

The Michigan Trauma Quality Improvement Program

Virtual
February 6, 2024



Disclosures

- ◆ Salary Support for MTQIP from BCBSM/BCN and MDHHS
 - Mark Hemmila
 - Bryant Oliphant
 - Judy Mikhail
 - Jill Jakubus

Disclosures

◆ Mark Hemmila Grants

- Blue Cross Blue Shield of Michigan
 - MTQIP
- Michigan Department of Health and Human Services
 - MTQIP, MOPEN
- Toyota North America, Insurance Institute for Highway Safety
 - VIPA - Vulnerable Road Users Injury Prevention Alliance
- Henry Jackson Foundation, DOD
 - Combat Wound Infection Study

Welcome

Blood Bank Personnel



Created by Adrien Coquet
from Noun Project

Trauma Surgery



Evaluations

- ◆ Link will be emailed to you following meeting
- ◆ Please answer the evaluation questions
- ◆ 4.75 CME credits for this meeting

Future Meetings

◆ Spring

- Wednesday May 1, 2024
- Kalamazoo, Radisson Plaza Hotel

◆ Registrars

- Tuesday June 4, 2024
- Ypsilanti, EMU Marriott

◆ Fall

- Tuesday October 8, 2024
- Ypsilanti, EMU Marriott

Agenda

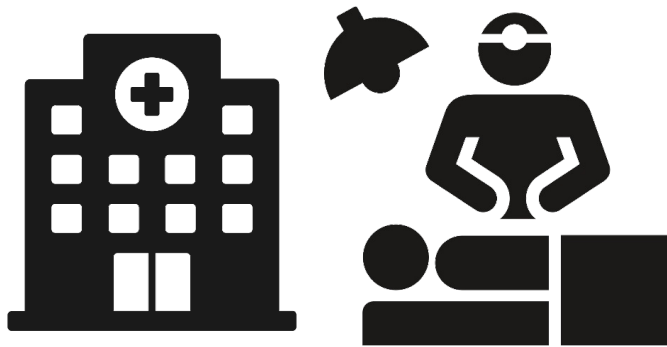
- Introductions
- MTQIP Explained
- Massive Transfusion
 - Survey Results
 - Trauma Center Presentations
- Whole Blood
- Break

Agenda

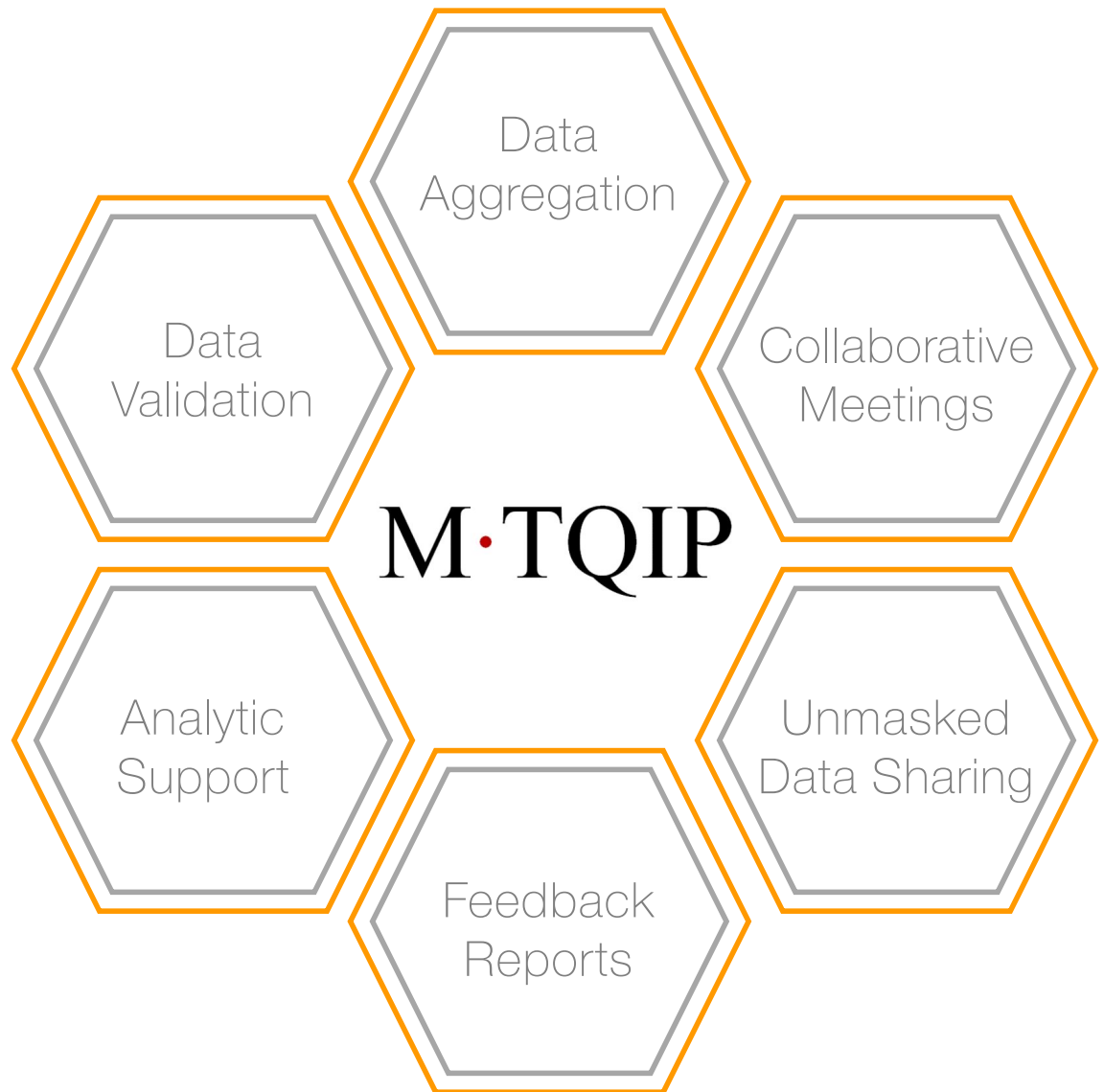
- MTQIP Performance Index/Reports
- Death Determination
- Program Manager Update
 - Interventional Radiology
- MTQIP Research Spotlight
 - Alistair Chapman, MD
- MTQIP/MACS Future Metrics



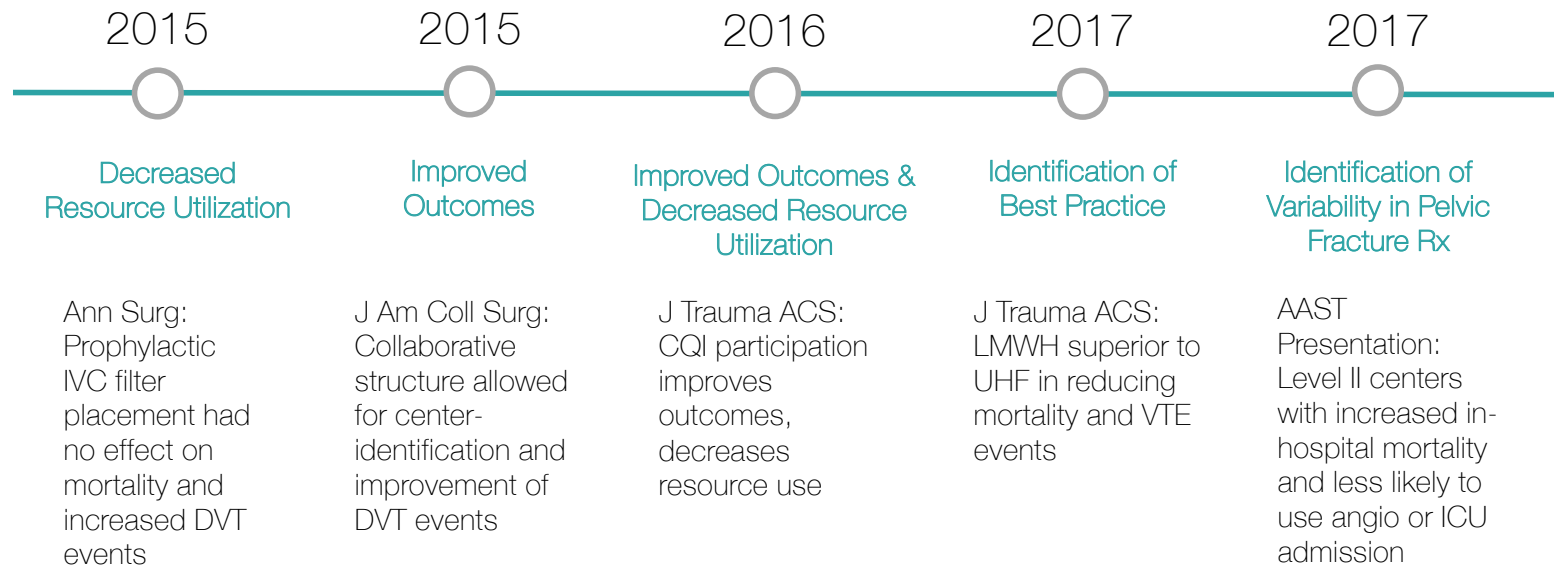
**Blue Cross
Blue Shield**
of Michigan



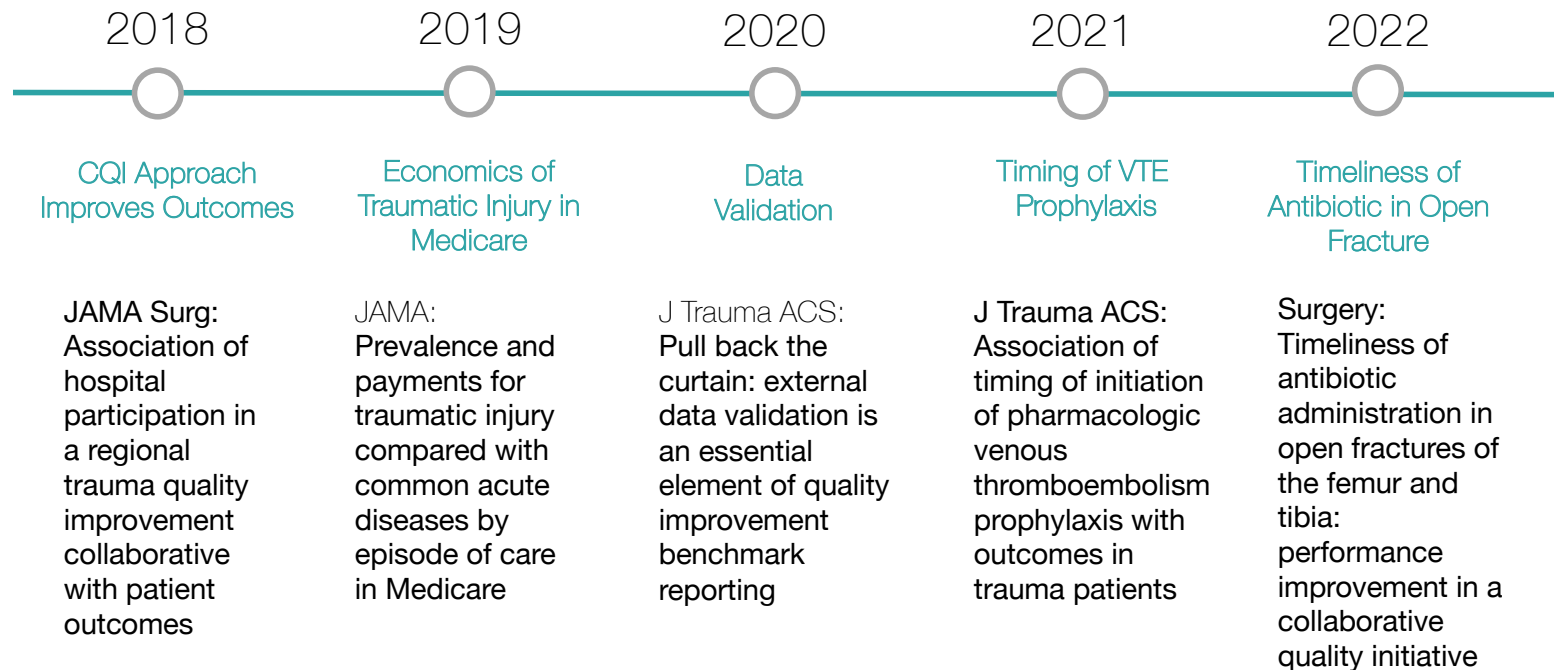
35 Level 1 and 2 Trauma Centers



The Impact



The Impact



Michigan Trauma Quality Improvement Program

Dedicated to improving the quality of care delivered to trauma patients

M·TQIP

VTE Prophylaxis Administration



23% → 59%
2012 2021
↑ 8.6K patients/yr

Getting trauma patients
the right drug at the right
time

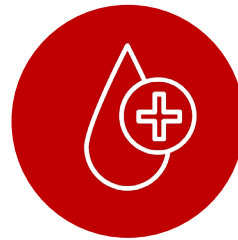
Timely Hip Fracture Repair



79% → 93%
2016 2021
↑ 543 patients/yr

Getting elderly patients
to the operating room to
get the right care

Massive Transfusion Resuscitation



54% → 88%
2013 2021
↑ 118 patients/yr

Getting patients with
bleeding the right blood
products

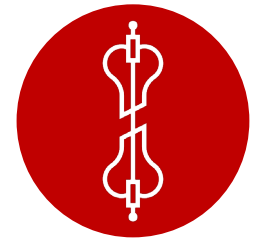
Traumatic Brain Injury



65% → 86%
2016 2021
↑ 107 patients/yr

Getting patients with
traumatic injury the
right imaging

Open Fracture Antibiotic



77% → 90%
2017 2021
↑ 100 patients/yr

Getting patients with an
open fracture the right
antibiotic

How do you create change?

Motivation Levers



Reports



Unmasking

A- B+
C

Hospital Index

M·TQIP

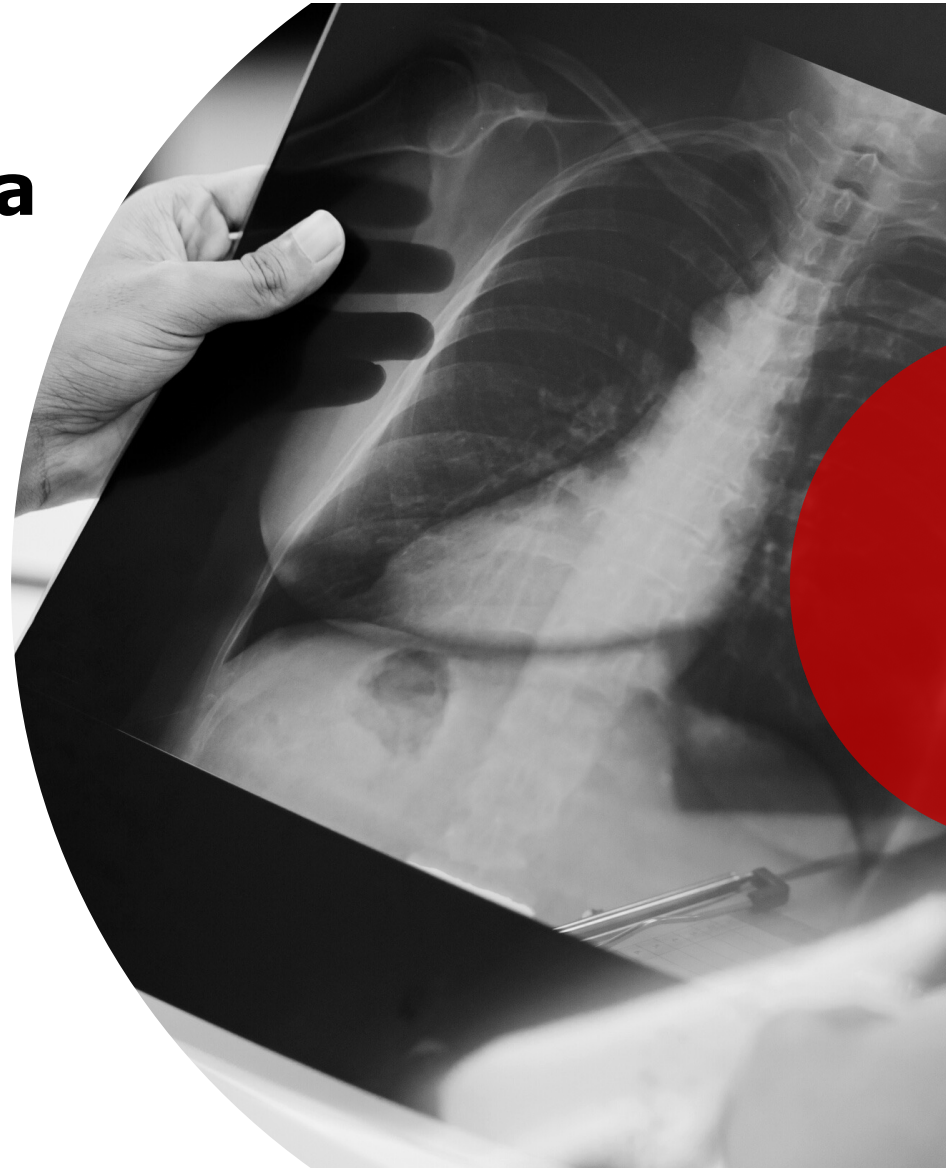
Create meaningful feedback

What do people want in data reports?

How do I look

Timely

Easy to read



Aggregate Feedback

Outcomes/Mortality Dashboard

Outcomes	Center	MTQIP	95% CI
Failure to Rescue	20.2	23.4	●
Superficial SSI	0.4	0.2	●
Deep SSI	0.3	0.2	●
Organ/Space SSI	0.2	0.2	●
Wound Disruption	0.1	0.1	●
Abd. Fascia Left Open	0.2	0.4	●
Acute Lung Injury/ARDS	0.9	0.5	●
Pneumonia	5.5	2.8	●
Unpl Intubation	2.2	1.5	●
Pulmonary Embolism	0.7	0.4	●
Renal Insufficiency	0.0	0.1	●
Acute Renal Failure	0.8	0.6	●
Urinary Tract Infection	3.0	1.1	●

Mortality	Center	MTQIP	95% CI
Dead	4.4	4.9	●
Dead or Hospice	5.0	5.9	●
Cohort 2 (Admit to Trauma Service)	4.3	4.8	●
Cohort 3 (Blunt Multi-System)	14.4	16.4	●
Cohort 4 (Blunt Single-System)	4.1	4.4	●
Cohort 5 (Penetrating)	10.4	12.3	●
Age 16-24	3.6	4.5	●
Age 25-44	2.7	4.0	●
Age 45-64	3.4	4.0	●
Age 65-84	5.7	5.9	●
Age >84	6.7	7.2	●
White	4.4	4.9	●
Non-white	1.7	4.7	●

Provider Feedback

Shock Drill Down

Trauma #	Age	Mechanism	ED SBP	Lowest ED BP	ISS	4 hr PRBC/FFP	24 hr PRBC/FFP	First Intervention	Both	Time to (hrs)	Mortality	Surgeon
67	67	Blunt	153	62	33	4.0	4.0	None	0	0.0	1	Jim Harbaugh
45	45	Blunt	124	79	29	4.0	2.5	Angio	1	7.0	0	John Adams
30	30	Blunt	44	24	20	3.5	3.5	Operation	0	0.0	1	Jim Harbaugh
67	67	Blunt	83	74	33	3.0	4.0	None	0	0.0	0	John Adams
45	45	Penetrating	101	86	19	3.0	2.0	Operation	0	1.1	0	Thomas Jefferson
30	30	Blunt	61	61	57	3.0	3.0	None	0	0.0	1	James Madison
67	67	Blunt	133	83	16	2.7	3.0	Operation	0	0.9	0	James Monroe
45	45	Blunt	155	46	34	2.5	2.5	None	0	0.0	1	Urban Meyer
30	30	Blunt	84	84	48	2.5	2.5	Angio	1	1.4	0	Jim Harbaugh
67	67	Blunt	105	66	34	2.0	3.0	Operation	0	2.1	1	John Adams
30	30	Blunt	182	63	43	1.3	1.3	None	0	0.0	0	Urban Meyer
67	67	Blunt	144	78	33	1.3	1.3	None	0	0.0	0	Jim Harbaugh
45	45	Blunt	148	44	34	1.0	1.0	Operation	0	1.0	1	John Adams
30	30	Penetrating	81	75	8	1.0	1.0	Operation	0	0.9	0	Thomas Jefferson
83	83	Blunt	100	47	38	1.0	5.0	Operation	0	4.7	1	James Madison
80	80	Blunt	106	70	8	0.2	0.6	Operation	0	1.6	0	James Monroe
46	46	Blunt	116	71	43			None	0	0.0	0	Urban Meyer

Performance Feedback

Scorecard

Michigan Trauma Quality Improvement Program (MTQIP)				
2024 Performance Index				
January 1 to December 31, 2024				
Measure	Weight	Measure Description	Points	PARTICIPATION (30%)
#1	10	Data Submission		
		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	0-10	
		Surgeon and TPM or MCR attend 3 of 3 meetings	9	
		Surgeon and TPM or MCR attend 2 of 3 meetings	6	
		Surgeon and TPM or MCR attend 0-1 of 3 meetings	0	
		Registrar or MCR attend the annual June data abstractor meeting	1	
#3	10	Data Validation Error Rate		
		0.0-3.0%	10	
		3.1-4.0%	8	
		4.1-5.0%	5	
		> 5.0%	0	

#4	5	PI Death Determination Documentation (12 mo: 7/1/23-6/30/24) 0-2 Cases missing documentation 3-4 Cases missing documentation > 4 Cases missing documentation	5 3 0	PERFORMANCE (70%)
#5A	8	Timely LMWH VTE Prophylaxis in Trauma Admits (18 mo: 1/1/23-6/30/24) ≥ 52.5 % of patients (≤ 48 hr) ≥ 50.0 % of patients (≤ 48 hr) ≥ 45.0 % of patients (≤ 48 hr) < 45.0 % of patients (≤ 48 hr)	8 6 3 0	
#5B	2	Weight Based LMWH Protocol in Use (12mo: 7/1/23-6/30/24) Yes No	2 0	
#6	10	Timely Surgical Repair in Geriatric (Age ≥ 65) Isolated Hip Fxs (12 mo: 7/1/23-6/30/24) ≥ 92.0 % of patients (≤ 42 hr) ≥ 87.0 % of patients (≤ 42 hr) ≥ 85.0 % of patients (≤ 42 hr) < 85.0 % of patients (≤ 42 hr)	10 8 5 0	
#7	10	RBC to Plasma Ratio in Massive Transfusion (18 mo: 1/1/23-6/30/24) Weighted Mean Points in Patients Transfused ≥ 5 Units 1st 4 hr	0-10	
#8	10	Serious Complication Z-Score Trend in Trauma Admits (3 yr: 7/1/21-6/30/24) < -1 (major improvement) -1 to 1 or serious complications low outlier (average or better rate) > 1 (rates of serious complications increased)	10 7 5	
#9	10	Mortality Z-Score Trend in Trauma Admits (3 yr: 7/1/21-6/30/24) < -1 (major improvement) -1 to 1 or mortality low outlier (average or better) > 1 (rates of mortality increased)	10 7 5	
#10	5	Patient Reported Outcomes Participation (12 mo: 7/1/23-6/30/24) Signed agreement and ≥90% of patients contact information submitted No agreement OR Signed agreement and <90% of patients contact information submitted	5 0	
#11	10	Timely Antibiotic in Femur/Tibia Open Fractures - <u>COLLABORATIVE WIDE MEASURE</u> (12 mo: 7/1/23-6/30/24) ≥ 85% patients (≤ 90 min) < 85% patients (≤ 90 min)	10 0	
Total (Max Points) =			100	

How hard is it?

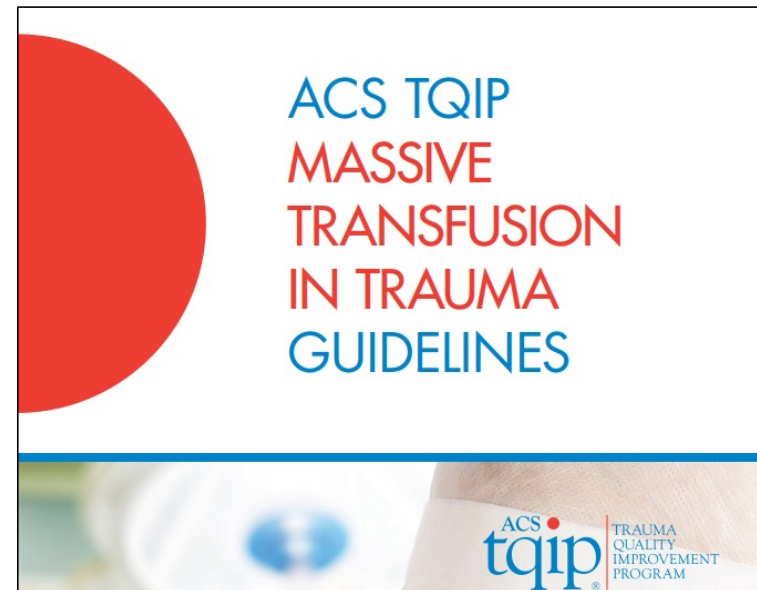
Trauma > Hemorrhage > Stop the bleed



M•TQIP

The ratio of Blood Products Matters

- Literature
 - 1:1:1 Blood, Plasma, Platelets
 - Better hemostasis
 - Increased 24 hr survival
 - Decreased overall mortality +/-
- Accepted practice
 - 1:1 or 2:1 Blood to Plasma ratio
- MTQIP Hospital CQI Metric
 - 2014



M•TQIP

Scoring of Resuscitation



Scoring of Resuscitation

- "OK Underline" – a perfect pass, generally under unfavorable circumstances. Naval aviators often have hundreds of carrier landings without ever receiving this grade. Worth 5 points.
- "OK" – a pass with only very minor deviations from centerline, glideslope and angle of attack. Worth 4 points.
- "Fair" – a pass with one or more safe deviations and appropriate corrections. Worth 3 points.
- "[Bolter](#)" - a safe pass where the hook is down and the aircraft does not stop. Worth 2.5 point, but counts against pilot/squadron/wing "boarding rate".
- "No Grade" – a pass with gross (but still safe) deviations or inappropriate corrections. Failure to respond to LSO calls will often result in this grade. Worth 2 points.
- "Technique Waveoff" – a pass with deviations from centerline, glideslope and/or angle of attack that are unsafe and need to be aborted. Worth 1 point.
- "Cut Pass" – an unsafe pass with unacceptable deviations, typically after a wave off is possible. Worth zero points.
- "Foul Deck Waveoff" – a pass that was aborted due to the landing area being "fouled". No points are assigned, and the pass is not counted toward the pilots landing grade average

Scoring of Resuscitation

Light Attack Greenie Board

Billet	Pilot Name/Type Aircraft	Call Sign	Sq	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CO -	Mo Peelle/A-4	Warchief 1	VA-23																									
XO -	Chuck Sweeney/A-4	FlyingEagle 2	VA-212																									
OPS -	Bob Kison/AD	FOFA Pres 1	VA-25																									
MAINT -	John Burkeholder/A-7	Burkee	VA-56																									
ADMIN -	Bill Gilchrist/A-4	OK3	VA-23																									
SAFETY -	Chuck Muhl/AD	Charlie	VA-25																									
NATOPS -	Will Trafton/A-7	Benjo	VA-56																									
SKEDS -	Bill Ashley/AD	Bakabill	VA-104																									
WEPS -	Steve Endacott/A-7	Squat	VA-56																									
QA -	Jack Feldhaus/AD	Locket 1	VA-25																									
LSO -	Mike Webber/A-4	Moon Pie	VA-23																									
LINE -	Craig Cover/A-7	Crash	VA-153																									
PERS -	Harry Najarian/A-7	Nudge	VA-153																									
A/C DIV -	Lee Van Oss/A-7	Beaver	VA-153																									

OK - Minimum deviations with good corrections.
 Fair - Reasonable deviations with average corrections.
 No Grade - Below average corrections but a safe pass
 Cut - Unsafe, gross deviations inside the wave off window

Black dot indicates night pass
 N/C No count, special case (Emergency)
 Wave Off
 Bolter - tailhook did not catch a wire, aircraft went around for another pass

Michigan Trauma Quality Improvement Program (MTQIP) 2018 Performance Index January 1, 2018 to December 31, 2018				
Measure	Weight	Measure Description		Points
#1	10	Data Submission (Partial/Incomplete Submissions No Points) On time and complete 3 of 3 times On time and complete 2 of 3 times On time and complete 1 of 3 times		10 5 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) 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)		0-10
#3	10	Data Accuracy 5 Star Validation 4 Star Validation 3 Star Validation 2 Star Validation 1 Star Validation	Error Rate 0-4.0% 4.1-5.0% 5.1-6.0% 6.1-7.0% >7.0%	10 8 5 3 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: 1/1/17-6/30/18) ≥ 55% ≥ 50% ≥ 40% < 40%		10 8 5 0
#5	10	Low Molecular Weight Heparin (LMWH) Venous Thromboembolism (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 Points) of Patients Transfused ≥5 Units in 1st 4 Hours (18 Mo's: 1/1/17-6/30/18) (See calculation info on page 2)		0-10
#7	10	Serious Complication Rate-Trauma Service Admits (3 years: 7/1/15-6/30/18) Z-score: < -1 (major improvement) Z-score: -1 to 1 or serious complications low-outlier (average or better rate) Z-score: > 1 (rates of serious complications increased)		10 7 5
#8	10	Mortality Rate-Trauma Service Admits (3 years: 7/1/15-6/30/18) Z-score: < -1 (major improvement) Z-score: -1 to 1 or mortality low-outlier (average or better rate) Z-score: > 1 (rates of mortality increased)		10 7 5
#9	10	Open Fracture Antibiotic Usage (12 Mo's: 7/1/17-6/30/18) ≥ 90% patients (Antibiotic type, date, time recorded) ≥ 80% patients (Antibiotic type, date, time recorded) ≥ 70% patients (Antibiotic type, date, time recorded) < 70% patients (Antibiotic type, date, time recorded)		10 7 5 0
#10	10	Head CT Scan performed in ED on patient taking anticoagulation medication with head injury (12 Mo's: 7/1/17-6/30/18) ≥ 90% patients (Head CT scan in ED with date and time recorded) ≥ 80% patients (Head CT scan in ED with date and time recorded) ≥ 70% patients (Head CT scan in ED with date and time recorded) < 70% patients (Head CT scan in ED with date and time recorded)		10 7 5 0
Total (Max Points) =				100

PARTICIPATION (30%)

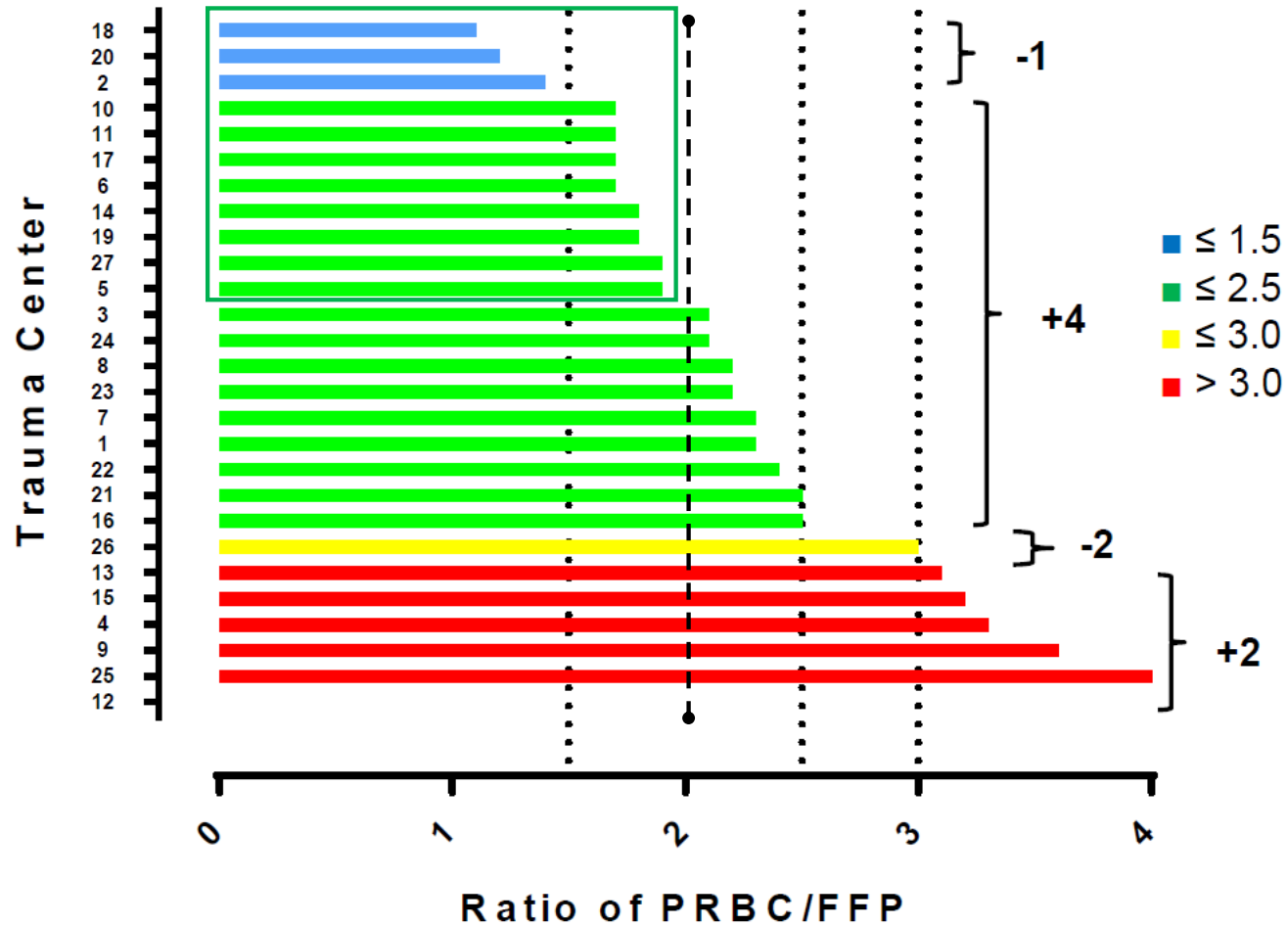
PERFORMANCE (70%)

Measure 6: Red Blood Cell to Plasma Ratio

1) Assign (weight) to each individual patient's 4 hr PRBC/FPP ratio to correct tier/points using chart below.

