The Michigan Trauma Quality Improvement Program

Program Director Update
Program Manager Update

Ypsilanti, MI
February 12, 2013
MTQIP Meeting

Agenda

- Larry Diebel, MD
  - Indications and Techniques for Rib Fracture Repair
- Brian Shapiro, MD
  - Rib Fractures and Pain Relief with On-Q Pumps
- Allan Lamb, DO
  - QI project – Rib Fractures and Pneumonia Prevention Strategies
- Markyta Armstrong-Goldman, RN
  - Trauma Performance Improvement

Agenda

- Mark Hemmila
  - MTQIP Reports
  - Appendectomy Reports
- Lunch
- Group Sessions
- Judy Mikhail
  - Wrap-Up Discussion
  - Updates
- Ray Bingham (Motorcycle Helmets)

Group Sessions

- 2 Sessions
- 40 minutes per session
- 3 Rooms
- PI and Verification/TPM/Registrar
- PI and Verification/Surgeon
- Rib Fracture Management
- Moderators

Information – Data

- AIS External
  - DI/NTRACS Centers
  - Fix (USRAISST → MAXIMUM_AIS_6)
- Safety Device (Helmets)
  - Backfill
  - From 3/1/11 to x
- Data Submission Tips
  - No filters
  - Verify that date range is correct

Information: ACS-TQIP

- Benchmark Reports
  - October 2012, Aggregate 2011 data
  - January 2013, TBI and Shock
- ACS-TQIP Meeting
  - Philadelphia, February 28-30, 2012

MTQIP Reports, etc.

Mark Hemmila, MD

DI/CDM

- MTQIP custom data elements (module)
- Mapping and transmittal of TQIP process measures
- Technical support for MTQIP tab
- Preprogramed report templates
- Will add future TQIP process measures
- Updates for 2013 data done
- Validation

Reports

- 3/1/11 to 2/29/12
- Penetrating
- > 65 and < 65 yo
- IVC Filter Use
- Brain Injury Monitors

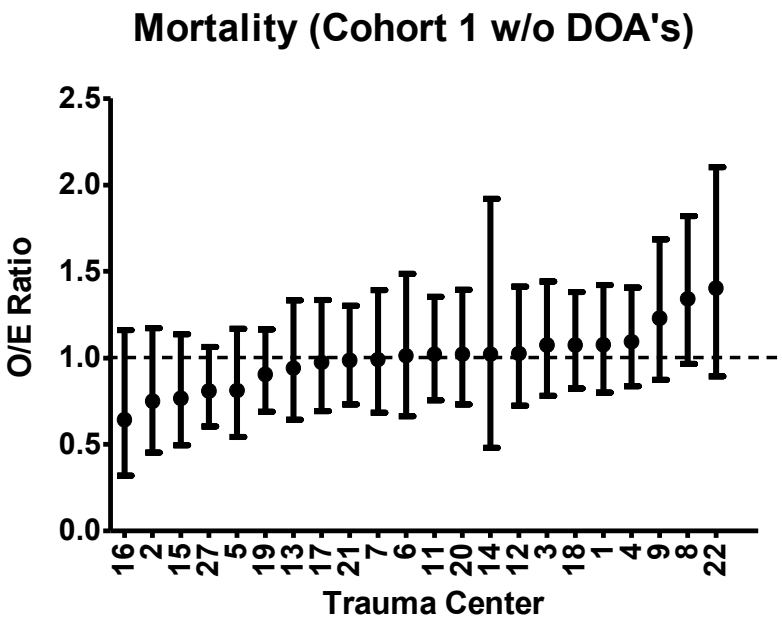
Cohort Formation

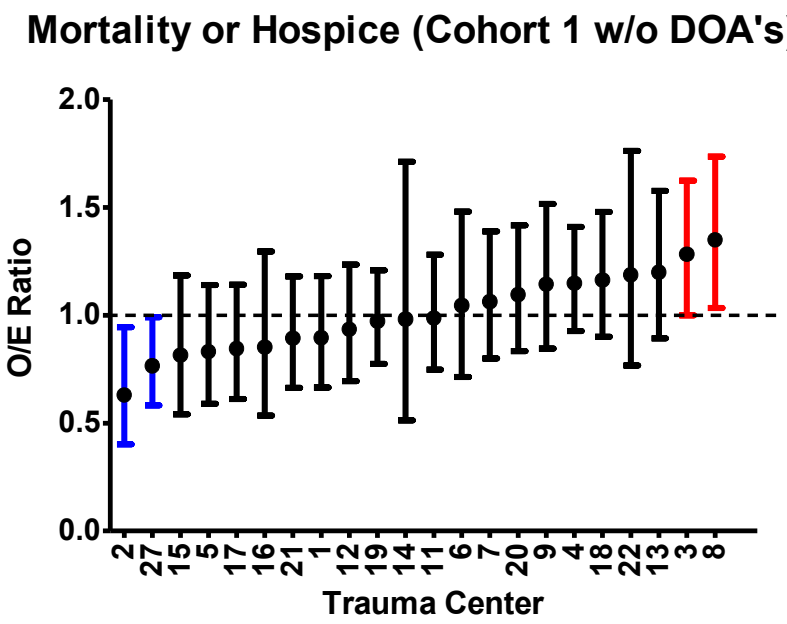
- Cohort 1
  - Blunt or penetrating
  - Age ≥ 18
  - ISS ≥ 5
  - Hospital LOS ≥ 1 or dead
- Cohort 2 (admit trauma service)
- Cohort 3 (blunt multi-system)
- Cohort 4 (blunt single-system)
- Cohort 5 (penetrating)

Signs of Life

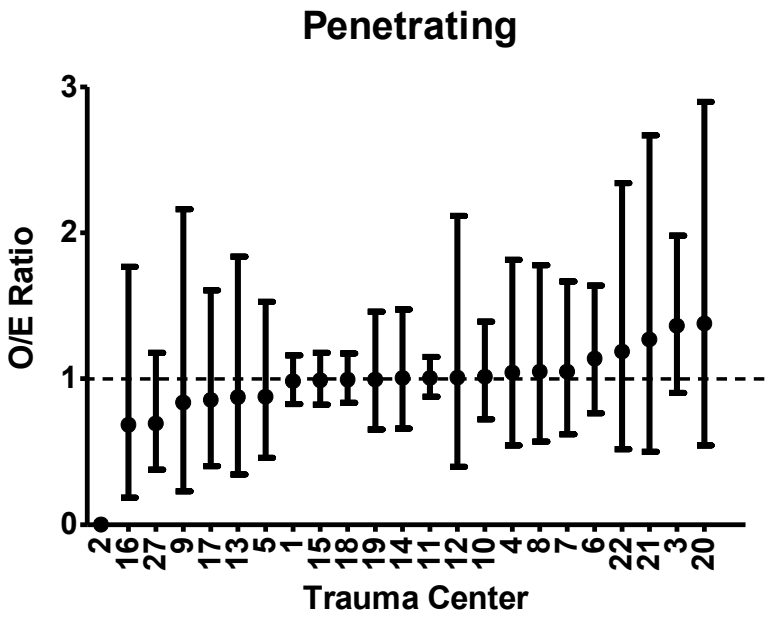
- Dead on Arrival
  - Definition not followed
  - Significant time and procedures
- Signs of Life
  - No, BP=0, HR=0, GCS=3
  - Replaced DOA with “No Signs of Life” in Analysis
  - DOA = No Signs of Life

