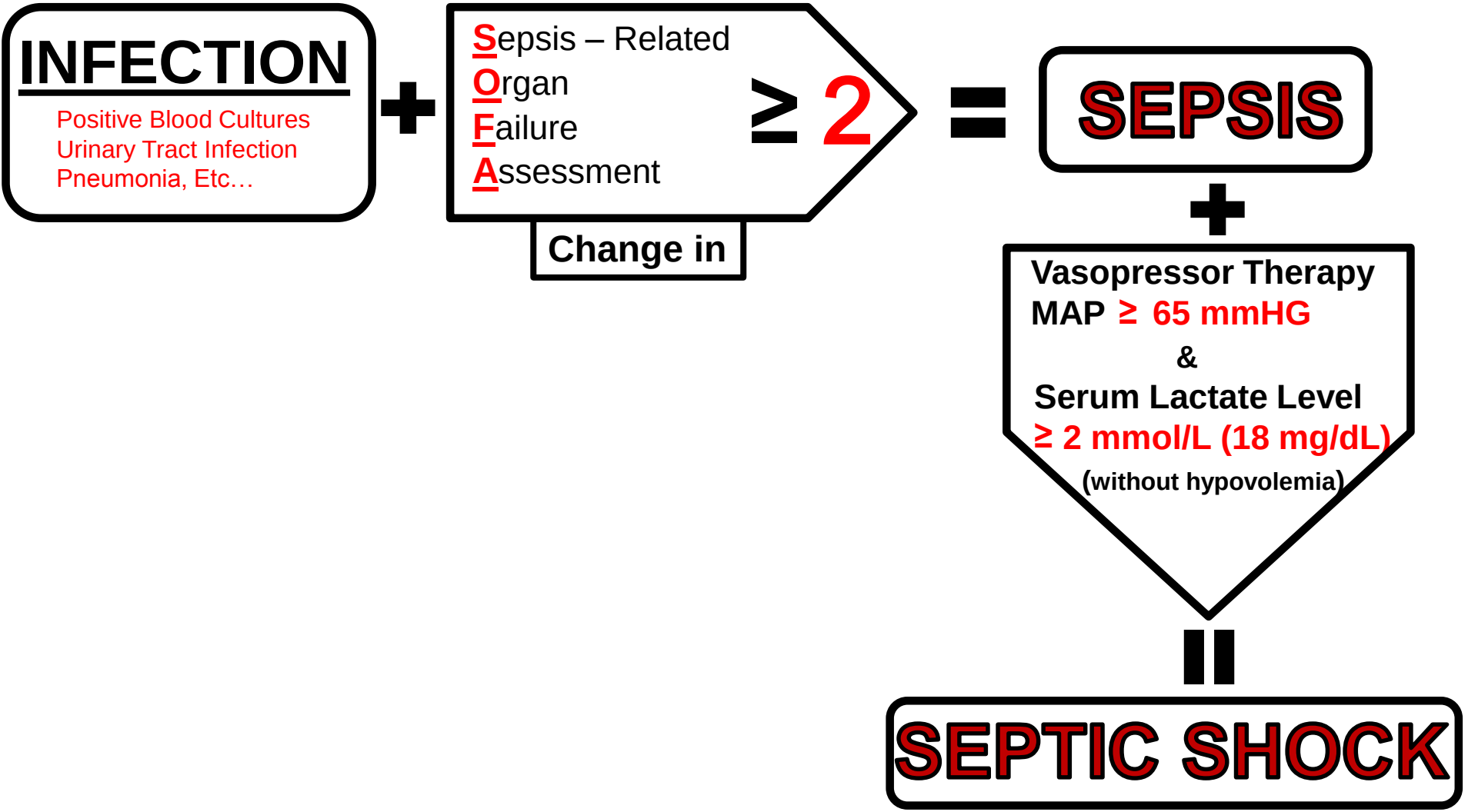
Central Nervous System
↓ Glasgow Coma Scale Score

Liver
↑ Bilirubin

Renal
↑ Creatinine
↓ Urine Output

Cardiovascular
Hypotension or Vasopressors

Delano, MJ. Ward, PA., *Immunological Reviews* 2106



Delano, MJ. Ward, PA., *Immunological Reviews* 2106

Delayed Mortality in Severe Sepsis *circa* 2015

Early Recognition, Protocol Bundling, Benchmarking Outcomes, Goal Directed Therapy and Improved Education have just delayed severe sepsis mortality!!

	ProMISe	ProCESS	ARISE
Outcomes - all groups			
28 day mortality	24.5	--	14.8 - 15.9%
60 day mortality		18.2 - 21%	--
90 day mortality	**29.5%**	**30.8 - 33.7%**	**18.6 - 18.8%**
1 year mortality		~40%	--

The ProCESS/ARISE/ProMISe Methodology Writing Committee., *Intensive Care Med*. 2013 October; 39(10).