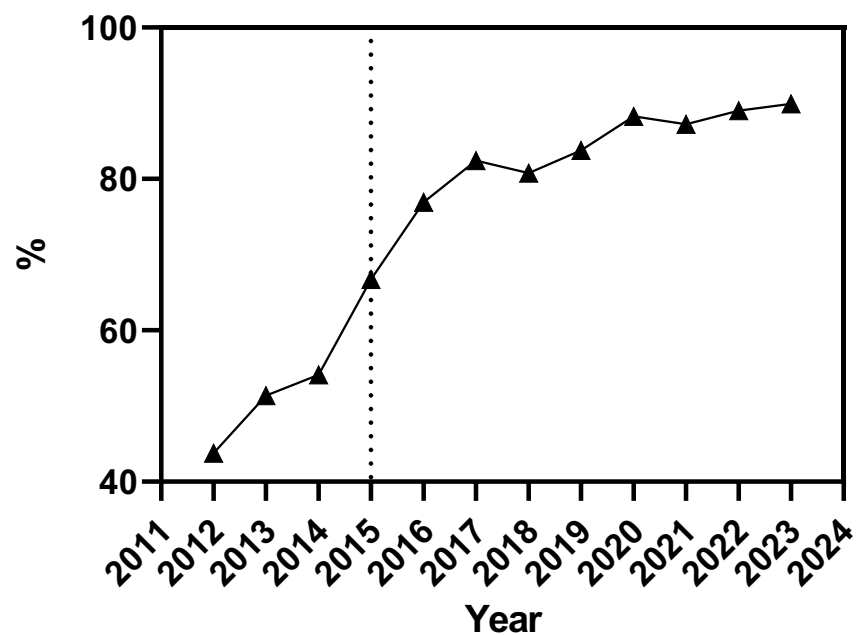
PRBC to Plasma Ratio	Tier	Points
≤ 1.5	1	10
1.6 – 2.0	2	10
2.1 – 2.5	3	5
> 2.5	4	0

Blood Product Ratio in first 4 hrs if ≥ 4 uPRBCs

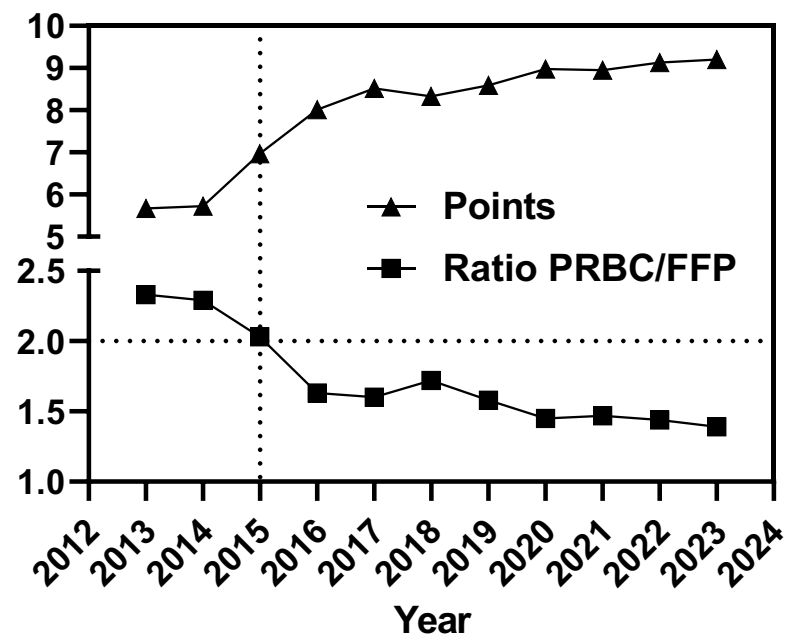


7/1/13 to 12/31/14

**% Patients with Blood Product Ratio
 ≤ 2.0 in first 4 hrs**



Blood Product Ratio in first 4 hrs



Trauma Centers

Name

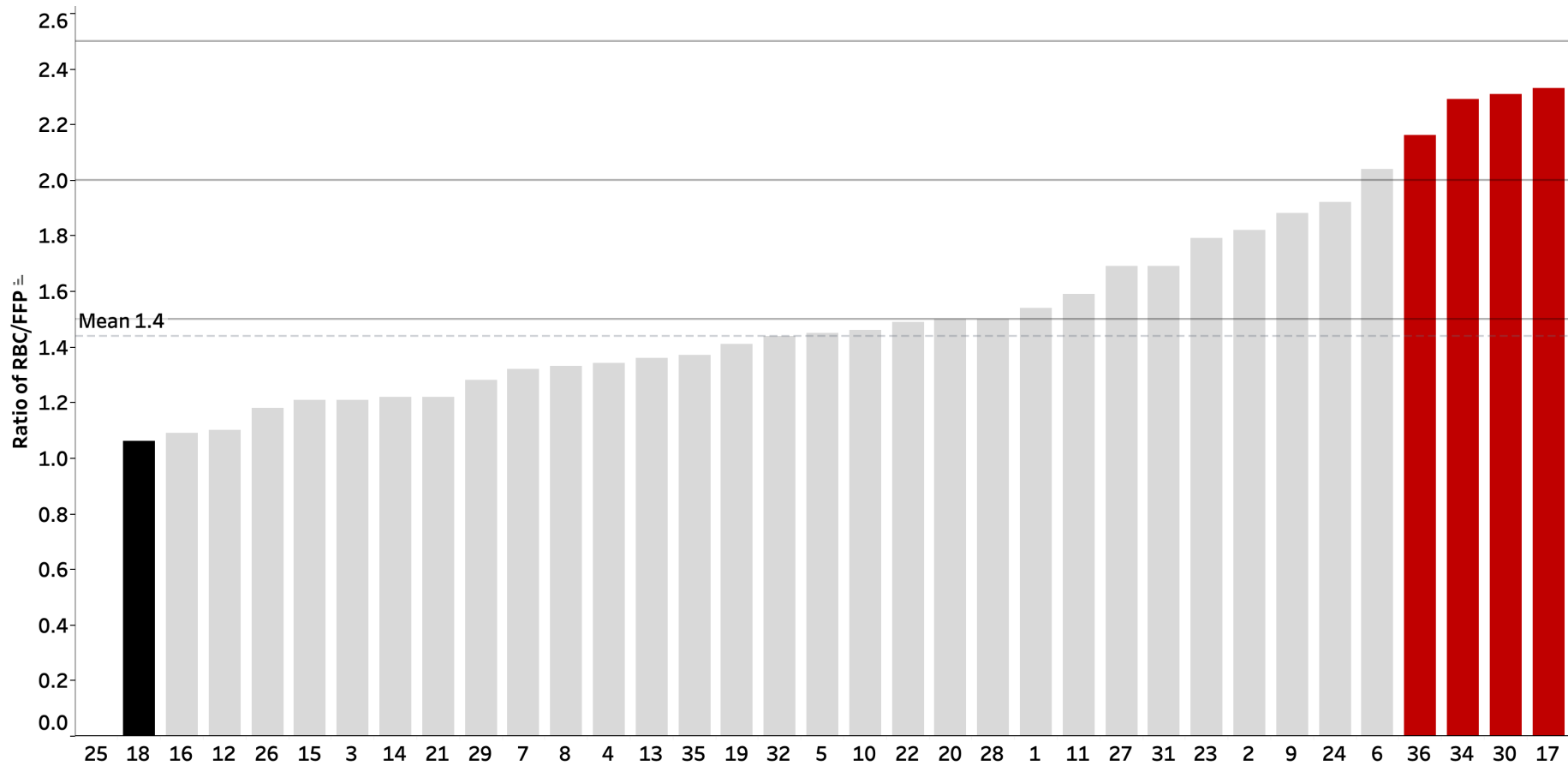
Ascension Borgess Hospital
Ascension Genesys Hospital
Ascension Providence Hospital Novi
Ascension Providence Hospital Southfield
Ascension St. John Hospital
Ascension St. Mary's Hospital
Bronson Methodist Hospital
Corewell Health Beaumont Troy Hospital
Corewell Health Dearborn Hospital
Corewell Health Farmington Hills Hospital
Corewell Health Grand Rapids Hospitals-Butterworth Hospital
Corewell Health Trenton Hospital
Corewell Health William Beaumont University Hospital
Covenant HealthCare
DMC Detroit Receiving Hospital
DMC Sinai-Grace Hospital
Henry Ford Allegiance
Henry Ford Hospital

Henry Ford Macomb Hospital
Hurley Medical Center
McLaren Lapeer Region
McLaren Macomb
McLaren Northern Michigan
McLaren Oakland
Michigan Medicine
Munson Medical Center
MyMichigan Medical Center Midland
Trinity Health Ann Arbor Hospital
Trinity Health Livonia Hospital
Trinity Health Muskegon Hospital
Trinity Health Oakland Hospital
Trinity Health Saint Mary's - Grand Rapids
University of Michigan Health - Sparrow
University of Michigan Health - West
UP Health System Marquette

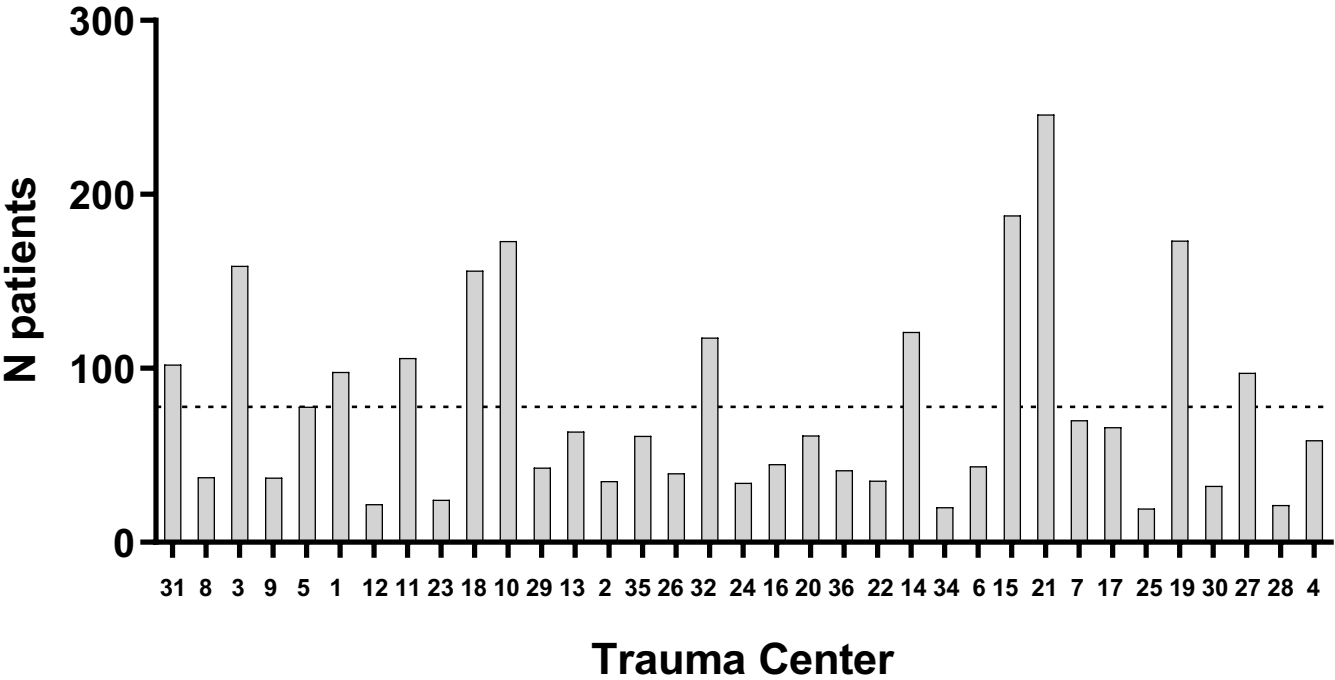
M•TQIP

Metric 7 | RBC/FFP Mean Ratio in Massive Transfusion
Cohort 1 (MTQIP All) | 1/1/22 - 6/30/23
Graph ID 38

From 11 to 31 Trauma Centers w/ ratio <=2.0

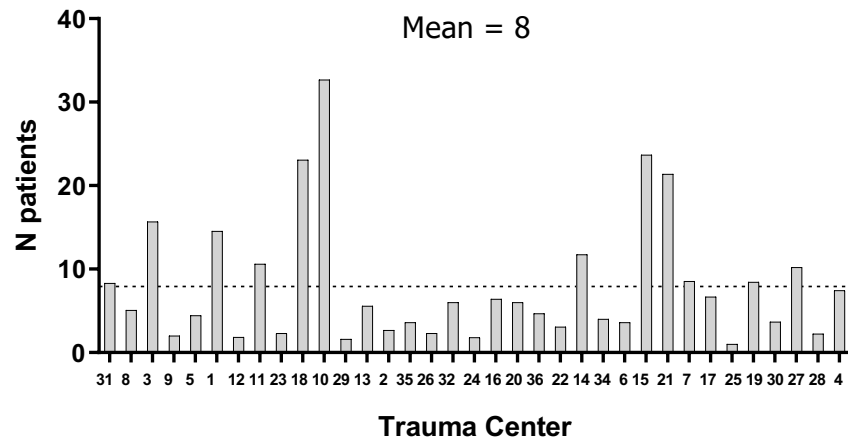


Highest Level Trauma Activation

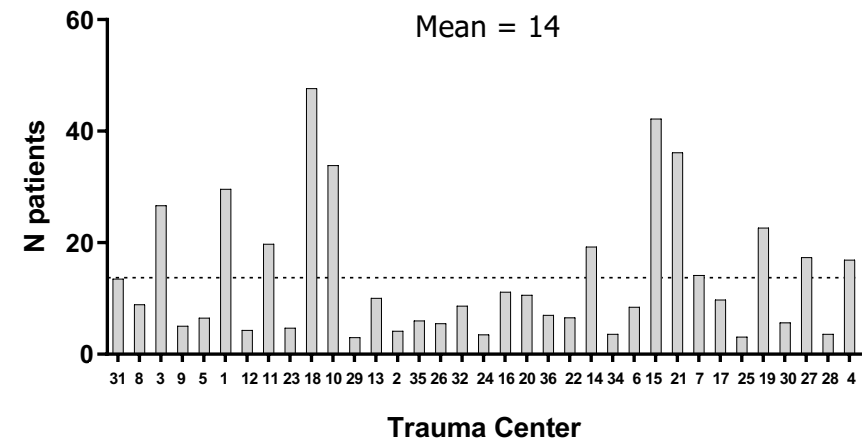


78

Massive Transfusion ≥5 u PBRC in 4 hrs



Intervention for Hemorrhage



Massive Transfusion

Judy Mikhail, PhD



Topic Importance

Military

2019

Civilian

2022

SPECIAL REPORT FROM MILITARY TRAUMA SYSTEM

The “Top 10” research and development priorities for battlefield surgical care: Results from the Committee on Surgical Combat Casualty Care research gap analysis

Matthew J. Martin, MD, John B. Holcomb, MD, Travis Polk, MD, Matthew Hannon, MD, Brian Eastridge, MD, Saaan Z. Malik, MD, Virginia S. Blackman, PhD, Joseph M. Galante, MD, Daniel Grabo, MD, Martin Schreiber, MD, Jennifer Gurney, MD, Frank K. Butler, MD, and Stacy Shackelford, MD, Fort Sam Houston, Texas

BACKGROUND:

The US Military has achieved significant advances in the management of trauma that present challenges for pre-hospital care.

METHODS:

A list of critical “focus areas” were solicited and mapped to the Joint Trauma System (JTS) and Joint Trauma System (JTS) and the Joint Trauma System (JTS) and the Joint Trauma System (JTS).

RESULTS:

13 research focus areas were identified (eight clinical and five adjunctive categories). Ninety individual topics were solicited. The survey received 64 responses. The majority of respondents were military (90%) versus civilians (10%). There was moderate to high agreement (inter-rater correlation coefficient = 0.93, $p < 0.01$) for 10 focus areas. The top five focus areas were Personnel/Staffing (mean, 8.03), Resuscitation and Hemorrhage Management (7.49), Pain/Sedation/Anxiety Management (6.96), Operative Interventions (6.9), and Initial Evaluation (6.9). The “Top 10” research priorities included four in Personnel/Staffing, four in Resuscitation/Hemorrhage Management, and three in Operative Interventions. A complete list of the topics/scores will be presented.

CONCLUSIONS:

This is the first objective ranking of research priorities for combat trauma care. The “Top 10” priorities were all from three focus areas, supporting prioritization of personnel/staffing of austere teams, resuscitation/hemorrhage control, and damage-control interventions. This data will help guide Department of Defense research programs and new areas for prioritized funding of both military and civilian researchers. (*J Trauma Acute Care Surg*. 2019;87:S14-S21. Copyright © 2019 Wolters Kluwer Health, Inc. All rights reserved.)

LEVEL OF EVIDENCE:

Study design, level IV.

KEY WORDS:

Combat casualty care; battlefield; forward surgical care; trauma; research; research gaps.

Developing a National Trauma Research Action Plan: Results from the acute resuscitation, initial patient evaluation, imaging, and management research gap Delphi survey

Todd W. Costantini, MD, FACS, Joseph M. Galante, MD, MBA, Maxwell A. Braverman, DO, Jim Phuong, MSPH, PhD, Michelle A. Price, PhD, Joseph Cuschieri, MD, Laura N. Godat, MD, John B. Holcomb, MD, Raul Coimbra, MD, PhD, Eileen M. Bulger, MD, and NTRAP Acute Resuscitation Panel, San Diego, California

#1 Hemorrhage/Shock/Transfusion Management

RESULTS:

There were 1,422 questions generated, of which 992 (69.8%) reached consensus. Of the questions reaching consensus, 327 (33.0%) were given high priority, 621 (62.6%) medium priority, and 44 (4.4%) low priority. Pharmaceutical intervention and fluid/blood product resuscitation were most frequently scored as high-priority intervention concepts. Research questions related to traumatic brain injury, vascular injury, pelvic fracture, and venous thromboembolism prophylaxis were highly prioritized.

CONCLUSION:

This research gap analysis identified more than 300 high-priority research questions within the broad category of Acute Resuscitation, Initial Evaluation, Imaging, and Definitive Management. Research funding should be prioritized to address these high-priority topics in the future. (*J Trauma Acute Care Surg*. 2022;93:200–208. Copyright © 2022 Wolters Kluwer Health, Inc. All rights reserved.)

KEY WORDS:

Outcomes; research agenda; transfusion; coagulopathy; operative intervention.

Massive Transfusion Survey Results

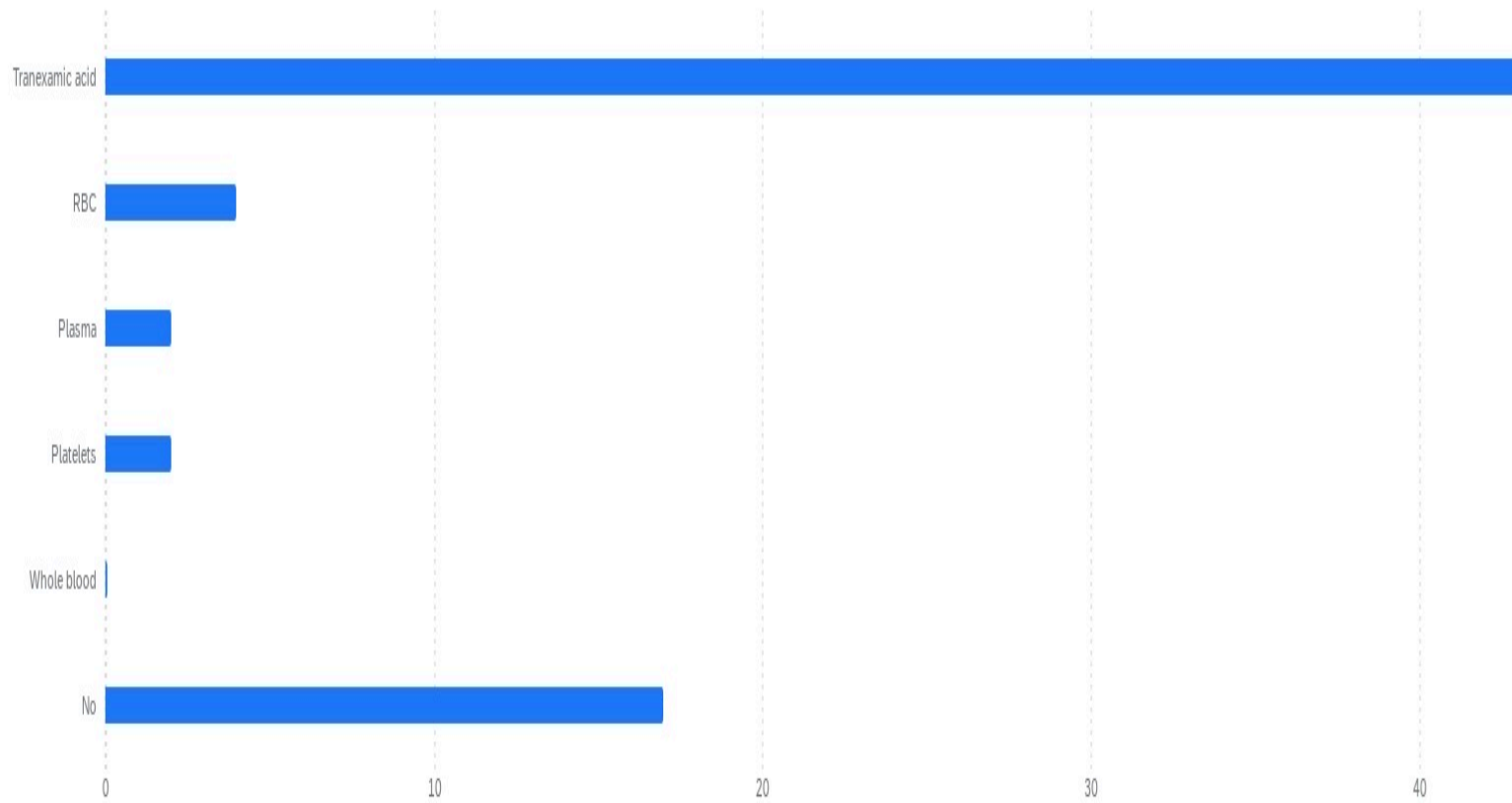
- MTQIP Participants:
 - Trauma Surgeons
 - Trauma Program Managers (RN)
 - MTQIP Clinical Reviewers (RN)
- (50%) Response Rate

Goal:

- Provide a snapshot of massive transfusion practices in MI
- Springboard for discussion where we learn from each other

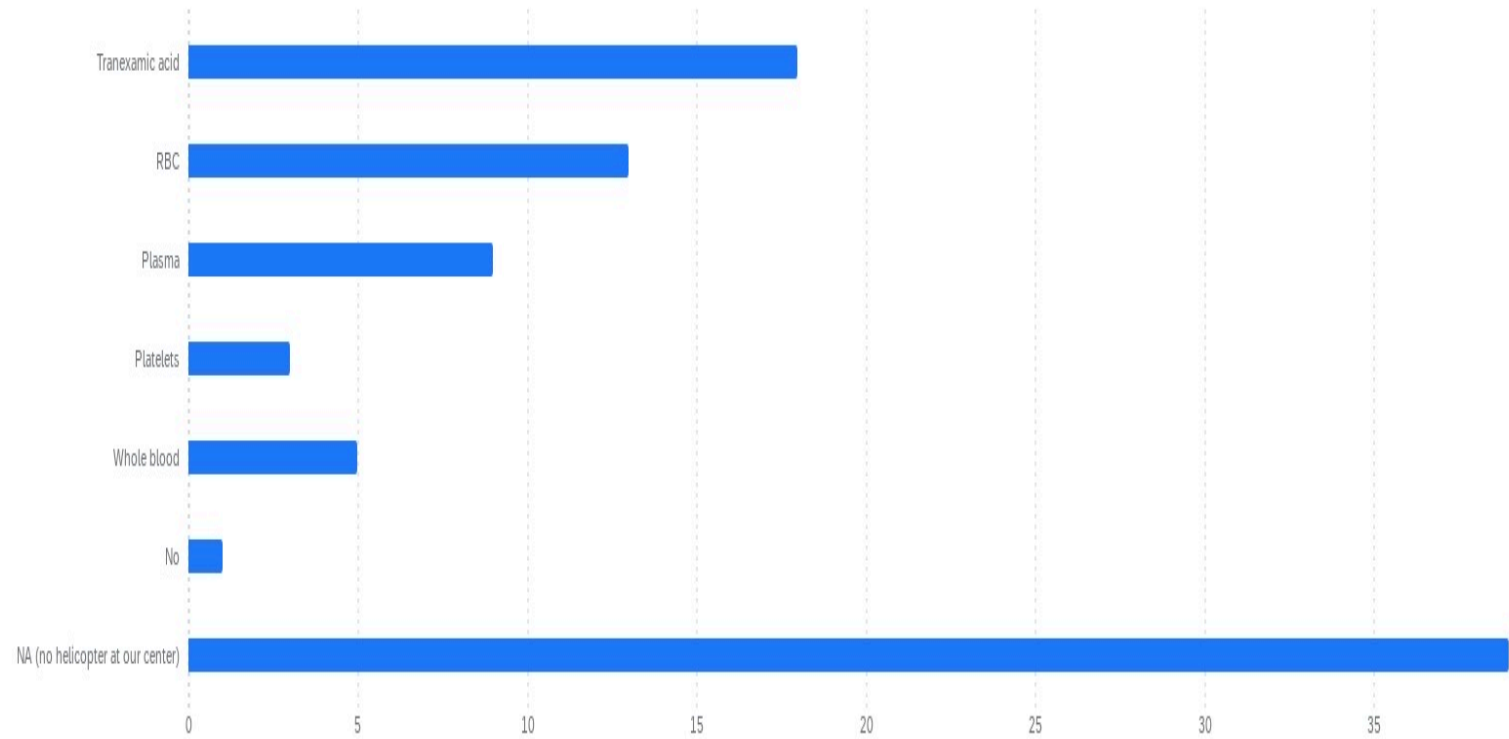
EMS

Do any of your EMS agencies carry the following for massive bleeding? (select all that apply)



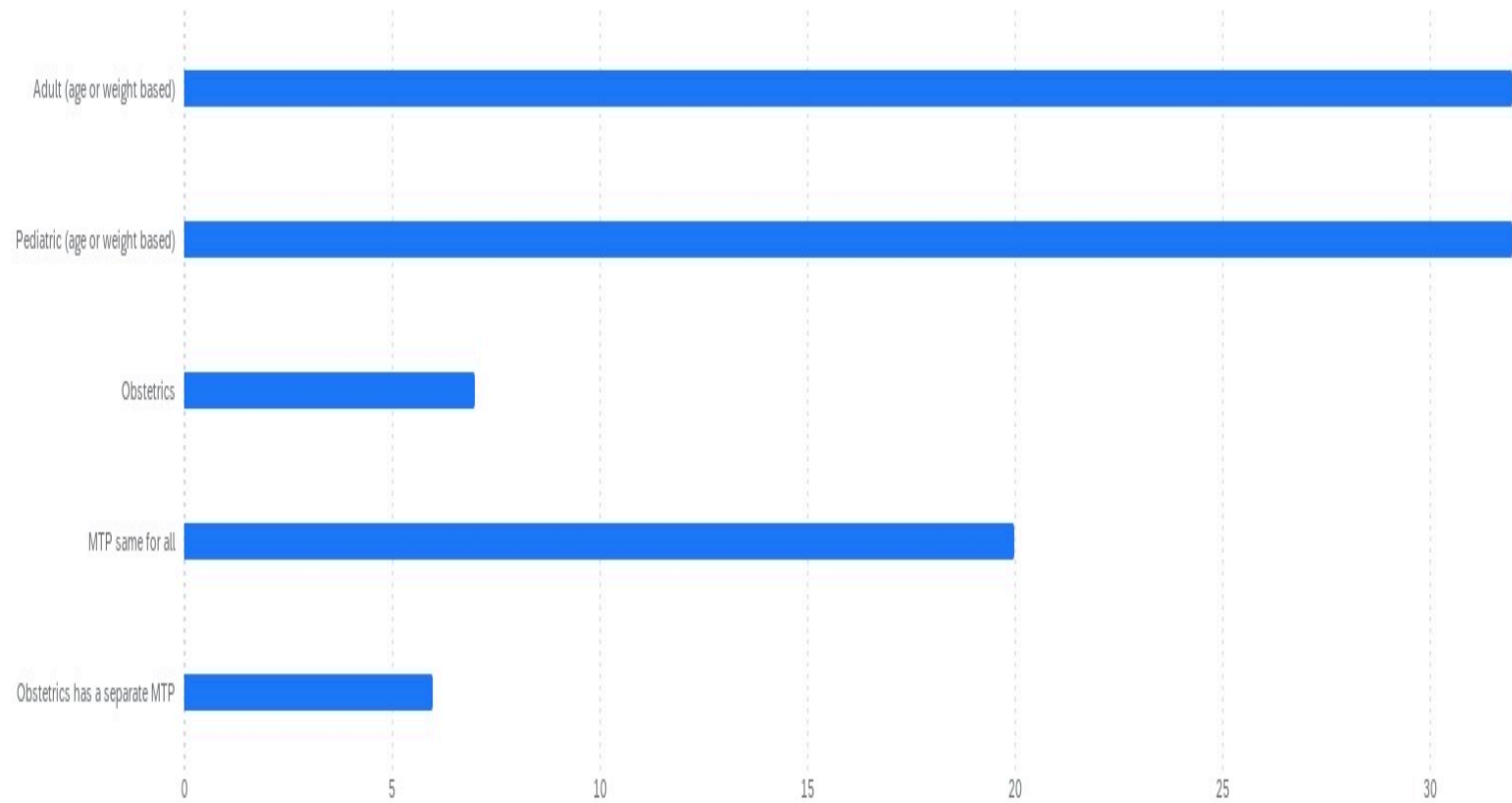
Helicopter

Does your helicopter crew carry any of the following for massive bleeding? (select all that apply)



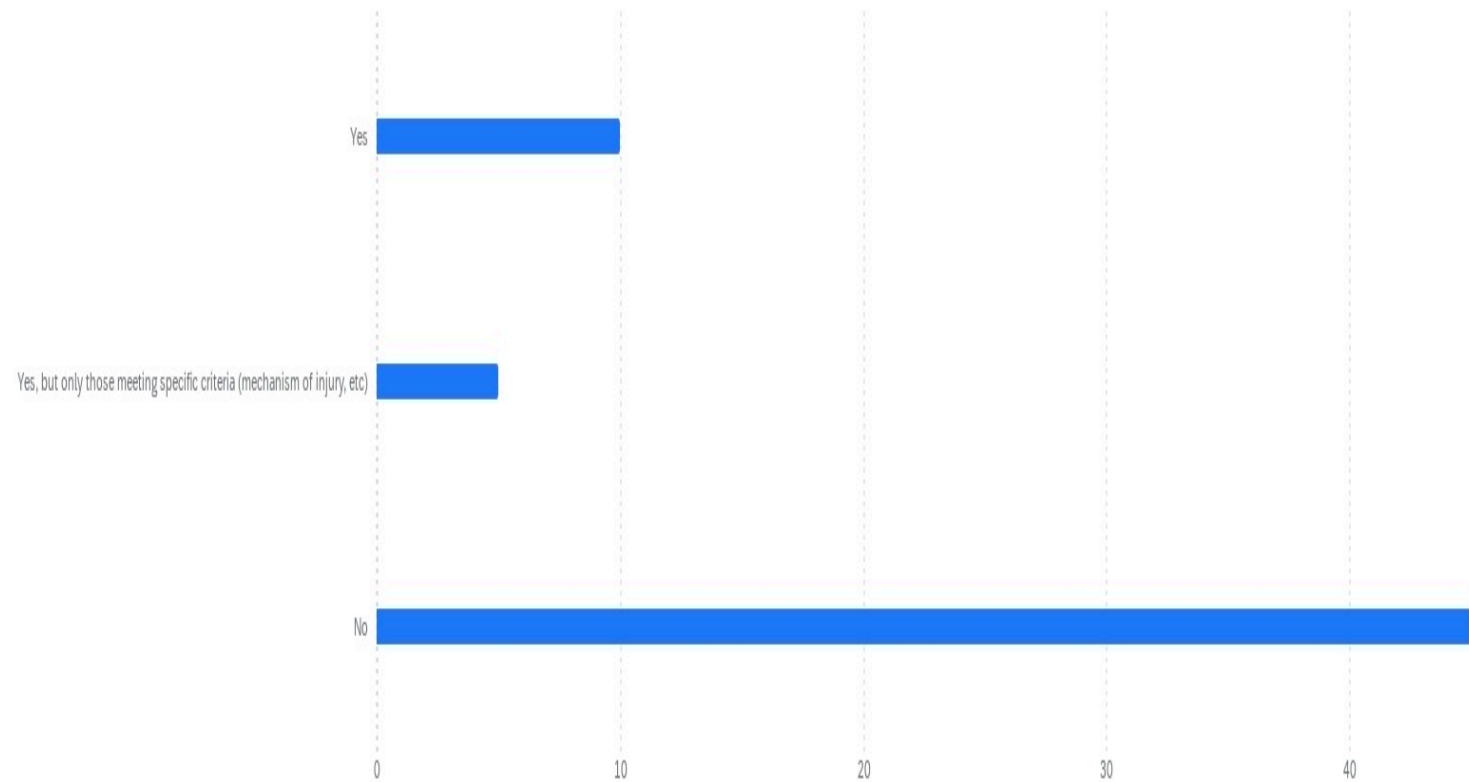
Patient Types

Does your trauma MTP include criteria for different patient types (select all that apply):



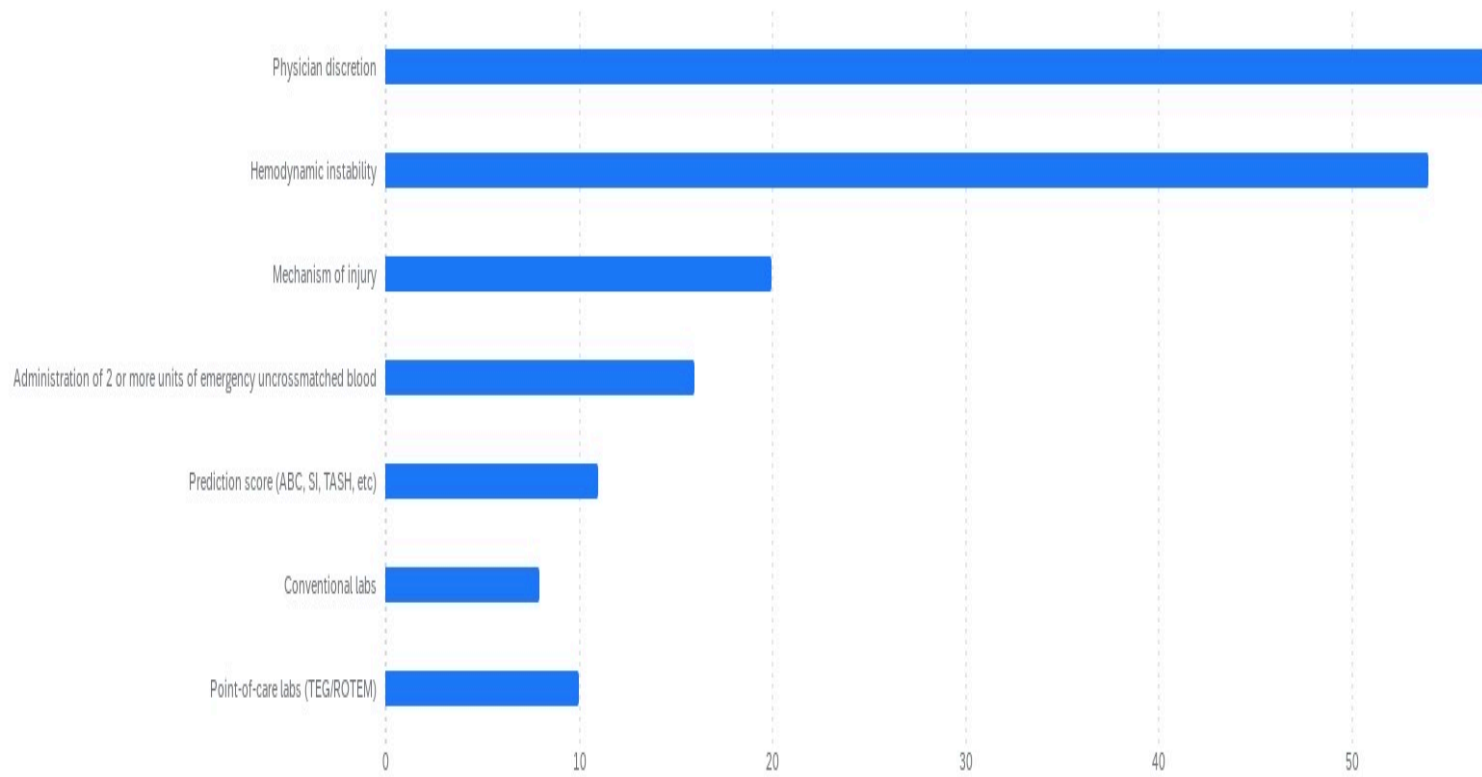
MTP w Trauma Activations

Does your center automatically deploy MTP for highest-level trauma activations?



Triggers

What criteria are used to activate the MTP? (select all that apply)



Scoring Systems as Triggers

Consider using one or more objective MHP triggers

Critical Administration Threshold

≥ 3 RBC units in 1 hour



Shock Index[†]

$\frac{\text{Heart Rate}}{\text{Systolic BP}} > 1$

ABC Score[‡]

≥ 2 of

- ✓ Penetrating mechanism
- ✓ Systolic BP < 90 mmHg
- ✓ Heart Rate > 120 bpm
- ✓ +FAST ultrasound

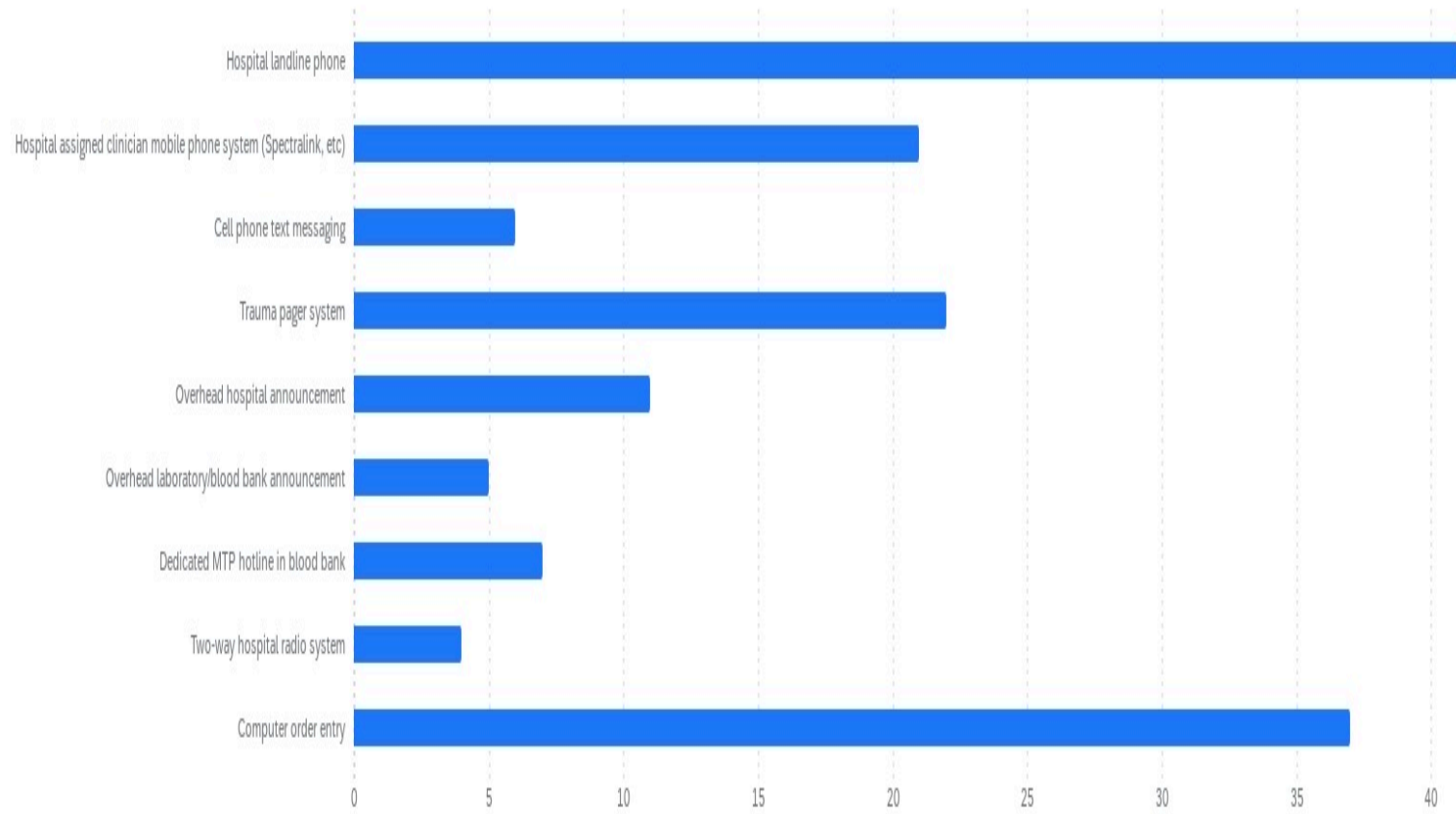
RABT Score^{*}

≥ 2 of

- ✓ Penetrating mechanism
- ✓ Shock Index > 1
- ✓ +FAST ultrasound
- ✓ Pelvic fracture

Communication

What communication methods are employed during MTPs? (select all that apply)



2016

Massive Transfusion Protocol

Communication Ordering Practice Survey (MTP COPS)

Minh-Ha Tran, DO,¹ Sarah Vossoughi, MD,² Sarah Harm, MD,³ Nancy Dunbar, MD,⁴ and Mark Fung, MD, PhD³

From the ¹University of California Irvine Health, School of Medicine, Irvine; ²Columbia University Medical Center, New York, NY; ³University of Vermont College of Medicine, Burlington; and ⁴Dartmouth-Hitchcock Medical Center, Lebanon, NH.