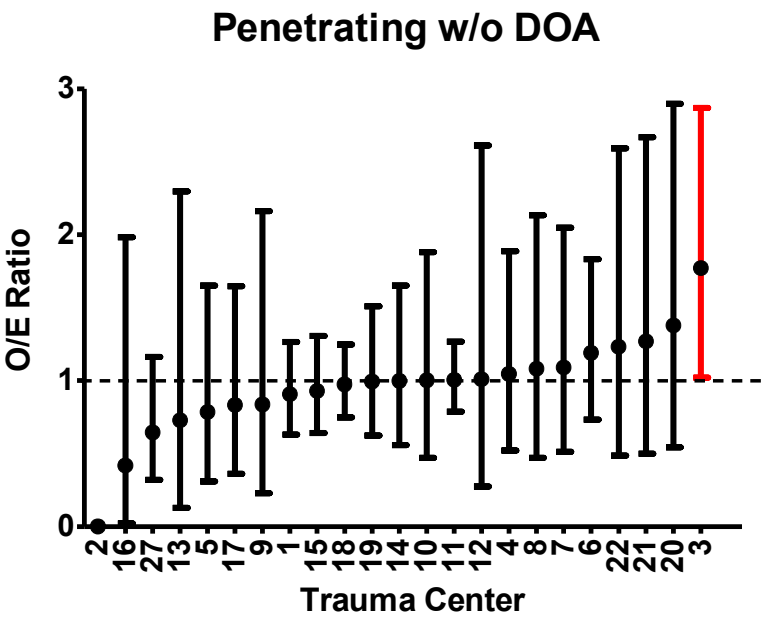
3/1/2011 to 2/29/2012

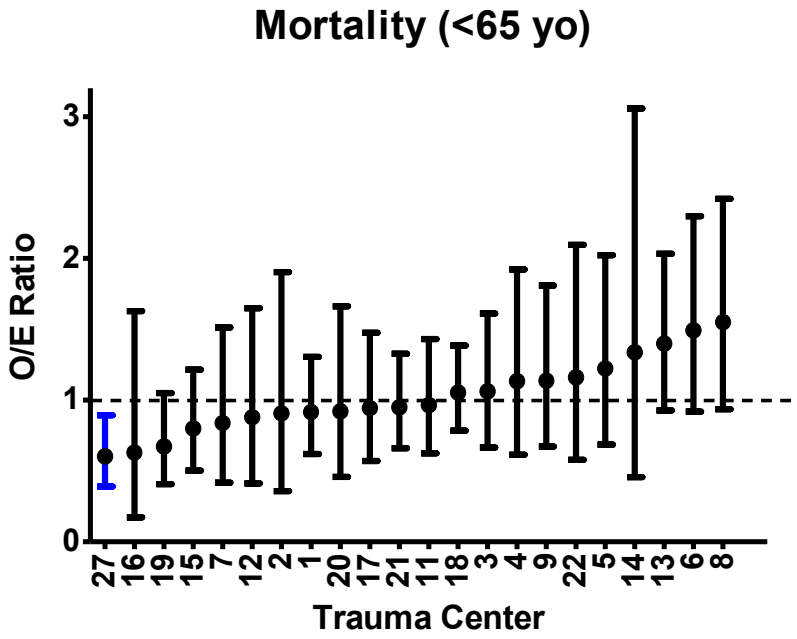


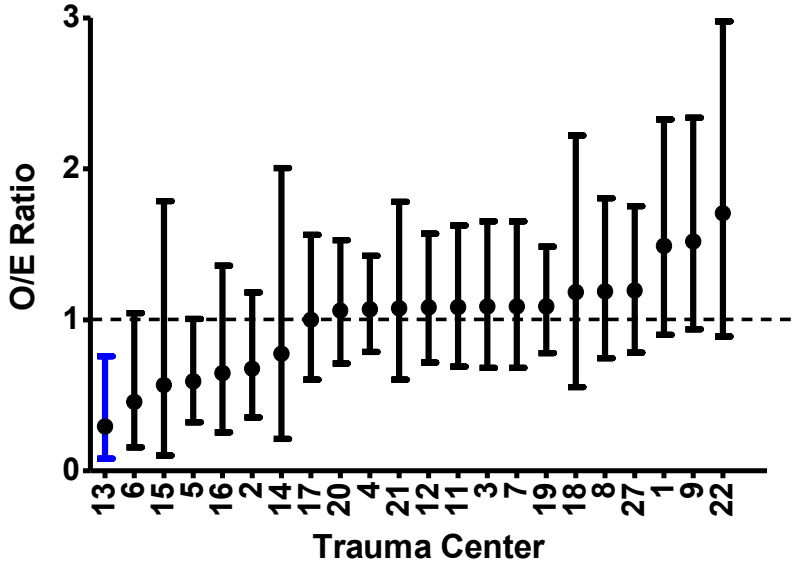


7/1/2008 to 2/29/2012






Mortality (<65 yo)
O/E Ratio
0
1
2
3
27
16
19
15
7
12
2
1
20
17
21
11
18
3
4
9
22
5
14
13
6
8
Trauma Center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16
2
14
17
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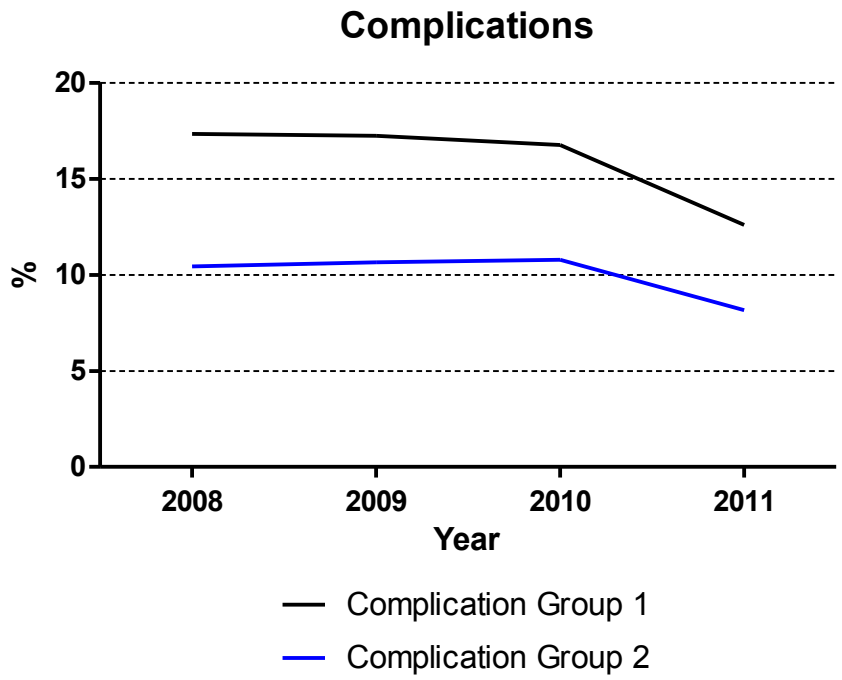
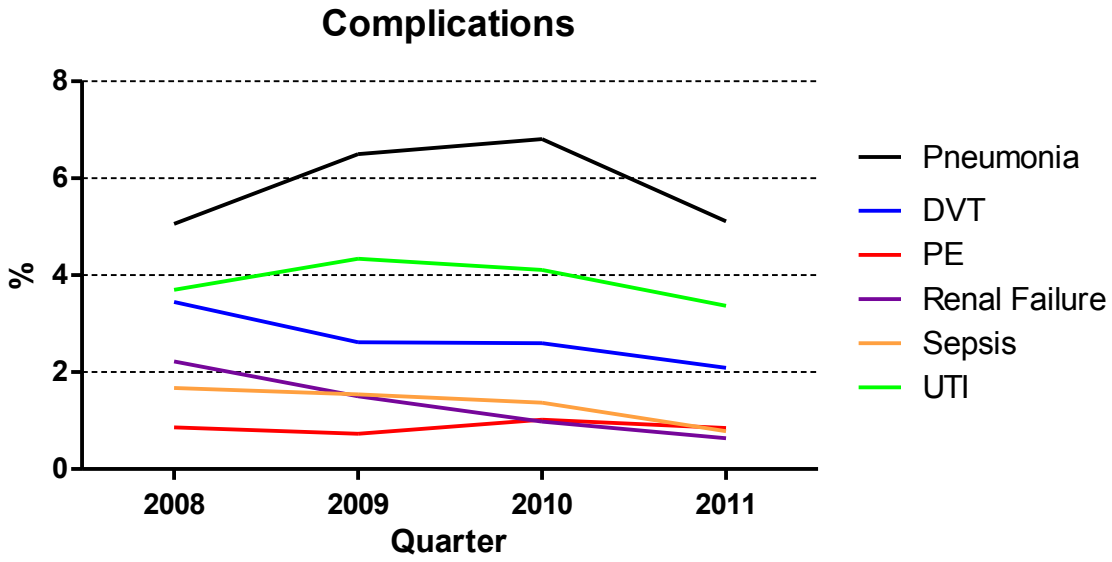
18
8
27
1
9
22
Trauma Center

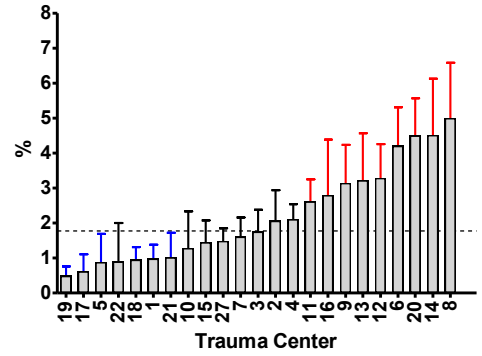
HF, SJ, UM, WB, HU, GH



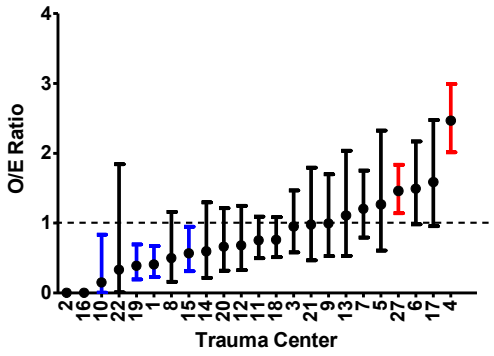
HF, SJ, UM, WB, HU, GH



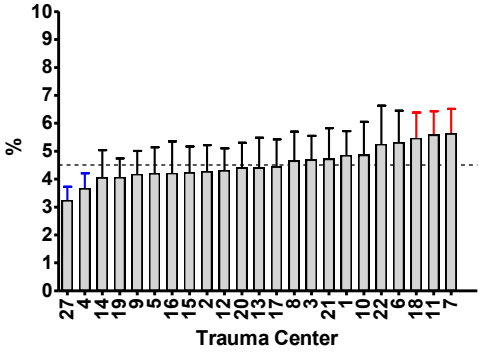
Risk and Reliability Adjusted IVC Filter Use



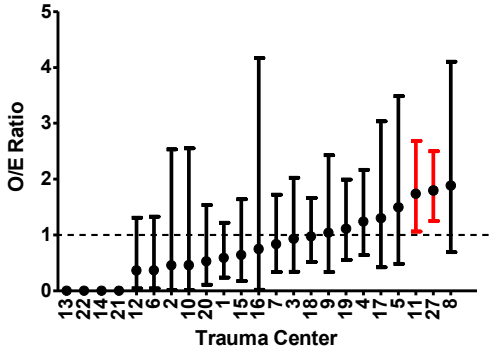
DVT



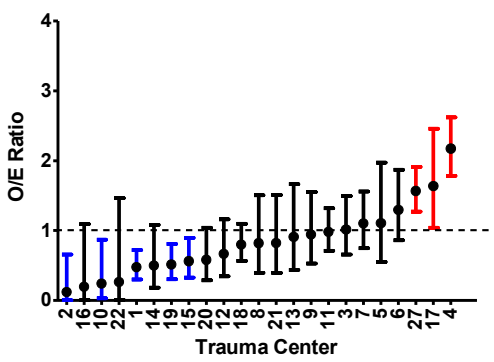
Risk and Reliability Adjusted Mortality



Pulmonary Embolus



VTE



Brain Injury Monitors

- 3/1/11 to 2/29/12
- Procedure Data – (ICD-9)
  - Ventriculostomy (2.20, 1.26, 1.28)
  - Intraparenchymal pressure monitor (1.10)
  - Brain tissue oxygen monitor (1.16)
- MTQIP Process Measures Data (7/1/11 to 2/29/11)
- Combined data for monitor type, date, time
  - Any Monitor, Vent, IPPM, O2Mon, JVB
  - Vent, IPPM, O2Mon, JVB
  - No assessment of injury (AIS Head or GCS)

Brain Monitors (3/1/11 to 2/29/12)

Trauma Center	Any Monitor	Ventriculostomy	IPPM	02 Monitor	Jugular Venous Bulb
21	37	16	37	1	0
27	34	25	16	0	0
11	22	8	14	1	0
1	18	5	14	1	0
18	18	7	13	5	0
3	15	2	13	0	0
20	13	1	12	0	0
6	13	3	13	0	0
15	13	4	6	3	6
17	13	13	1	0	0
19	12	9	5	0	0
5	10	10	1	1	0
4	10	6	6	1	1
8	8	6	7	0	0
9	7	1	6	4	0
2	7	6	6	0	0
22	6	1	6	0	0
7	6	1	4	3	0
16	5	3	4	0	0
12	3	3	0	0	0
13	3	3	0	0	0
14	2	1	1	0	0
Total	275	134	185	20	7