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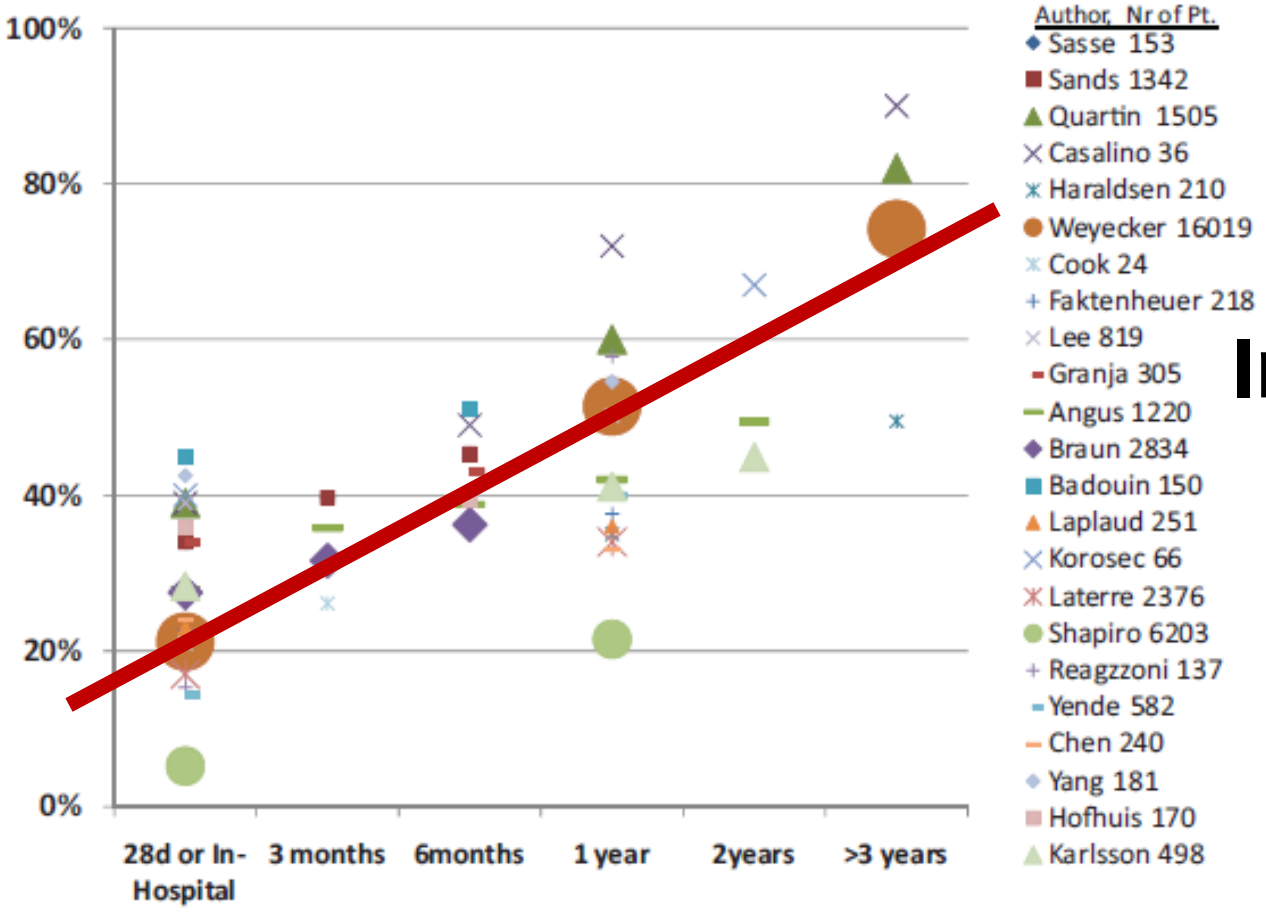
Substantial Severe Sepsis Mortality Occurs Long After Hospital Discharge

- Systematic review of studies reporting long-term mortality and quality-of-life data (>3 months) in patients with sepsis, severe sepsis, and septic shock using defined search criteria.



Mortality Increases With Time

WHY?

Winters, B.D. et. al. Crit Care Med 2010 Vol. 38, No. 5

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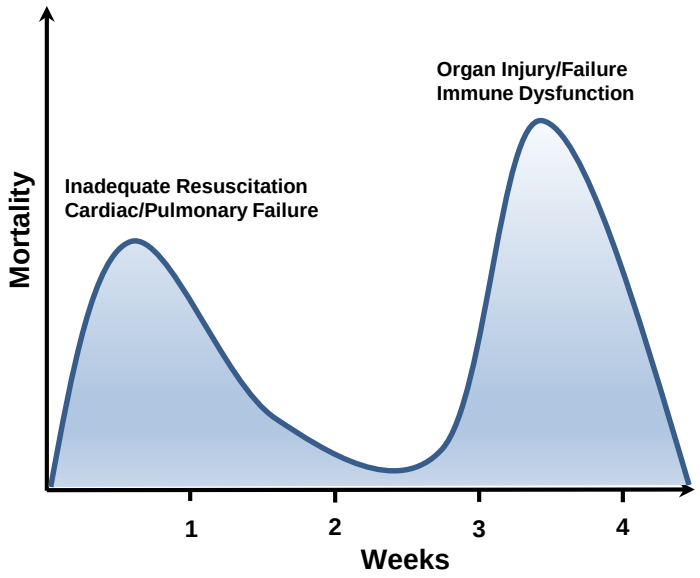
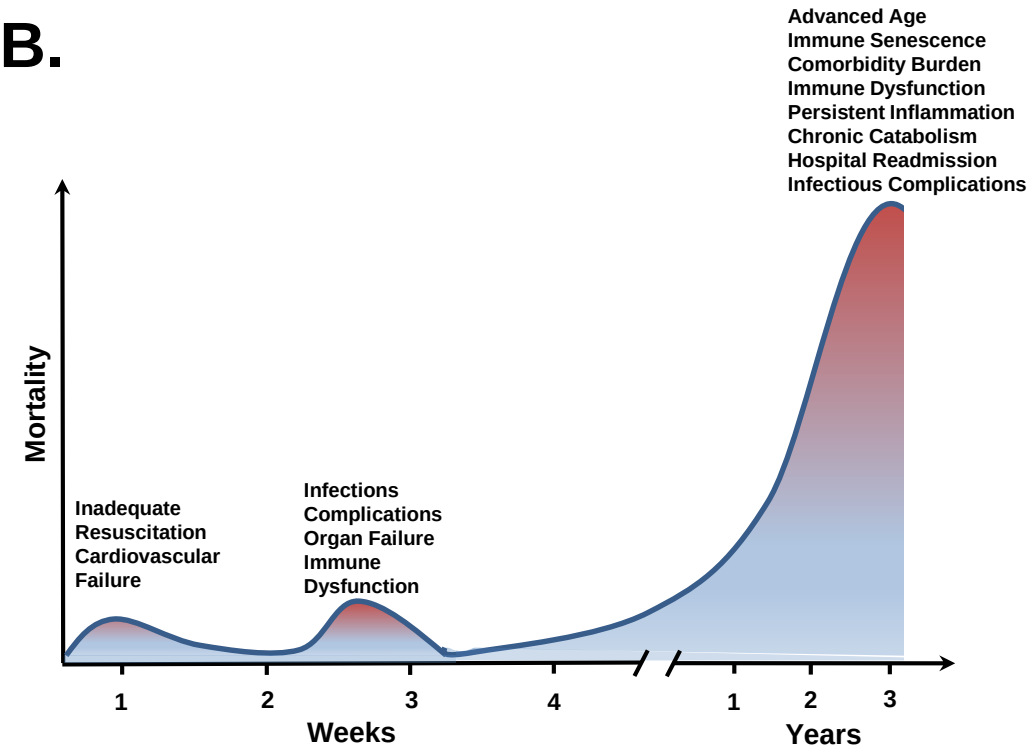
A.