Key Words: Trauma; Massive transfusion; Massive transfusion protocol; Resuscitation; Level I trauma center; Fixed-ratio transfusion; Damage control resuscitation

Am J Clin Pathol September 2016;146:319-323

DOI: 10.1093/AJCP/AQW123

ABSTRACT

Objectives: We sought to assess ordering practices and quality of communication during massive transfusion at US level I trauma centers.

Computerized physician order entry (CPOE) has been adopted at many centers for blood component ordering.¹⁻⁴ Certain scenarios, however, may preclude time-of-care CPOE. During massive transfusion, for example, intense

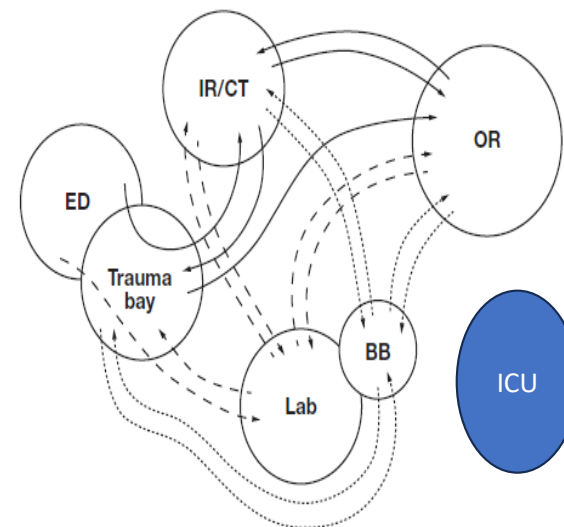
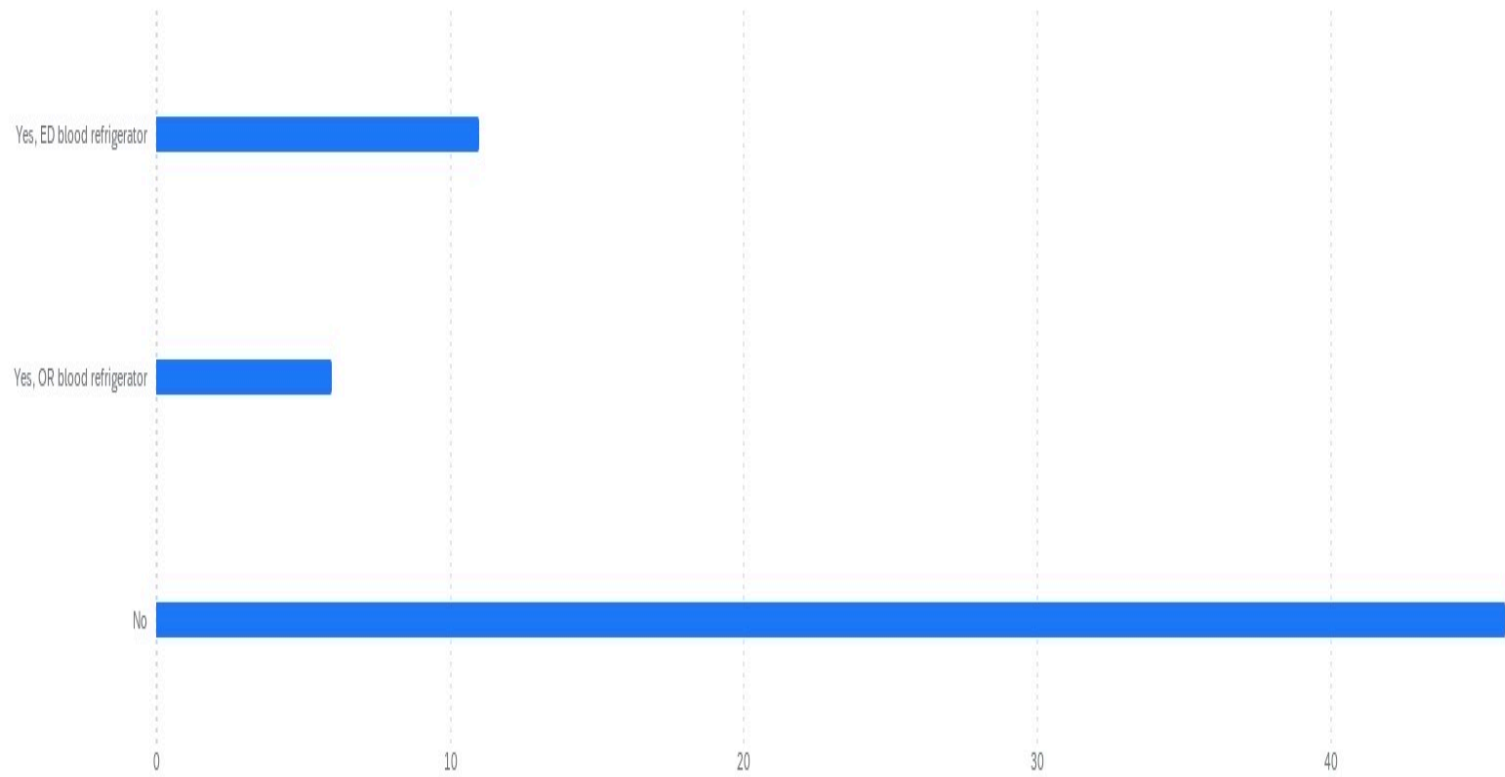


Figure 3 The complexity of the trauma environment. Solid

Delivery Methods: Blood Storage

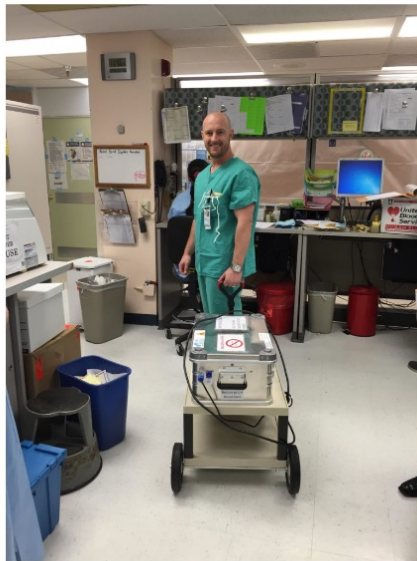
Does your center store blood products outside of the Blood Bank? (Select all that apply)



Hybrid Model

Refrigerator on Wheels (ROW)

POSTER: USING A REFRIGERATOR ON WHEELS TO REDUCE BLOOD WASTAGE IN THE OPERATING ROOM



[Link to Refrigerator on Wheels Poster](#)

Conclusion:

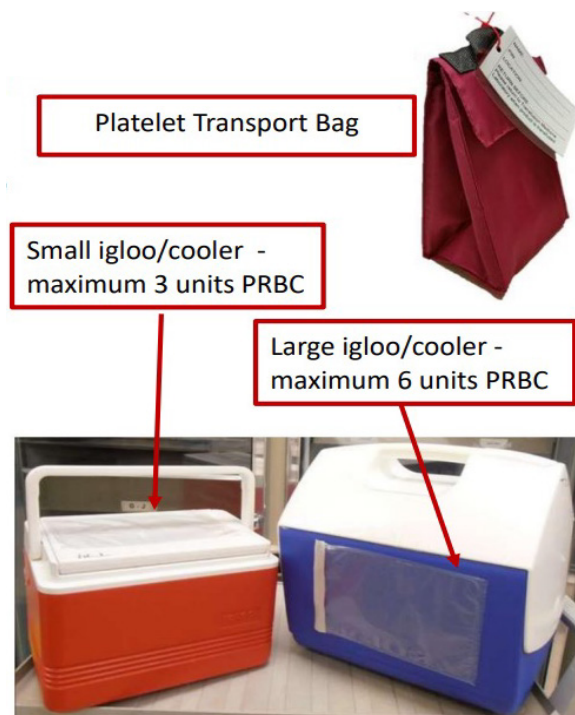
By educating OR staff and adding a refrigerator on wheels (ROW) to the equipment for holding RBCs in the high-RBC using OR cases:

- RBC wastage decreased by 66%
- Reduction of RBC acquisition cost by \$92,202
- No RBCs issued in the ROW were wasted
- ROW purchase gave an almost immediate return on investment

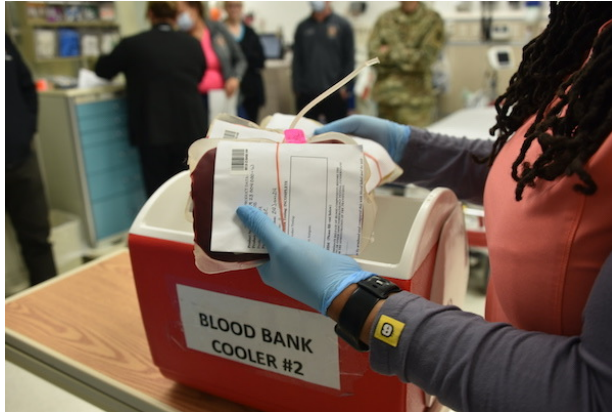
Based on these results, we expanded our ROW inventory by two more ROWs as well as purchasing new coolers

Continuous monitoring of wastage is an important part of inventory management

Chests/Coolers



Temperature Tracking Strategies

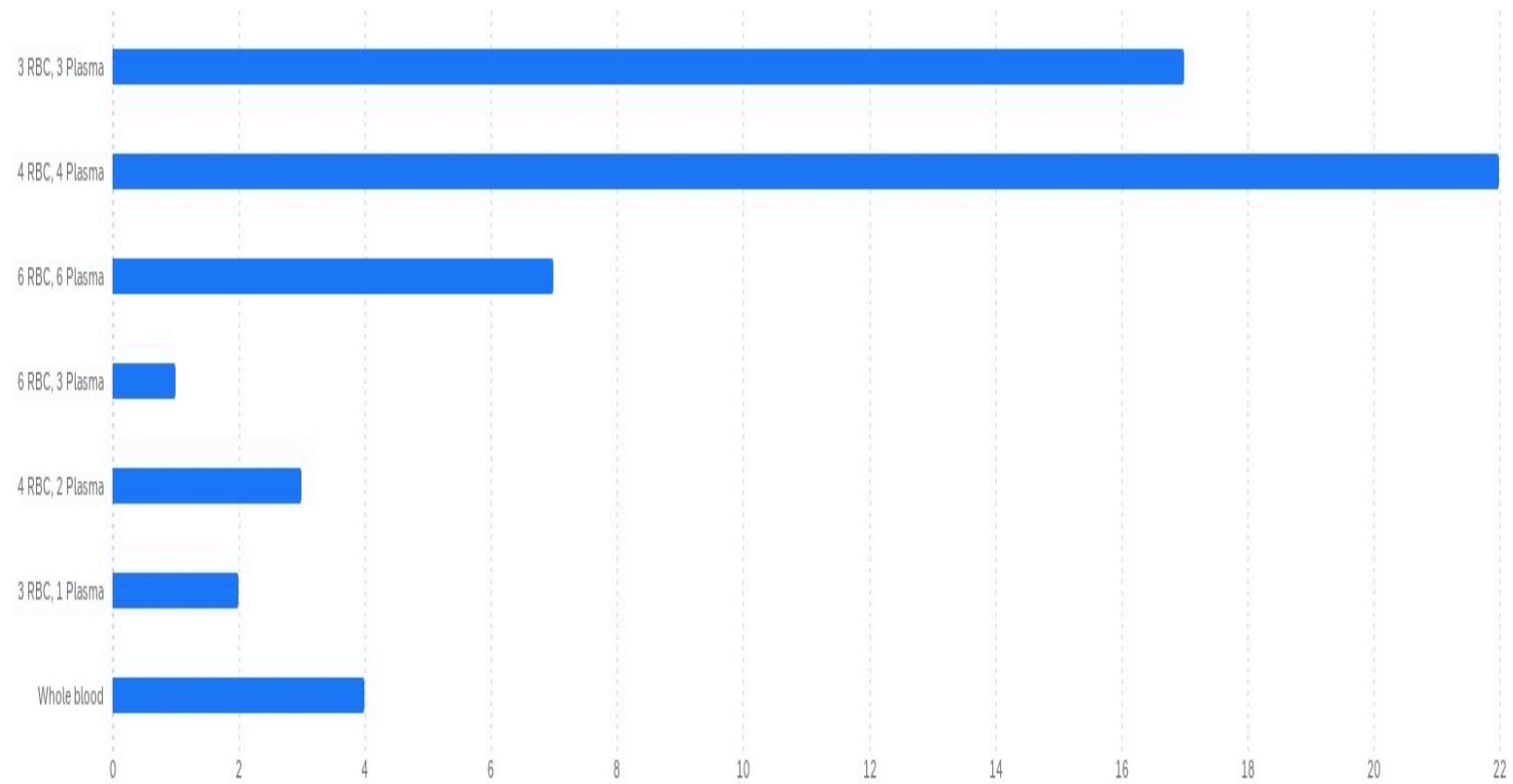


Time chest allowed out of blood bank?



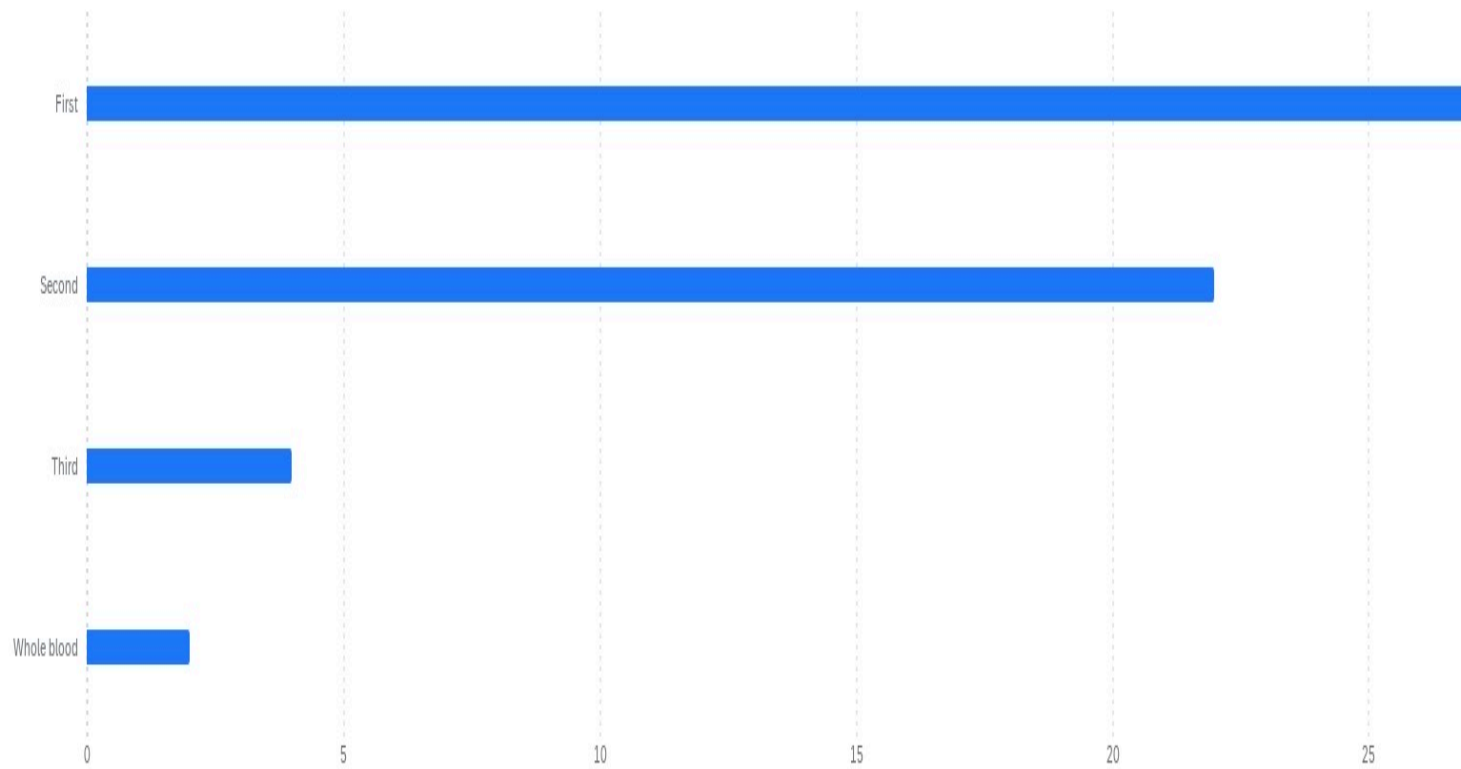
Ratios

Which of the following most closely describes the ratio of RBC to Plasma units included in your initial MTP pack/chest?



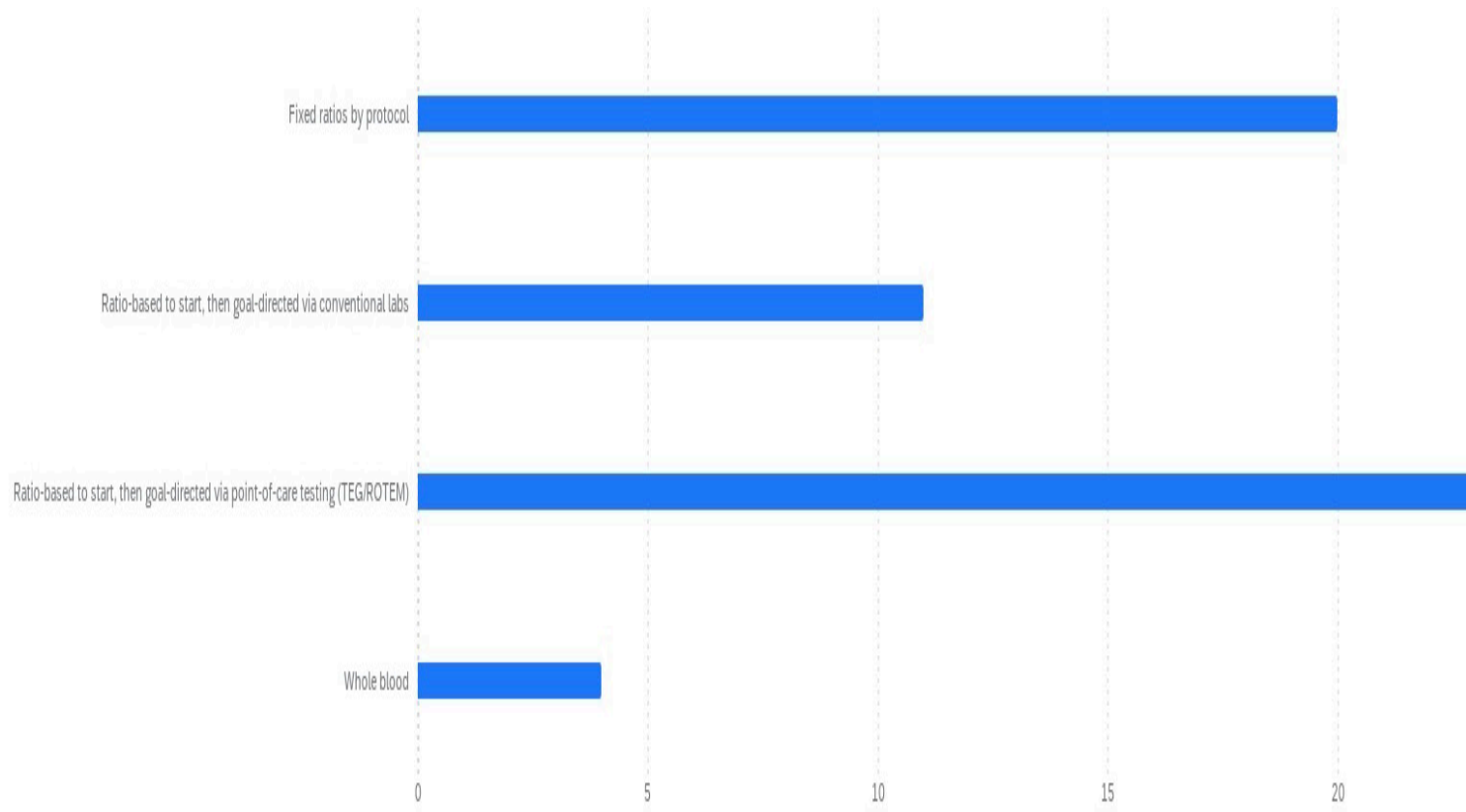
First Platelets

In which MTP pack/chest do you first include Platelets?



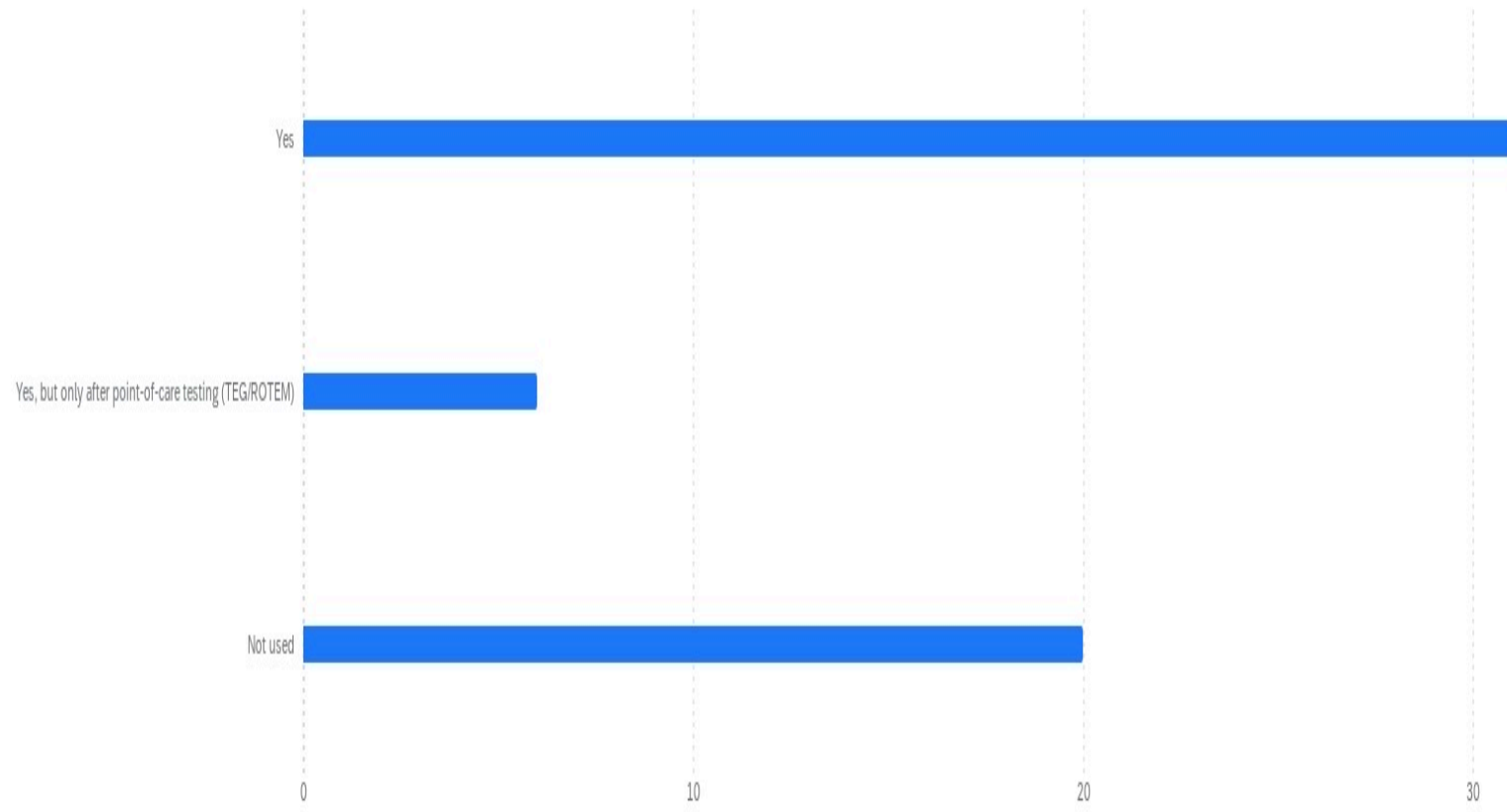
Guiding Strategy

Which of the following best describes your centers strategy to guide MTP product administration?



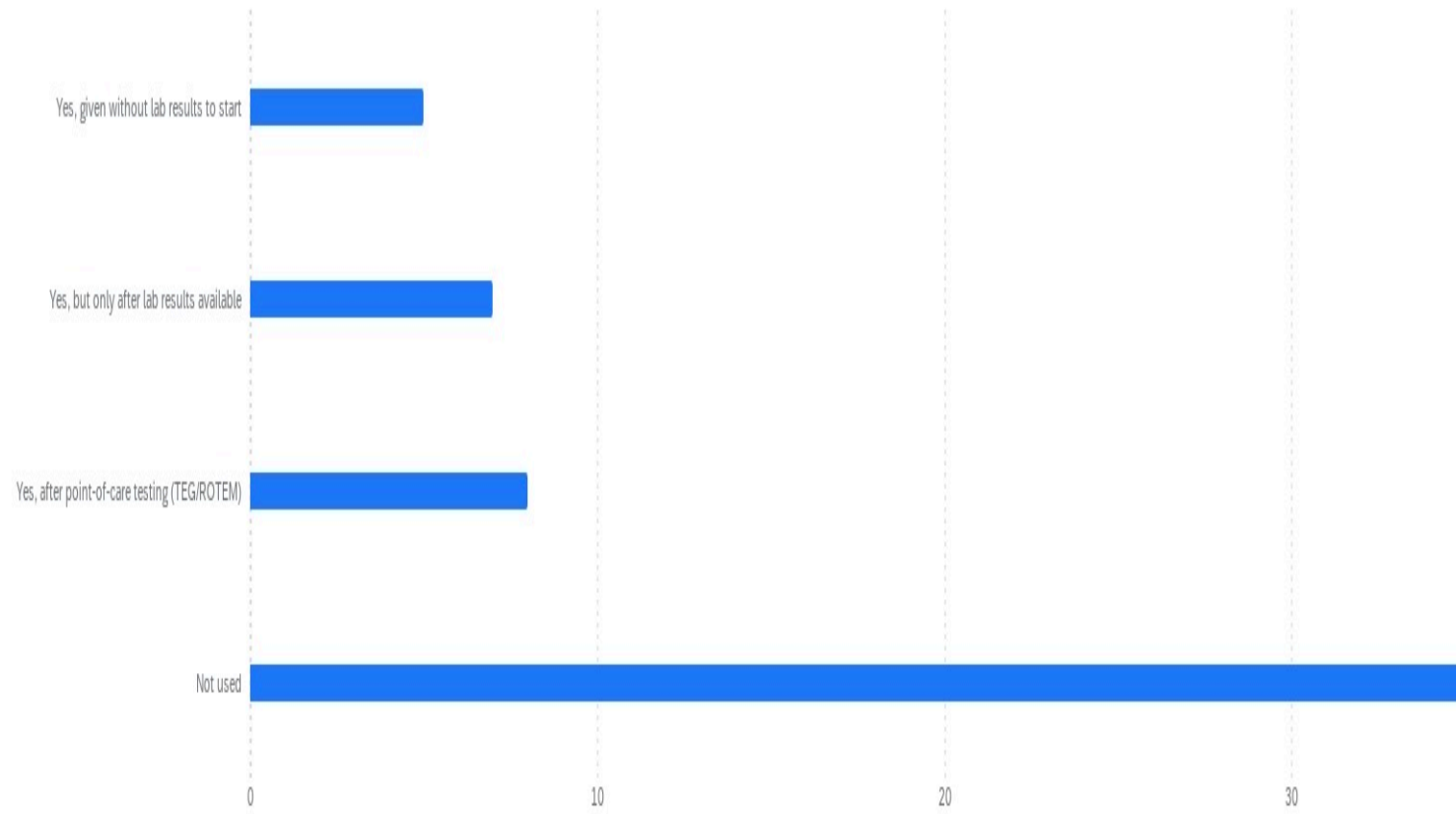
TXA

Do you administer tranexamic acid (TXA) in your MTP?



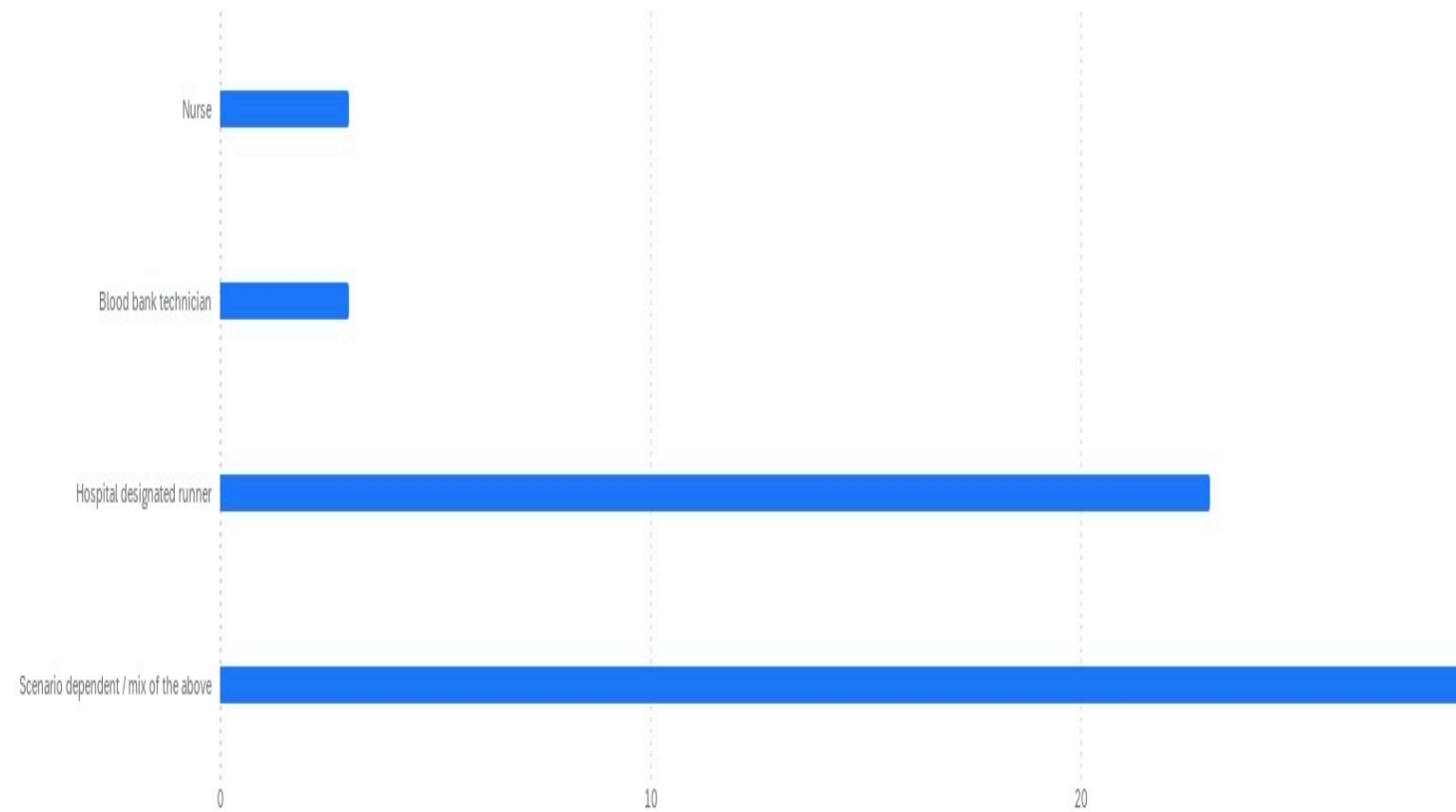
PCCs

Do you administer prothrombin complex concentrates (PCC) during MTP?



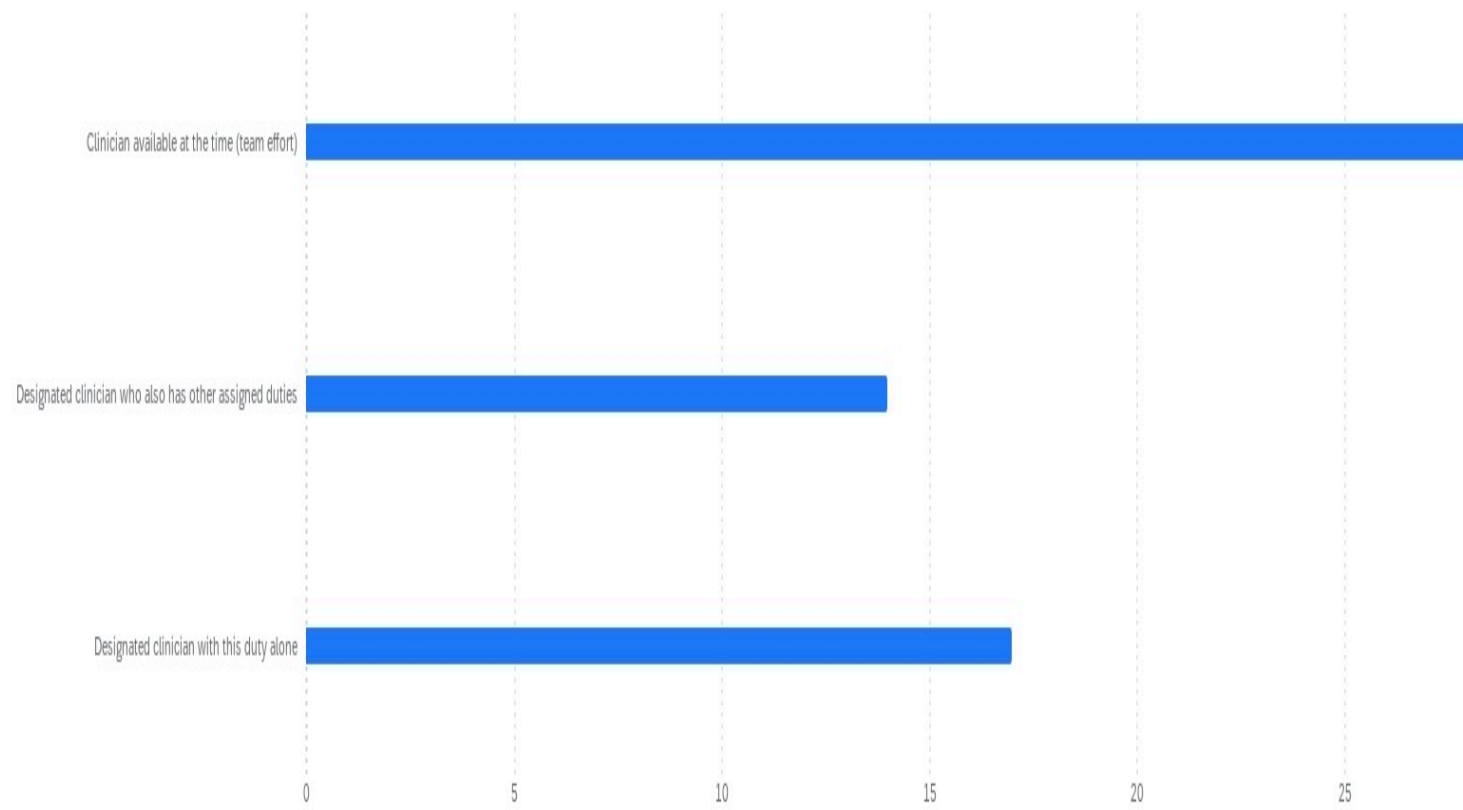
Runner

Who serves as the designated runner to deliver MTP pack/chests from blood bank to the patient?