Brain Injury Monitors

- 7/1/11 to 10/31/11
- Exclude if AIS Head = 0
- AIS Head
  - N, Total
  - Without any monitor
  - With any monitor
- ED GCS
- Highest GCS within 24 hrs (Process measures)

Brain Monitors (3/1/11 to 2/29/12)

Exclude if AIS Head = 0

Summary

AIS Head	N	w/o Monitor	with Monitor	%
1	325	325	0	0.0%
2	1823	1817	6	0.3%
3	1059	1035	24	2.3%
4	695	636	59	8.5%
5	443	334	109	24.6%
6	11	10	1	9.1%
Total	4356	4157	199	

ED GCS	N	w/o Monitor	with Monitor	%
14-15	3380	3349	31	0.9%
9-13	303	286	17	5.9%
3-8	502	361	141	39.1%
Missing	171	161	10	6.2%
Total	4356	4157	199	

Highest GCS w/in 24 hrs	N	w/o Monitor	with Monitor	%
14-15	3532	3478	54	1.6%
9-13	96	85	11	12.9%
3-8	330	212	118	55.7%
Missing	398	382	16	4.2%
Total	4356	4157	199	

Monitor for Head Injury

- 7/1/11 to 10/31/11
- Include if AIS Head > 0
- Exclude if
  - No signs of life
  - ED GCS > 8 and TBI GCS > 8
- Eligible patients
  - Dead
  - Dead with and without any monitor
  - Alive with and without any monitor
  - Dead and monitor withheld
  - Any Monitor, Vent, IPPM, O2Mon, JVB
- Summary
- Reason monitor withheld

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:	Exclusion:
AIS Head > 0	No signs of life
	ED GCS > 8 & TBI GCS > 8

Trauma Center	N	Dead	Alive w/o Monitor	Alive with Monitor	Dead w/o Monitor	Dead with Monitor	Dead and Monitor Withheld	Any Monitor	Ventric	IPPM	02 Mon	JVB
27	65	14	33	18	7	7	5	25	18	13	0	0
21	61	31	11	19	18	13	8	32	14	32	1	0
19	38	12	21	5	11	1	0	6	5	2	0	0
3	34	13	16	5	10	3	0	8	2	6	0	0
18	32	15	12	5	11	4	0	9	3	8	3	0
17	31	4	25	2	3	1	1	3	3	0	0	0
1	30	12	11	7	11	1	3	8	1	7	1	0
4	26	13	10	3	10	3	1	6	5	4	1	0
13	23	11	11	1	11	0	0	1	1	0	0	0
11	20	7	9	4	4	3	1	7	1	6	1	0
15	18	5	10	3	4	1	1	4	2	1	1	1
6	18	7	7	4	4	3	0	7	2	7	0	0
2	18	6	8	4	4	2	3	6	5	6	0	0
20	16	5	4	7	3	2	0	9	0	9	0	0
9	15	8	5	2	7	1	7	3	0	3	1	0
8	15	9	5	1	8	1	5	2	2	2	0	0
7	13	6	5	2	5	1	0	3	0	2	1	0
5	13	3	6	4	3	0	1	4	4	1	1	0
14	12	4	7	1	4	0	0	1	0	1	0	0
22	9	5	2	2	5	0	0	2	1	2	0	0
12	8	6	1	1	6	0	1	1	1	0	0	0
16	6	1	4	1	1	0	0	1	0	1	0	0
Total	521	197	223	101	150	47	37	148	70	113	11	1

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:	Exclusion:
AIS Head > 0	No signs of life
	ED GCS > 8 & TBI GCS > 8

Summary

	N	%
Alive w/o Monitor	223	43%
Alive with Monitor	101	19%
Dead	197	38%
Total	521	

	N	%
Dead w/o Monitor	150	76%
Dead with Monitor	47	24%
Total	197	

	N	%
Dead and Monitor Withheld for reason	37	25%
Dead, no Monitor, not Withheld for reason	113	75%
Total	150	

	Alive	Dead	Total
Not known/Not recorded/Missing	214	113	327
Decision to withhold life sustaining measures	0	19	19
Death prior to correction of coagulopathy	0	14	14
Expected to improve within 8 hours due to effects of alcohol and/or drugs	3	0	3
Operative evacuation with improvement post-op	4	1	5
No ICP because of coagulopathy	2	3	5
Total	223	150	373

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:	Exclusion:
AIS Head > 0	No signs of life
	ED GCS > 8 & TBI GCS > 8

Summary

	N	%
Alive w/o Monitor	223	43%
Alive with Monitor	101	19%
Dead	197	38%
Total	521	

	N	%
Dead w/o Monitor	150	76%
Dead with Monitor	47	24%
Total	197	

	N	%
Dead and Monitor Withheld for reason	37	25%
Dead, no Monitor, not Withheld for reason	113	75%
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	Alive	Dead	Total
Not known/Not recorded/Missing	214	113	327
Decision to withhold life sustaining measures	0	19	19
Death prior to correction of coagulopathy	0	14	14
Expected to improve within 8 hours due to effects of alcohol and/or drugs	3	0	3
Operative evacuation with improvement post-op	4	1	5
No ICP because of coagulopathy	2	3	5
Total	223	150	373

Calculation of % Eligible w/o Monitor

- Eligible and no monitor = N - Alive w/o monitor - Alive with monitor - Dead with monitor - Dead and monitor withheld for reason

- Eligible = N - Alive w/o monitor - Dead and monitor withheld for reason

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:
AIS Head > 0

Exclusion:
No signs of life
ED GCS > 8 & TBI GCS > 8

Trauma Center	N	Dead	Alive w/o Monitor	Alive with Monitor	Dead w/o Monitor	Dead with Monitor	Dead and Monitor Withheld	Eligible & no Monitor	Eligible	% Eligible w/no Monitor
27	65	14	33	18	7	7	5	2	27	7%
21	61	31	11	19	18	13	8	10	42	24%
19	38	12	21	5	11	1	0	11	17	65%
3	34	13	16	5	10	3	0	10	18	56%
18	32	15	12	5	11	4	0	11	20	55%
17	31	4	25	2	3	1	1	2	5	40%
1	30	12	11	7	11	1	3	8	16	50%
4	26	13	10	3	10	3	1	9	15	60%
13	23	11	11	1	11	0	0	11	12	92%
11	20	7	9	4	4	3	1	3	10	30%
15	18	5	10	3	4	1	1	3	7	43%
6	18	7	7	4	4	3	0	4	11	36%
2	18	6	8	4	4	2	3	1	7	14%
20	16	5	4	7	3	2	0	3	12	25%
9	15	8	5	2	7	1	7	0	3	0%
8	15	9	5	1	8	1	5	3	5	60%
7	13	6	5	2	5	1	0	5	8	63%
5	13	3	6	4	3	0	1	2	6	33%
14	12	4	7	1	4	0	0	4	5	80%
22	9	5	2	2	5	0	0	5	7	71%
12	8	6	1	1	6	0	1	5	6	83%
16	6	1	4	1	1	0	0	1	2	50%
Total	521	197	223	101	150	47	37	113	261	43%

Timing of Monitor for Head Injury

- 7/1/11 to 2/29/12
- Include if AIS Head > 0
- Exclude if
  - No signs of life
  - ED GCS > 8
  - Placement time > 5 days or negative
- Eligible patients
  - Any Monitor, Vent, IPPM, O2Mon, JVB
  - Mean time from ED admit to placement of first monitor
  - N, patients where time to placement of first monitor < 8 hrs

Timing of Monitor for Head Injury (7/1/2011 to 2/31/12)

Inclusion:
AIS Head > 0

Exclusion:
No signs of life
ED GCS > 8
Placement time > 5 days

Timely = Placement ≤ 8hrs after ED arrival

Trauma Center	N Any Monitor	Ventric	IPPM	02 Mon	JVB	Mean Time to Placement (hrs)	N Timely	% Timely
21	25	12	25	1	0	7.0	21	84%
27	23	18	10	0	0	5.8	18	78%
3	11	1	10	0	0	1.9	11	100%
18	9	2	8	3	0	23.6	6	67%
11	8	2	6	1	0	14.3	3	38%
6	8	2	8	0	0	2.5	8	100%
15	8	3	5	1	4	12.6	7	88%
5	7	7	1	1	0	6.4	6	86%
20	7	1	6	0	0	4.8	6	86%
2	6	5	5	0	0	7.0	5	83%
17	6	6	1	0	0	8.0	4	67%
1	5	0	5	0	0	4.8	4	80%
19	5	4	2	0	0	3.1	5	100%
4	4	2	4	0	0	12.7	1	25%
8	3	3	3	0	0	21.9	1	33%
9	2	0	2	0	0	6.3	1	50%
13	2	2	0	0	0	8.0	1	50%
22	2	1	2	0	0	4.3	2	100%
7	2	0	1	2	0	2.2	2	100%
12	1	1	0	0	0	10.8	0	0%
14	1	0	1	0	0	4.2	1	100%
Total	145	72	105	9	4	8.0	113	78%

MTQIP and MSQC

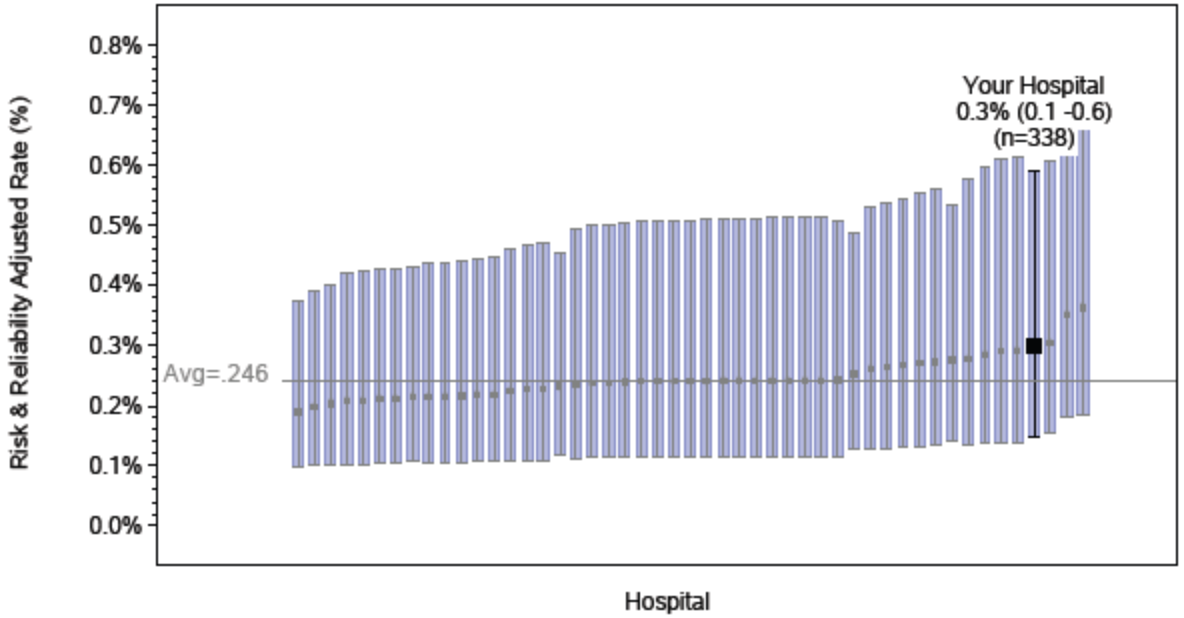
- Emergent General Surgery Collaboration
  - Feedback Reports
  - Best Practices
  - Dissemination of Information
- Appendectomy Report
  - January 2006 to September 2011 (5 years data)
  - ICD-9 (Appendicitis)
  - CPT (Appendectomy)
  - 12,410 Cases