B.



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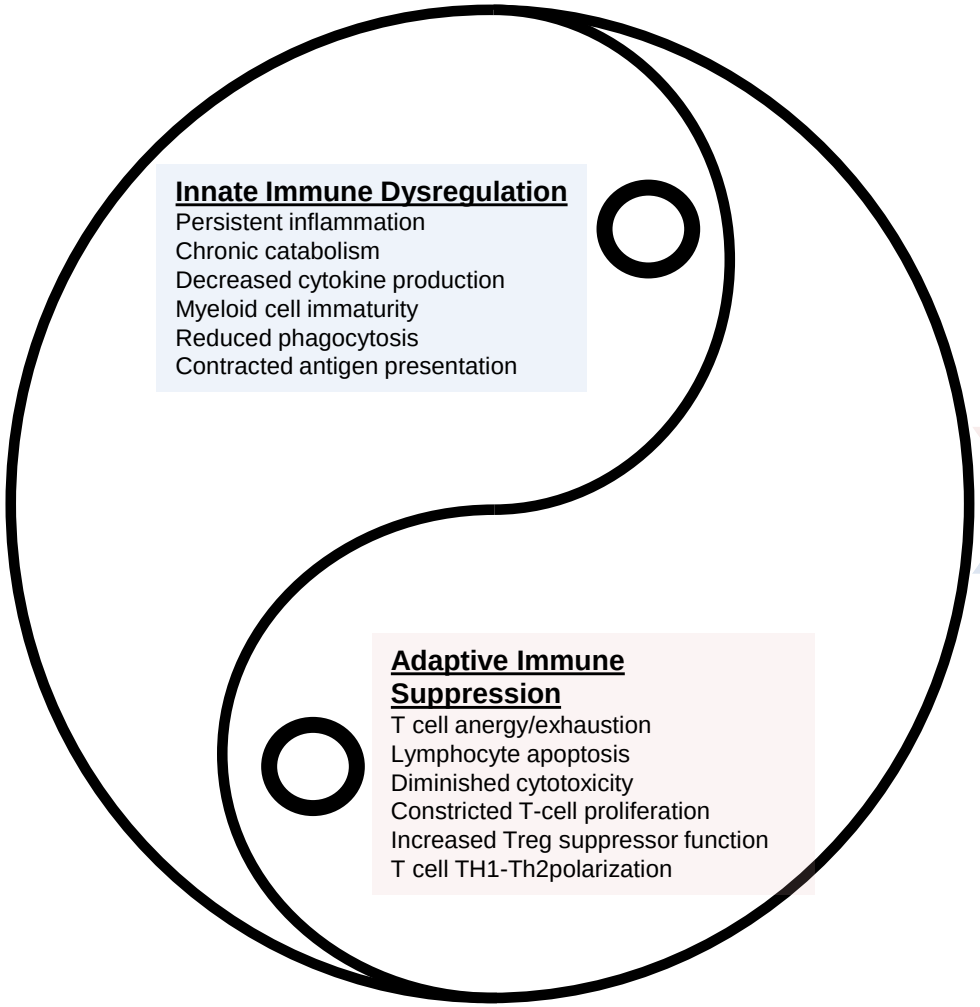

Ongoing Organ Injury
Poor Tissue Regeneration

Hospital Readmission

Recurrent, Persistent, Secondary and Nosocomial Infections

Long-Term Deaths

Delano, MJ. Ward, PA., *Immunological Reviews* 2106

T2D and Infection Susceptibility

Author	Year	Infection type	n	Study design	Main outcome measures	Main findings
Zhao (29)	2009	Skin infection	8,655	Longitudinal matched control	Incidence of skin infections	Higher risk for skin infections (adjusted OR 2.8)
Kornum (57)	2008	CAP	34,329	Population-based matched control	Pneumonia-related hospitalization	Increased risk for CAP-related hospitalization (RR 1.26 [95% CI 1.21–1.31])
Benfield (32)	2007	Infectious diseases	10,063	Prospective	Hospitalization, 28-day mortality	Higher risk for infection-related hospitalizations and UTI-related mortality (HR 3.9 [95% CI 1.2–12.7]); no difference in mortality because of sepsis, CAP, skin infection, and other infections
Boyko (30)	2005	UTI	1,017	Longitudinal matched control	Incidence of UTI	Higher risk of UTI (RR 1.8 [95% CI 1.2–2.7]) and antibiotic treatment (RR 2.3 [95% CI 1.3–3.9])
Thomsen (58)	2004	Pneumococcal bacteremia	598	Matched control	Bacteremia	Higher risk for pneumococcal pneumonia (OR 1.9 [95% CI 1.4 –2.6])
Shah (31)	2003	Infectious diseases	513,749	Matched control	Hospitalization, mortality	Higher risk for hospitalization (RR 2.17 [95% CI 2.10 –2.23]) and infection-related mortality (1.92 [1.79 –2.05]); no difference in in-hospital mortality (1.05 [0.89–1.01] and 0.84 [0.87–1.01])