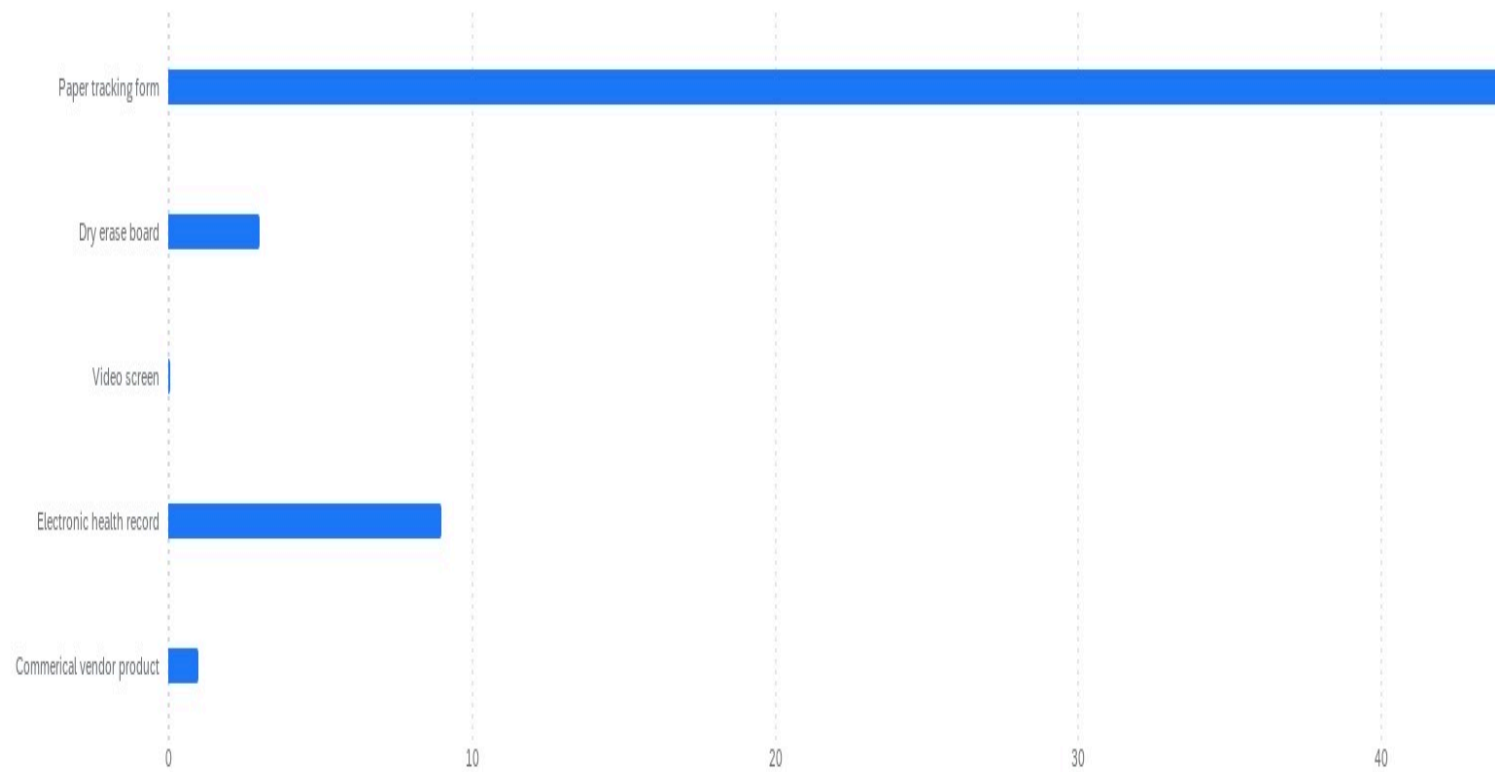
Hanging/Tracking

Who most often manages the hanging and tracking of blood products during MTPs?



Real-time tallies

What system is used to track and communicate blood product tallies in real time?





Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury



Achieving optimal massive transfusion ratios: The trauma white board, whole blood, and liquid plasma. Real world low-tech solutions for a high stakes issue



Jason Beckermann*, Hayden Swartz, Jill Albright, Wayne Street, Scott Martin, Clint Hagen, Maria Linnaus, David Ciresi

Mayo Clinic Health System, 1400 Bellinger St., United States

ARTICLE INFO

Article history:
Accepted 8 June 2022

Keywords:
Transfusion
Whole blood
Liquid plasma
Trauma
Massive transfusion protocol

ABSTRACT

Background: It is well established that achieving optimal ratios of packed red blood cells (PRBC) to fresh frozen plasma (FFP) to platelet ratios during massive transfusion leads to improved outcomes but is difficult to accomplish.

Methods: Between September 2018 and May 2019 our level 2 trauma center implemented 3 new processes to optimize transfusion ratios during massive transfusion protocol (MTP). Two units of low titer group O whole blood (LTOWB) were added as the first step to our MTP. Second, a dry erase board white-board was attached to each fluid warmer for real time recording of transfusions. Last, liquid plasma was incorporated into our MTP. We performed a retrospective review evaluating PRBC:FFP ratios for patients who had the massive transfusion protocol initiated and received 4 or more units of blood.

Results: A total of 50 patients had the massive transfusion protocol initiated and received 4 or more units of PRBCs and/or LTOWB within 4 h of arrival. There were 21 patients evaluated prior to protocol changes and 29 patients after the changes. In the study group mean age was 45 years, median blood pressure (SBP)

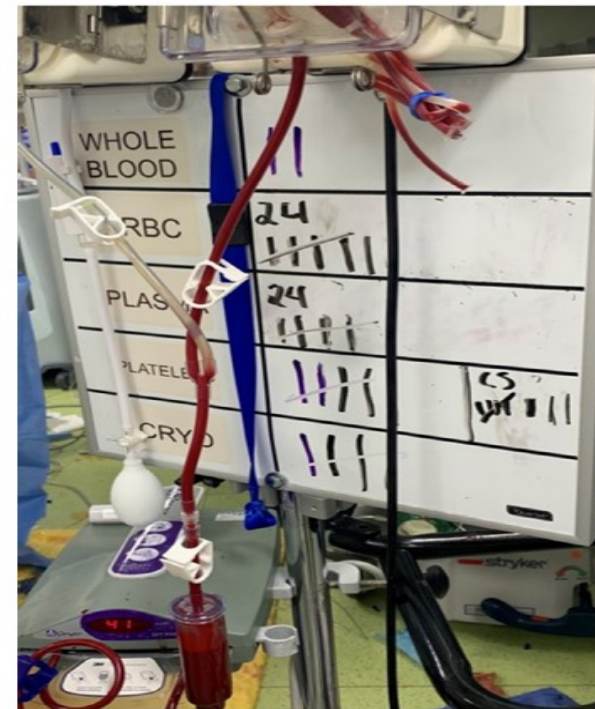
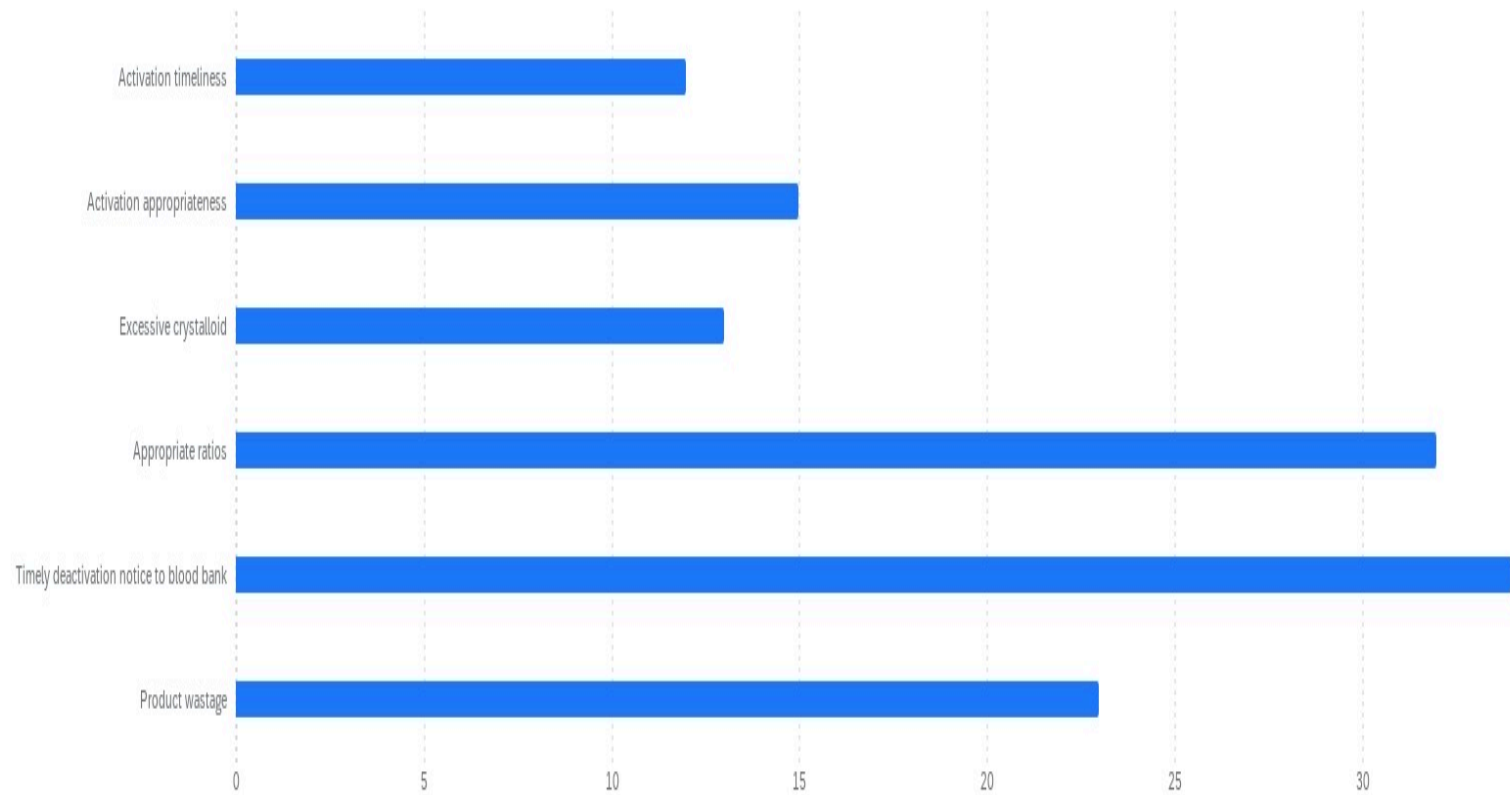


Fig. 1. Trauma white board following massive transfusion protocol.

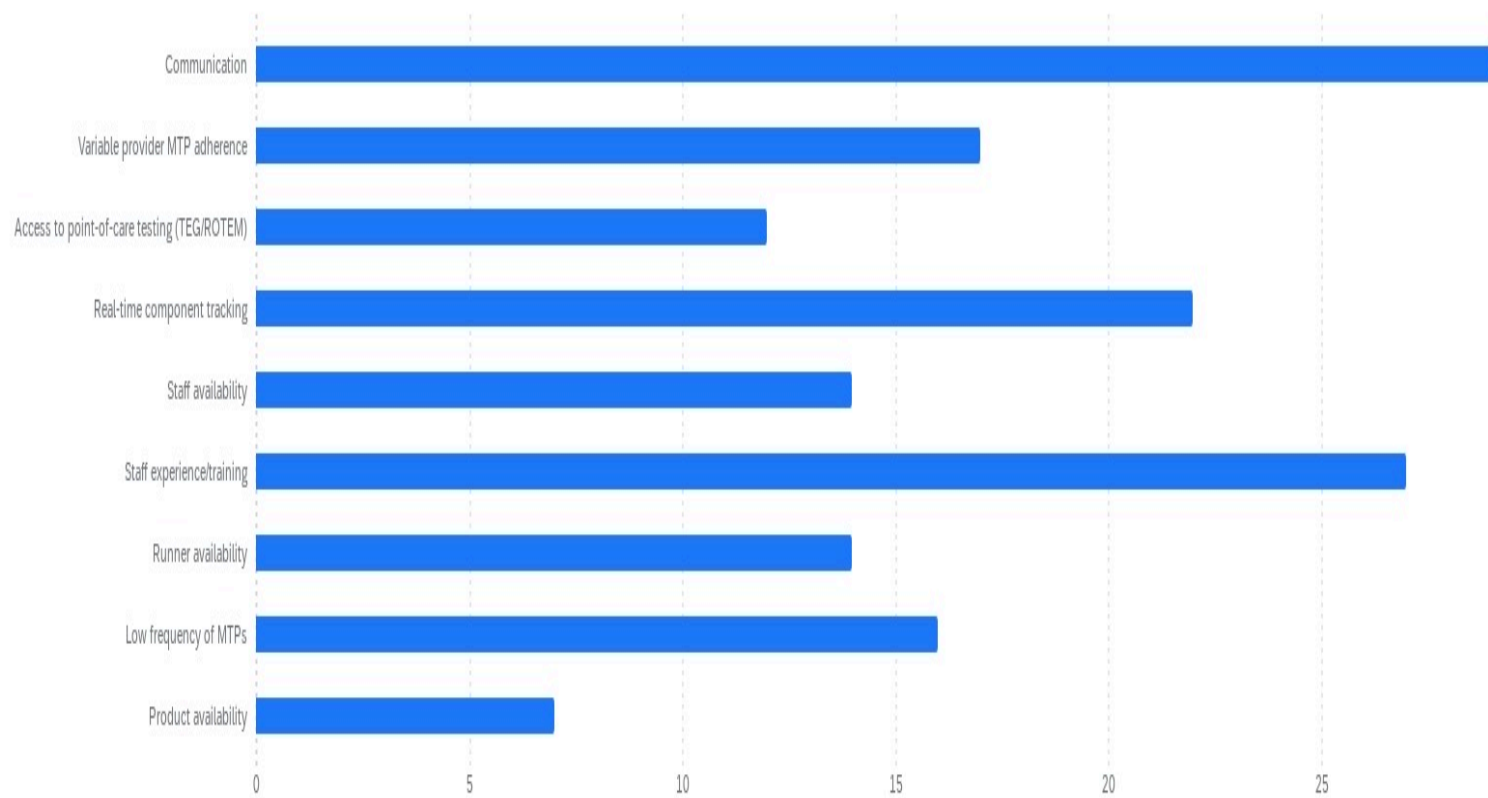
Quality Improvement

What opportunities for improvement are most commonly identified in your center's MTPs? (select all that apply)



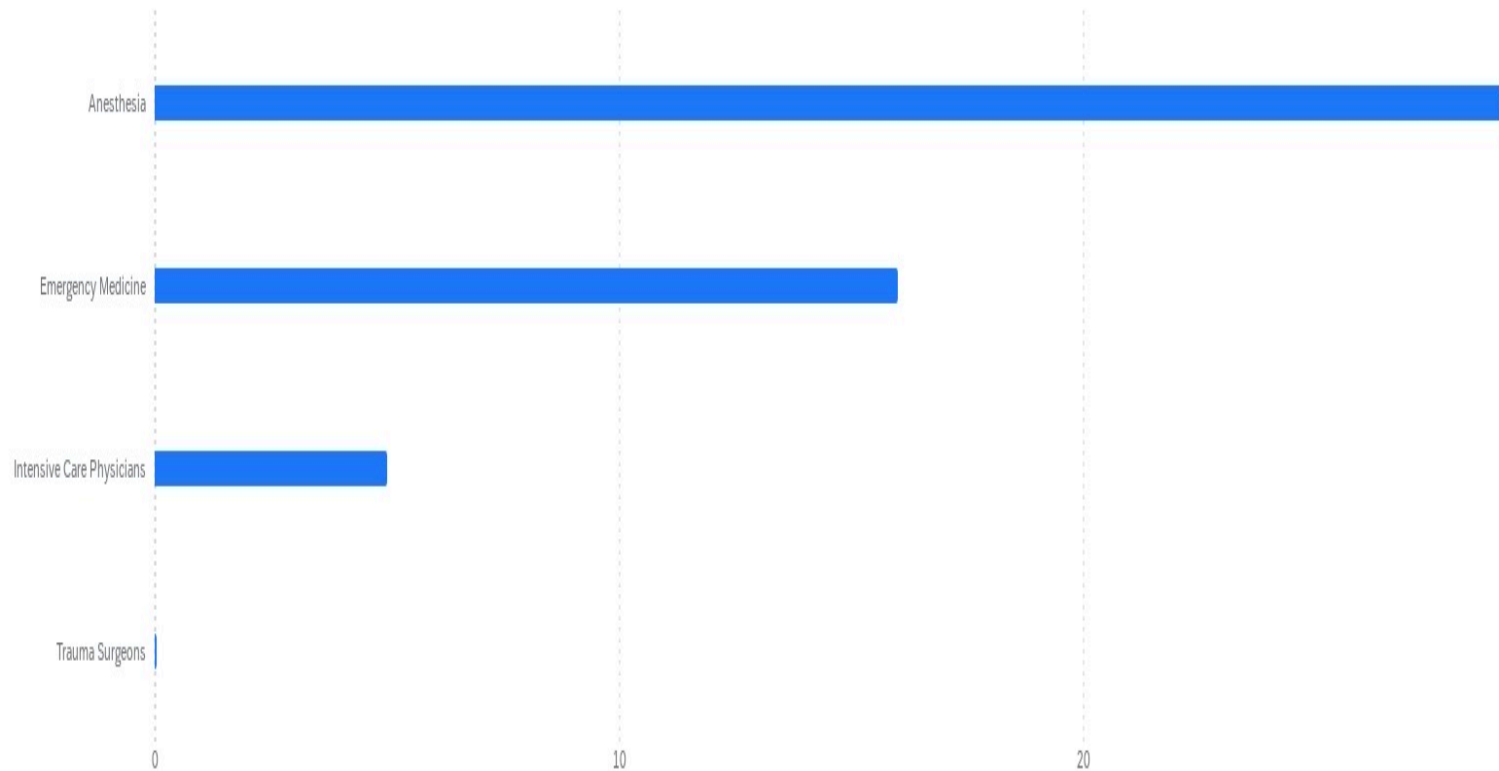
Limitations

What do you perceive as limitations to running effective MTPs in your center? (select all that apply)



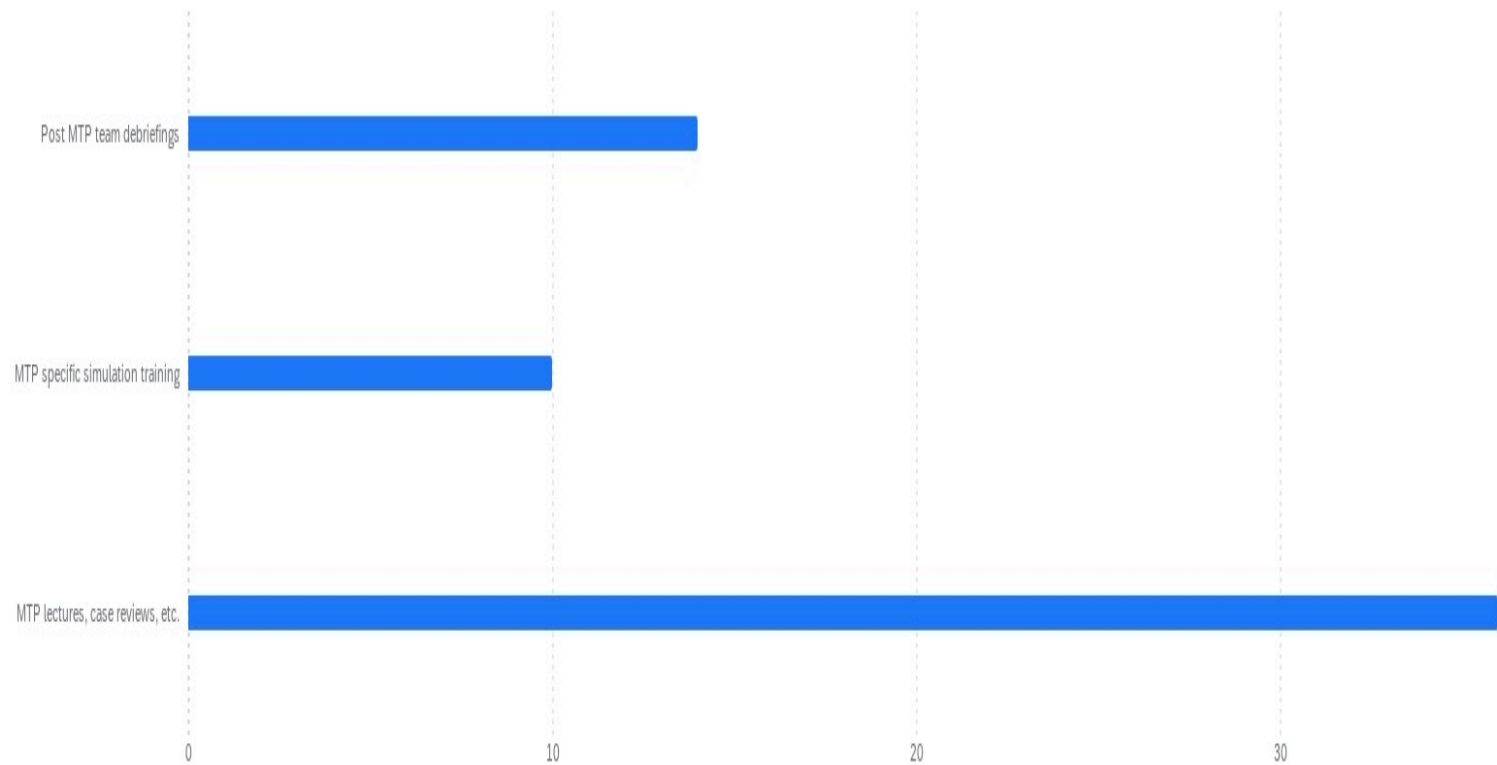
Physician Group Adherence

Which physician group tends to struggle the most to adhere to your center's MTP?



Education

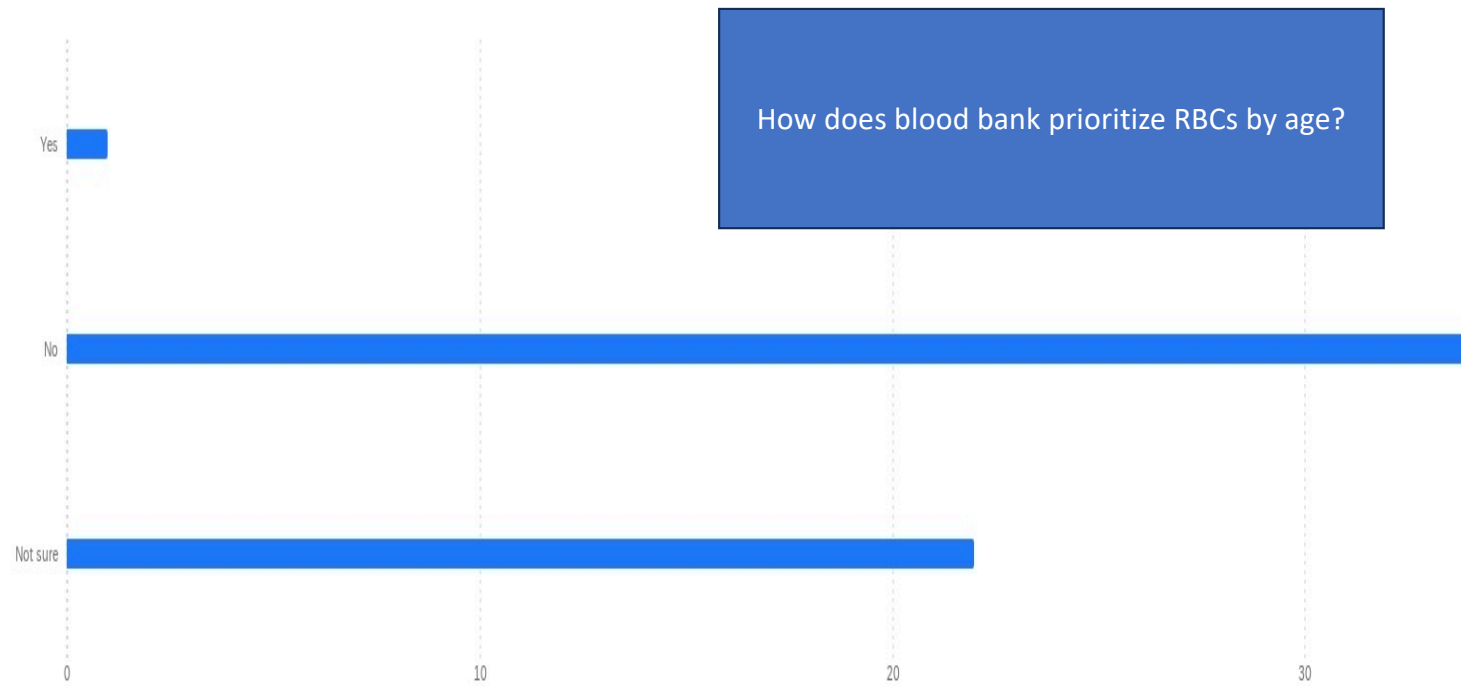
Does your center offer the following opportunities? (select all that apply)



Blood Bank Specific Questions

RBC Age

Does your MTP specify the age of the units to be included (i.e. not older than XX days)?



Emergency Uncrossmatched Blood Practices

- Preservation strategies for O Neg
 - O Pos for males
 - O Pos for post menopausal females
 - O Neg for females (child bearing age)
 - O Neg for pediatrics < Age 12

Blood Management Strategies

- How to handle units close to expiration?

Questions?

Emergency Blood & MTP @ UMHW

Yvonne Prowant, TPM and Krystal Johnson, Blood Bank Supervisor



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MICHIGAN MEDICINE

Answer: Emergency Release Cooler taken to ED by lab when trauma code is paged.

- We worked with lab to create a 'ready cooler' of 2 units of 'O' RBC
- Cooler arrives at trauma bay and lab staff stays until released by surgeon.
- The cooler can be kept by the trauma team for up to 4 hrs.



How does Lab do it?

- Vocera page
 - “Type”
 - Stroke, Alert, Code or MTP
 - Pt sex/age
 - ETA
- Cooler insert 2 Grp O RBC
 - Rh dependent on page
- Color wrist band
- Dispatched
 - 1st: Phlebotomy
 - 2nd: Specimen processing
 - 3rd: Technologist in core lab

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MICHIGAN MEDICINE

Emergency Release Check-off Form

[Patient Epic Chart Sticker] ☒ Please when complete

Patient armband and Epic Chart sticker match? ☐
 Place Epic chart sticker on both copies of each Transfusion tag. ☐
 Writes Epic ID on each Sticker. ☐
 Remove yellow (Blood Bank) copy and return to Blood Bank. ☐

Released cooler to (Epic ID): _____
 Date/ Time Released: _____
 Blood Bank Runner's Epic ID: _____

Revised 6/20/2013 Return this form to Blood Bank

M METRO HEALTH DEPARTMENT OF LABORATORY MEDICINE
UNIVERSITY OF MICHIGAN HEALTH-WEST 3000 Zeeb Road, S.E. Lansing, Michigan 48906

TRANSFUSION RECORD

PATIENT INFORMATION		PRODUCT INFORMATION	
Medical Record Number: _____	Birth Date: _____	Unit Number: _____	Expiration Date: _____
Patient Name: _____	Location: _____	Component: _____	Volume: _____
Patient Institution: _____	ABO/Rh: _____	Unit Results: _____	

Crossmatch Result: UNMATCHED/Matched Crossmatch Date/Time: NOT PERFORMED/Specimen In Date/Time: _____
 Antibody Screen: NOT PERFORMED/COMPLETED Antibodies Identified: NA
 Need Where? _____ Need When? _____ Ordering Physician: _____

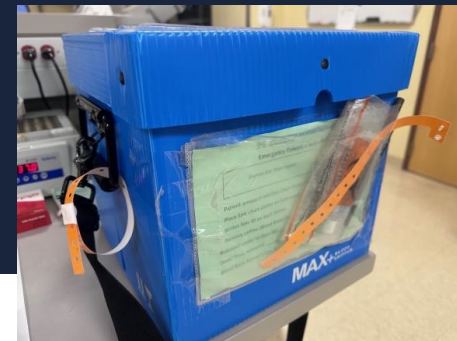
Visual Inspection: _____ Blood Bank Signature: _____ Date/Time: _____ Was Blood Tested? Yes/No _____

THIS FORM MUST BE SIGNED BY A PHYSICIAN PRIOR TO ADMINISTRATION OF THE BLOOD COMPONENT WHEN THE CROSSMATCH OR PATIENT TESTING IS NOT COMPLETED.

UNCROSSMATCHED/EMERGENCY RELEASED

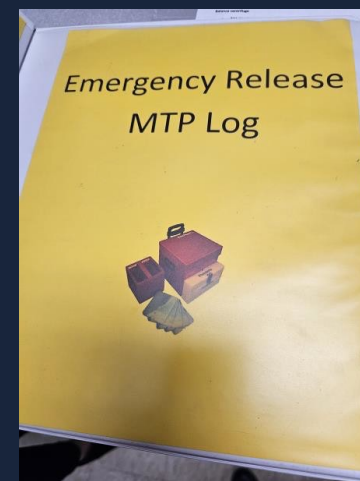
My patient's clinical condition is serious and needs the above blood component regardless of the result of the Transfusion Testing results. The nature of my patient's condition requiring the Emergency Blood Release is: _____

Requesting Physician's Signature: _____ Date/Time: _____
 REMOVE FROM BLOOD COMPONENT AFTER TRANSFUSION IS COMPLETED AND RETURN SIGNED FORM TO THE BLOOD BANK
 3000 Zeeb Road, S.E. Lansing, Michigan 48906



How does Lab track it?

- Emergency Release Binder
 - Individual units
 - Trauma code
 - MTP
- Used for QC and PI
 - Call, ready & issue
 - Trauma codes
 - <2 min
 - MTP
 - <7 min
- Data sent monthly
 - Quality
 - Trauma coordinator



How does BB prepare the coolers?

- BB daily tasks
 - Check outdates and rotate stock when <7 days exp
 - Checking temperature indicators
- All shifts responsible for 'refill' when used
- Multiple safety checks
 - Daily
 - Prior to release
 - Upon cooler return



When MTP is required

- An MTP is paged via Vocera, much like an RRT or ERT
- The response is by 2 RNs trained in MTP; one from the ED, one from the ICU
- The MTP coolers are pre-ready in the blood bank
- Someone from the unit the patient is on goes to the Blood Bank with a pt sticker to retrieve the cooler

Details of MTP Process

- MTP paged via Vocera
- Blood bank prepares cooler. The platelet cooler is 'room temperature' controlled. The red cooler is 'cooled'.
- MTP cooler retrieved from blood bank.
- Colored wristband affixed to trauma code cooler and second wristband affixed to patient.
 - The color of this wristband is matched with each new cooler
- Charting completed on paper record that travels with the patient throughout the MTP



Details of the Process

- A total volume of each type of unit is added to I/O flowsheet.
- Reconciliation is performed at the end of MTP
- Reconciliation is requested by Blood Bank for the total number of products issued to patient.



**A big thanks to McLaren in
Petoskey for sharing their
process 5 years ago.**

**A PI team was formed and
customized their process
for UMHW.**



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MICHIGAN MEDICINE

MTP Handoff Communication Tool

Erin Driscoll, BSN, RN
MCR/Trauma Quality Nurse
Corewell Health Beaumont Troy Hospital

FEBRUARY 6, 2024

The importance of high-quality and complete communication between healthcare providers

A cross-sectional study (300 patients and 101 nurses) was performed by Ghahramanian et al. to investigate patient safety as it relates to medical staff communication (and other variables). The study analyzed questionnaires taken by surgical patients to evaluate their perceptions of the factors affecting the quality of care they received. “The results also suggest the need for designing strategies such as the change in hospital culture towards reporting of errors and effective communication and teamwork between healthcare professionals, which can consequently influence the quality of healthcare services and patient outcomes.”

- Ghahramanian A, Rezaei T, Abdullahzadeh F, Sheikhalipour Z, Dianat I. Quality of healthcare services and its relationship with patient safety culture and nurse-physician professional communication. *Health Promot Perspect.* 2017;7(3):168-174. doi:10.1517/hpp.2017.30.

Supporting Evidence for the Importance of Effective Communication

- “Communication failures contribute to nearly 70% of sentinel events.”
- “Effective teamwork is essential in high-risk environments such as the operating room.”
- “There are differing communication styles used by various members of the surgical team which on occasion, lead to communication failures.”
- “Good communication is an integral component of the culture of teamwork and as such, an important surrogate of patient safety.”
- “The aim of this qualitative study was to better understand the organisational and individual influences that shape interdisciplinary team communications in surgery. Such an understanding is important as it will inform the identification of interventions that would improve communication practices used by surgical teams.”
 - Gillespie B, Chaboyer W, Longbottom P, Wallis M. The impact of organisational and individual factors on team communication in surgery: A qualitative study. *International Journal of Nursing Studies*. 2010;47(6):732-741. doi:10.1016/j.ijnurstu.2009.11.001.

Supporting Evidence for the Importance of Effective Communication

- A survey of 170 interdisciplinary surgical team members was performed at an academic medical center.
 - “Preoperative communication was rated as suboptimal by surgical team members.”
 - Of the proposed barriers to preoperative communication (lack of time, difficulty in determining the assigned staff for a given case, high number of staff members per case, perceived personality differences, lack of a standard method of communication, or other individualized responses), lack of a standard method of communication (52.4% of respondents) was selected as the biggest issue.
 - “All groups strongly agreed that preoperative communication contributes to health care quality and patient outcomes.”
- Cruz S, Idowu O, Ho A, Lee MJ, Shi LL. Differing perceptions of preoperative communication among surgical team members. *The American Journal of Surgery*. 2019;217(1):1-6. doi:10.1016/j.amjsurg.2018.06.001.

Developing and Implementing New Handoff Tool

MTP Blood Administration Workflow Handoff

Ratio: 6u RBC: 6U FFP: 1U Platelets (administered within the first 4hrs of patient's arrival to hospital, then please return completed form to Blood Bank tube station #200)

Were other products infused prior to initiation of MTP? Yes ☐ No ☐

Product	Time	Initial	Department

Cooler	Blood Products Administered			
	Ck box for all administered products			
1 st Cooler (Cooler #_____)	<input type="checkbox"/> RBC	Time _____	Initial _____	Department _____
	<input type="checkbox"/> RBC	Time _____	Initial _____	Department _____
	<input type="checkbox"/> FFP	Time _____	Initial _____	Department _____
	<input type="checkbox"/> FFP	Time _____	Initial _____	Department _____
2 nd Cooler (Cooler #_____)	<input type="checkbox"/> RBC	Time _____	Initial _____	Department _____
	<input type="checkbox"/> RBC	Time _____	Initial _____	Department _____
	<input type="checkbox"/> RBC	Time _____	Initial _____	Department _____
	<input type="checkbox"/> RBC	Time _____	Initial _____	Department _____
	<input type="checkbox"/> FFP	Time _____	Initial _____	Department _____
	<input type="checkbox"/> FFP	Time _____	Initial _____	Department _____
	<input type="checkbox"/> FFP	Time _____	Initial _____	Department _____
	<input type="checkbox"/> FFP	Time _____	Initial _____	Department _____
	<input type="checkbox"/> PLT	Time _____	Initial _____	Department _____

We have more work to do.

- Future:
 - Complete a study?
 - Subjective vs. objective

Thank you

Contact

Dr. Peter Perakis, MD
Trauma Medical Director
peter.perakis@corewellhealth.org

Kayela Gamble, BSN, RN
Trauma Program Manager
kayela.voss@corewellhealth.org

Erin Driscoll, BSN, RN
MTQIP Clinical Reviewer/Quality Nurse
erin.driscoll@corewellhealth.org

Massive Transfusion and Blood Utilization

Michelle Maxson, RN, MSN, ACCNS-AG

Senior Manager of Trauma Operations

Hurley Medical Center

Mean Ratio PRBC/FFP 4 Hrs

Blood Release

- Blood chest automatically released for all Class I traumas
 - Brought to ED by runner
 - Time of arrival documented in EMR
- MTP activated via trauma radio
 - Activated by Trauma Attending



MTP

- Blood chest contains 3 O-/O+ PRBC and 3 A FFP (AB for pediatrics)
- Every odd chest beginning with chest 3 contains jumbo PLT
- Every even number beginning with chest 4 contains 2 units of cryo
- Blood Bank staff keep track of MTP
 - Essential for success of MTP
 - Utilize Massive Transfusion Tracking Sheet



Massive Transfusion Tracking Sheet

Suggested use of this sheet: Cross off units as you given. Volume transfused must be charted under the I&O flow sheet as intake in the "Blood- MTP only" row

Chest Shipment		Thawed Plasma	PRBCs	Platelets (1 jumbo apheresis unit)	Cryo 10 units	
	Chest #1 ***	1	2			
		3	4			
		5	6			
	Chest #2	7	8			
		9	10			
		11	12			
Massive Transfusion	Chest #3	14	15	13		
		16	17			
		18	19			
	Chest #4	22	23		20, 21	
		24	25			
		26	27			
	Chest #5	29	30	28		
		31	32			
		33	34			
	Chest #6	37	38		35, 36	
		39	40			
		41	42			
	Chest #7	44	45	43		
		46	47			
		48	49			
	Chest #8	52	53		50, 51	
		54	55			
		56	57			
	Chest #9	59	60	58		
		61	62			
		63	64			
	Chest #10	67	68		65, 66	
		69	70			
		71	72			
	Continue MTP as necessary					
	Remember to deactivate the massive transfusion over the trauma radio/phone when MTP is terminated					

MTP

- Tranexamic acid is given as soon as need for MTP is identified
- Rapid TEG is included in standard labs for all Class I traumas
- Rapid TEG drawn every 20 minutes during active MTP to guide further transfusion



Blood Usage and Wastage

November 2023

	Discarded	Transfused
Packed Red Blood Cells	2	374
Fresh Frozen Plasma	9	57
Platelet Pheresis	0	36
Cryoprecipitate	0	9

December 2023

	Discarded	Transfused
Packed Red Blood Cells	1	426
Fresh Frozen Plasma	6	76
Platelet Pheresis	0	56
Cryoprecipitate	0	7

How Did We Get Here?