MTQIP and MSQC

- Graphs
  - Risk and Reliability adjustment
  - CI
  - Green (low outlier), Red (high outlier)
- Excel Files
  - Center vs. Aggregate
  - Summary
  - Co-morbids
  - Outcomes

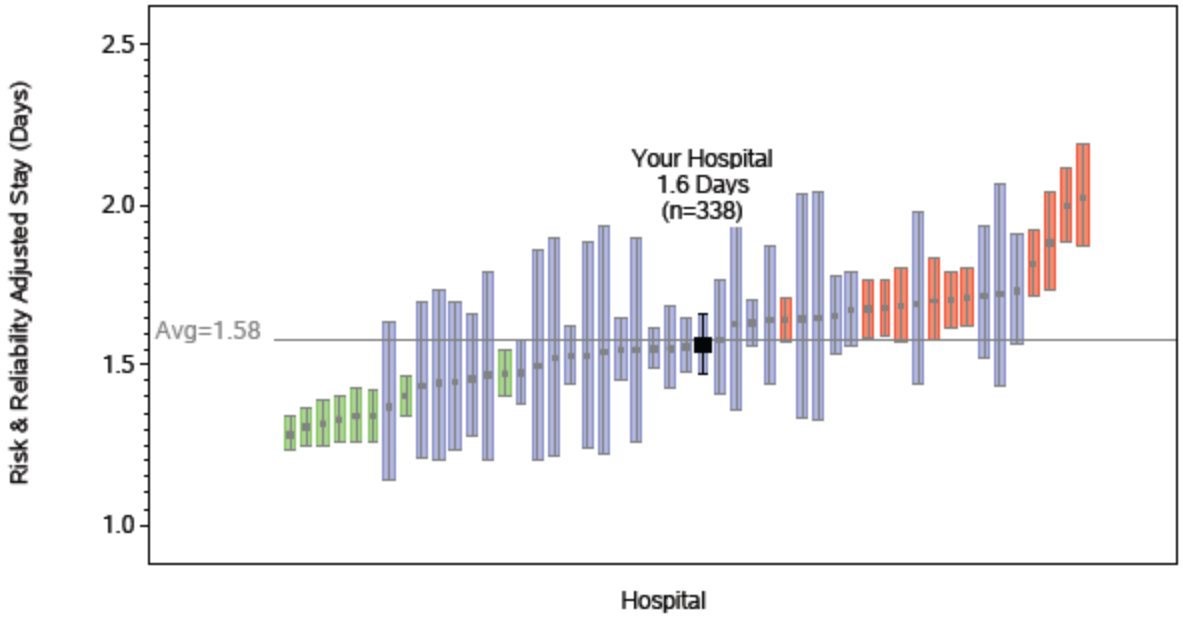
Mortality

Risk and Reliability Adjusted Rate (%) with 90% confidence Intervals by Hospital
for All Cases of Appendectomy for Acute Appendicitis, MSQC Group 1/1/2006 - 9/21/2011 (n=12,410)



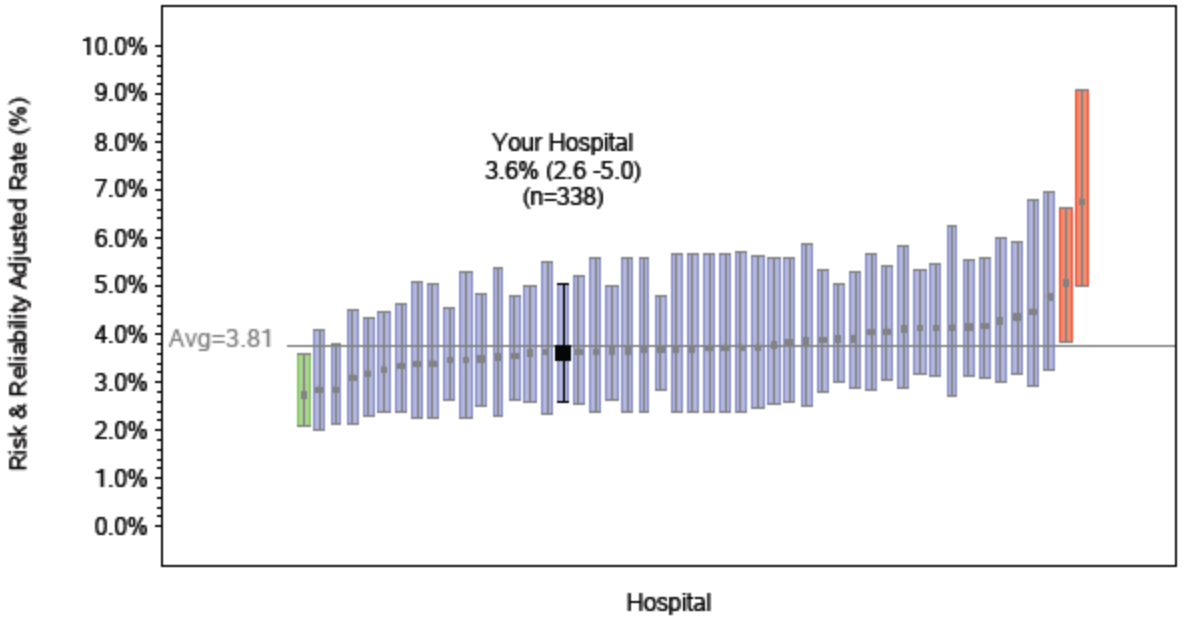
LOS

Risk and Reliability Adjusted Stay (Days) with 95% confidence Intervals by Hospital
for All Cases of Appendectomy for Acute Appendicitis, MSQC Group 1/1/2006 - 9/21/2011 (n=12,410)



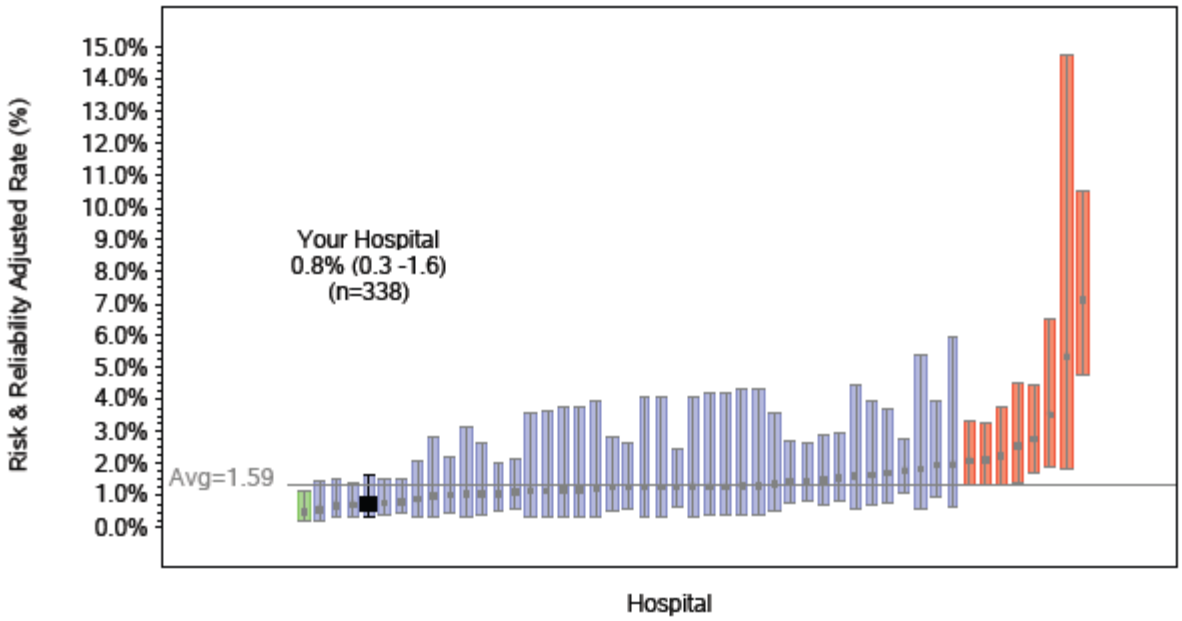
Major Complication

Risk and Reliability Adjusted Rate (%) with 90% confidence Intervals by Hospital
for All Cases of Appendectomy for Acute Appendicitis, MSQC Group 1/1/2006 - 9/21/2011 (n=12,410)



Sepsis or Septic Shock

Risk and Reliability Adjusted Rate (%) with 90% confidence Intervals by Hospital
for All Cases of Appendectomy for Acute Appendicitis, MSQC Group 1/1/2006 - 9/21/2011 (n=12,410)



MTQIP
Program Manager Update

02.12.13

Judy Mikhail

Resource Benchmarking

CLINICAL RESOURCES

REGISTRY RESOURCES

Provide enough information to be useful…

While maintaining hospital anonymity

Challenge

Clinical Resource Benchmarking

Adult Trauma Center	Acuity (MTQIP Data)						
Letter	Annual MTQIP Volume	% Head AIS ≥ 3	% Age > 65	% ISS > 15	% ISS > 25	% Admitted to ICU	% Ventilated