↑ Infection = ↑ Sepsis

Schuetz, P. et.al. Diabetes Care, Volume 34, March 2011

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T2D and Sepsis

Author	Year	Infection type	n	Study design	Main outcome measures	Main findings
Kornum (37)	2007	CAP	29,900	Population-based cohort	Complications, bacteremia, mortality	Higher mortality rates (1.2 [95% CI 1.1–1.3]), but similar rates of complications and bacteremia; mortality within patients with diabetes increased when initial glucose levels >14 mmol/L in multivariate analysis (adjusted MMR 1.46 [95% CI 1.01–2.12] compared with patients with glucose <6.1 mmol)
Thomsen (36)	2005	*Enterobacteria* bacteremia	1,317	National registry	Bacteremia, 30-day mortality	Higher risk for bacteremia (OR 2.9 [95% CI 2.4–3.4]) and a trend toward higher 30-day mortality (1.4 [1.0–2.0])
Fine (35)	1996	CAP	33,148	Meta-analysis	30-day mortality	Higher risk for mortality (OR 1.3 [95% CI 1.1–1.5])

T2D ⟶ ↑Infection = ↑Sepsis ⟶ ↑Mortality

Schuetz, P. et.al. Diabetes Care, Volume 34, March 2011

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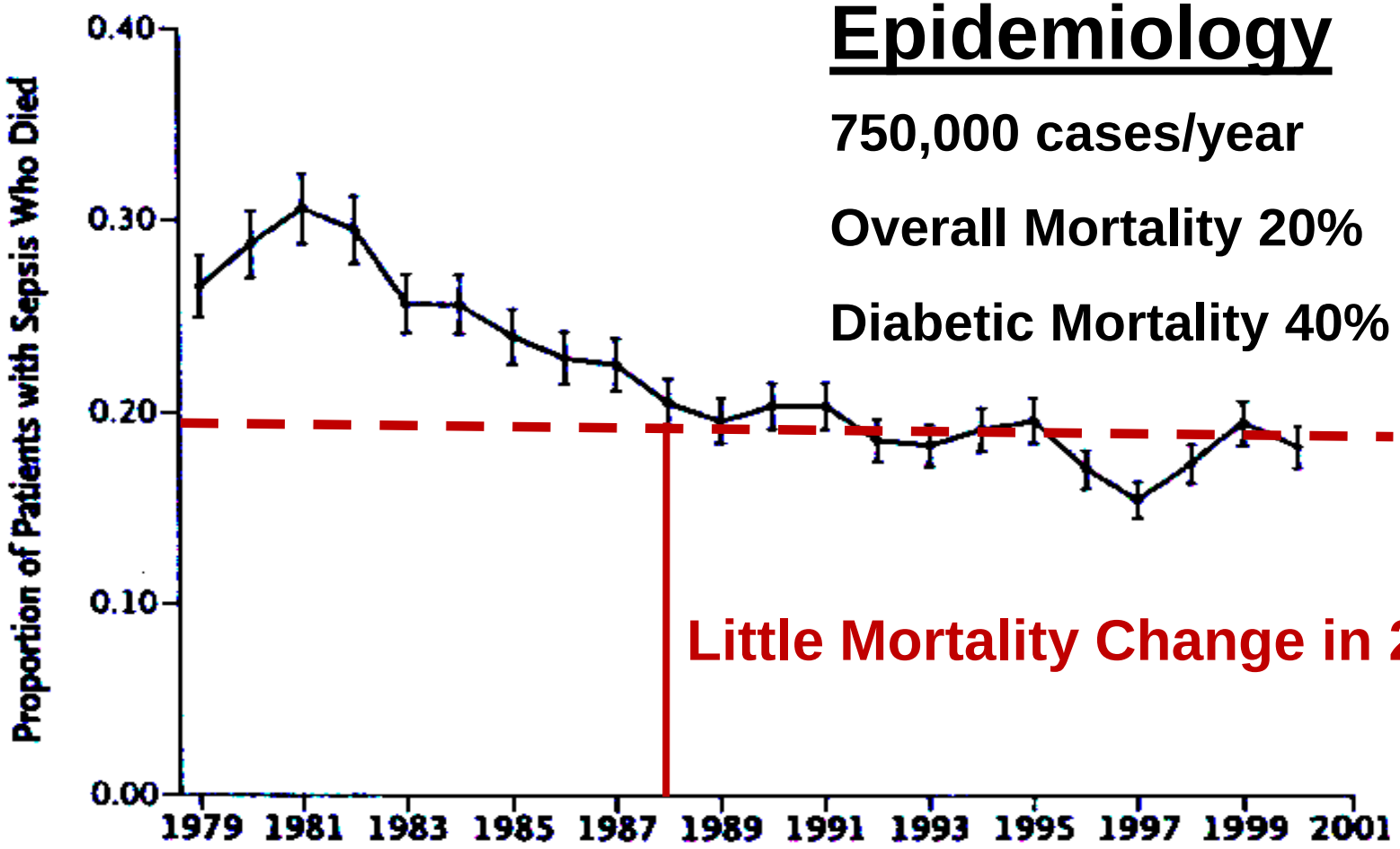
Sepsis Mortality Rate



Epidemiology

750,000 cases/year

Overall Mortality 20%

Diabetic Mortality 40%

Little Mortality Change in 20 yrs!

Martin, GS, *et al*. 2003. *NEJM* 348:1546-54.