- Review of all MTPs
 - Identify where the process broke down
- Education to key stakeholders
 - Dedicated ED nurses
 - Anesthesia
- Blood Bank Staff



A photograph of the Hurley Medical Center Main Entrance. The building is a large, multi-story brick structure with a modern glass and steel canopy over the entrance. The canopy has "MAIN ENTRANCE" written on it. In the foreground, there is a green lawn on the left and a landscaped area with brown mulch and small plants on the right. A set of white stairs leads up to the entrance. An American flag is visible on a pole in the background. The sky is blue with some clouds.

Thank You!

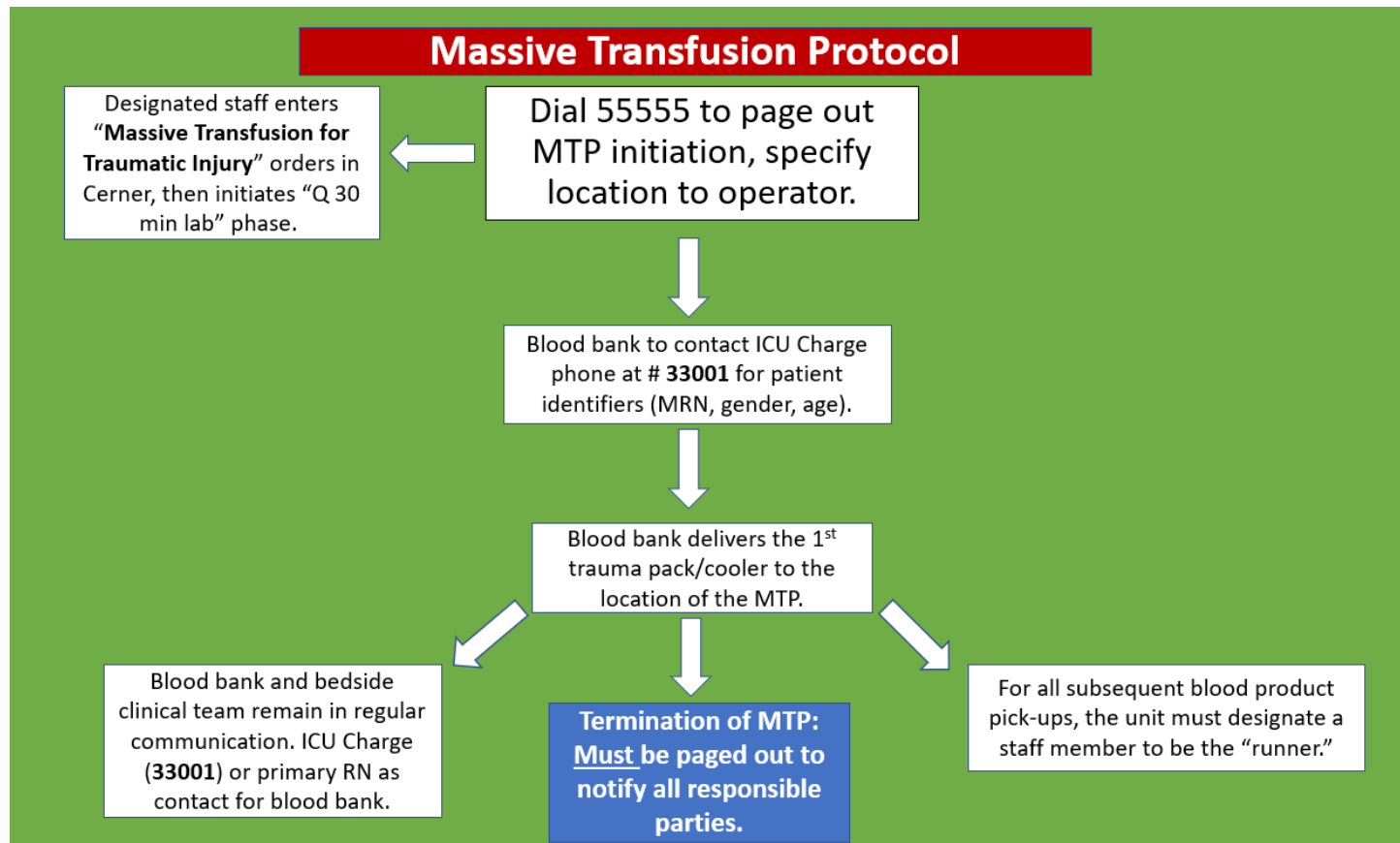


Massive Transfusion Protocol

Delivery of blood products

- Multidisciplinary team met: included Blood Bank, Trauma, OR, ICU, ED, OB
- Developed a process where the first pack in the MTP will be delivered to the department by the blood bank, no matter where it happened in the hospital.
 - All subsequent packs to be picked up by a designated runner from the department/unit initiating the MTP.

Delivery of Blood Products



Delivery of Blood Products

- All Trauma-related MTPs are reviewed through the PIPS process.
- Debriefs take place if/when anyone involved has concerns about the process, communication, or any part of the MTP.

Blood to Plasma Ratio

- Nursing education:
 - Engaged educators from the ED, ICU, and OR to add this topic to shift huddles, emphasize the balanced resuscitation in the annual MTP education, and share the trend we were seeing.
- Provider education:
 - Any cases that had a significantly unbalanced ratios discussed with the provider directly.
 - This as a reminder that the team leader needs to drive the 1:1 transfusion
 - Understand their perceived barriers/opportunities during the event

- Nursing documentation flowsheet for MTP.

Pack #	PRBC 1	PRBC 2	PRBC 3	PRBC 4
EXAMPLE →	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER
1	STICKER	STICKER	➤ ORDER NEXT PACK STICKER	STICKER
2	STICKER	STICKER	➤ ORDER NEXT PACK STICKER	STICKER
3	STICKER	STICKER	➤ ORDER NEXT PACK STICKER	STICKER

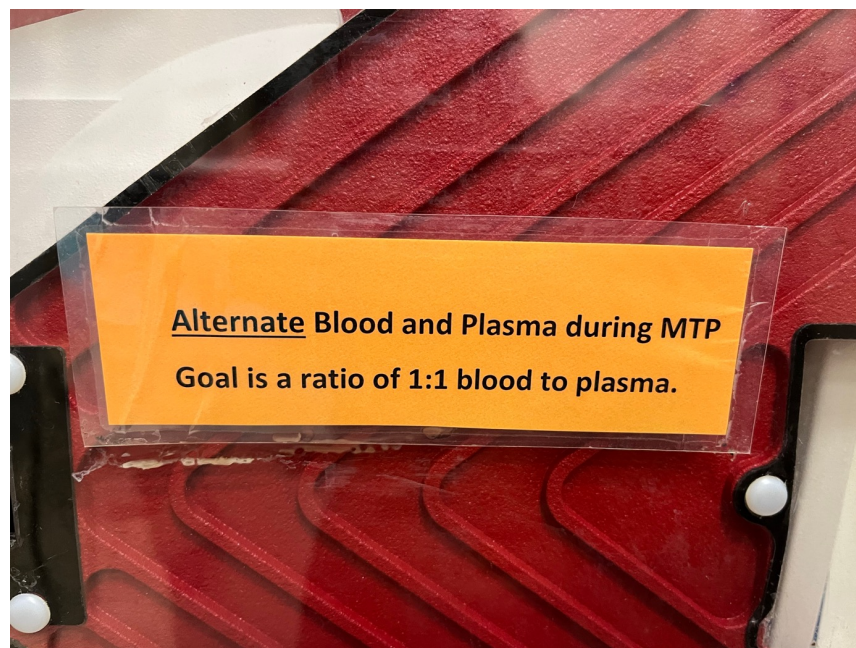
Pack #	PRBC 1	Plasma 1	PRBC 2	Plasma 2
EXAMPLE →	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER
1	STICKER	STICKER	STICKER	STICKER
2	STICKER	STICKER	STICKER	STICKER
3	STICKER	STICKER	STICKER	STICKER

CRUISE WATCHED
C-NEED C-PROG

PRBC 3	Plasma 3	PRBC 4	Plasma 4
TIME UP ATTACH STICKER	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER	TIME UP ATTACH STICKER
ORD ER NEXT PACK STICKER	STICKER	STICKER	STICKER
ORD ER NEXT PACK STICKER	STICKER	STICKER	STICKER
ORDER NEXT PACK STICKER	STICKER	STICKER	STICKER

PRBC 5	Plasma 5
TIME UP ATTACH STICKER	TIME UP ATTACH STICKER
STICKER	STICKER
STICKER	STICKER
STICKER	STICKER

Blood to Plasma Ratio



How are we doing?

What's next?

- Whole blood at Munson Medical Center!

Bronson Methodist Hospital

Mass Transfusion Protocol-Process Improvement

Oreste Romeo, MD, FACS-Trauma Medical Director

Cheryl Stevenson, MSN, RN- Trauma Program Manager

Collaboration

- Blood Bank Leadership
- Trauma Surgeons
- Trauma Process Improvement Nurse(s)
- Emergency Department Leadership
- Trauma Care Unit Leadership
- Monthly report out at Trauma Process Improvement Committee
- TMD attends Lab Process Improvement meeting monthly

Blood Bank

- Quick follow-up
- Direct feedback to provider
- Includes TEG analysis
- Allows for provider input
- Summarizes MTP
- Looks at delays in MTP activation until first unit spiked from cooler #1

Pt. #1, BB Follow-Up

Patient #2, BB follow-up

Patient #2, BB follow-up

Patient #2, BB follow-up

Patient #2, BB follow-up

Trauma Surgeon

- Receives email from BB
- TMD/TPM included on email
- Allows for comment and feedback from surgeon

Provider Comment pt. #1

Provider Comment pt. #2

Trauma Process Improvement

- Add feedback to registry in document vault
- Provides insight on 1:1 ratio
- Allows for follow-up with ED/TCU staff

Monthly Report Out at Trauma PI

- MTP Data
 - Number of MTP for previous month
 - Time of activation of MTP to first unit spiked
- Compare year to year MTP
- Whole blood usage
- Whole blood wastage

2022 vs 2023 MTPs

Whole Blood Usage

Whole Blood Waste

Thank You!

Break

Back at 12:45p

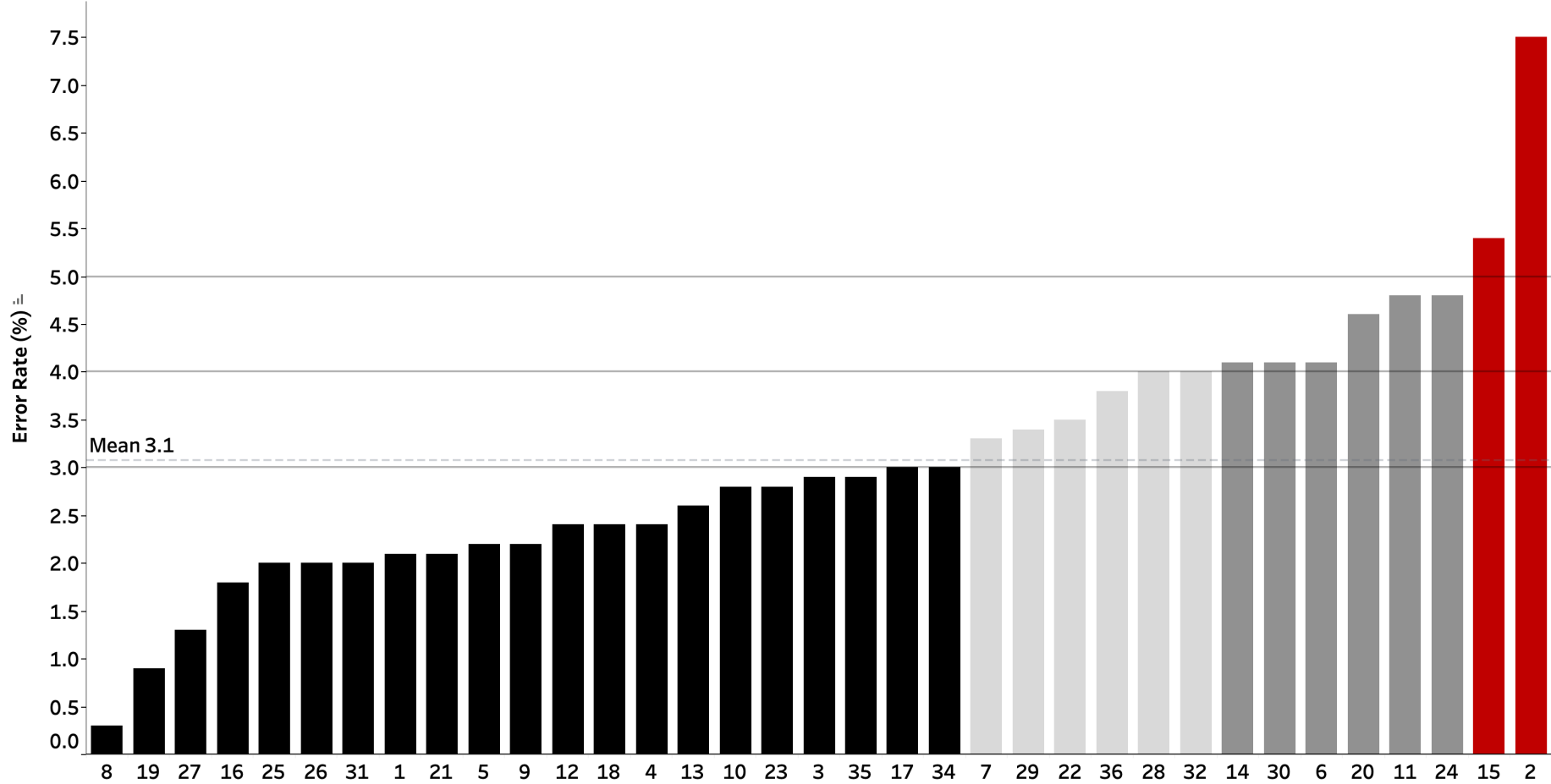


**MTQIP Data
Hospital Scoring Index Results
Value Based Reimbursement**

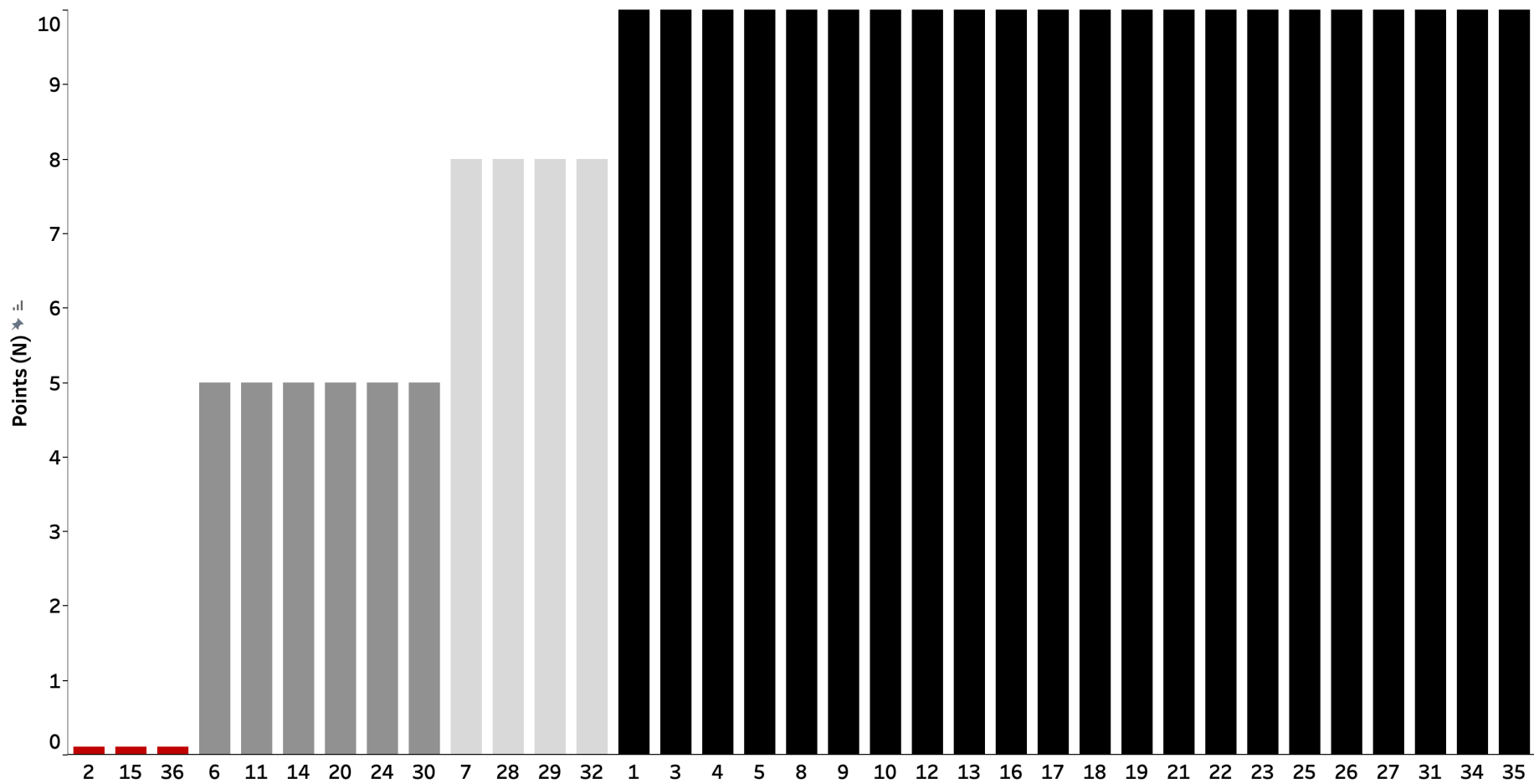
Mark Hemmila, MD



Metric 3 | Data Validation
Graph ID 39



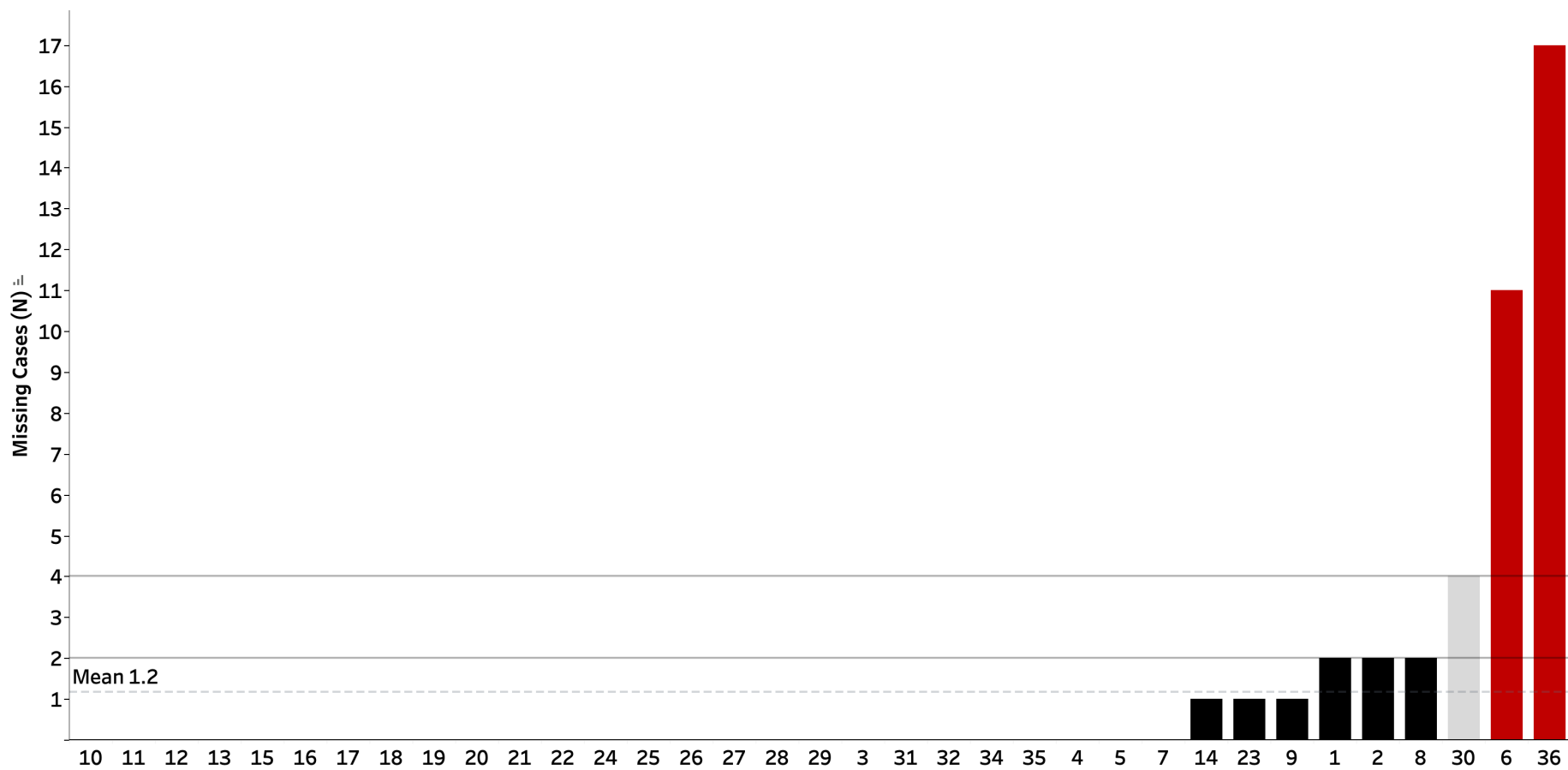
Metric 3 Points | Data Validation



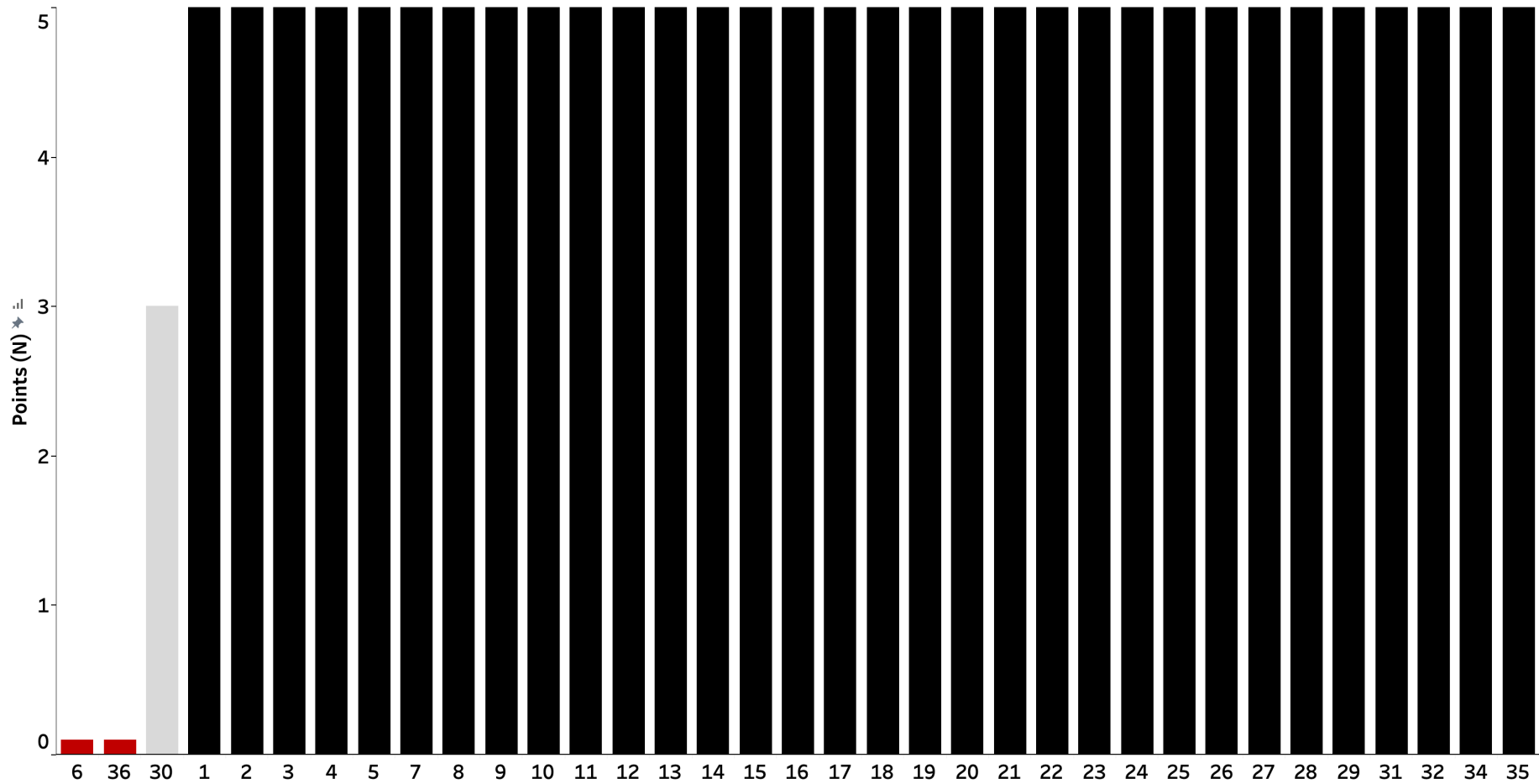
#4 PI Death Determination Documentation

- ◆ Completed PI death determination (12 mo: 7/1/22-6/30/23)
- ◆ Cohort 2 (Admit trauma)
- ◆ Exclude no signs of life
 - 0-2 patients missing = 5 points
 - 3-4 patients missing = 3 points
 - > 4 patients missing = 0 points

Metric 4 | PI Death Determination Documentation
Cohort 2 (Admit to Trauma) | 7/1/22 - 6/30/23
Graph ID 106



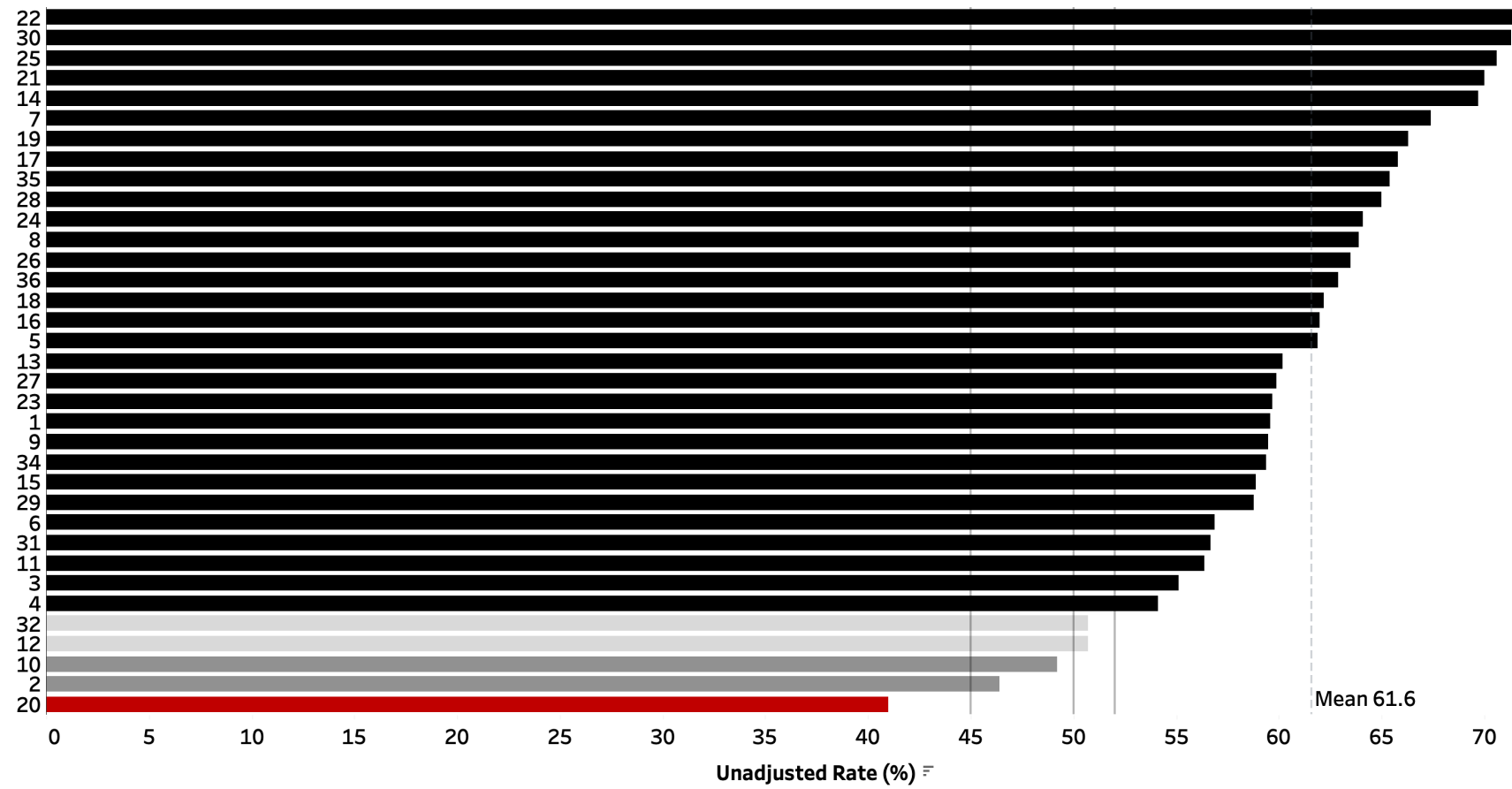
Metric 4 Points | Death Determination Documentation



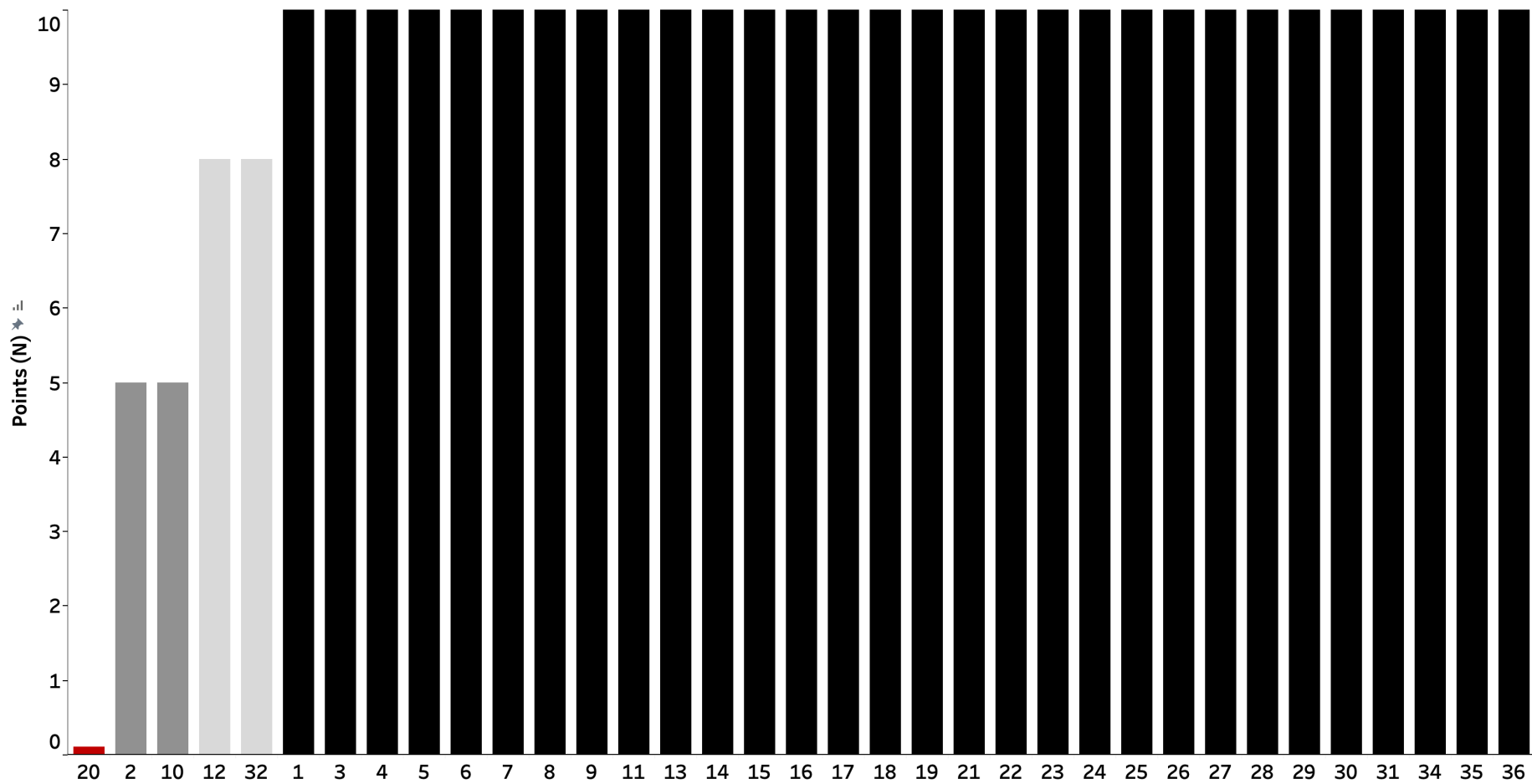
#5 Timely LMWH VTE Prophylaxis in Trauma Service Admits

- ◆ Venous Thromboembolism (VTE) Prophylaxis with LMWH Initiated Within 48 Hours of Arrival in Trauma Service Admits with > 2 Day Length of Stay (18 mo: 1/1/22-6/30/23)
 - $\geq 52.5\%$ of patients (≤ 48 hr)
 - $\geq 50\%$ of patients (≤ 48 hr)
 - $\geq 45\%$ of patients (≤ 48 hr)
 - $< 45\%$ of patients (≤ 48 hr)

Metric 5 | LMWH VTE Prophylaxis <= 48 Hours
Cohort 2 (Admit to Trauma) | 1/1/22 - 6/30/23
Graph ID 97



Metric 5 Points | Timely LMWH VTE Prophylaxis



Early VTE prophylaxis in severe traumatic brain injury: A propensity score weighted EAST multicenter study

Asanthi M. Ratnasekera, DO, FACS, Daniel Kim, MD, Sirivan S. Seng, MD, Christina Jacovides, MD, Elinore J. Kaufman, MD, MDHP, Hannah M. Sadek, AGACNP-BC, Lindsey L. Perea, DO, FACS, Christina Monaco, DO, Ilya Shnaydman, MD, FACS, Alexandra Jeongyoon Lee, BS, Victoria Sharp, DO, FACS, FACOS, Angela Miciura, MD, Eric Trevizo, MD, Martin Rosenthal, MD, FACS, Lawrence Lottenberg, MD, William Zhao, MD, Alicia Keininger, MD, Michele Hunt, MSN, John Cull, MD, FACS, Chassidy Balentine, AGNP-BC, MS, TCRN, Tanya Egodage, MD, FACS, Aleem Mohamed, BS*, Michelle Kincaid, MD, FACS, Stephanie Doris, DO, Robert Cotterman, DO, Sara Seegert, MSN, RN, Lewis E. Jacobson, MD, FACS, Jamie Williams, MSML, BSN, RN, CCRP, Melissa Whitmill, MD, FACS, Brandi Palmer, MS, Caleb Mentzer, DO, FACS* Nichole Tackett, MS, Tjasa Hranjec, MD, MS-CR, FACS, Thomas Dougherty, MD, Shawna Morrissey, DO, FACS, Lauren Donatelli-Seyler, DO, FACOS, FACS, Amy Rushing, MD, Leah C. Tatebe, MD, FACS, Tiffany J. Nevill, DO, Michel B. Aboutanos, MD, MPH, FACS, David Hamilton, MD, Diane Redmond, MSN, Daniel C. Cullinane, MD, Carolyne Falank, MS, PhD, Mark McMellen, MD, FACS, Christ Duran, RN, MBA, Jennifer Daniels, DO, Shana Ballow, DO, FACS, Kevin Schuster, MD, MPH, FACS, and Paula Ferrada, MD, FACS, FCCM, Newark, Delaware

BACKGROUND: Patients with traumatic brain injury (TBI) are at high risk of venous thromboembolism events (VTE). We hypothesized that early chemical VTE prophylaxis initiation (≤ 24 hours of a stable head CT) in severe TBI would reduce VTE without increasing risk of intracranial hemorrhage expansion (ICHE).