Trauma Surgeons (TS)									Trauma Fellows	Surgical Residents
# Surgeons on Call Panel	# Hospital Employed/ Private Practice	% TS on EGS Call	% EGS Call by TS	# Critical Care Boarded	% ICU Pts Covered by Surgeons	ICU Closed Y/N	Simultaneous Tr/EGS Call?	In House Call Y/N	# On Clinical Trauma (per month)	# Rotating on Trauma (per month)

Advanced Practitioners (NPs/PAs) Hospital Employed									Date Last Updated
				Deployed					
# Trauma	# NS	# Ortho	# EGS	ED Y/N	OR Y/N	ICU Y/N	Floor Y/N	Clinic Y/N	

Adult Trauma Center	Trauma Registry Information			
Letter	ED Trauma Activations Included Y/N	All ED Trauma Patients Included Y/N	Hip Fx's Included Y/N	Total Admitted Trauma Volume (All Ages & MOI)

Registry / Performance Improvement Benchmarking

Registry/Performance Improvement FTE's											Date Last Updated
Traditional Roles		Others Dedicated to PI / Registry			Injury Prevention		Research		Education and/or Outreach		Clerical	
TPM/TC	Registrars	Non RN	RN	NP/PA	Non RN	RN	Non RN	RN	EMS	RN	Admin Assistant / Secretary	

Hospital PI Projects

- 2012 Inaugural Year - Good start
- Everyone should be involved
  - → Surgeons, TPM's, Registrars
- Pick something *meaningful* to your program
- Utilize data from:
  - Chart review, Registry, MTQIP
  - Report data 3 times a year
    - April 1, September 1, January 1

➢ Share successes & failures at MTQIP

Weight	2013 MTQIP Measures	Points
20%	Timeliness of MTIQP Data Submission (within 2 weeks of request) • 3 of 3 times • 2 of 3 times • 1 of 3 times	 20 0 0
15%	Data Validation Audit • Completed • Not Completed	 15 0
25%	Meeting Participation - Surgeon • 3 of 3 meetings • 2 of 3 meetings • 1 of 3 meetings • No participation	 25 10 5 0
25%	Meeting Participation - Program Manager and/or Registrar • 3 of 3 meetings • 2 of 3 meetings • 1 of 3 meetings • No participation	 25 10 5 0
15%	Timeliness of PI Data Submission (within 2 weeks of request) • 3 of 3 times • 2 of 3 times • 1 of 3 times • No participation	 25 10 5 0

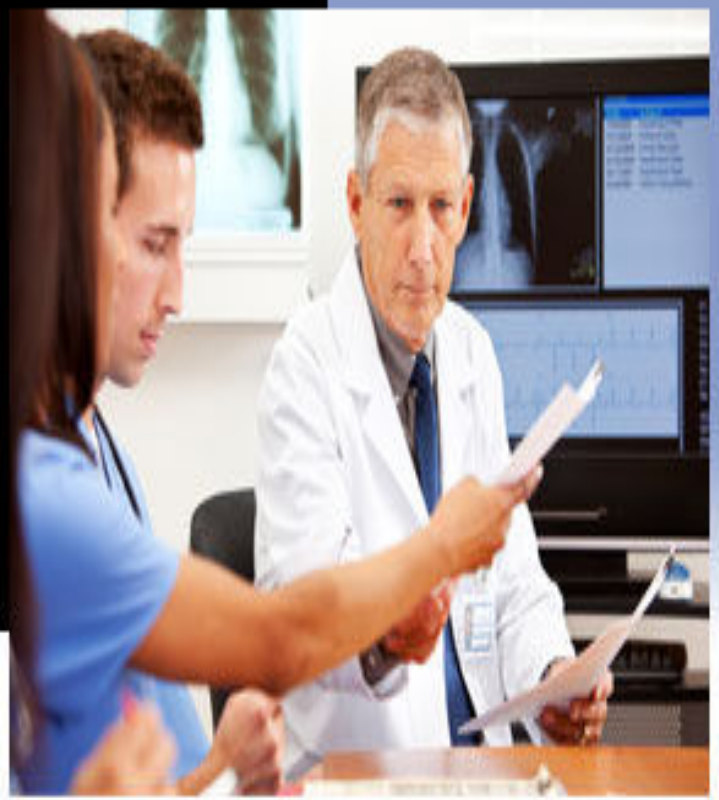
MTQIP.org

Measuring trauma center outcomes with:

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

and correlation with processes of care.

That's M·TQIP



Motorcycle Helmets

Ray Bingham, PhD

Call for Data, Feedback

- Data from 7/1/11 to 6/30/12
  - Due 2/22/13
- Next call
  - Data from 11/1/11 to 10/31/12
  - Due June 7, 2013
- Evaluations
  - Meeting ideas, Topics, Location
- CME
  - Turn in evaluation, get certificate

Future Meetings

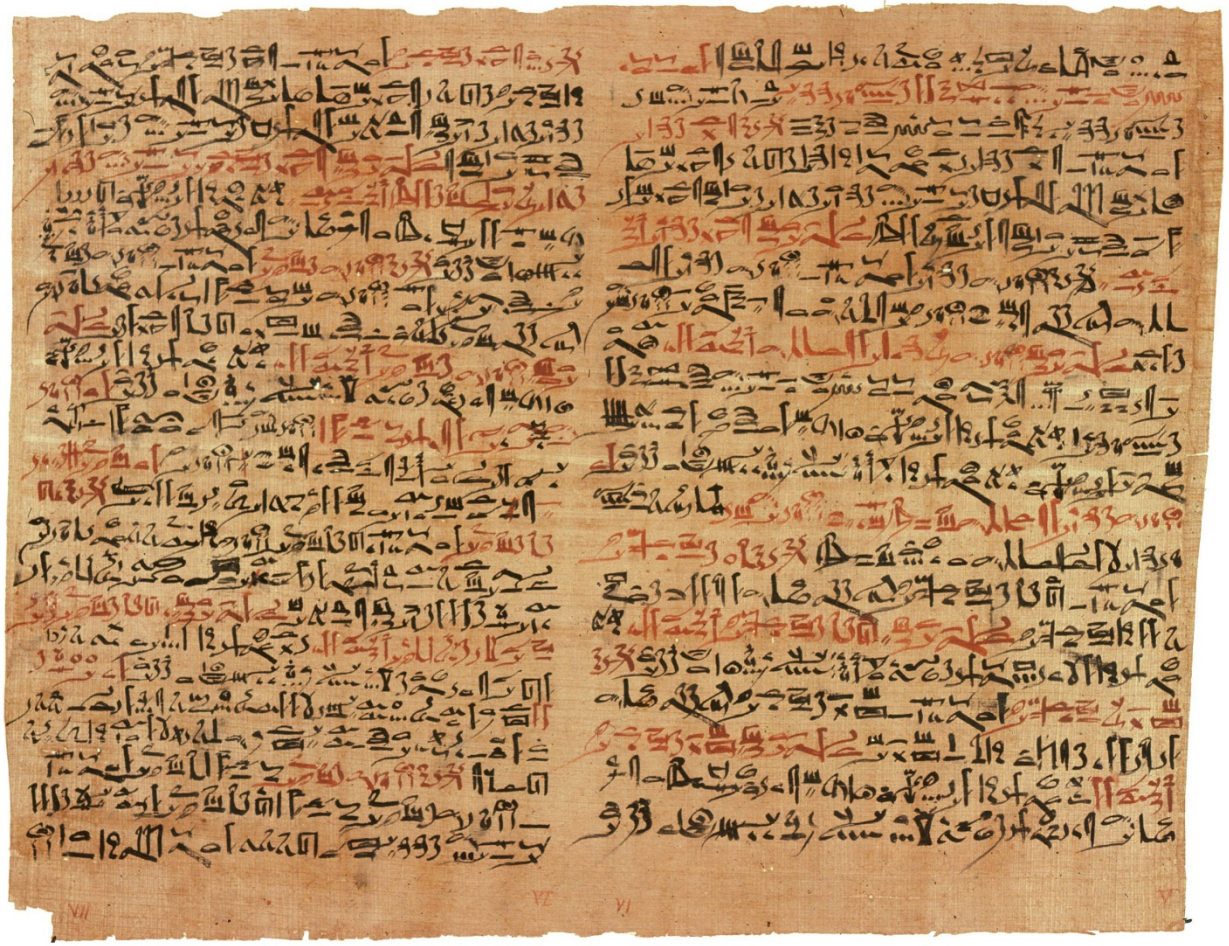
- Wednesday May 15, 2013
  - Location: Kalamazoo
- Tuesday June 4, 2013
  - Location: Ann Arbor
  - Registrars
- Tuesday October 15, 2013
  - Location: Ann Arbor/Ypsilanti

Rib Fractures and Pain Management

Brian Shapiro, MD
Genesys Regional Medical Center
Grand Blanc, Michigan

GENESYS

Edwin Smith Papyrus



Edwin Smith Papyrus

- 27 head injuries (cases #1-27)
- 6 throat and neck injuries (cases #28-33)
- 2 injuries to the clavicle (collarbone) (cases #34-35)
- 3 injuries to the arm (cases #36-38)
- 8 injuries to the sternum (breastbone) and ribs (cases #39-44)
- 1 tumor and 1 abscess of the breast (cases #45-46)
- 1 injury to the shoulder (case #47)
- 1 injury to the spine (case #48)

Case Forty-Two:

Instructions concerning a sprain in the ribs of his breast.

- Examination: If thou examinest a man having a sprain in the ribs of his breast, (and) he suffers in the ribs of his breast, not having a dislocation, (and) it is not broken while that man continues to suffer with it and shudders exceedingly.
- Diagnosis: Thou shouldst say concerning him: "One having a pain in the ribs of his breast. An ailment which I will treat."
- Treatment: Thou shouldst bind it with ymrw; thou shouldst treat it afterwards with honey every day until he recovers.

Case Forty-Three:
Instructions concerning a dislocation of the ribs of his breast.

- Examination: If thou examinest a man having a dislocation of the ribs of his breast, (and) thou findest that the ribs of his breast are projecting and their heads are ruddy, while that man suffers continually with swellings in his two sides.

- Diagnosis: Thou shouldst say concerning him: "One having a dislocation in the ribs of his breast. An ailment which I will treat."

- Treatment: Thou shouldst bind it with ymrw; thou shouldst treat it afterwards with honey every day, until he recovers.

Case Forty-Four:

Instructions concerning a break in the ribs of his breast.