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Hypothesis

Over-arching Hypothesis:

T2D acts as an immune deficiency associated with defects in neutrophil function that directly contribute to bacterial persistence and sepsis mortality.

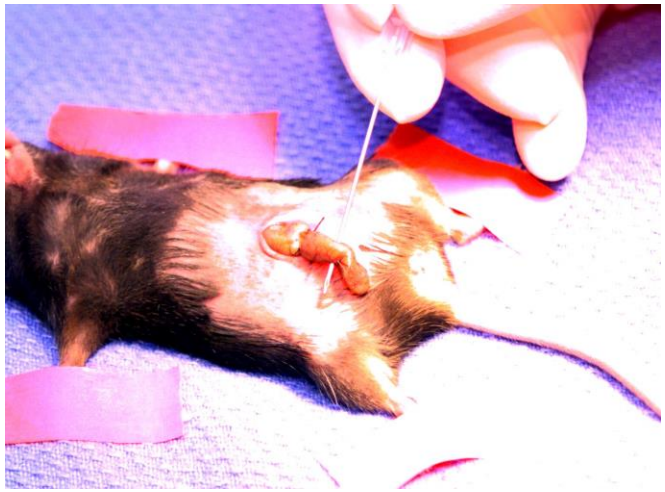
Diet Induced Obesity (DIO)

Key Points:

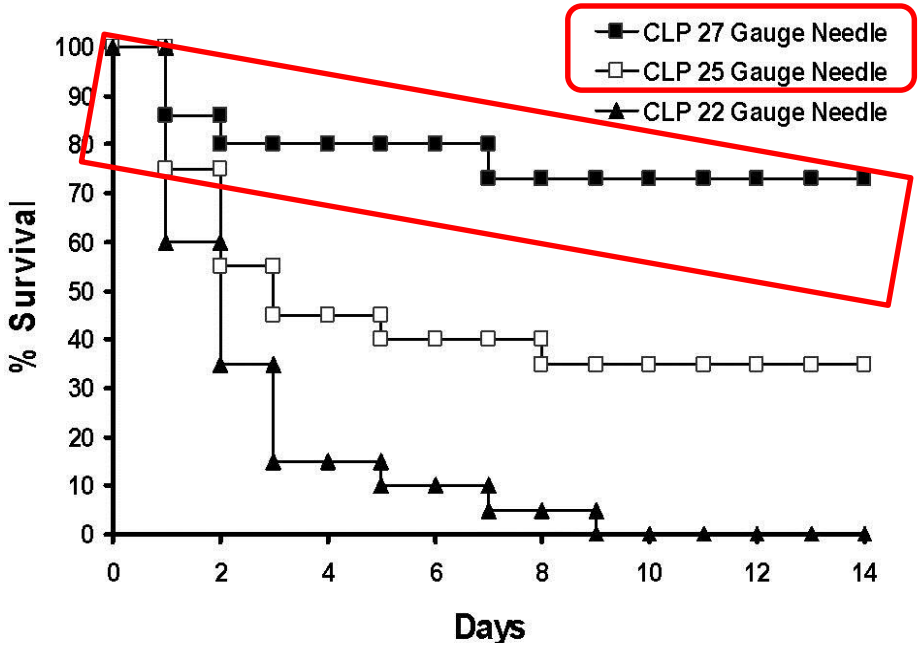
C57BL/6J males and controls at least 30 weeks of age to mimic middle aged and older humans

Model of pre-diabetic type 2 diabetes and obesity with elevated blood glucose and impaired glucose tolerance, hyperlipidemia

DIO and Cecal Ligation and Puncture (CLP)



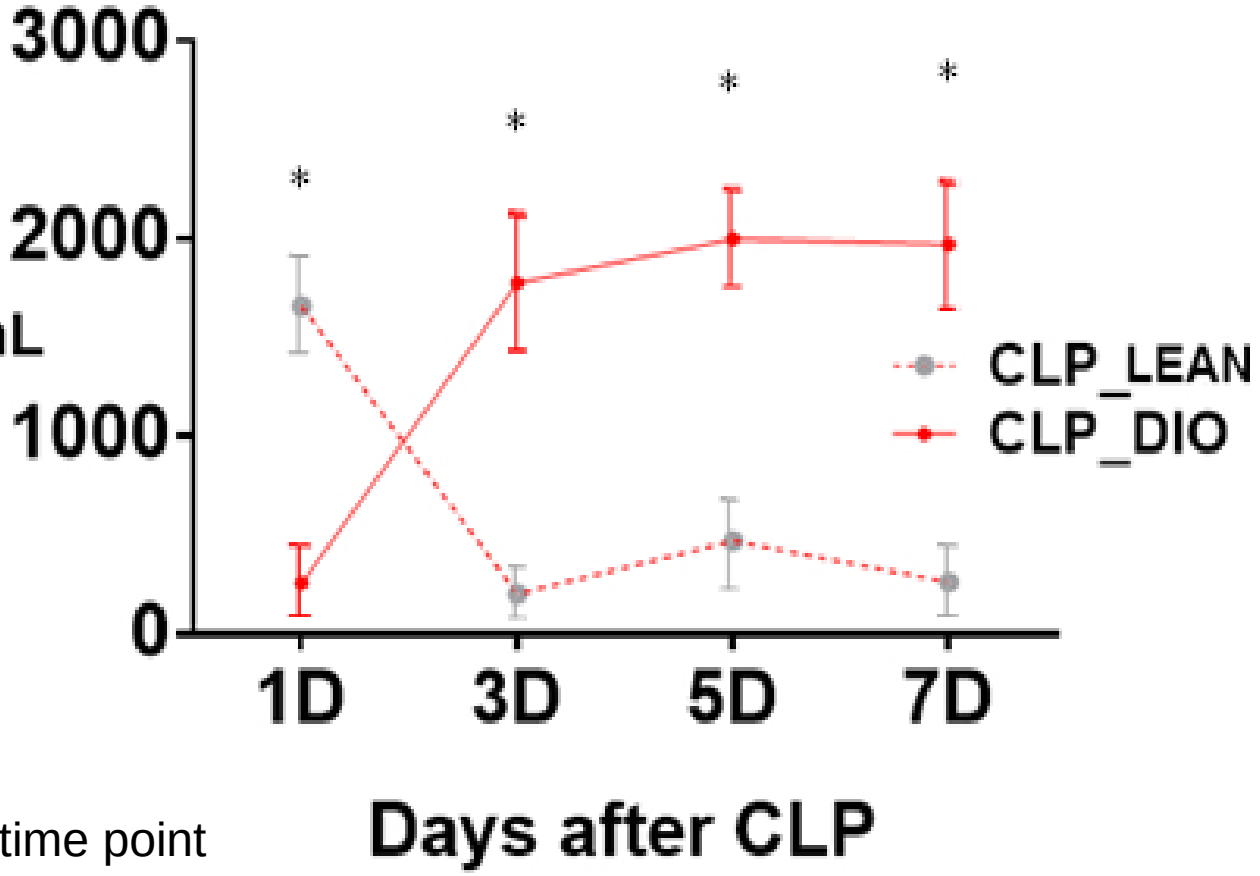
$LD_{10\text{-}20}$ in C57BL/6 mice at 7 days