METHODS: A retrospective review of adult patients 18 years or older with isolated severe TBI (Abbreviated Injury Scale score, ≥ 3) who were admitted to 24 Level I and Level II trauma centers from January 1, 2014 to December 31 2020 was conducted. Patients were divided into those who did not receive any VTE prophylaxis (NO VTEp), who received VTE prophylaxis ≤ 24 hours after stable head CT (VTEp ≤ 24) and who received VTE prophylaxis >24 hours after stable head CT (VTEp >24). Primary outcomes were VTE and ICHE. Covariate balancing propensity score weighting was utilized to balance demographic and clinical characteristics across three groups. Weighted univariate logistic regression models were estimated for VTE and ICHE with patient group as predictor of interest. Of 3,936 patients, 1,784 met inclusion criteria. Incidences of VTE was significantly higher in the VTEp >24 group, with higher incidences of DVT in the group. Higher incidences of ICHE were observed in the VTEp ≤ 24 and VTEp >24 groups. After propensity score weighting, there was a higher risk of VTE in patients in VTEp >24 compared with those in VTEp ≤ 24 (odds ratio, 1.51; 95% confidence interval, 0.69–3.33; $p = 0.307$), however was not significant. Although, the No VTEp group had decreased odds

Early venous thromboembolism prophylaxis in patients with trauma intracranial hemorrhage: Analysis of the prospective multicenter Consortium of Leaders in Traumatic Thromboembolism study

Yu-Tung Wu, MD, Chih-Ying Chien, MD, Kazuhide Matsushima, MD, Morgan Schellenberg, MD, MPH, Kenji Inaba, MD, Ernest E. Moore, MD, Angela Sauaia, MD, PhD, M. Margaret Knudson, MD, Matthew J. Martin, MD, and the CLOTT Study Group, Los Angeles, California

BACKGROUND: The optimal time to initiate venous thromboembolism prophylaxis (VTEp) for patients with intracranial hemorrhage (ICH) is controversial and must balance the risks of VTE with potential progression of ICH. We sought to evaluate the efficacy and safety of early VTEp initiation after traumatic ICH.

METHODS: This is a secondary analysis of the prospective multicenter Consortium of Leaders in the Study of Thromboembolism study. Patients with head Abbreviated Injury Scale score of > 2 and with immediate VTEp held because of ICH were included. Patients were divided into VTEp \leq or > 48 hours and compared. Outcome variables included overall VTE, deep vein thrombosis (DVT), pulmonary embolism, progression of intracranial hemorrhage (pICH), or other bleeding events. Univariate and multivariate logistic regressions were performed.

RESULTS: There were 881 patients in total; 378 (43%) started VTEp ≤ 48 hours (early). Patients starting VTEp > 48 hours (late) had higher VTE (12.4% vs. 7.2%, $p = 0.01$) and DVT (11.0% vs. 6.1%, $p = 0.01$) rates than the early group. The incidence of pulmonary embolism (2.1% vs. 2.2%, $p = 0.94$), pICH (1.9% vs. 1.8%, $p = 0.95$), or any other bleeding event (1.9% vs. 3.0%, $p = 0.28$) was equivalent between early and late VTEp groups. On multivariate logistic regression analysis, VTEp > 48 hours (odds ratio [OR], 1.86), ventilator days > 3 (OR, 2.00), and risk assessment profile score of ≥ 5 (OR, 6.70) were independent risk factors for VTE (all $p < 0.05$), while VTEp with enoxaparin was associated with decreased VTE (OR, 0.54, $p < 0.05$). Importantly, VTEp ≤ 48 hours was not associated with pICH (OR, 0.75) or risk of other bleeding events (OR, 1.28) (both $p = \text{NS}$).

CONCLUSION: Early initiation of VTEp (≤ 48 hours) for patients with ICH was associated with decreased VTE/DVT rates without increased risk of pICH or other significant bleeding events. Enoxaparin is superior to unfractionated heparin as VTE prophylaxis in patients with severe TBI. (*J Trauma Acute Care Surg.* 2023;95: 649–656. Copyright © 2023 Wolters Kluwer Health, Inc. All rights reserved.)

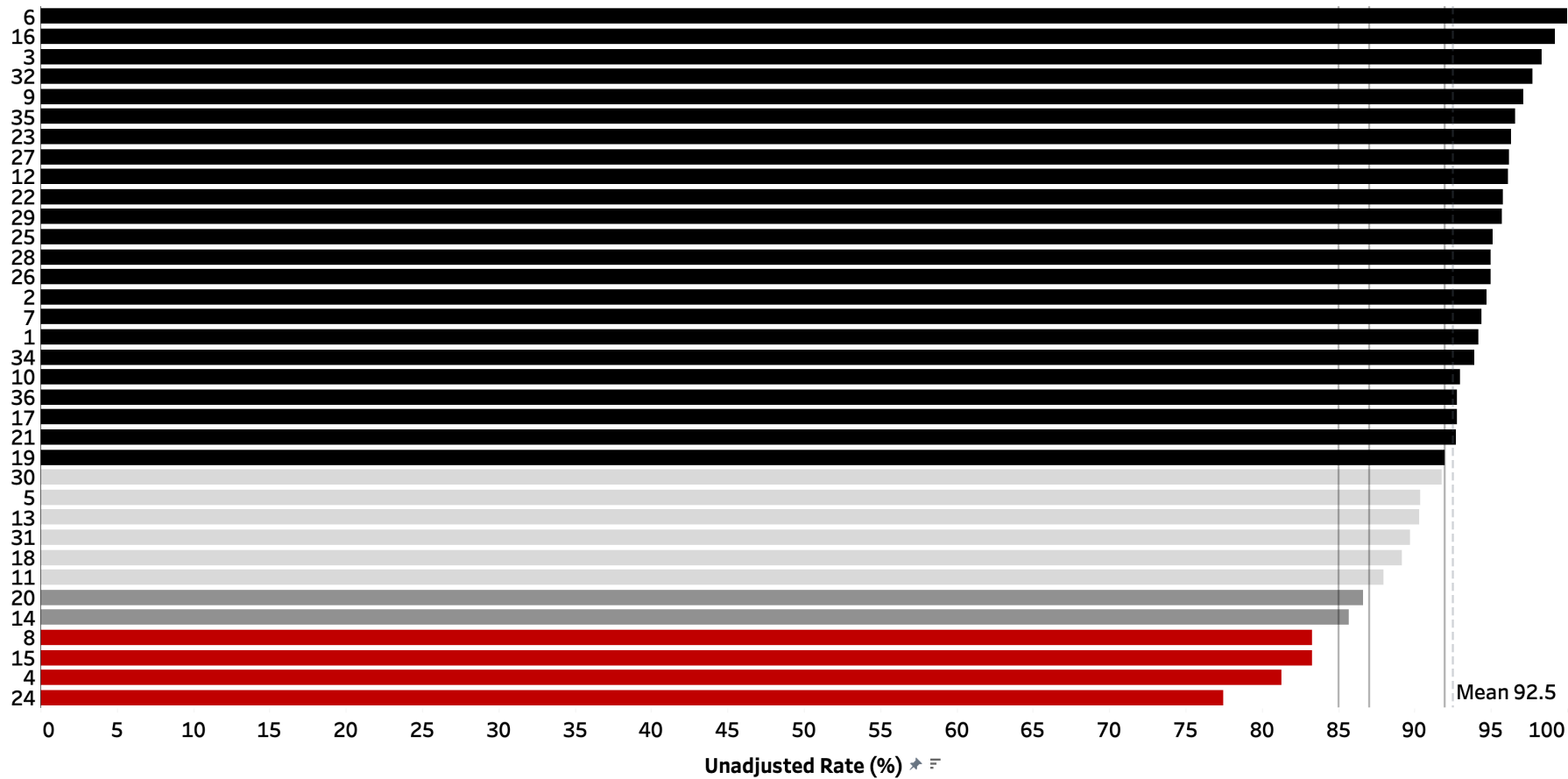
LEVEL OF EVIDENCE: Therapeutic/Care Management; Level IV.

KEY WORDS: Traumatic brain injury; intracranial hemorrhage; venous thromboembolism; deep vein thrombosis; pulmonary embolus; chemoprophylaxis.

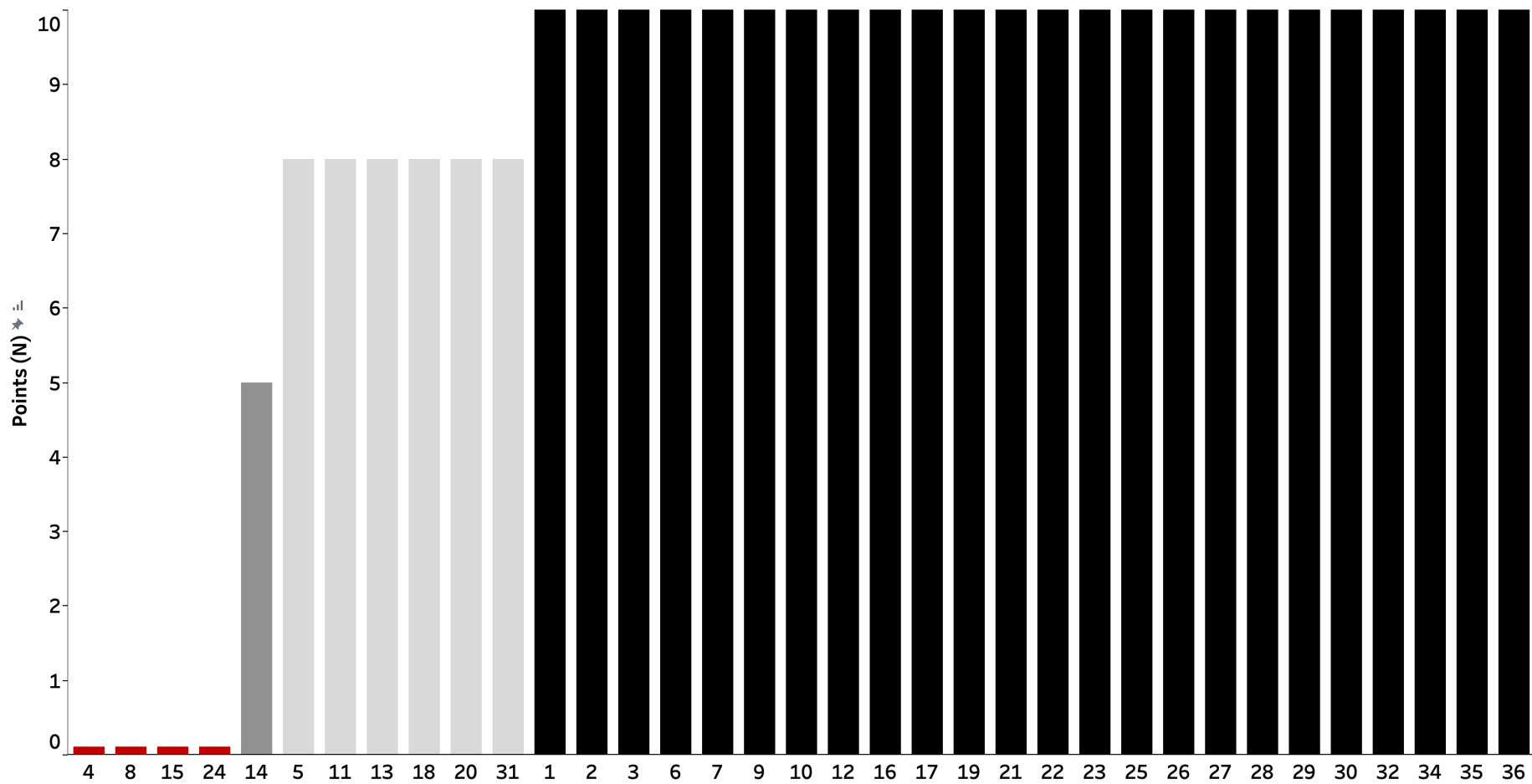
#6 Timely Surgical Repair in Geriatric (Age \geq 65) Isolated Hip Fracture

- ◆ Time to surgical repair of isolated hip fracture in patients age 65 or older (12 mo: 7/1/22-6/30/23)
 - \geq 92% of patients (\leq 48 hr)
 - \geq 87% of patients (\leq 48 hr)
 - \geq 85% of patients (\leq 48 hr)
 - $<$ 85% of patients (\leq 48 hr)

Metric 6 | Timely Surgical IHF Repair
Cohort 8 (Isolated Hip Fracture) | 7/1/22 - 6/30/23
Graph ID 99



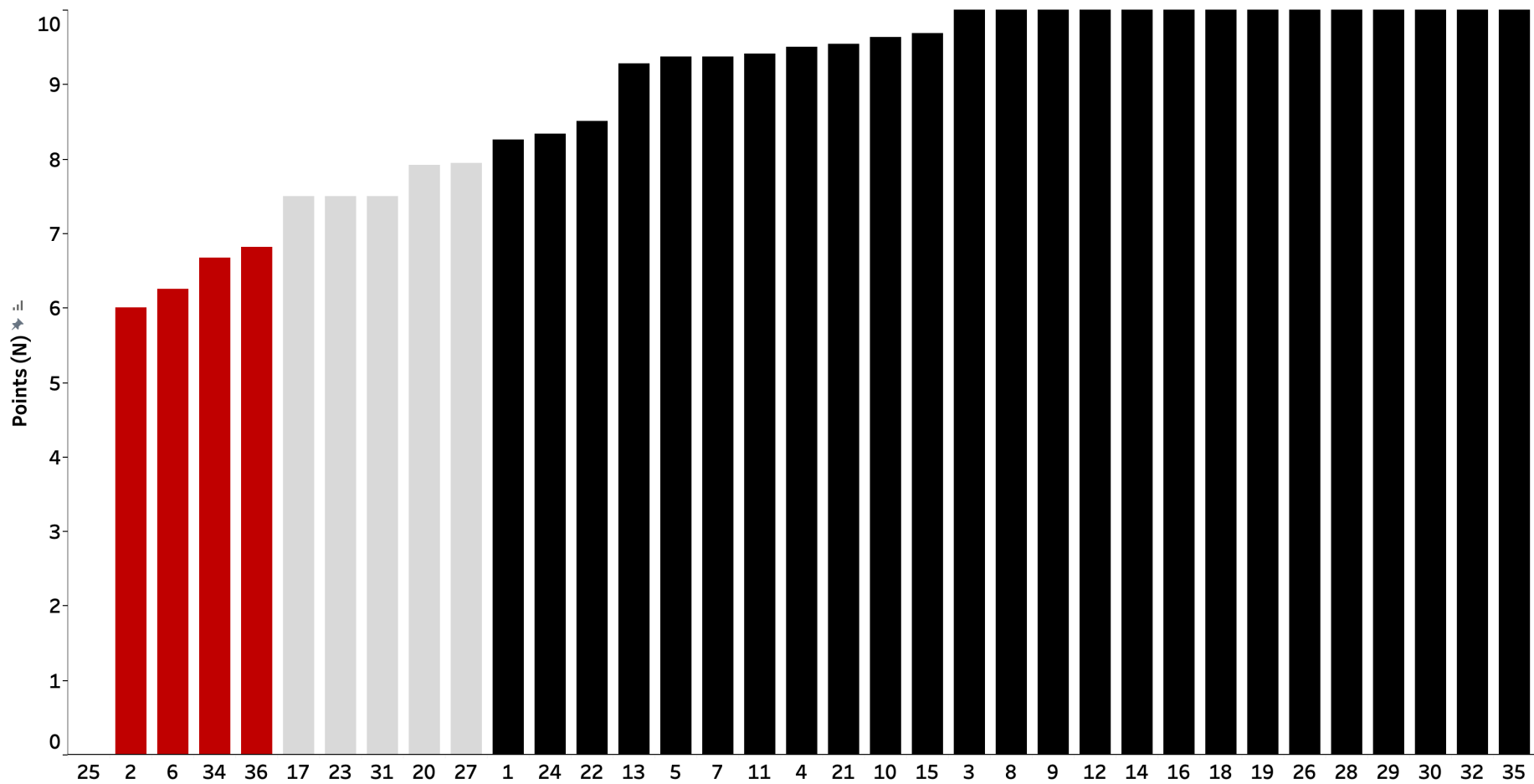
Metric 6 Points | Timely Surgical Repair IHF



#7 Red Blood Cell to Plasma Ratio

- ◆ Red blood cell to plasma ratio (weighted mean points) of patients transfused ≥ 5 units in first 4 hours (18 Mo's: 1/1/22-6/30/23)

Metric 7 Points | RBC:Plasma Ratio in Massive Transfusion



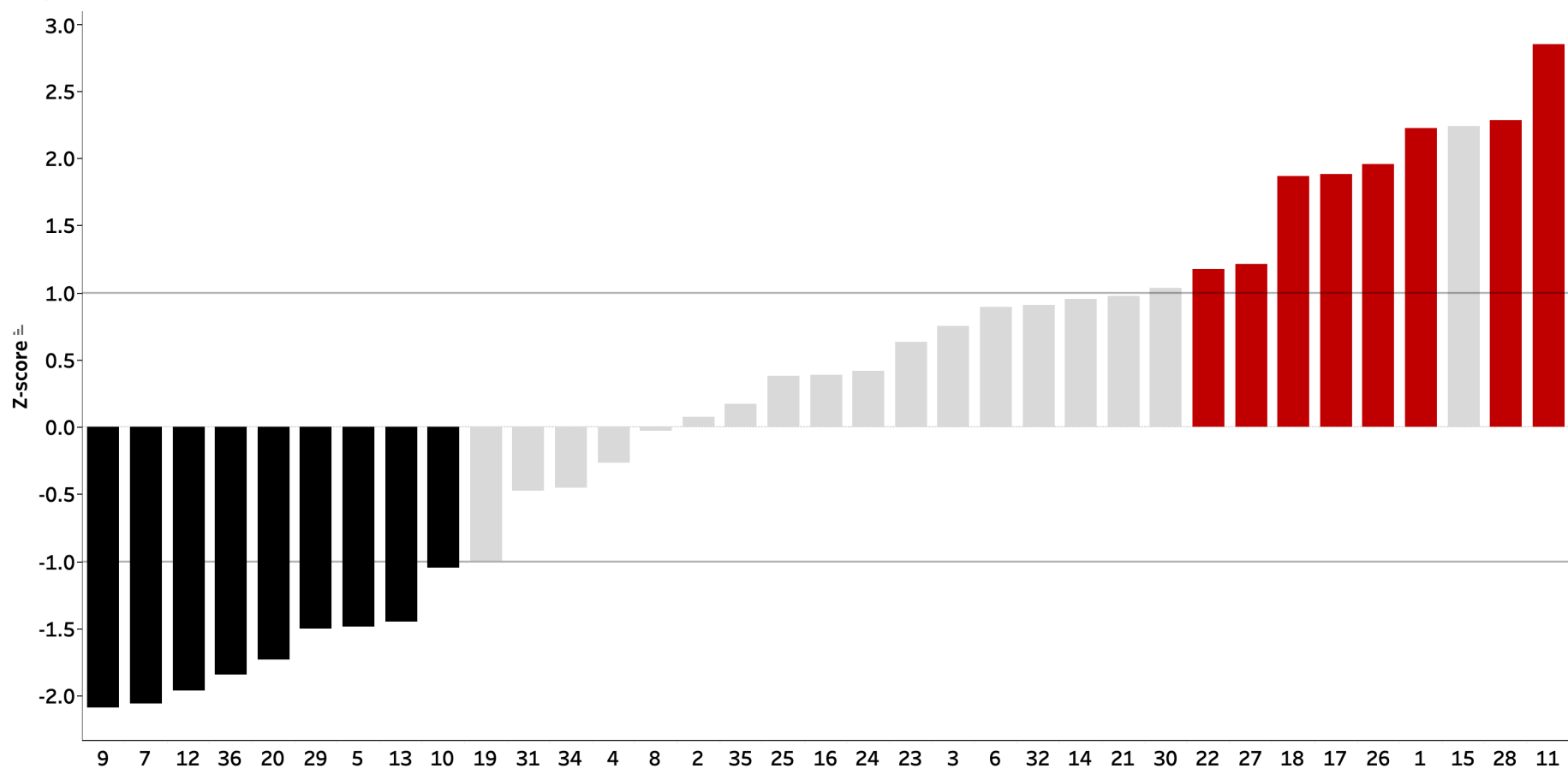
#8 Serious Complications

- ♦ Serious Complication Rate-Trauma Service Admits (3 years: 7/1/20-6/30/23)

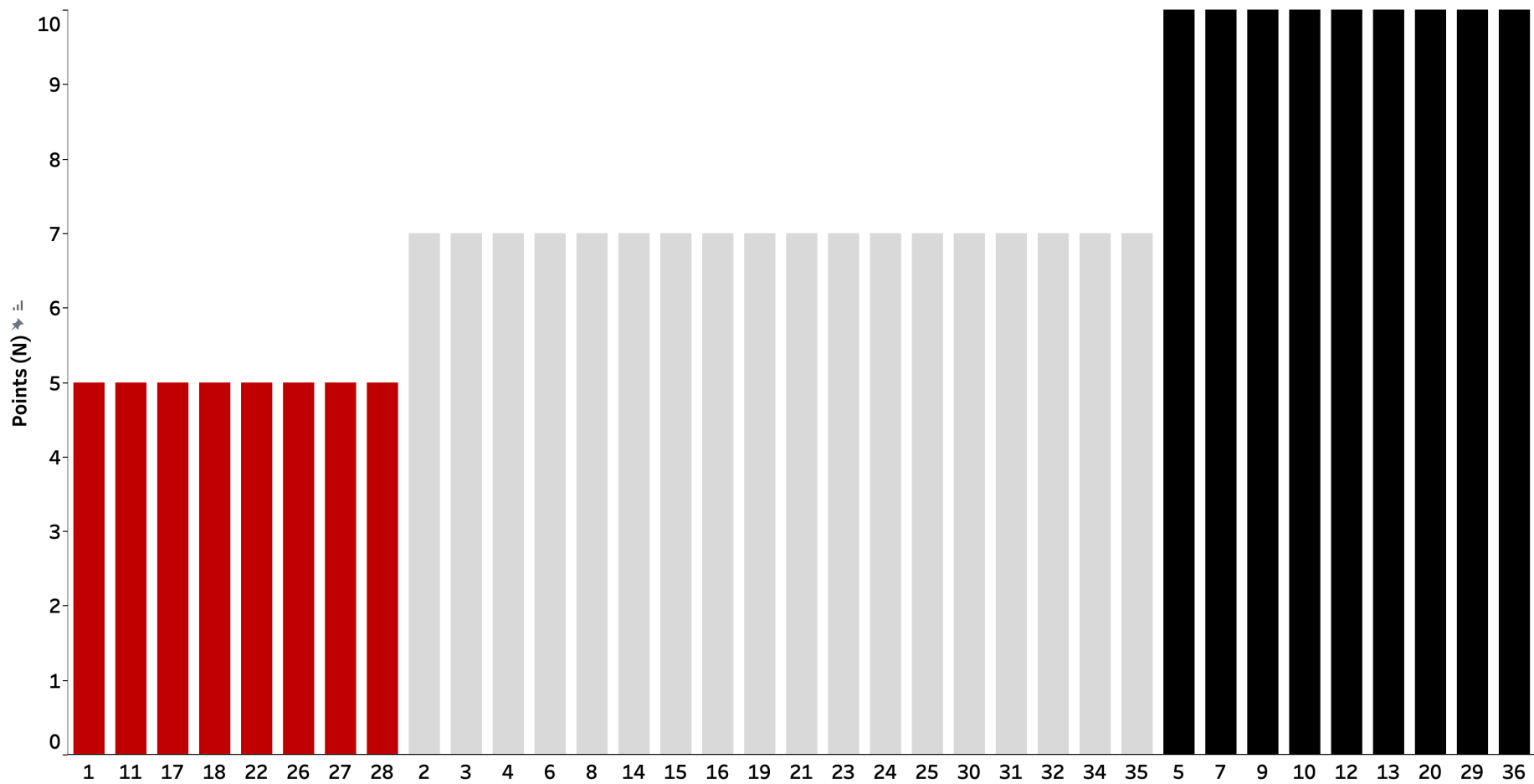
#9 Mortality

- ♦ Mortality Rate-Trauma Service Admits (3 years: 7/1/20-6/30/23)

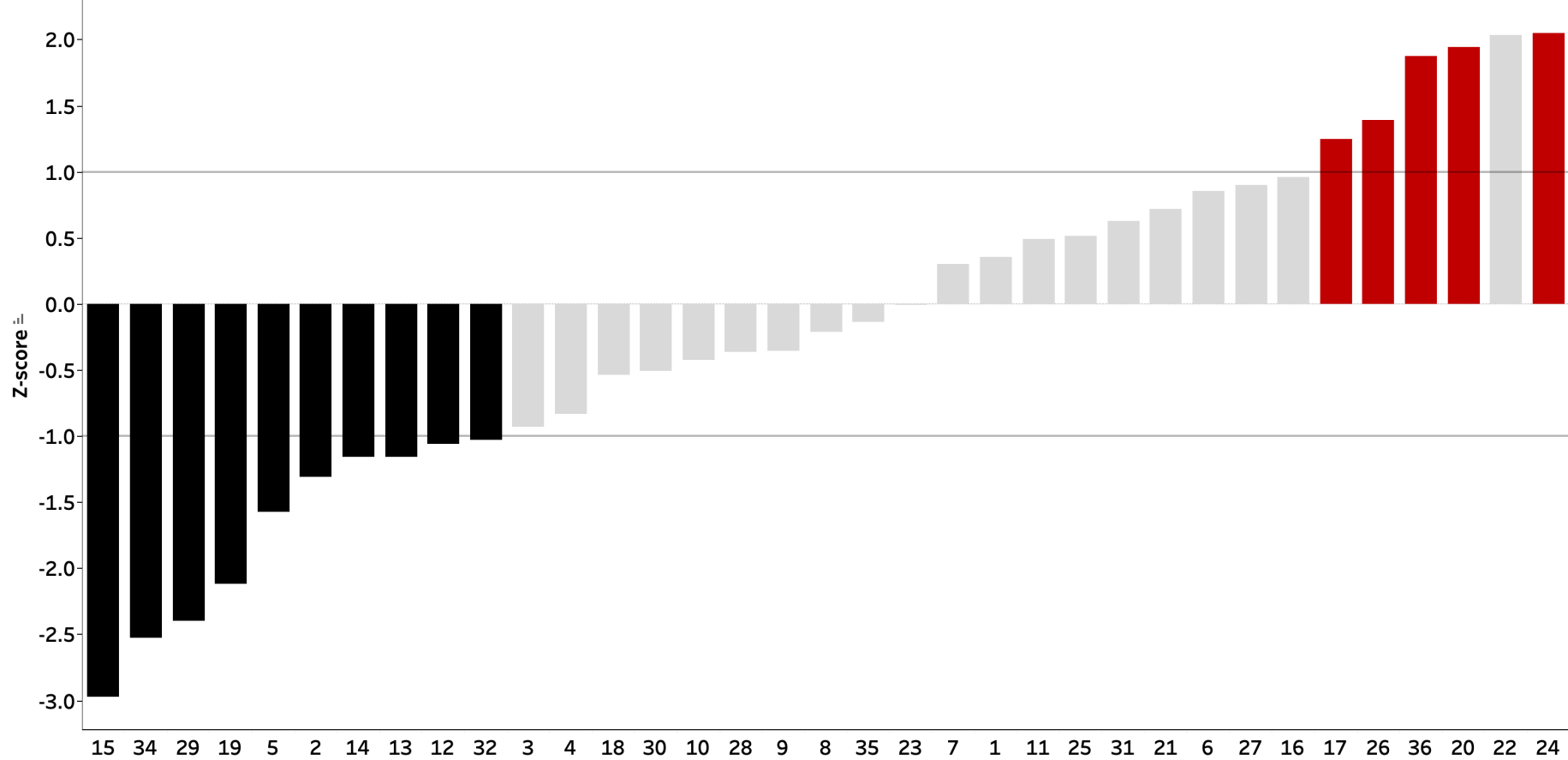
Metric 8 | Z-score Serious Complication Rate
Cohort 2 (Admit to Trauma) | 7/1/20 - 6/30/23
Graph ID: 72



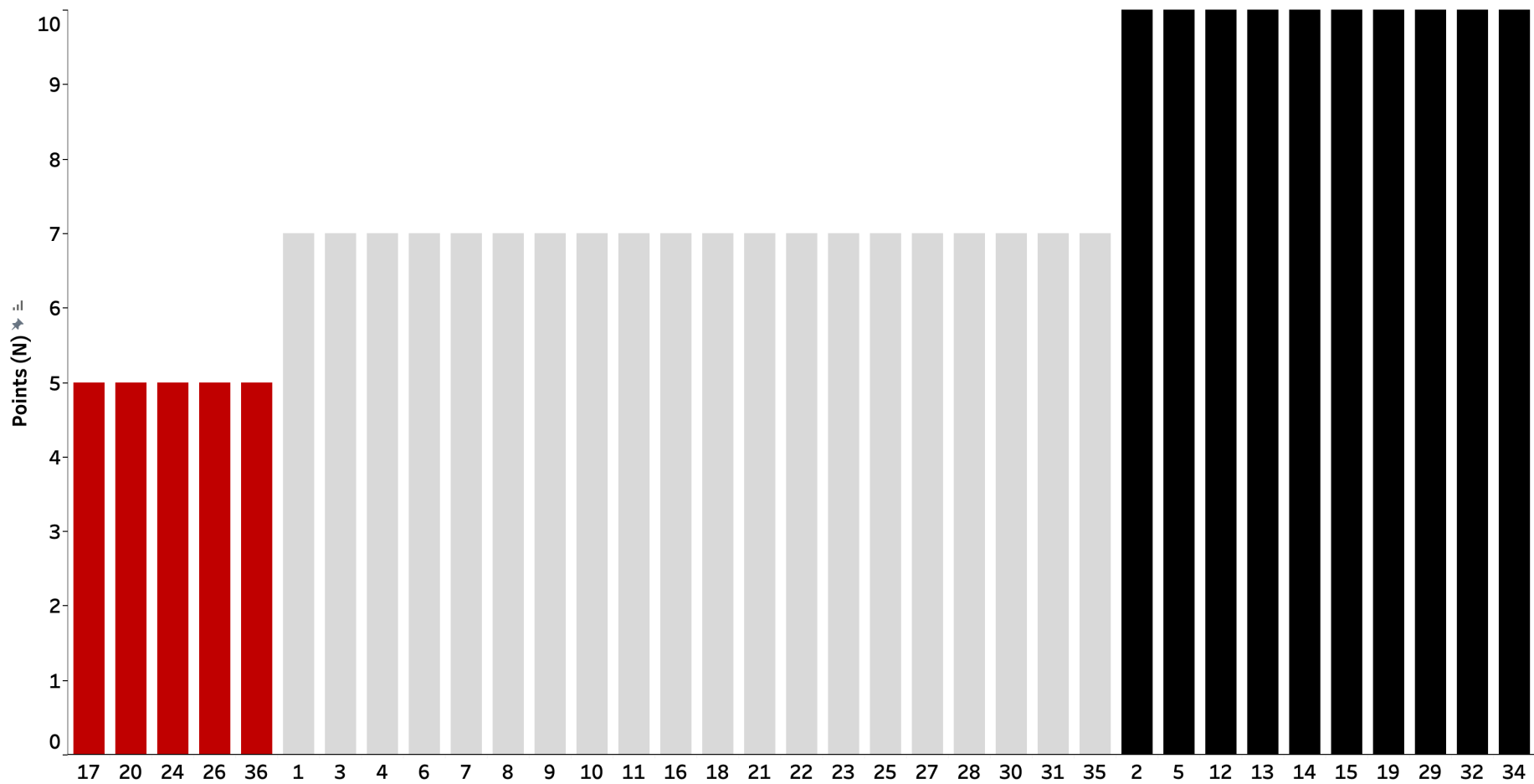
Metric 8 Points | Z-score Serious Complications



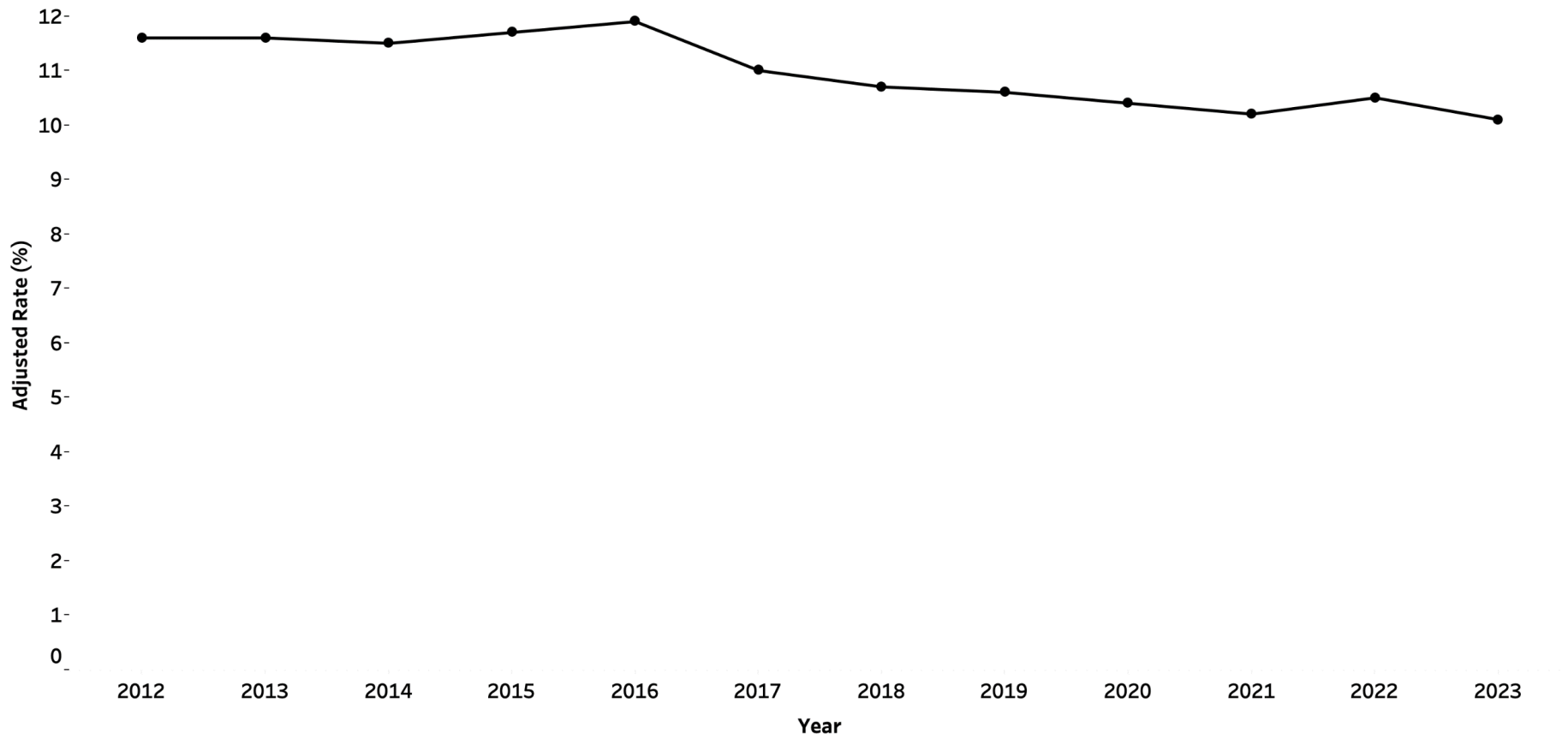
Metric 9 | Z-score Mortality Rate
Cohort 2 (Admit to Trauma) | 7/1/20 - 6/30/23
Graph ID 73



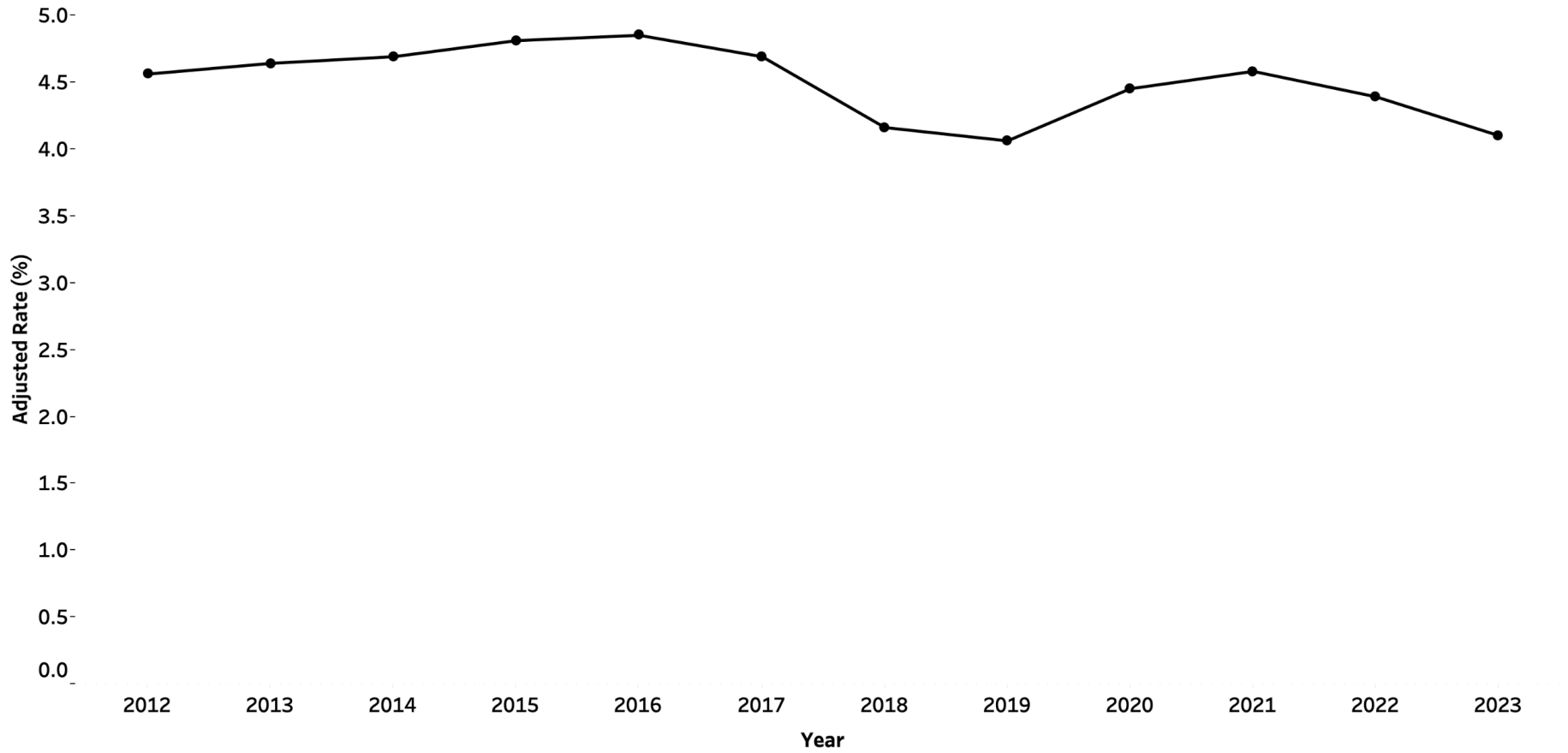
Metric 9 Points | Z-score Serious Mortality