- Examination: If thou examinest a man having a break in the ribs of his breast, over which a wound has been inflicted; (and) thou findest that the ribs of breast crepitate under thy fingers.
- Diagnosis: Thou shouldst say concerning him: "One having a break in the ribs of his breast, over which a wound has been inflicted. An ailment not to be treated."

RIB FRACTURES

- PEOPLE DIE FROM RIB FRACTURES
- **PEOPLE DIE FROM RIB FRACTURES**
- **PEOPLE DIE FROM RIB FRACTURES**

Fig 2

Rib Fractures in the Elderly

Bulger, Eileen M.; Arneson, Matthew A.; Mock, Charles N.; Jurkovich, Gregory J.

The Journal of Trauma. 48(6):1040-1047, June 2000.
doi:

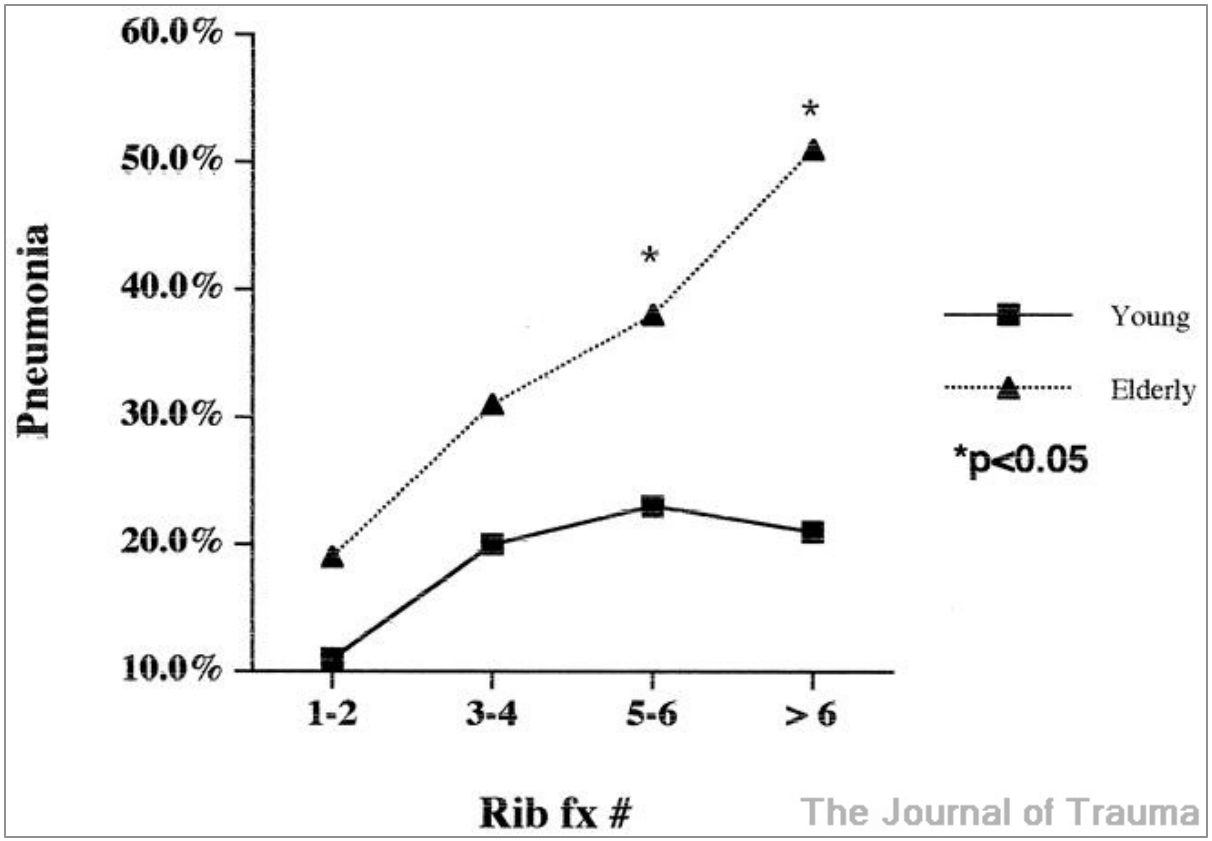


FIG 2. Relationship between pneumonia and number of rib fractures. Increasing pneumonia rates as the number of rib fractures increased were most notable for the elderly group.

Fig 3

Rib Fractures in the Elderly

Bulger, Eileen M.; Arneson, Matthew A.; Mock, Charles N.; Jurkovich, Gregory J.

The Journal of Trauma. 48(6):1040-1047, June 2000.
doi:

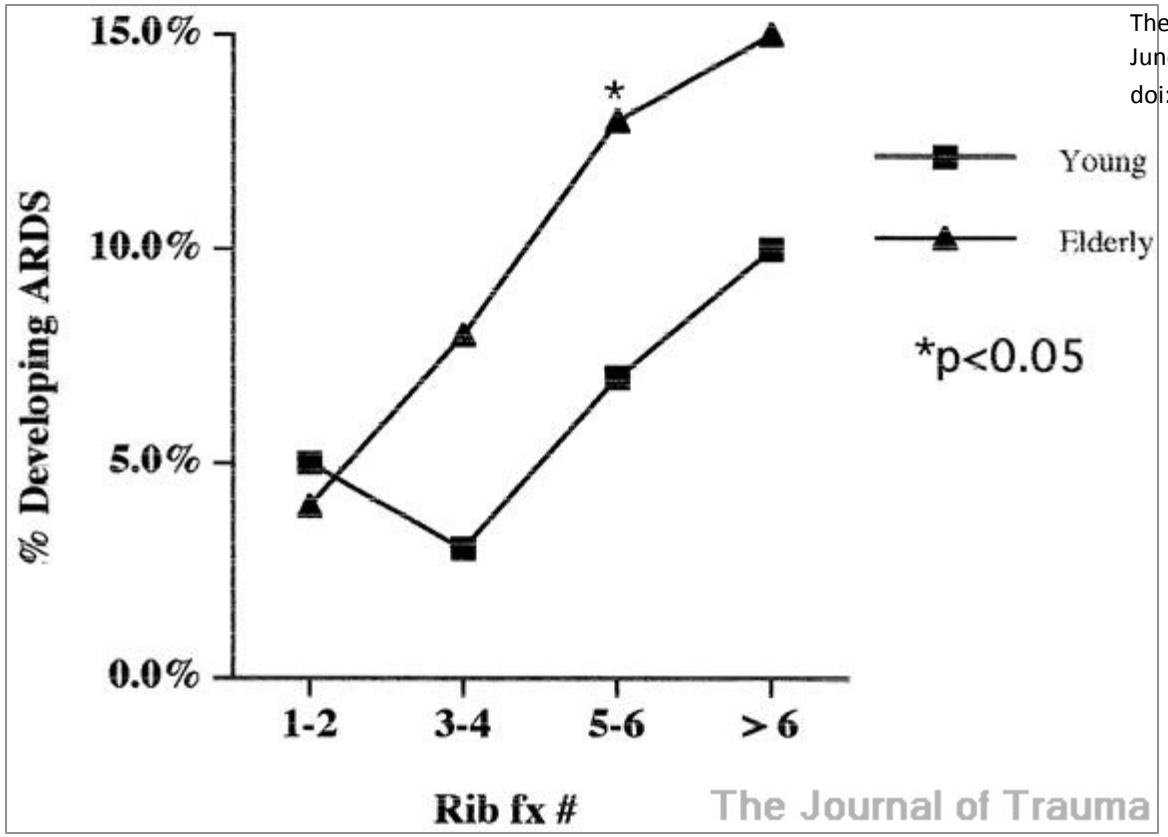


FIG 3. Relationship between development of ARDS and number of rib fractures.

Fig 4

[Rib Fractures in the Elderly]

Bulger, Eileen M.; Arneson, Matthew A.; Mock, Charles N.; Jurkovich, Gregory J.

The Journal of Trauma. 48(6):1040-1047, June 2000.

doi:

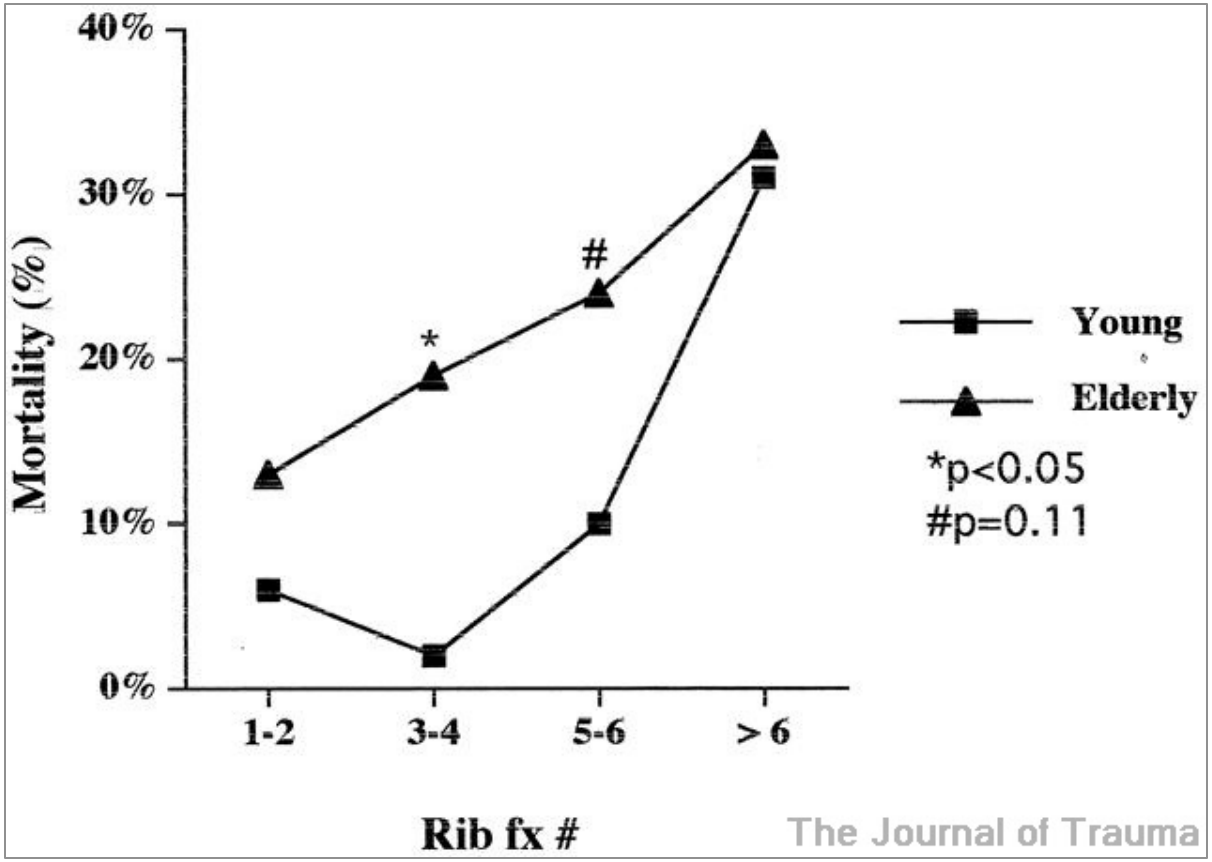


FIG 4. Relationship between mortality and number of rib fractures. Increasing number of rib fractures was associated with increased mortality in both groups with a nearly linear increase in the elderly group.