Delano, M.J., et. al. *J Exp Med*. 2007. 204(6):1463-74.

Cuenca AG, Delano MJ, Kelly-Scumpia KM, Moldawer LL, Efron PA Curr Protoc Immunol. 2010 Nov;Chapter 19:Unit 19.13.

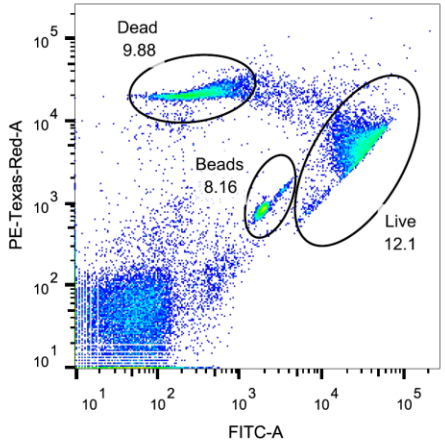
DIO vs WT : Bacteria Eradication

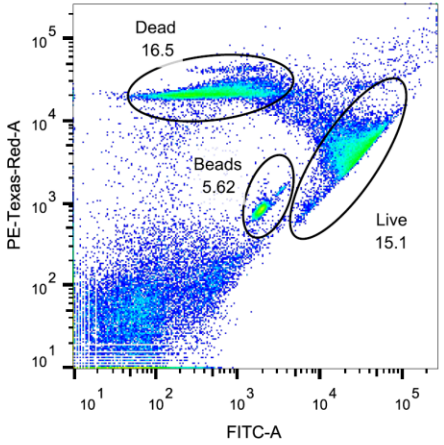


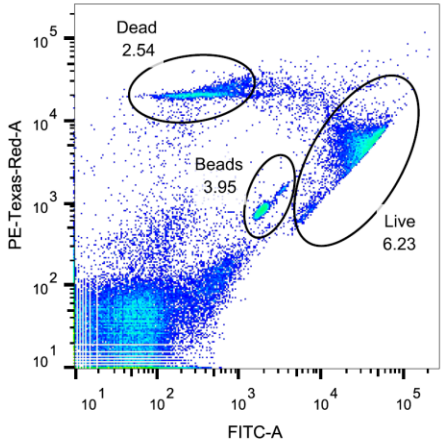
n=5 mice/group/time point
ANOVA

Detect Bacteria by Flow

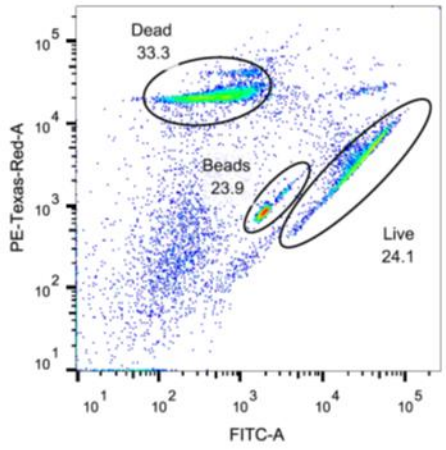
DIO

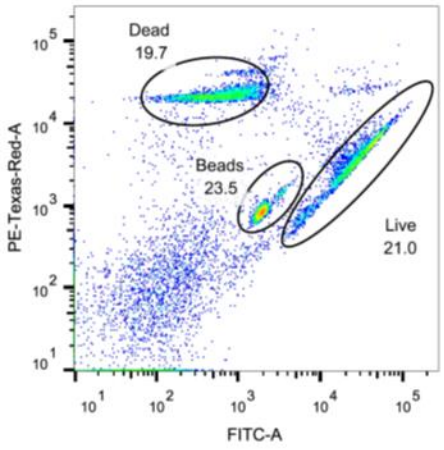


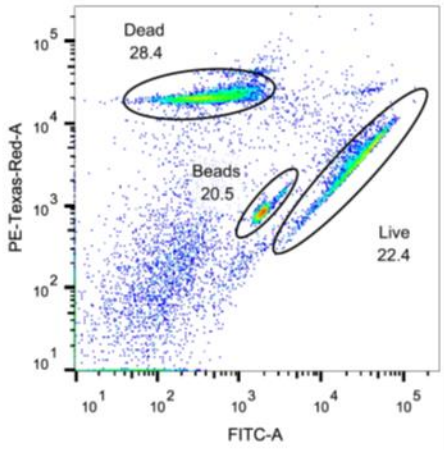




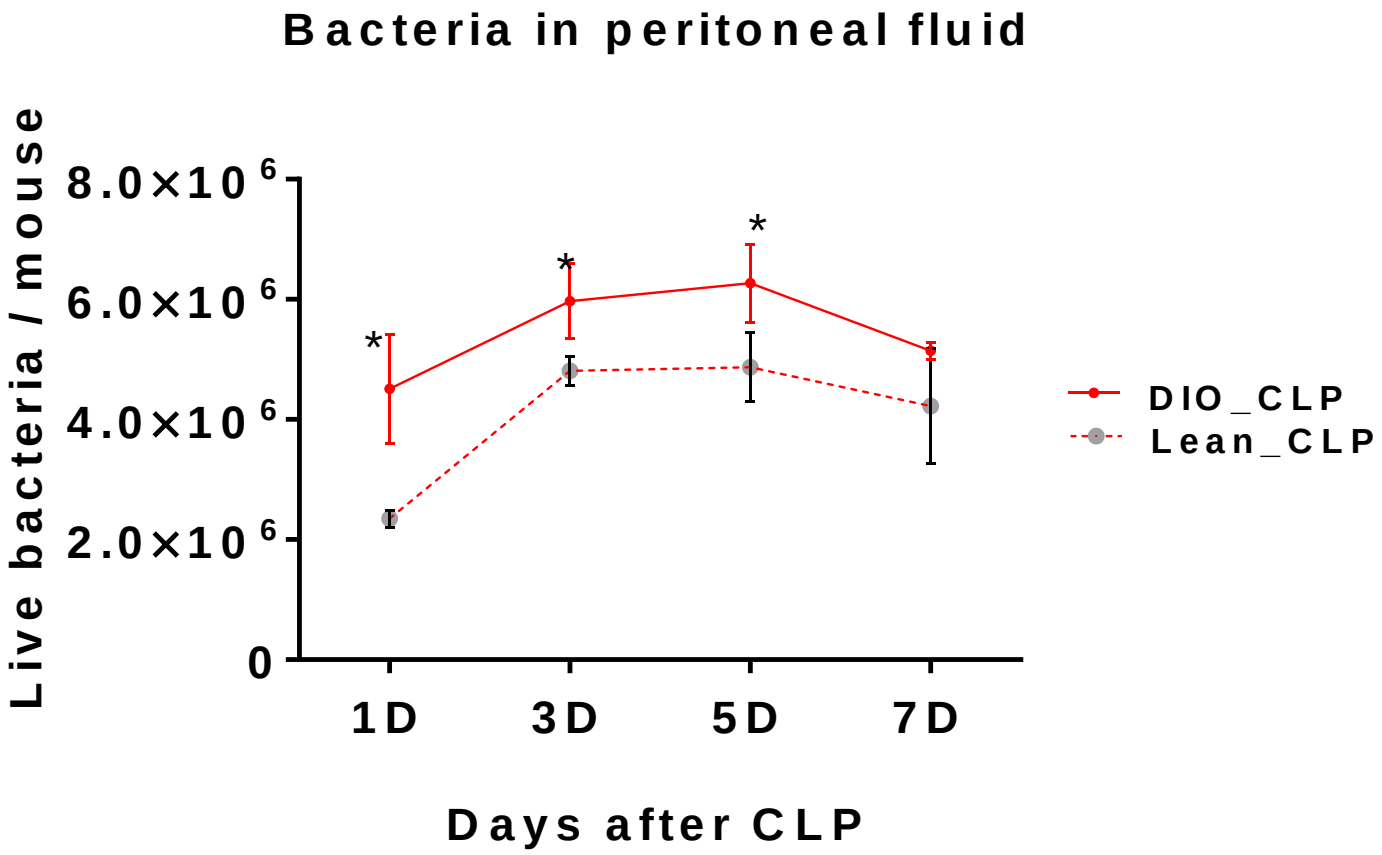
Lean







DIO *vs* Lean : Bacteria in peritoneal fluid



n=5 mice/group/time point, ANOVA

Conclusion

- DIO mice demonstrate overall bacterial persistence compared with Lean controls long after sepsis.
- What accounts for the bacterial persistence observed in the DIO mice?

Conclusions

- Trauma patients admitted with T2D experience much higher rates of all, serious, and infectious complications.
- A better understanding of the physiologic aberrations associated with T2D is necessary to reduce excess morbidity, resource consumption, and improve quality survival in trauma patients with T2D.

Acknowledgements

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Nonprofit corporations and independent licensees
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HEALTH SYSTEM
UNIVERSITY OF MICHIGAN

Questions?

MTQIP CQI Hospital Performance Index Scoring Changes

Judy Mikhail, PhD
Mark Hemmila, MD

MTQIP
Performance Index
2016
2017
2018

Judy Mikhail

Mark Hemmila

2016 Performance Index

- Preliminary final results
  - Site Specific Project
    - Last piece of data due → Dec 16
  - Preliminary results prepared → 2 weeks of Dec
  - Prelim results → Early January
  - Adjudication → Month of January
- Final results to BCBSM → Feb

2017
Performance Index

Michigan Trauma Quality Improvement Program (MTQIP)
Proposed 2017 Performance Index January 1, 2017 to December 31, 2017