Collaborative Serious Complication Trend
Cohort 2 (Admit to Trauma)
Graph ID 28



Collaborative Mortality Trend
Cohort 2 (Admit to Trauma)
Graph ID 27



#10 Timely Antibiotic in Femur/Tibia Open Fractures - Collaborative Wide Measure

- ◆ Type of antibiotic administered along with date and time for open fracture of femur or tibia
- ◆ Presence of acute open femur or tibia fracture based on AIS or ICD10 codes (See list)
- ◆ Cohort = Cohort 1 (All)
- ◆ Exclude direct admissions and transfer in
- ◆ No Signs of Life = Exclude DOAs
- ◆ Transfers Out = Include Transfers Out
- ◆ Time Period = 7/1/22 to 6/30/23

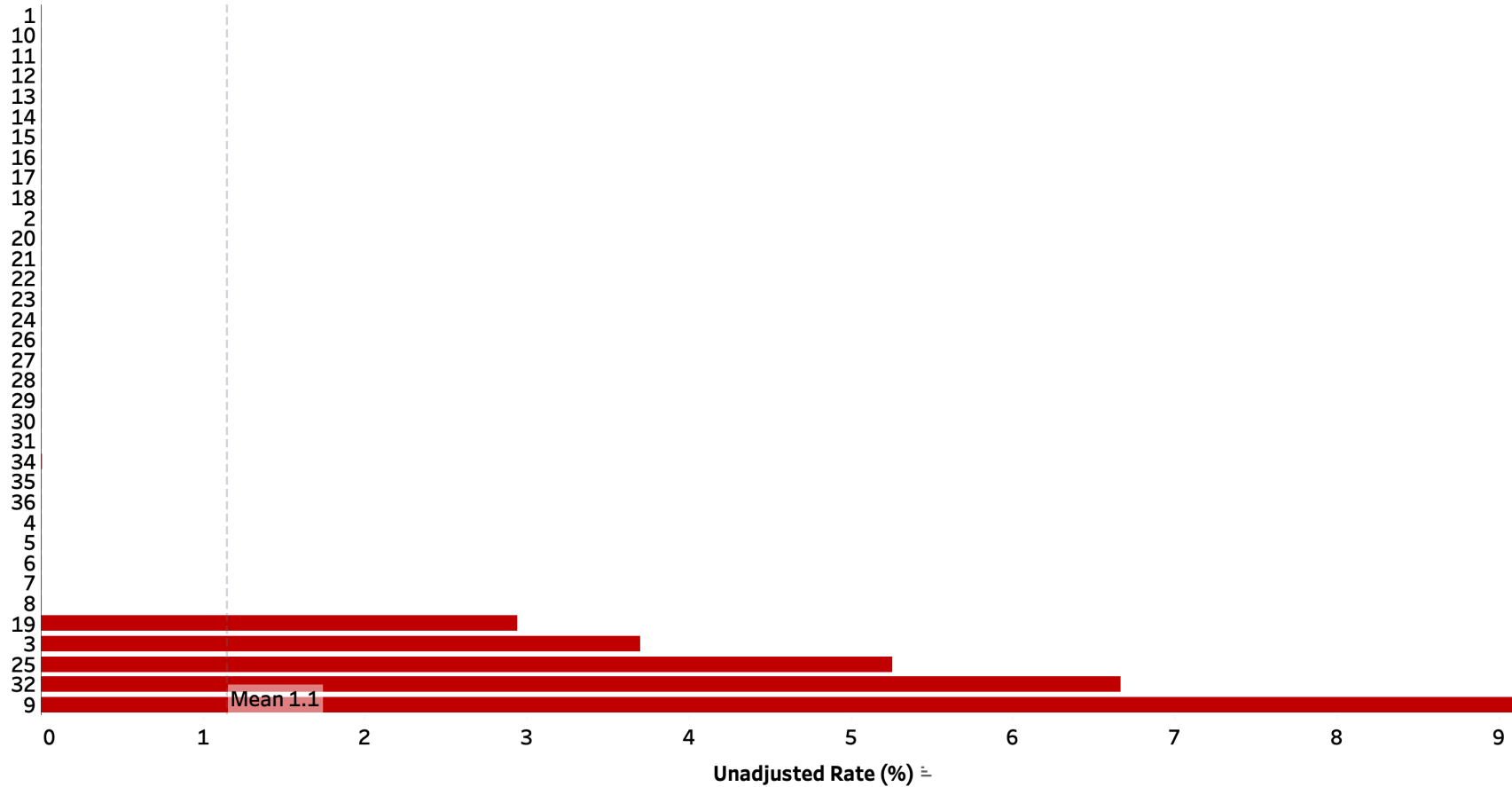
#10 Open Fracture Antibiotic Usage

- ◆ Measure = % of patients with antibiotic type, date, time recorded ≤ 90 minutes
 - $\geq 85\%$ patients (≤ 90 min) > 10 points
 - All or nothing
- ◆ ACS-COT Orange Book – VRC resources
 - Administration within 60 minutes
 - ◆ ACS OTA Ortho Update
 - ◆ ACS TQIP Best Practices Orthopedics

Head CT Missing/Negative Metric Data

Cohort 1 (MTQIP All) | 7/1/22 - 6/30/23

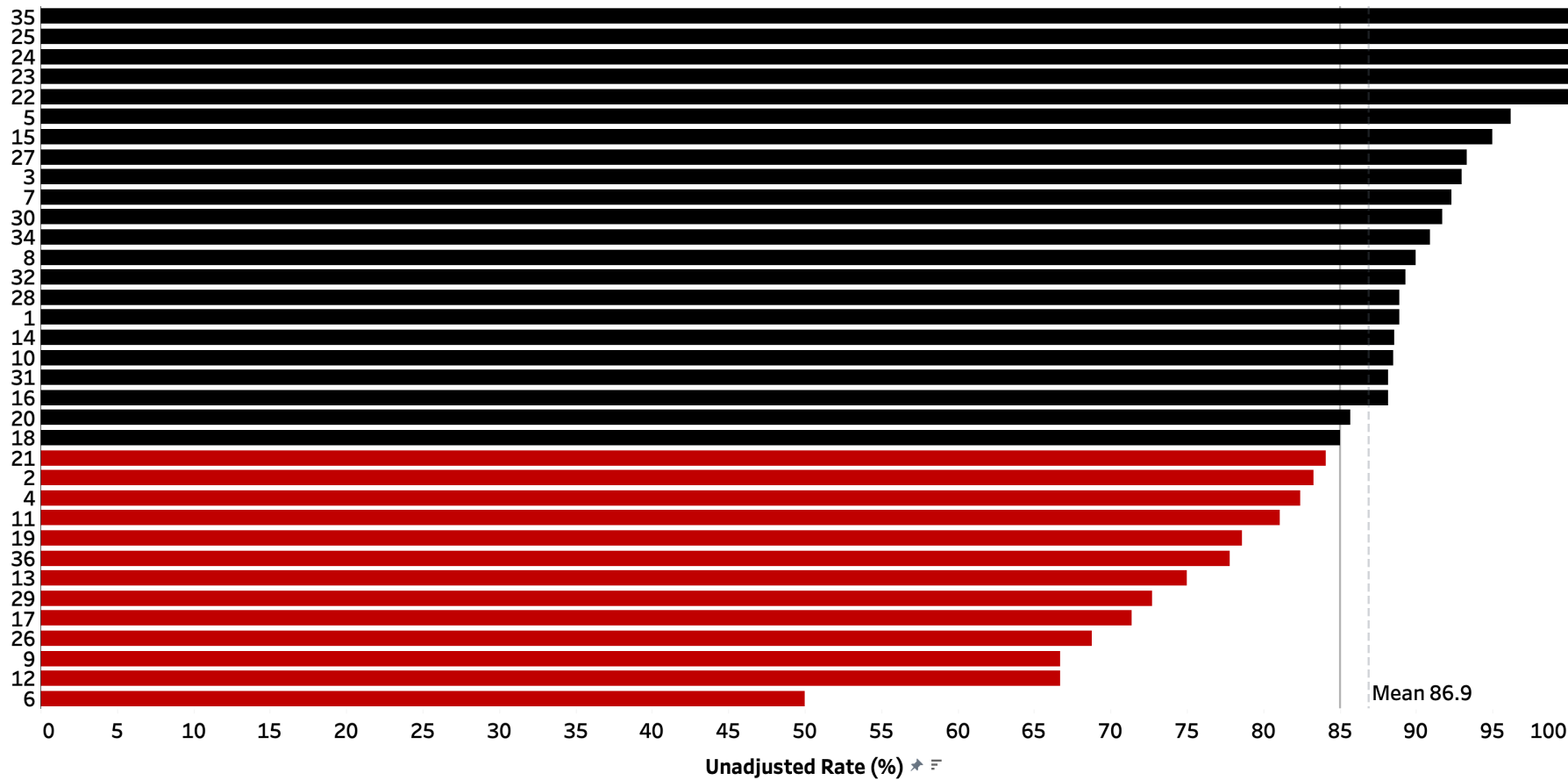
Graph ID 88



Metric 11 | Open Fracture Antibiotic Administration <= 90 Min

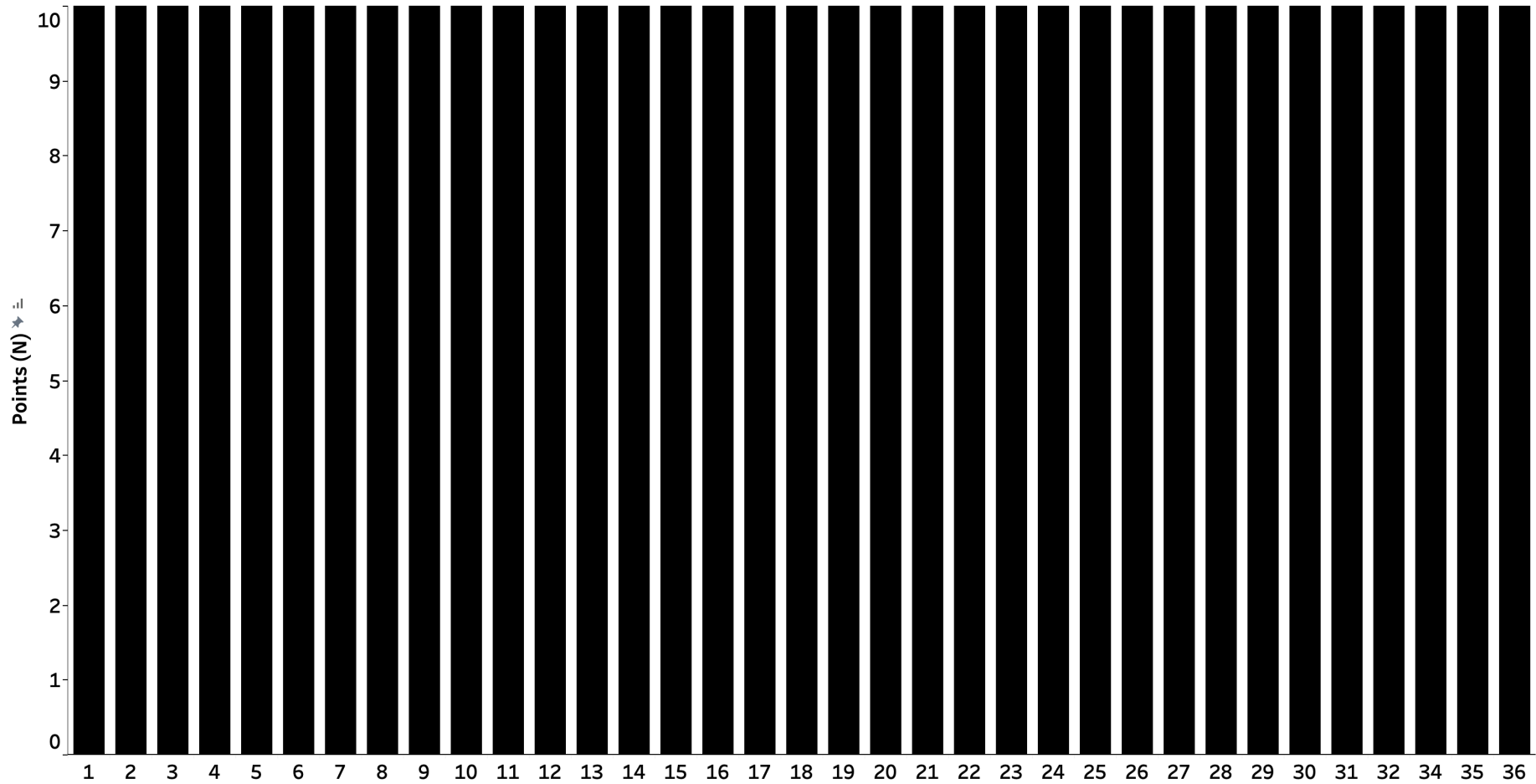
Cohort 1 (MTQIP All) | 7/1/22 - 6/30/23

Graph ID 96



Metric 11 Points | Timely Antibiotic Administration in Open Femur/Tibia Fractures

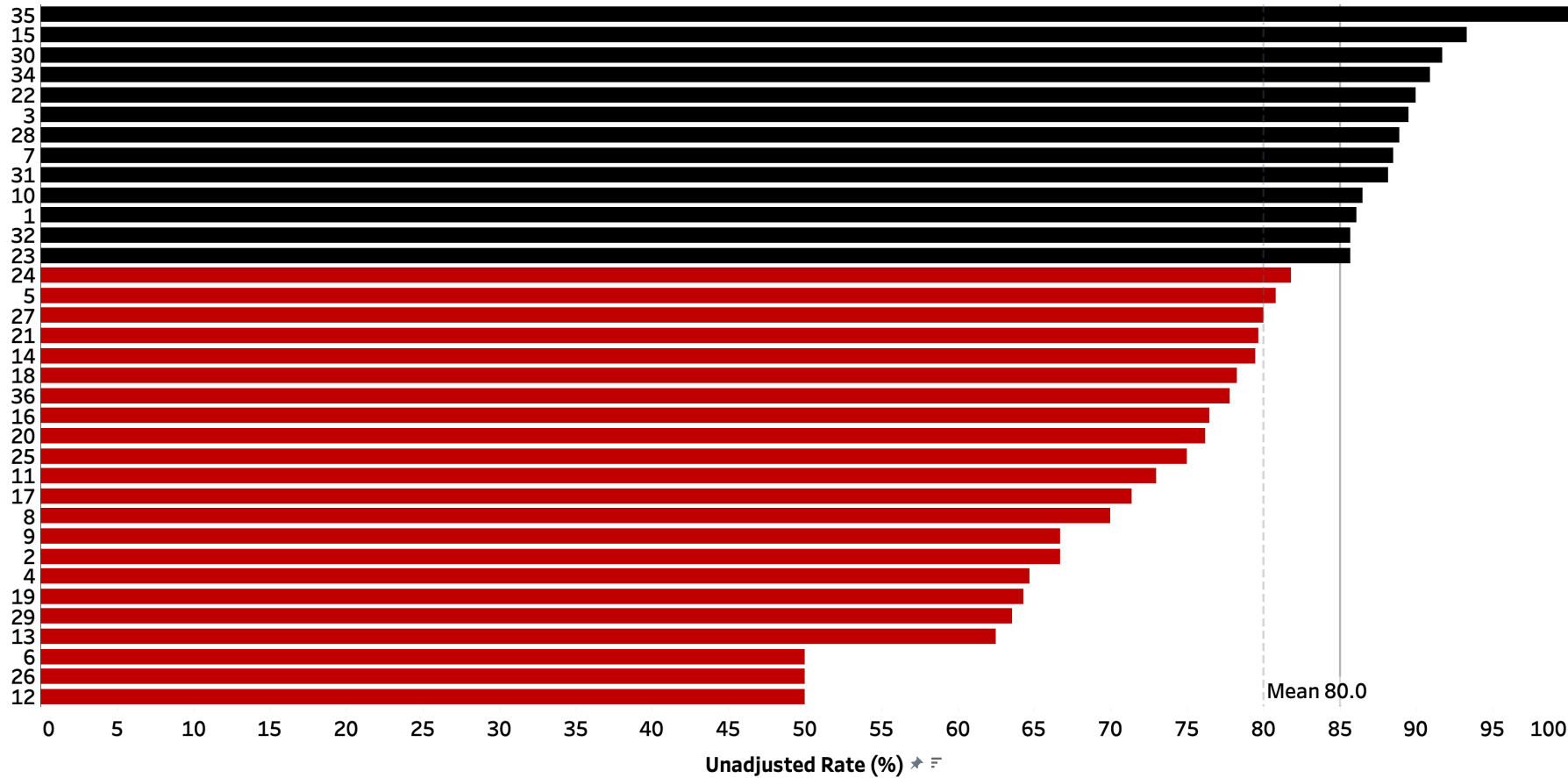
Collaborative-wide measure



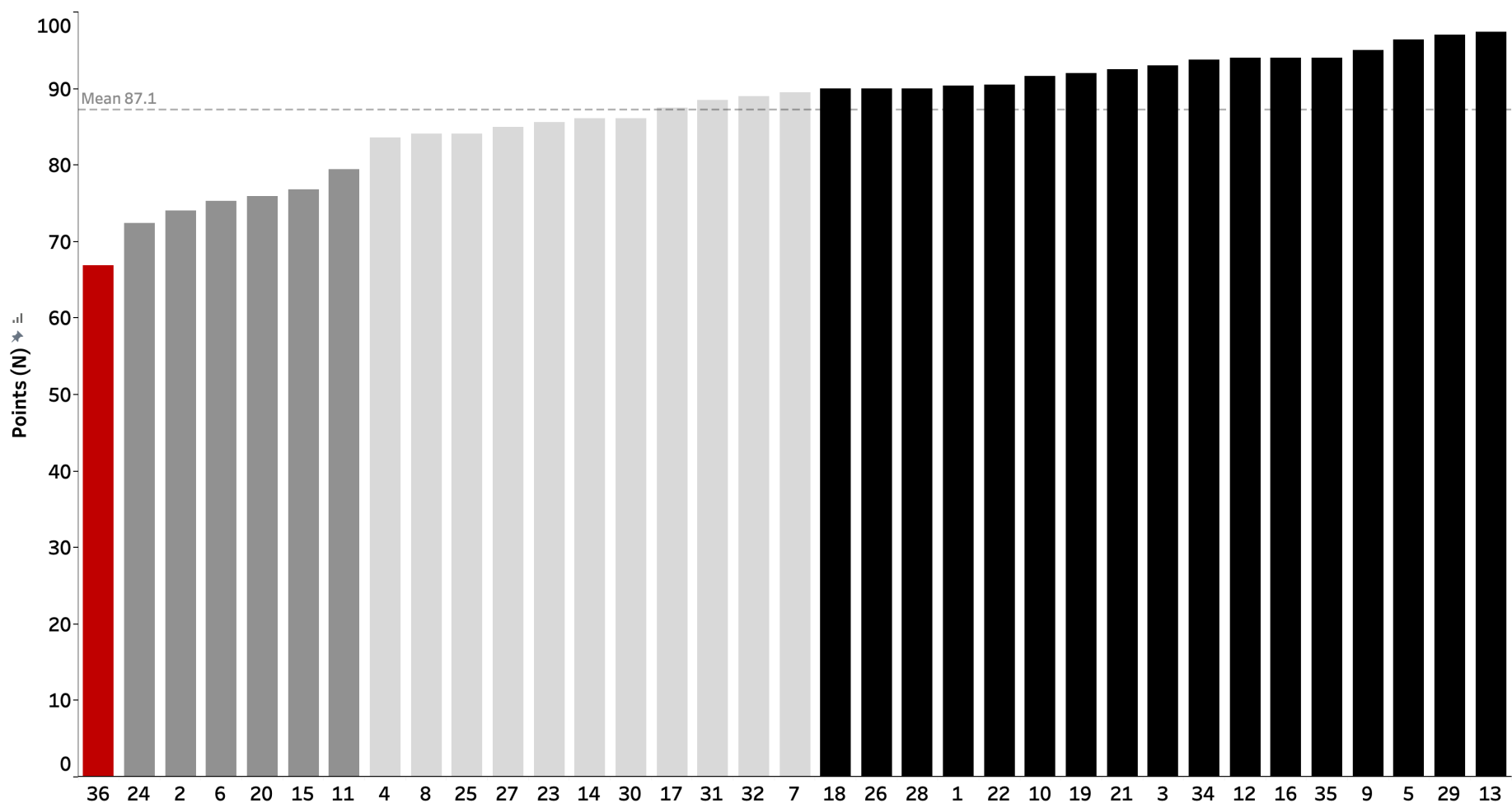
Open Fracture Antibiotic Administration <= 60 Min

Cohort 1 (MTQIP All) | 7/1/22 - 6/30/23

Graph ID 87



Total Points



Questions



MTQIP Hospital CQI Index Changes for 2024

#5B	2	Weight Based LMWH Protocol in Use (12mo: 7/1/23-6/30/24) Yes No	2 0
#6	10	Timely Surgical Repair in Geriatric (Age ≥ 65) Isolated Hip Fxs (12 mo: 7/1/23-6/30/24) ≥ 92.0 % of patients (≤ 42 hr) ≥ 87.0 % of patients (≤ 42 hr) ≥ 85.0 % of patients (≤ 42 hr) < 85.0 % of patients (≤ 42 hr)	10 8 5 0
#10	5	Patient Reported Outcomes Participation (12 mo: 7/1/23-6/30/24) Signed agreement and ≥90% of patients contact information submitted No agreement OR Signed agreement and <90% of patients contact information submitted	5 0

Value Based Reimbursement

- ◆ Professional Fees
- ◆ Physician Organization
- ◆ PGIP
 - Enrolled
- ◆ Uplift for BCBSM professional fees
 - MTQIP
 - Other CQI's (MSQC, MBSC)

VBR (2023 scoring for 2024 payout)

- ◆ Timely LMWH VTE Prophylaxis ($\geq 52.5\%$ of patients within 48 hours)
- ◆ Timely operative repair in geriatric hip fractures ($\geq 92\%$ of patients within 48 hours)
- ◆ Timely antibiotic in femur/tibia open fractures ($\geq 85\%$ of patients within 90 min)
 - Collaborative wide
- ◆ Scoring
 - 2 of 3 Measures = 103%
 - 3 of 3 Measures = 105%

VBR (2024 scoring for 2025 payout)

- ◆ Timely LMWH VTE Prophylaxis ($\geq 52.5\%$ of patients within 48 hours)
- ◆ Timely operative repair in geriatric hip fractures ($\geq 92\%$ of patients within 42 hours)
- ◆ Timely antibiotic in femur/tibia open fractures ($\geq 85\%$ of patients within 90 min)
 - Collaborative
- ◆ Scoring
 - 2 of 3 Measures = 103%
 - 3 of 3 Measures = 105%

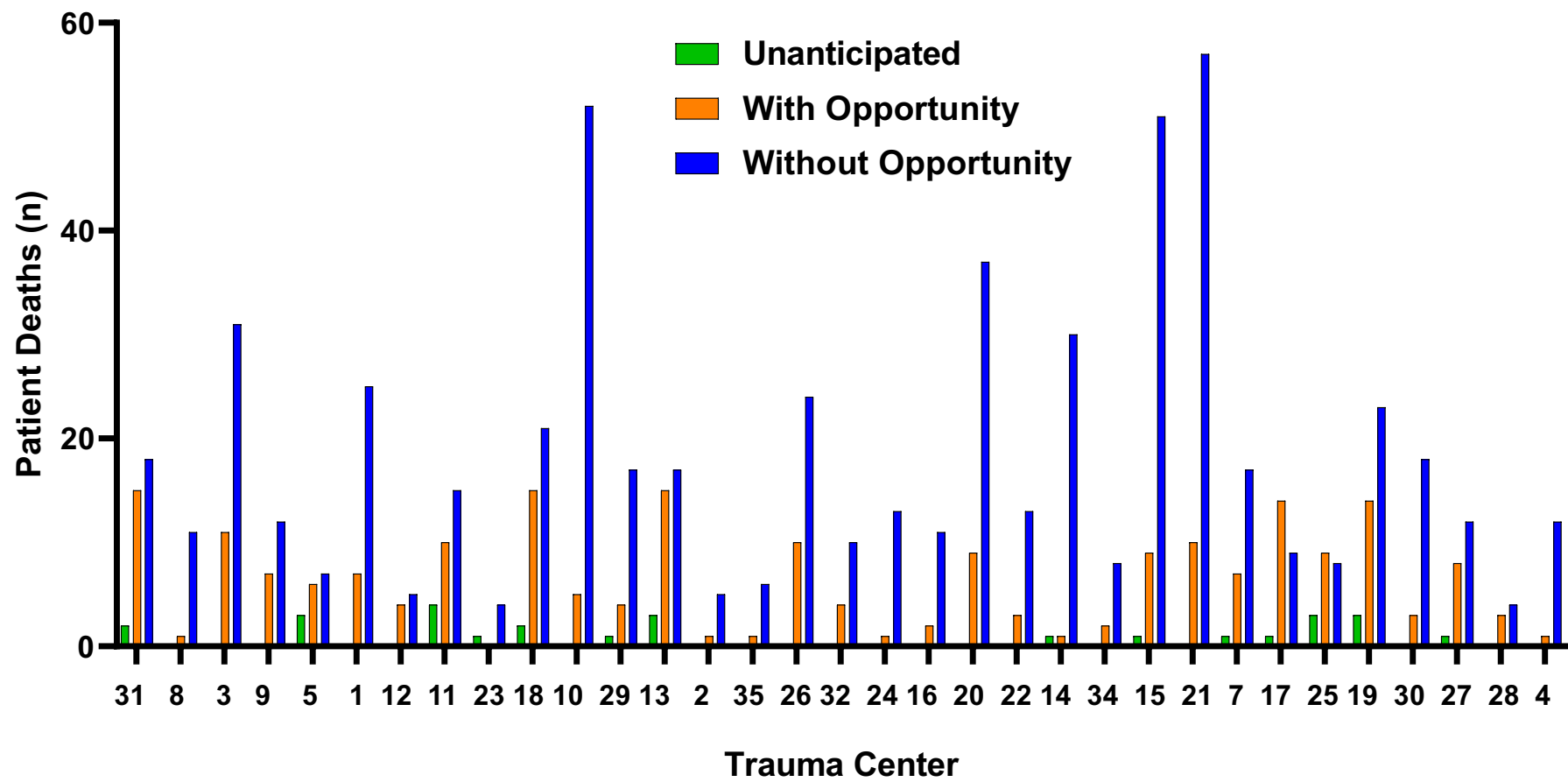
MTQIP Patient Death Determination

Mark Hemmila, MD



Patient Death Determination

- 7/1/2022 to 6/30/2023
- Unanticipated mortality
- Anticipated mortality, with opportunity for improvement
- Anticipated mortality, without opportunity for improvement
- Not done



Patient Death Determination

Mortality Determination	N	%
Unanticipated	27	3
Anticipated, with opportunity	212	24
Anticipated, without opportunity	603	68
Not done	41	5

Mortality Determination	N	%
Mortality, with opportunity	239	27
Mortality, without opportunity	603	68
Not done	41	5

Patient Death Determination

Mortality Determination	Age	ISS
Unanticipated	66±5	18.3±1.8
Anticipated, with opportunity	62±2	26.8±1.0
Anticipated, without opportunity	60±1	26.6±0.6

Mortality Determination	N	%
Mortality, with opportunity	239	27
Mortality, without opportunity	603	68
Not done	41	5

Patient Death Determination

Mortality Determination	Asian	Black	White	Other	p=0.4
Mortality, with opportunity	0.4%	19%	77%	3%	
Mortality, without opportunity	1.2%	24%	72%	3%	

Mortality Determination	Blunt	Penetrating	p=0.003
Mortality, with opportunity	87%	13%	
Mortality, without opportunity	78%	22%	

Operation

Mortality Determination	No	Yes	p<0.001
Mortality, with opportunity	49%	51%	
Mortality, without opportunity	72%	28%	

**Are these patients having complications
before they die, and does it matter?**

Complications

Complication	With	Without	p-value
Cardiac Arrest	28.5%	20.4%	0.01
DVT	6.3%	1.2%	<0.001
Unplanned ICU Admit	14.6%	6.8%	<0.001
CRBSI	0.8%	0%	0.03
Return to OR	8.8%	3.2%	0.001
Acute Renal Failure	10.5%	2.5%	<0.001
Unplanned Intubation	19.7%	11.1%	0.001
Systemic Sepsis	8.0%	4.2%	0.03
ARDS	8.8%	3.3%	0.001
Stroke/CVA	3.4%	1.2%	0.03
Serious Complication	59%	39%	<0.001

Yes

- Cardiac
 - Arrest
 - Stroke/CVA
- Respiratory/Infection
 - Unplanned intubation
 - ARDS
 - Sepsis
- Acute Renal Failure
- Return to ICU
- Return to OR



Questions?

Ideas on how to use?



MTQIP Analytic Updates

Jill Jakubus, PA-C, MHSA, MS



M•TQIP

Interventional Radiology

*Exploring time to hemorrhage control intervention
across Level I and II trauma centers in Michigan*



Our Goal

Using logic can we identify high-performing centers and understand what can we learn from them?



2022 Standards IR Response

Request time missing
Clinical situation unspecific
Potential information deficit
Provider vs. patient centric perspective

Limitations

Definition and Requirements

Level I and II trauma centers must have the necessary human and physical resources continuously available so that an endovascular or interventional radiology procedure for hemorrhage control can begin within 60 minutes of request.

Additional Information

“Continuously” is defined as 24/7/365 and implies there are no gaps in coverage.

The response time is tracked from request to arterial puncture. It is not expected that every case undergoing intervention must be initiated within 60 minutes. The expectation is that if the clinical situation dictates the need for rapid intervention, that it can be initiated within 60 minutes.

Physician resources could include an interventional radiologist, a neurosurgeon/neurologist, or a vascular surgeon credentialed to perform angiography and embolization or stent placement.

Measures of Compliance

- Report of time interval between request and arterial puncture for patients undergoing interventions for hemorrhage control
- Call schedules

Logic

Clinical Situation

- PRBC or whole blood 0 – 4 hours ≥ 1 units

Time to Intervention Calculation

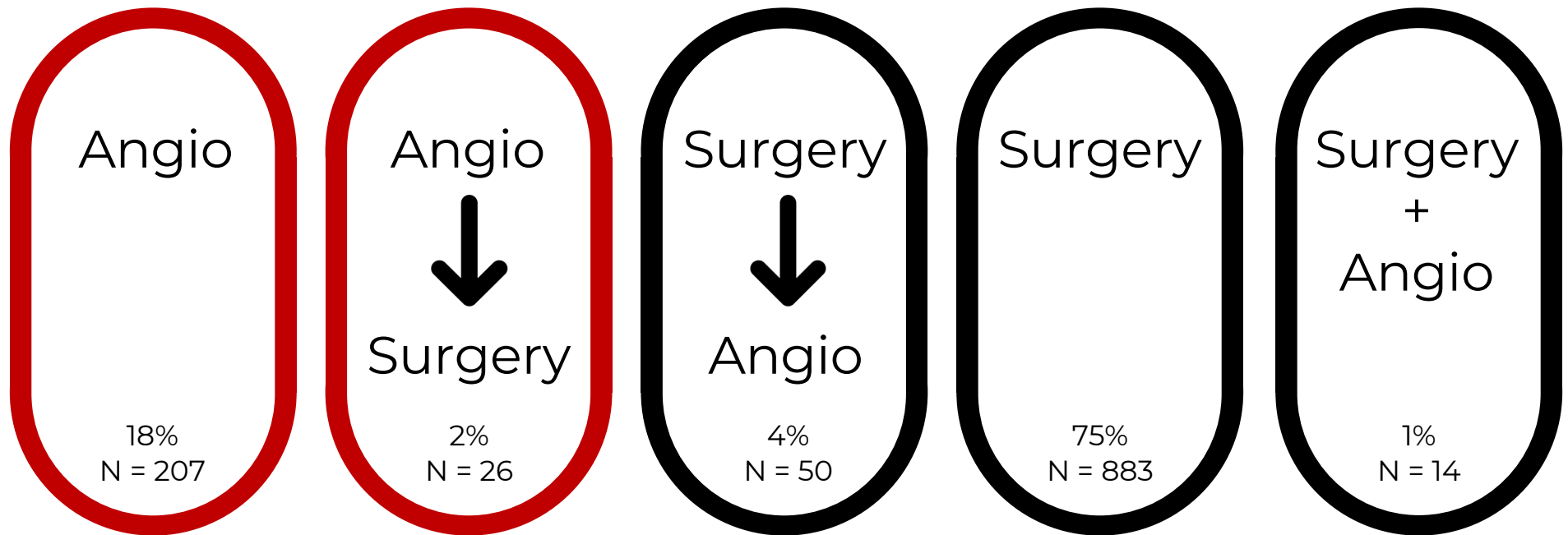
- Hemorrhage Control Process Measures
- Intervention Date/Time – Arrival Date/Time

Time to Intervention Criteria

- First Intervention 0 - 24 hours



Scenarios

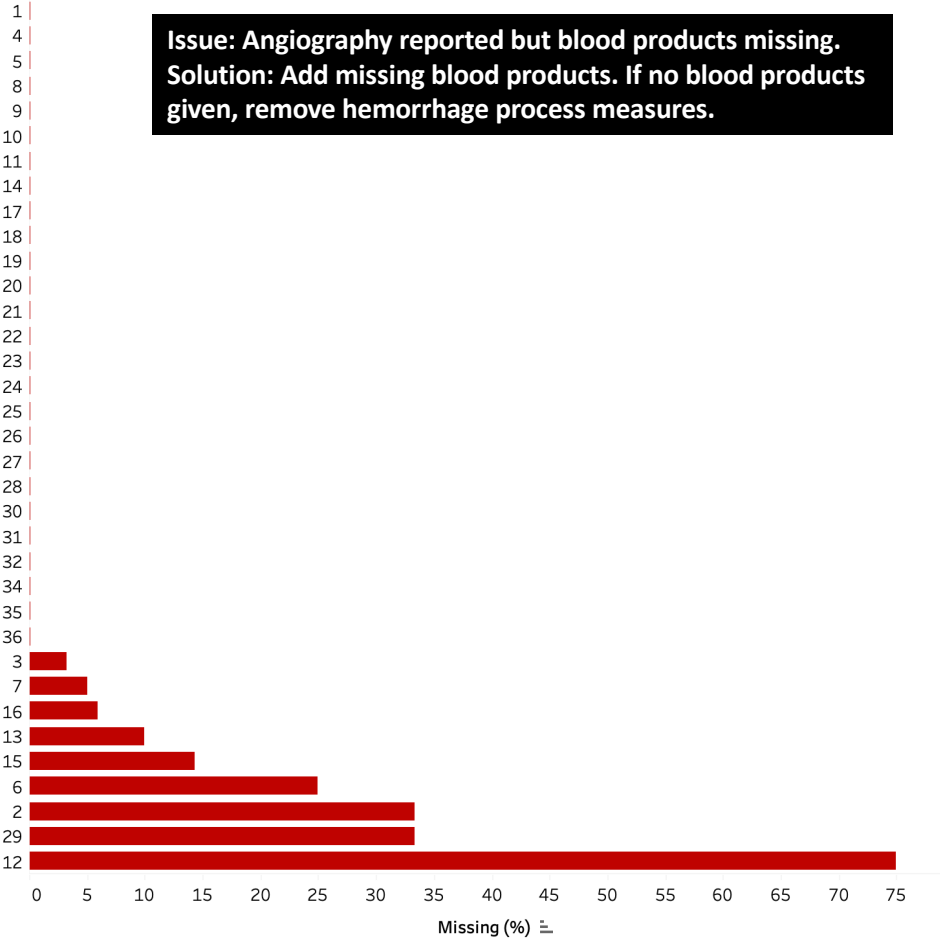


Data Quality Check

Missing PRBC or Whole Blood Values

Angio Reported Hemorrhage Control Process Measures
Cohort 1 (All) | Year >= 2022

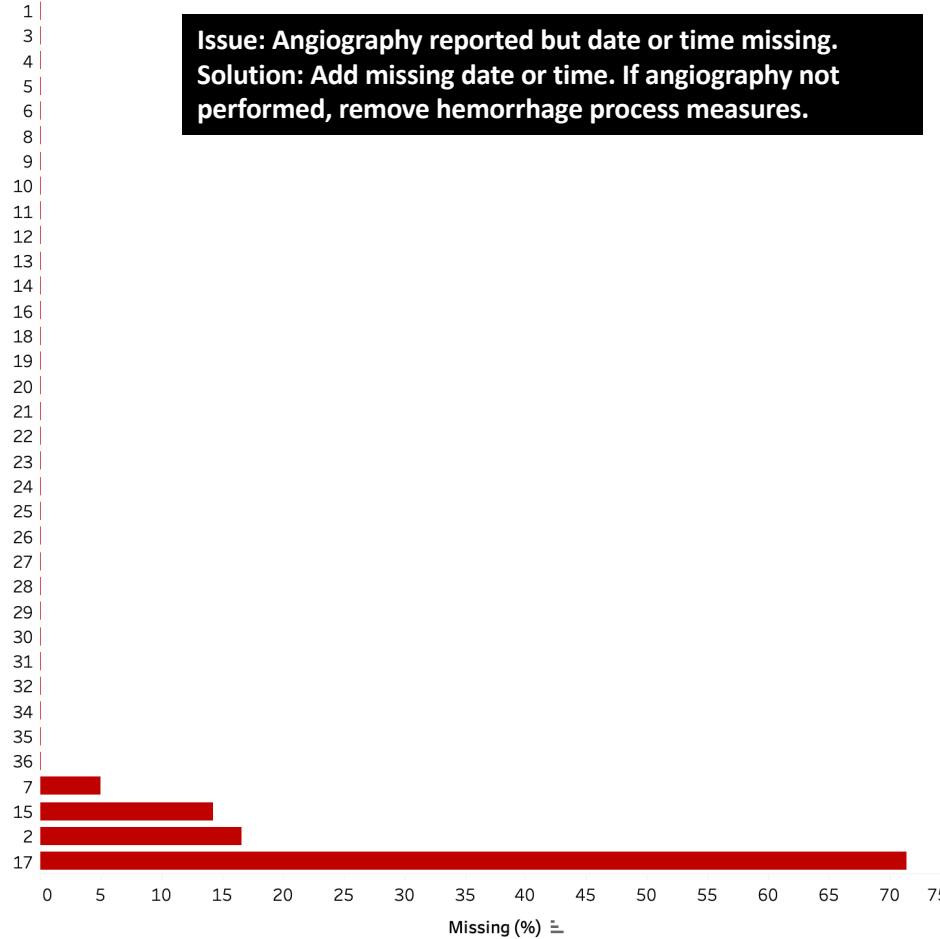
Issue: Angiography reported but blood products missing.
Solution: Add missing blood products. If no blood products given, remove hemorrhage process measures.