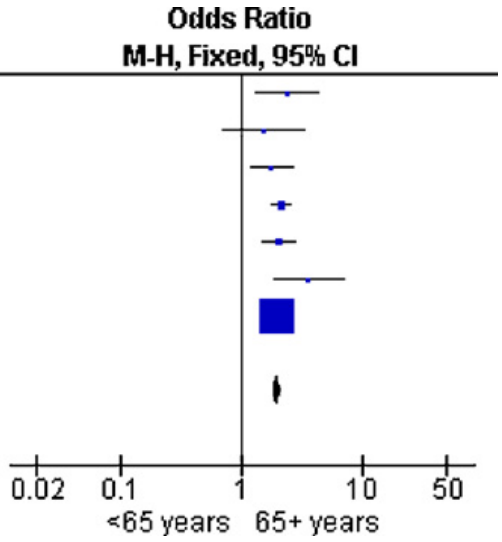
Rib Fracture Mortality and Age

Injury 43 2012

Study or Subgroup	65+ years Events	Total	<65 years Events	Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Bergeron	22	113	27	292	0.9%	2.37 [1.29, 4.37]
Bulger	22	277	10	187	0.8%	1.53 [0.71, 3.30]
Lee b	45	818	52	1633	2.5%	1.77 [1.18, 2.66]
Lien	194	5079	251	13777	9.8%	2.14 [1.77, 2.59]
Sharma	86	480	109	1136	4.0%	2.06 [1.52, 2.79]
Shorr	17	46	66	469	0.6%	3.58 [1.86, 6.88]
Stawicki	1738	8648	2190	19207	81.5%	1.95 [1.82, 2.09]
Total (95% CI)		**15461**		**36701**	**100.0%**	**1.98 [1.86, 2.11]**
Total events	2124		2705			

Heterogeneity: $Chi^2 = 5.06$, $df = 6$ ($P = 0.54$); $I^2 = 0\%$

Test for overall effect: $Z = 21.67$ ($P < 0.00001$)



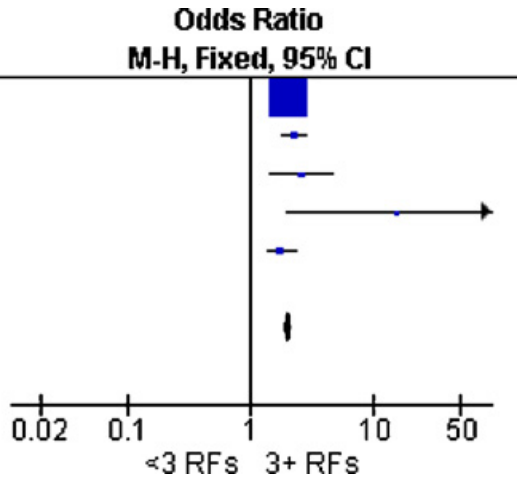
Rib Fracture Mortality 3 or more RFs

Injury 43 2012

Study or Subgroup	3+ RFs Events	3+ RFs Total	<3 RFs Events	<3 RFs Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Flagel	2222	19969	1494	25397	86.4%	2.00 [1.87, 2.14]
Lee b	97	2477	1837	103016	6.1%	2.24 [1.82, 2.76]
Lien	43	3018	15	2691	1.2%	2.58 [1.43, 4.65]
Liman	12	214	1	259	0.1%	15.33 [1.98, 118.85]
Sharma	174	1208	94	1075	6.3%	1.76 [1.35, 2.29]
Total (95% CI)		**26886**		**132438**	**100.0%**	**2.02 [1.89, 2.15]**
Total events	2548		3441			

Heterogeneity: $Chi^2 = 6.53$, $df = 4$ ($P = 0.16$); $I^2 = 39\%$

Test for overall effect: $Z = 21.83$ ($P < 0.00001$)



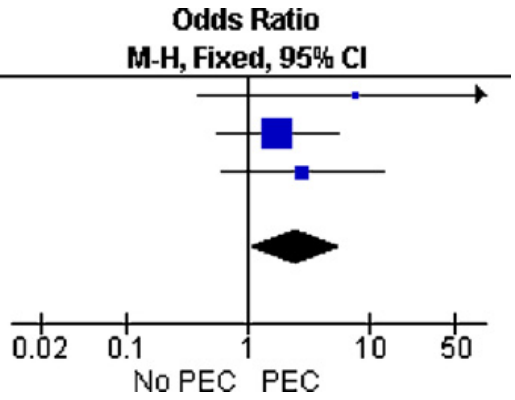
Mortality with Preexisting condition

Injury 43 2012

Study or Subgroup	PEC Events	PEC Total	No PEC Events	No PEC Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Alexander	3	31	0	31	6.6%	7.74 [0.38, 156.36]
Barnea	8	49	6	60	67.0%	1.76 [0.57, 5.46]
Elmistekawy	4	12	5	33	26.4%	2.80 [0.61, 12.95]
Total (95% CI)		**92**		**124**	**100.0%**	**2.43 [1.03, 5.72]**
Total events	15		11			

Heterogeneity: $Chi^2 = 0.92$, $df = 2$ ($P = 0.63$); $I^2 = 0\%$

Test for overall effect: $Z = 2.03$ ($P = 0.04$)



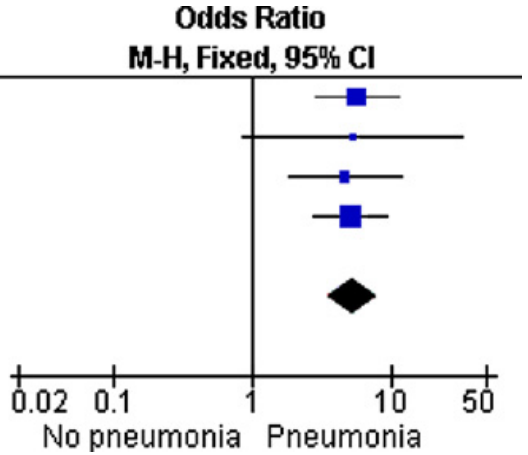
Mortality with Pneumonia

Injury 43 2012

Study or Subgroup	Pneumonia Events	Pneumonia Total	No pneumonia Events	No pneumonia Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Bergeron	18	49	31	336	33.6%	5.71 [2.87, 11.37]
Elmistekawy	3	7	4	32	5.5%	5.25 [0.84, 32.63]
Harrington	6	56	27	1072	16.1%	4.64 [1.83, 11.76]
Svennevig	21	96	29	556	44.8%	5.09 [2.76, 9.38]
Total (95% CI)		**208**		**1996**	**100.0%**	**5.24 [3.51, 7.82]**
Total events	48		91			

Heterogeneity: $Chi^2 = 0.13$, $df = 3$ ($P = 0.99$); $I^2 = 0\%$

Test for overall effect: $Z = 8.09$ ($P < 0.00001$)



Treatment Rib Fractures

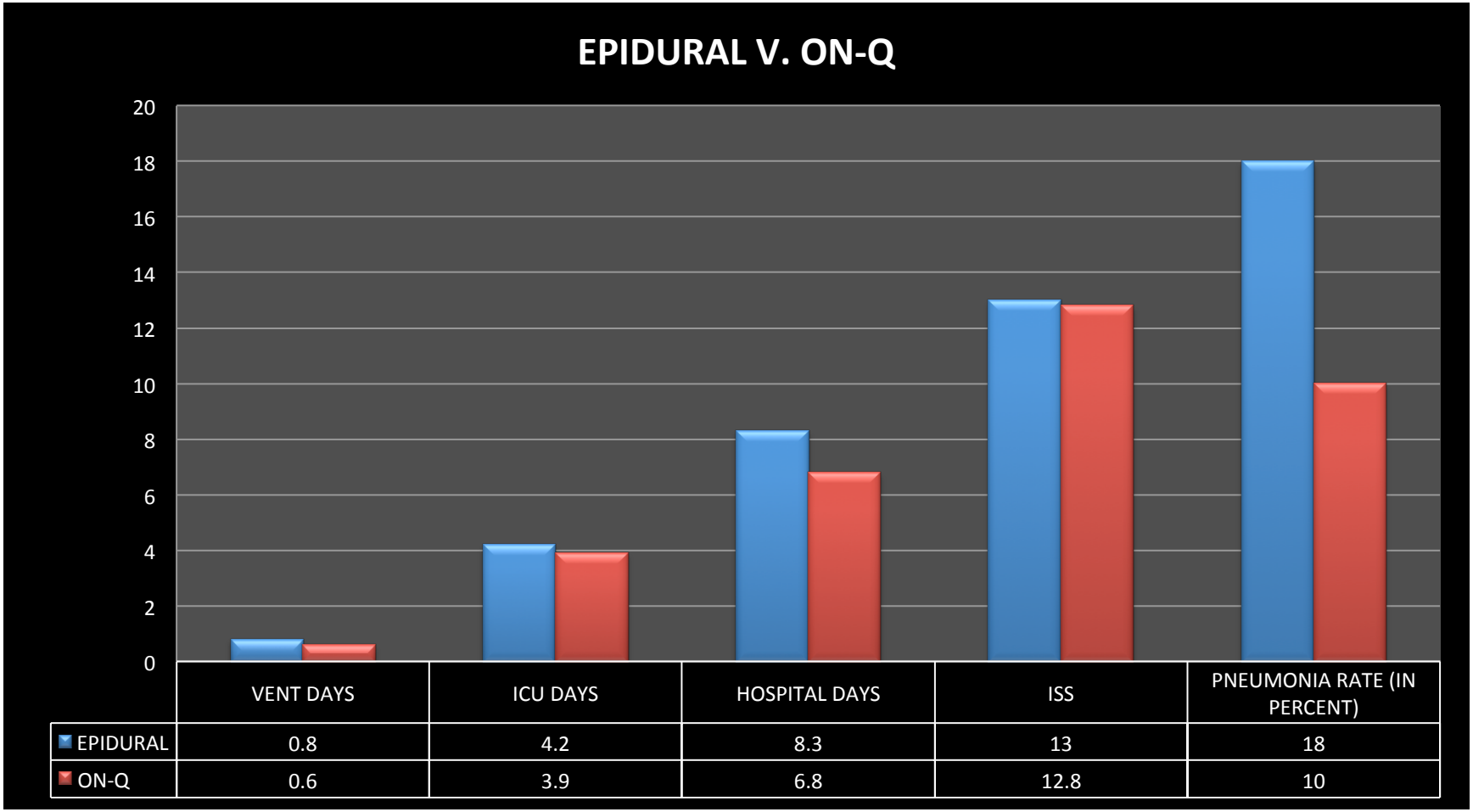
- **Rib Blocks** **PNTX rate 8.5% per patient** J Trauma. 2001 Sep;51(3):536-9.
- **Epidural analgesia improves outcome after multiple rib fractures.** Surgery. 2004 Aug;136(2): 426-30
- **Extrapleural bupivacaine for amelioration of multiple rib fracture pain.** J Trauma. 1995 Jan;38(1):22-7