Measure	Weight	Measure Description			Points	
#1	10	**Data Submission (Partial/Incomplete Submissions No Points)**				PARTICIPATION (30%)
		On time and complete 3 of 3 times			10	
		On time and complete 2 of 3 times			5	
		On time and complete 1 of 3 times			0	
#2	10	**Meeting Participation All Disciplines *Surgeon represents 1 hospital only**				
		Surgeon, and (TPM or MCR) Participate in 3 of 3 Collaborative meetings (9 pts)			0-10	
		Surgeon, and (TPM or MCR) Participate in 2 of 3 Collaborative meetings (6 pts)				
		Surgeon, and (TPM or MCR) Participate in 1 of 3 Collaborative meetings (3 pts)				
		Surgeon, and (TPM or MCR) Participate in 0 of 3 Collaborative meetings (0 pts)				
		Registrar, and/or MCR Participate in the Data Abstractor Meeting (1 pt)				
#3	10	**Data Accuracy**	**1st Validation Visit-Error Rate**	**≥2 Validation Visits-Error Rate**		
		5 Star Validation	0-4.5%	0-4.0%	10	
		4 Star Validation	4.6-5.5%	4.1-5.0%	8	
		3 Star Validation	5.6-8.0%	5.1-6.0%	5	
		2 Star Validation	8.1-9.0%	6.1-7.0%	3	
		1 Star Validation	>9.0%	>7.0%	0	

#4	10	**Venous Thromboembolism (VTE) Prophylaxis Initiated Within 48 Hours of Arrival in Trauma Service Admits with ≥ 2 Day Length of Stay (18 Mo's: 1/1/16-6/30/17)** ≥ 50% ≥ 40% < 40%	 10 5 0	PERFORMANCE (70%)
#5	10	**LMWH VTE Prophylaxis Use in Trauma Service Admits (18 Mo's: 1/1/16-6/30/17)** ≥ 50% 21-49% 5-20% < 5%	 10 7 5 0	
#6	10	**Red Blood Cell to Plasma Ratio (Weighted Mean) of Patients Transfused ≥5 Units in 1st 4 Hours (18 Mo's: 1/1/17-6/30/18)** 10 pts: Tier 1: ≤ 1.5 10 pts: Tier 2: 1.6-2.0 5 pts: Tier 3: 2.1-2.5 0 pts: Tier 4: >2.5	 0-10	
#7	10	**Serious Complication Rate-Trauma Service Admits (3 years: 7/1/14-6/30/17)** Major improvement (z-score less than -1 or serious complication low-outlier) Moderate improvement/maintained complication rate (z-score between 0 and -1) No improvement/rates of serious complications increased (z-score ≥ 0)	 10 5 0	
#8	10	**Mortality Rate-Trauma Service Admits (3 years: 7/1/14-6/30/17)** Major improvement (z-score less than -1 or mortality low outlier) Moderate improvement/maintained mortality rate (z-score between 0 and -1) No improvement/rates of mortality increased (z-score ≥ 0)	 10 5 0	
#9	10	**Inferior Vena Cava Filter Use (All Admits) (Collaborative Wide) (7/1/16-6/30/17)** ≤ 1.2 > 1.2	 10 0	
#10	10	**Site Specific Quality Improvement Project (Jan-Dec 2017)** Implemented, and met or exceeded target Implemented, showed improvement, but did not meet target Implemented, but showed no improvement	 10 7 0	
		Total (Max Points) =	100	

2017 Performance Index

- Consolidated surgeon, TPM, MCR, and registrar attendance into one metric.
- Changed the ranges for validation scoring
- Added LMWH usage (low target – higher target)
- Added serious complication z-score
- Added mortality z-score
- Reduced IVC filter use rate

2017 Performance Index

- LMWH usage
  - ≥ 50% 10 points
  - 21-49% 7 points
  - 5-20% 5 points
  - < 5% 0 points
- Reduced IVC filter use rate
  - 1.2 %

Site Specific Projects Planning for 2017

2016

Measure	#
LMWH Use	7
VTE Prophy None	6
Pneumonia	3
DVT	1
C Diff	1
Acute Lung Injury	1
VTE	1
Vent Days	2
ICU LOS	1
ICU Admissions	1
Unplanned Ret OR	1
Unplanned Ret ICU	3
Unplanned Intubation	2

2017

LMWH use will need to change

- 2016 PI Projects end in Dec
- Can keep same measure or → new
- Plan now for:
  - 2017 measure selection
  - Baseline data → Nov-Dec 2016
  - Establish your target
  - Targets will be reviewed by advisory board for equity

2017 Site Specific Project

MTQIP Data Submissions		Site Specific Projects Due Dates
February	→	April 21, 2017
June	→	August 25, 2017
October	→	December 22, 2017

2018
Proposed Performance Index

Michigan Trauma Quality Improvement Program (MTQIP) **Proposed 2018 Performance Index** January 1, 2018 to December 31, 2018						
Measure	**Weight**	**Measure Description**			**Points**	
#1	10	**Data Submission (Partial/Incomplete Submissions No Points)**				PARTICIPATION (30%)
		On time and complete 3 of 3 times			10	
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#5	10	**LMWH VTE Prophylaxis Use in Trauma Service Admits (18 Mo's: 1/1/17-6/30/18)** ≥ 50% 37-49% 25-36% 20-24% < 20%	 10 7 5 3 0	
#6	10	**Red Blood Cell to Plasma Ratio (Weighted Mean) of Patients Transfused ≥5 Units in 1st 4 Hours (18 Mo's: 1/1/17-6/30/18)** 10 pts: Tier 1: ≤ 1.5 10 pts: Tier 2: 1.6-2.0 5 pts: Tier 3: 2.1-2.5 0 pts: Tier 4: >2.5	0-10	
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#10	10	**Site Specific Quality Improvement Project (Jan-Dec 2017)** Implemented, and met or exceeded target Implemented, showed improvement, but did not meet target Implemented, but showed no improvement	 10 7 0	
		Total (Max Points) =	100	

2018 Performance Index

- Changed the LMWH usage scoring
  - ≥ 50% 10 points
  - 37-49% 7 points
  - 25-36% 5 points
  - 20-24% 3 points
  - < 20% 0 points
- Reduced IVC filter use rate
  - 1.0 %

MTQIP Future Vision

Mark Hemmila, MD

Conclusion

- Evaluations
  - Fill out and turn in
- Questions?
- See you in February