Missing Angio Date or Time Values

Angio Reported Hemorrhage Control Process Measures
Cohort 1 (All) | Year >= 2022

Issue: Angiography reported but date or time missing.
Solution: Add missing date or time. If angiography not performed, remove hemorrhage process measures.



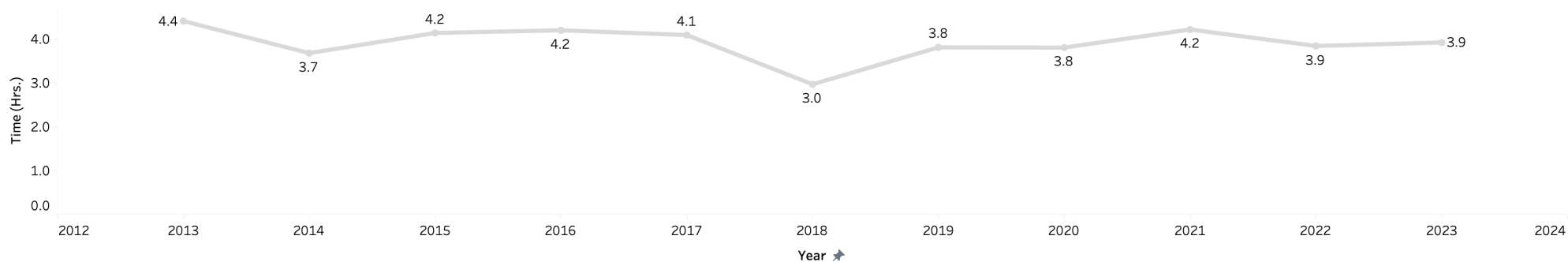
Collaborative Performance

Mean Time to First Intervention

Angio Reported Hemorrhage Control Process Measures | Time 0-24 hours
Cohort 1 (All) | PRBC or Whole Blood 0-4 Hrs. >= 1

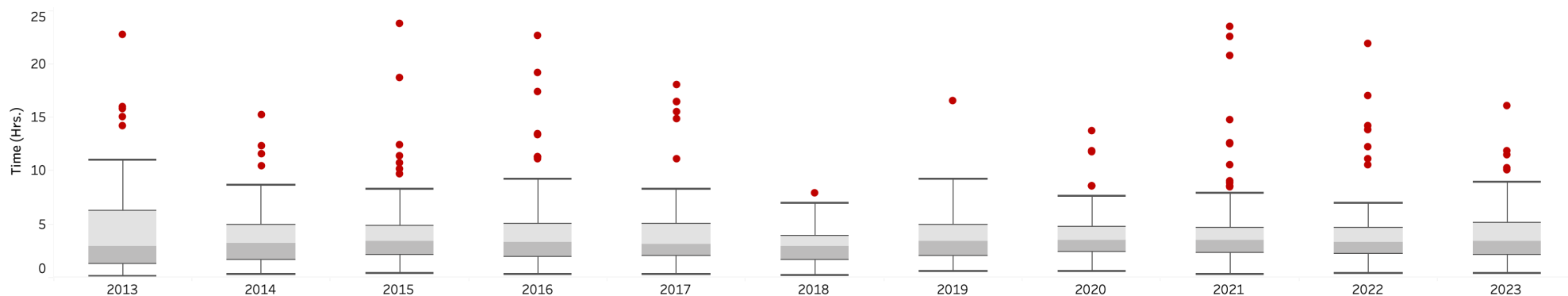
Summary

Mean time to first intervention angiography has been stable. Outlier values resulting in increased mean due to low volumes/yr (min 66, max 132, mean 91 cases/yr).



Median Time to First Intervention

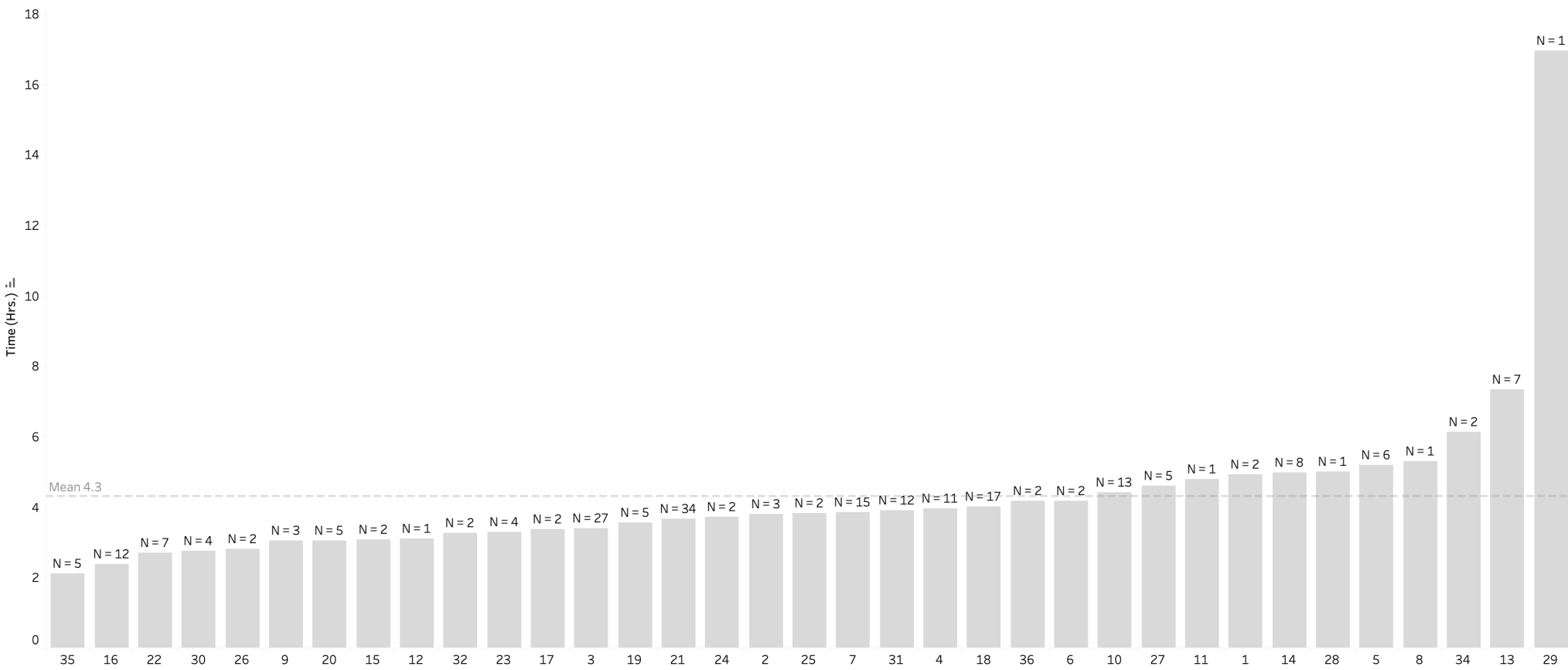
Angio Reported Hemorrhage Control Process Measures | Time 0-24 hours
Cohort 1 (All) | PRBC or Whole Blood 0-4 Hrs. >= 1



Center Performance

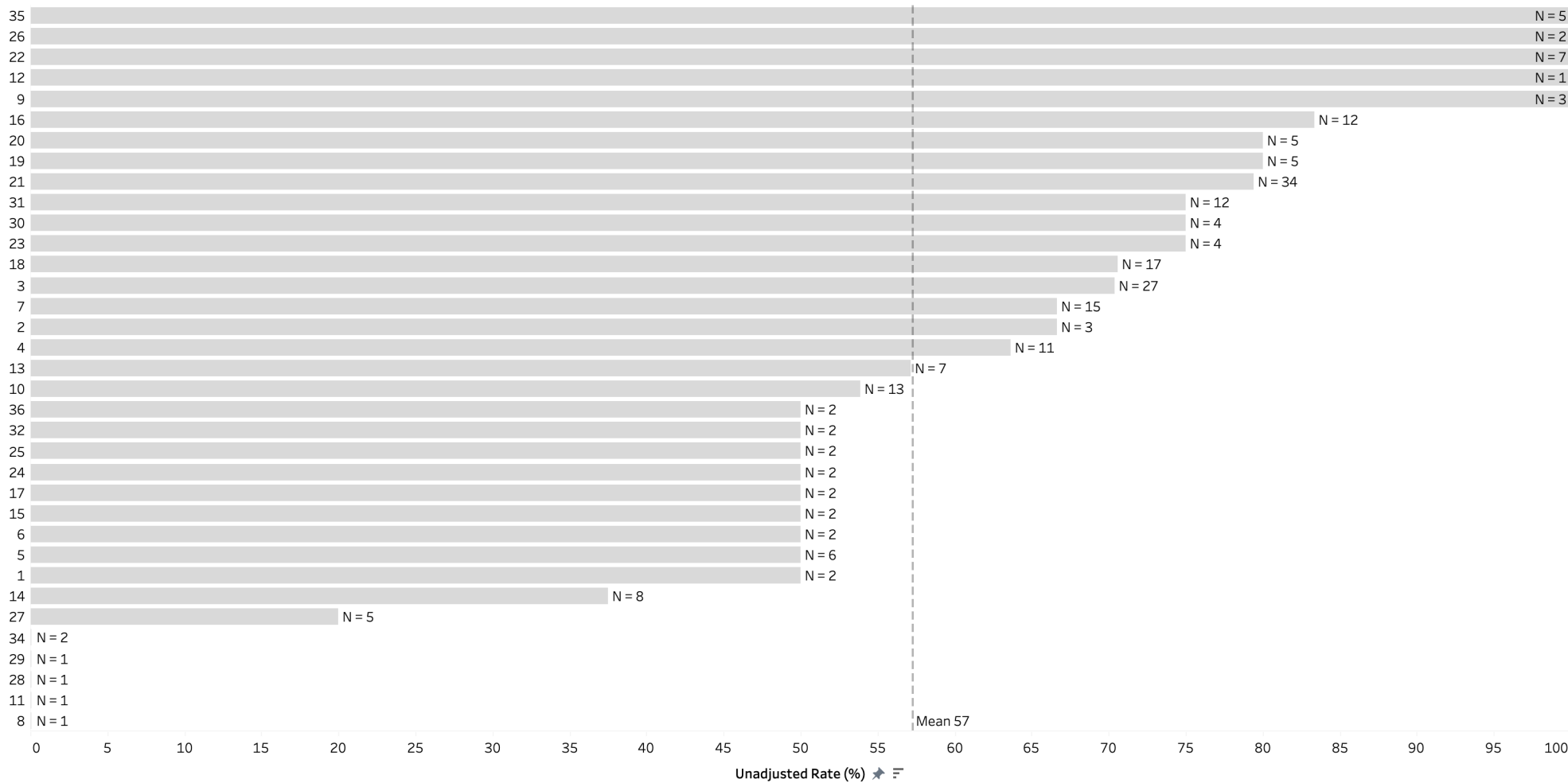
Mean Time to First Intervention

Angio Reported Hemorrhage Control Process Measures | Time 0-24 hours
Cohort 1 (All) | Year >= 2022 | PRBC or Whole Blood 0-4 Hrs. >= 1



Timely First Intervention <= 4.3 Hours

Angio Reported Hemorrhage Control Process Measures | Time 0-24 hours
Cohort 1 (All) | Year >= 2022 | PRBC or Whole Blood 0-4 Hrs. >= 1



MTQIP Member High Performer Insights

Our process is focused around having open communication.

- IR physician phone numbers posted on the call schedule.
- ED to hold these patients in the ED if IR was coming in for hemorrhage control.
- Licensed staff member greets at the door for rapid assessments of all incoming non-activated patients.
- PI every IR case.

4.15 IR Response for Hemorrhage Control

Measures of Compliance:

- Report of time interval between request and arterial puncture for patients undergoing interventions for hemorrhage control.
- Call schedule

Goals

- Identify in Epic source of truth for notification and needle time.
- Establish process for clear communication with IR for hemorrhage control
- Include PI nurses for concurrent review of cases

Actions:

Established IR (radiologist and APP) leads to function as our liaisons and IR nurse manager.

- Review ACS standards
- Walked through Epic IR charting to identify data elements
- Established hierarchy for data elements for registrar
- Hosted Clinical PI conference with IR to discuss cases for hemorrhage control

Established language and pathway:

- Emergent Trauma consult – (60 minutes)
- Urgent Trauma consult – (within 2-4 hours)

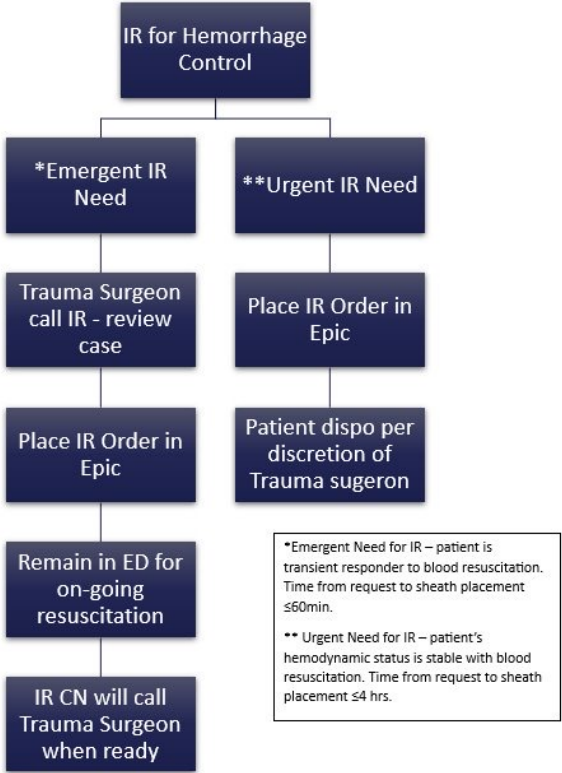
Build fields in registry to capture notification & puncture time

Monitor process: PI Team, Registry Report

- Epic .dotphase

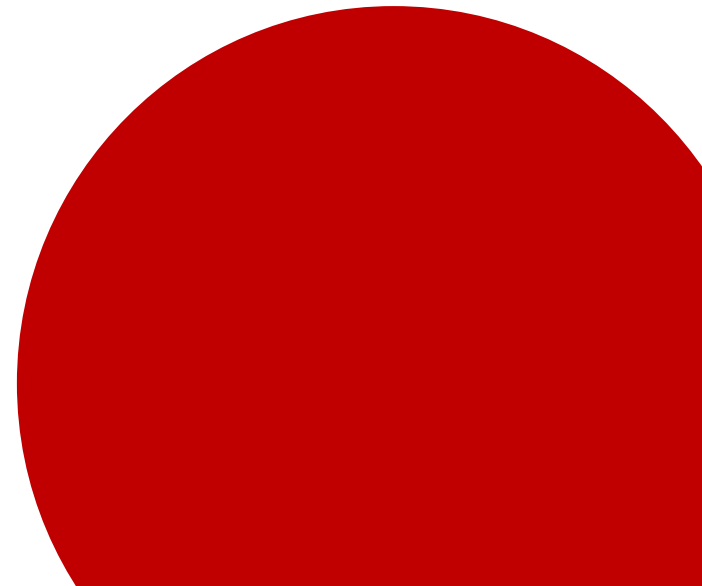
IR for Hemorrhage Control

Emergent vs Urgent IR Request for the Hemorrhaging Trauma Patient
Corewell Health Butterworth Hospital



M·TQIP

Thank You



Research Spotlight

Alistair Chapman, MD





To Plate or Not to Plate: A Propensity Matched Analysis of Outcomes in Patients Undergoing Rib Fixation; An MTQIP Study

Chapman AJ, Krech LA, Fisk C, Pounders S, Gibson CJ, Davis AT

Corewell Health West – Butterworth Hospital – Level 1 Trauma Center

FEBRUARY 6TH, 2024

MTQIP Presentation



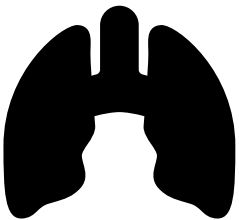
Disclosure Information

- Speaker: Synthes

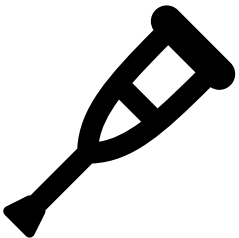
Background



Rib fractures: Nearly 15% of all trauma admissions
Mortality rate: All patients 13%.



Short term: Pain, respiratory failure, pneumonia & death
Elderly: Each rib increases risk of pneumonia by 27% and death by 19%



Long term: Decreased functional capacity & chronic pain.
Return to work: 59% at 6 months

Background



Traditional management: Multi-modal pain control, pulmonary hygiene, early mobilization & ventilatory support



Surgical stabilization: Investigated to mitigate sequelae of rib fractures

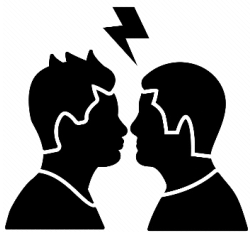


Increased adoption: 76% increased utilization from 2007 to 2014

Background



Evolving indications: Flail chest conditionally recommended
Research: Non-flail, geriatrics



Controversy ongoing
Variable benefit: Mortality, mechanical ventilation, LOS, QOL

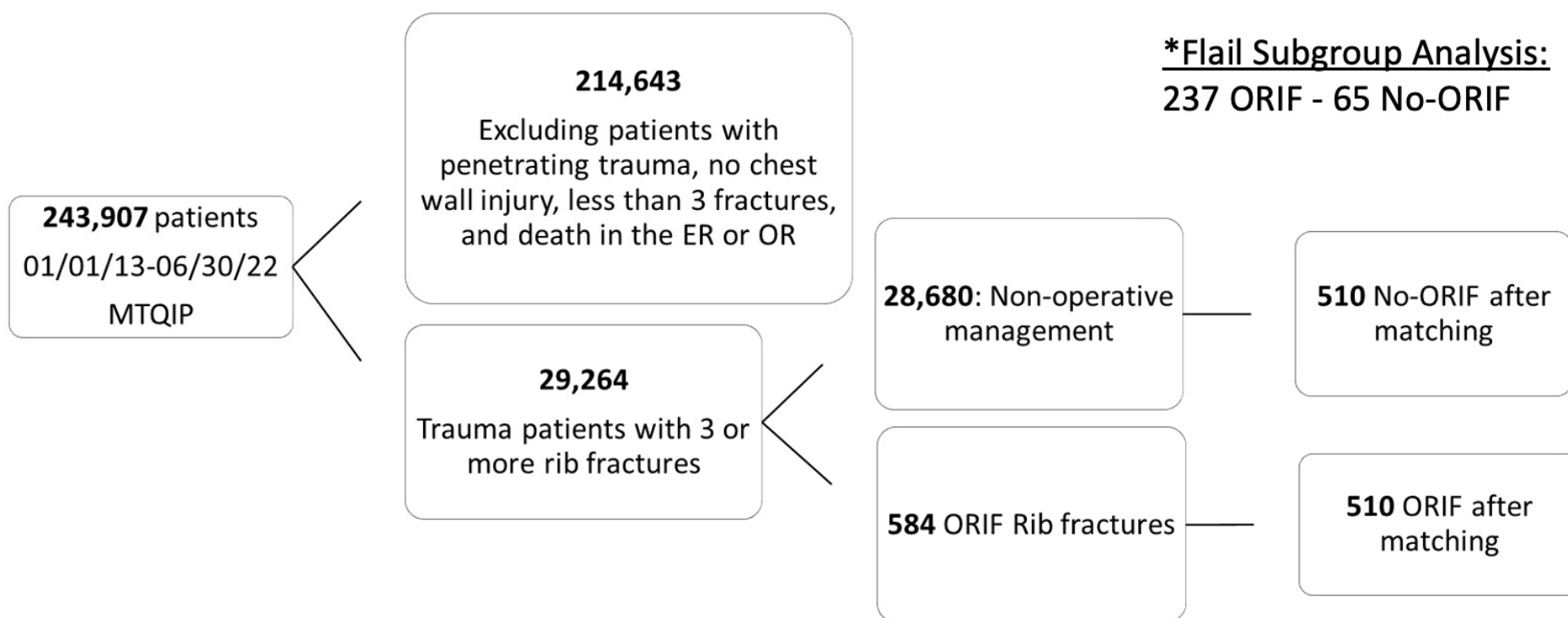


Fill the gap: Propensity matched analysis – ORIF vs No-ORIF
Geriatric and flail sub-analysis

Methods

*Geriatric Subgroup Analysis:
163 ORIF - 150 No-ORIF

*Flail Subgroup Analysis:
237 ORIF - 65 No-ORIF



Statistics

Propensity match analysis across 25 demographic, injury, & comorbid conditions

Age	AIS Head & Neck	Functionally Dependent
Race	AIS Chest	COPD
Ethnicity	AIS Abdomen	CHF
Sex	AIS Extremity	MI w/in 6 months
Insurance Status	Blood Pressure	Hypertension
ISS	Pulse	CRF
Intubation Status	Smoker	DM
>4 U pRBC	Cirrhosis	GCS

Primary & Secondary Outcomes

Primary outcome

Death and/or hospice

Secondary outcomes

Hospital Disposition	Deep SSI	DVT
*ARDS	Pulmonary embolism	Systemic Sepsis
*Pneumonia	Acute Renal Failure	Return to OR
*VAP	Stroke/CVA	Return ICU
*Ventilator Days	Cardiac Arrest	ICU & HLOS
*Unplanned Intubation	MI	Other complication

Demographics

Demographics	No-ORIF	ORIF	p.overall
	N=510	N=510	
Age	58.5 [49.0;69.8]	59.0 [48.4;68.0]	0.845
Sex:			0.237
Female	135 (26.5%)	153 (30.0%)	
Male	375 (73.5%)	357 (70.0%)	
Race:			0.743
African American	50 (9.80%)	40 (7.84%)	
Asian	4 (0.78%)	4 (0.78%)	
Caucasian	436 (85.5%)	446 (87.5%)	
Multiracial/Other	20 (3.92%)	20 (3.92%)	

Injury Status

Demographics	No-ORIF	ORIF	p.overall
	N=510	N=510	
GCS	15.0 [15.0;15.0]	15.0 [15.0;15.0]	0.107
ISS	17.0 [11.0;24.0]	17.0 [11.0;24.0]	0.612
Head/Neck AIS	2.00 [2.00;3.00]	2.00 [2.00;3.00]	0.561
Chest AIS	3.00 [3.00;3.00]	3.00 [3.00;4.00]	0.079
Abdomen AIS	2.00 [2.00;3.00]	2.00 [2.00;3.00]	0.522
Extremity AIS	2.00 [2.00;3.00]	2.00 [2.00;2.00]	0.106

Comorbidities

Comorbidities	No-ORIF N=510	ORIF N=510	p.overall
Smoker:			0.422
No	338 (66.3%)	351 (68.8%)	
Yes	172 (33.7%)	159 (31.2%)	
COPD:			0.46
No	478 (93.7%)	471 (92.4%)	
Yes	32 (6.27%)	39 (7.65%)	
CHF:			1
No	496 (97.3%)	495 (97.1%)	
Yes	14 (2.75%)	15 (2.94%)	
Hypertension:			0.948
No	322 (63.1%)	320 (62.7%)	
Yes	188 (36.9%)	190 (37.3%)	

Comorbidities	No-ORIF N=510	ORIF N=510	p.overall
Chronic Renal Failure:			1
No	509 (99.8%)	509 (99.8%)	
Yes	1 (0.20%)	1 (0.20%)	
Diabetes:			0.858
No	439 (86.1%)	436 (85.5%)	
Yes	71 (13.9%)	74 (14.5%)	
MI:			1
No	510 (100%)	509 (99.8%)	
Yes	0 (0.00%)	1 (0.20%)	

Significant Outcomes

Outcomes	No-ORIF	ORIF	p.overall
	N=510	N=510	
Death:			<0.001
No	469 (92.0%)	503 (98.6%)	
Yes	41 (8.04%)	7 (1.37%)	
Death/Hospice Care:	+ 6	+ 1	<0.001
No	463 (90.8%)	502 (98.4%)	
Yes	47 (9.22%)	8 (1.57%)	
ICU Days (n = 653)	5.00 [2.5;11.0]	6.00 [4.00;11.0]	0.001
HLOS Days	6.00 [3.00;11.0]	10.0 [7.00;15.0]	<0.001
Ventilator Days (n = 333)	5.00 [2.00;9.00]	7.00 [3.00;14.0]	0.002

Insignificant Outcomes

ARDS:	No-ORIF	ORIF	0.836
No	497 (97.5%)	499 (97.8%)	
Yes	13 (2.55%)	11 (2.16%)	
Pneumonia:			0.421
No	459 (90.0%)	450 (88.2%)	
Yes	51 (10.0%)	60 (11.8%)	
VAP:			0.052
No	396 (96.6%)	477 (93.5%)	
Yes	14 (3.41%)	33 (6.47%)	
Unplanned Intubation			0.789
No	479 (93.9%)	482 (94.5%)	
Yes	31 (6.08%)	28 (5.49%)	

ARDS:	No-ORIF	ORIF	0.836
No	497 (97.5%)	499 (97.8%)	
Yes	13 (2.55%)	11 (2.16%)	
Pneumonia:			0.421
No	459 (90.0%)	450 (88.2%)	
Yes	51 (10.0%)	60 (11.8%)	
VAP:			0.052
No	396 (96.6%)	477 (93.5%)	
Yes	14 (3.41%)	33 (6.47%)	
Unplanned Intubation			0.789
No	479 (93.9%)	482 (94.5%)	
Yes	31 (6.08%)	28 (5.49%)	

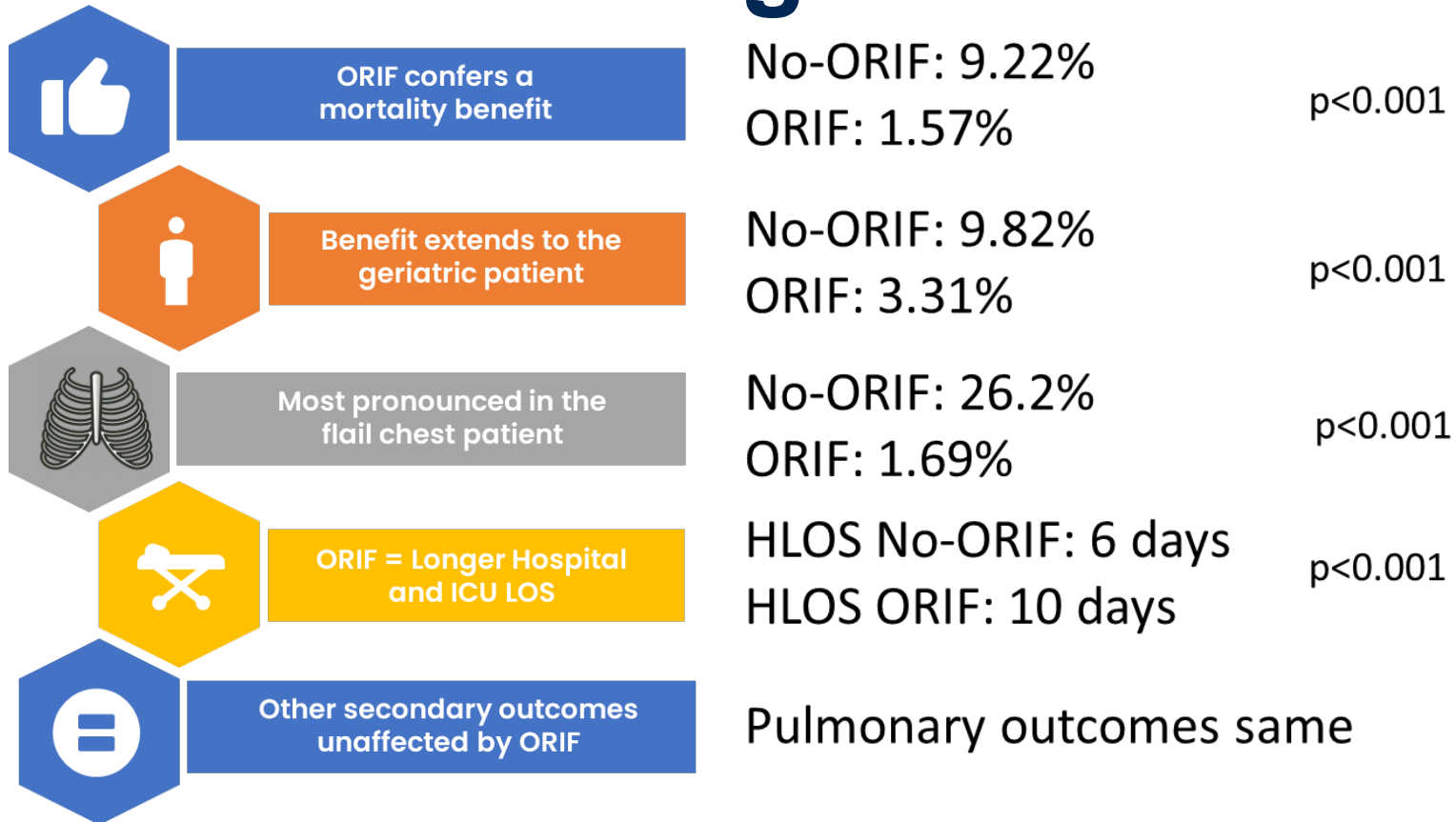
Geriatric Sub-Analysis

Outcomes	No-ORIF	ORIF	p.overall
	N=163	N=151	
Death:			0.101
No	151 (92.6%)	147 (97.4%)	
Yes	12 (7.36%)	4 (2.65%)	
Death/Hospice Care:	+ 4	+ 1	0.038
No	147 (90.2%)	146 (96.7%)	
Yes	16 (9.82%)	5 (3.31%)	
ICU Days (n = 197)	5.00 [2.5;10.5]	6.00 [4.00;10.0]	0.027
HLOS Days	5.00 [3.00;10.0]	10.0 [7.00;14.5]	<0.001

Flail Chest

Outcomes	No-ORIF	ORIF	p.overall
	N=65	N=237	
Death:			<0.001
No	52 (80.0%)	234 (98.7%)	
Yes	13 (20.0%)	3 (1.27%)	
Death/Hospice Care:			<0.001
No	48 (73.8%)	233 (98.3%)	
Yes	17 (26.2%)	4 (1.69%)	
Cardiac arrest:			0.001
No	58 (89.2%)	234 (98.7%)	
Yes	7 (10.8%)	3 (1.27%)	
ICU Days (n = 230)	7.00 [2.5;10.0]	7.00 [4.00;14.0]	0.03
HLOS Days	9.00 [3.00;13.0]	11.0 [8.00;17.0]	<0.001
Ventilator Days (n = 122)	3.00 [2.0;9.0]	9.00 [3.0;14.5]	0.002

Overall Findings



Discussion

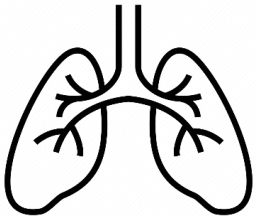


Findings support the role of ORIF in trauma patients

Reinforces the broadly accepted benefit in flail chest patients



Contributes to a growing body of evidence that ORIF should be considered in the geriatric patient



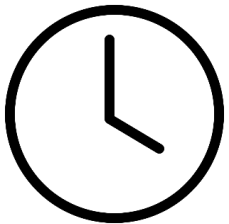
ORIF does not appear to impact pulmonary outcomes (VAP, PNA, ARDS)
Why the mortality benefit?

Discussion



Hospice use is very low in the operative group

Are mortality statistics impacted by desire to be aggressive and not ORIF alone?



LOS outcomes across the literature vary

Longer LOS may be due to 17% of patients getting ORIF > 72 hours

Limitations

Retrospective study

Cannot evaluate the impact of plating on pain control

No insight into quality-of-life outcomes

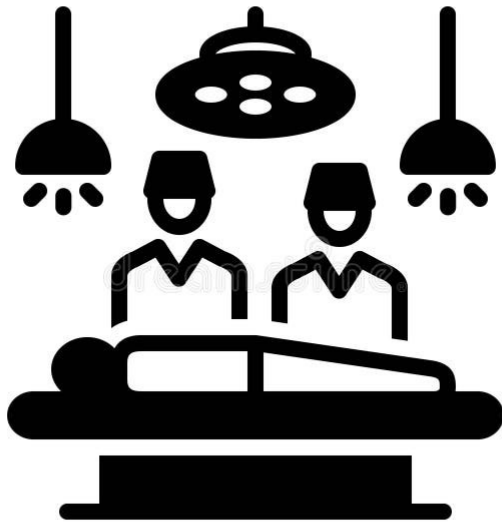
Heterogeneous indications for ORIF

Cannot specifically evaluate rib fracture pattern

Did not measure differences over time (2013 vs 2022)

Did not specifically evaluate non-flail

Recommendation



ORIF should be considered as a treatment modality in the polytrauma patient

Survival benefit justifies the costs associated with Increased LOS

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Future Metrics

Mark Hemmila, MD



MTQIP Future Metrics

- ◆ Cannot have a separate MTQIP and MACS Hospital CQI Index
- ◆ BCBSM
 - MACS is a sub-program of MTQIP
 - MACS is not a standalone CQI
- ◆ Options
 - Composite (MTQIP, MTQIP and MACS)
 - Bonus *
 - VBR - Most of our surgeons are already in 2-3 CQI's

MTQIP Future Metrics

- ◆ What would bonus points look like?
- ◆ 100 points base MTQIP
- ◆ Can get up to 10 points in bonus
 - MACS Hospital CQI Index (0-100) / 10 and get bonus points
 - MTQIP specific
 - ◆ Orthopedics MD engagement
 - ◆ Neurosurgical MD engagement
 - ◆ Presenting at a meeting

MTQIP Future Metrics - Tweaks

- ♦ Isolated Hip Fracture time to OR, 42 hrs > Lower
- ♦ Timely antibiotic in open fracture, 90 minutes > Lower

MTQIP Future Metrics - Potential

- ◆ Opioid prescribing
 - % Opioid naïve patients > 75th percentile
 - Some other morphine mg equivalents
- ◆ Time to hemorrhage intervention
 - Operation
 - IR
- ◆ PI
 - Opportunities for improvement

MTQIP Future Metrics - Potential

◆ Smoking cessation

- BCBSM focus across CQI's
- Hospital CQI Index
- VBR
- We do not see the patient beforehand? How to do?

◆ Alternative

- Alcohol
- SBIRT
- How could we get you credit?

Wrap Up



Conclusion

- ◆ Thank you for attending
- ◆ Evaluations
 - Judy will send out email
- ◆ Questions?
- ◆ See you in May