Genesys Trauma Services

	2009-2010	**2009-2010 Epidural**	2011-2012	**2011-2012 ON-Q**
Vent Days	0.7	**0.8**	0.2	**0.6**
ICU Days	2.6	**4.2**	1.8	**3.9**
Hospital Days	6.3	**8.3**	4.5	**6.8**
Average ISS	11.8	**13**	11	**12.8**
Average Age	64	**64**	66	**70**
Pneumonia Rate	3%	**18%**	2%	**10%**
Total Patients	180	**33**	214	**46**
ICU Admissions	101		117	

* Above Data Reflects All Trauma Patients With 2 Or More Rib Fractures

Genesys Trauma Services



	VENT DAYS	ICU DAYS	HOSPITAL DAYS	ISS	PNEUMONIA RATE (IN PERCENT)
EPIDURAL	0.8	4.2	8.3	13	18
ON-Q	0.6	3.9	6.8	12.8	10

QI Project – Rib Fractures and Pneumonia Prevention Strategies

Allan Lamb, DO
Oakwood Southshore Medical Center

Pneumonia as a complication of Rib Fractures in Trauma

Allan D. Lamb, DO, FACOS

Trauma Medical Director

Oakwood Southshore Medical Center

Trauma Services

Pneumonia

- **$ 40.2 billion cost in 2005**
- **8th leading cause of death**
- **55,477 deaths from pneumonia in 2006**
- **Trauma patients susceptible from stress and weakened immune system, in addition to direct injury**
- **Well known complication of rib fractures, especially in elderly**

Problem

OSMC pneumonia rate (complication) associated with rib fractures was 5.2%

Significant outlier in MTQIP data 2011.

Above NTQIP benchmark of 4.9%

2011-2012 quality improvement project began in October, 2011.

Goal was a rate of 3.9%

Guidelines developed

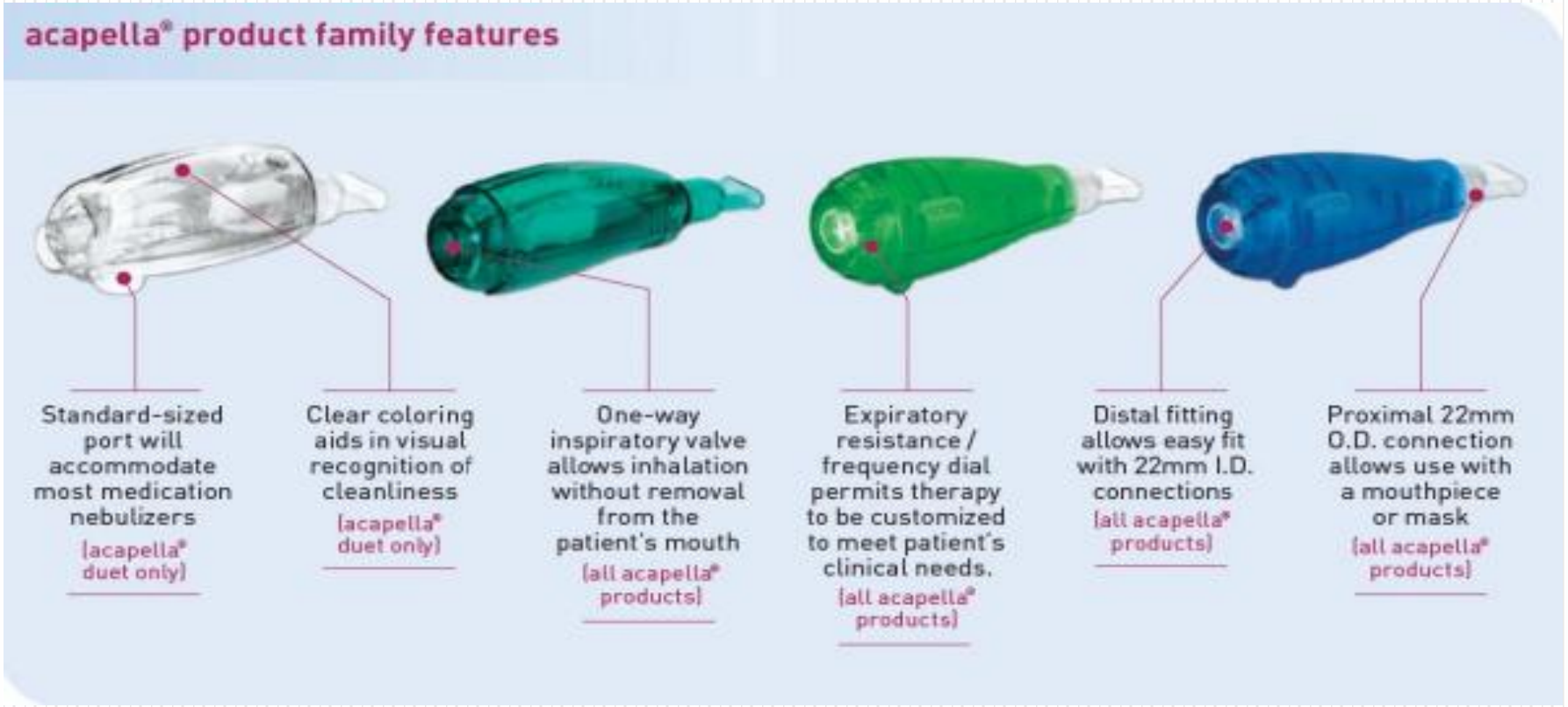
Patient group identified

- **2 or more rib fractures**
- **Patients requiring admission to the hospital**
- **Hospital LOS > 1 day**

Initial intervention, begun November,2011

- **Changed Incentive Spirometer to Acapella device.**

Acapella device



October 2011- January 2012

- Initial reporting period
  - 22 patients
  - 50.77 average age
  - 5.5 day average LOS
  - 16 average ISS
  - 2.81 average Chest AIS
  - 4.40% pneumonia rate (down 0.8 %)

Guidelines revised

Acapella continued

On-Q pain pump with marcaine inserted for continuous rib block. Para spinal insertion position

Increased staff awareness (physician, nurse and RT)

On-Q pain pump

February 2012 to May 2012

- Follow up reporting period
  - 31 patients
  - 56.29 average age
  - 4.58 average LOS (down.92 days)
  - 20.5 average ISS (higher severity)
  - 2.52 average Chest AIS (lower severity)

  - 3.23% pneumonia rate (down 1.17%)

Further guideline revision

Acapella continued
On-Q pain pump continued

BiPap utilize at night 2100 – 0800 for pulmonary support and to maintain lung recruitment

BiPAP

June 2012 to September 2012

- Final reporting period
  - 15 patients
  - 51.91 average age
  - 3.6 day average LOS (down additional .98 day)
    - **overall LOS decrease of 1.9 days**
  - 12.07 average ISS (lower injury severity)
  - 2.73 average Chest AIS (Higher chest injury)

  - Pneumonia rate 0% (down 3.2%)

Rib Fracture Protocol

Inclusion

- **2 or more rib fractures**
- **Hospital admission**
- **>1 day LOS**

Intervention

- **Acapella**
- **On-Q Pain pump with marcaine, para spinal insertion**
- **BiPap support at night 2100 – 0800 throughout admission**

Results

- 1 year study period
- 68 patients
- LOS decreased from 5.5 to 3.6 day average
  - 1.9 day decrease
- Average age 53
- Average ISS 16.04
- Average Chest AIS 2.7
- 12 month pneumonia average 0.64%
  - 4.56% decrease with 0% in final 4 months

Conclusion

- Aggressive control of pain with On-Q pain catheters in para spinal position
- Respiratory support and recruitment with Acapella vibratory PEP therapy system ($40 cost)
- Maintenance of recruited air space with BiPAP therapy overnight with full face mask ($50 cost)
- Combined, these therapies are synergistic and drastically reduce the incidence of pneumonia.
- There is reduced morbidity, mortality and length of stay with minimal cost, more than covered by decreased LOS

Summary

- **Rib Fracture Protocol is effective and beneficial**
  - **Decreased length of stay by 1.9 days**
  - **Decreased ICU stay by 1.34 days**
  - **Decreased Ventilator support by 1.18 days**
  - **Decreased pneumonia rate by 4.56%**

Oakwood Southshore Medical Center

Trauma Services

Trauma Performance Improvement

Markyta Armstrong-Goldman, RN
Trauma Program Coordinator/Manager

What is PI?

- Performance/Process Improvement is: the concept of measuring the output of a particular process or procedure, then modifying the process or procedure to increase the output, increase efficiency, or increase the effectiveness of the process or procedure. .(http://en.wikipedia.org/wiki/Performance_improvement)
- Simply put – to find a way to do things better for a better outcome.

PI in the DRH Trauma Dept.

- >2000 patients seen & treated at DRH annually.
- Multidisciplinary approach to Trauma Care & Processes ~ Team Approach
- PI meetings = Weekly Trauma Rounds, monthly Trauma Morbidity & Mortality, and monthly Trauma Systems
- Cooperation & Collaboration ingrained in the culture of DRH from ED - Hospital Administration and every dept. in between.

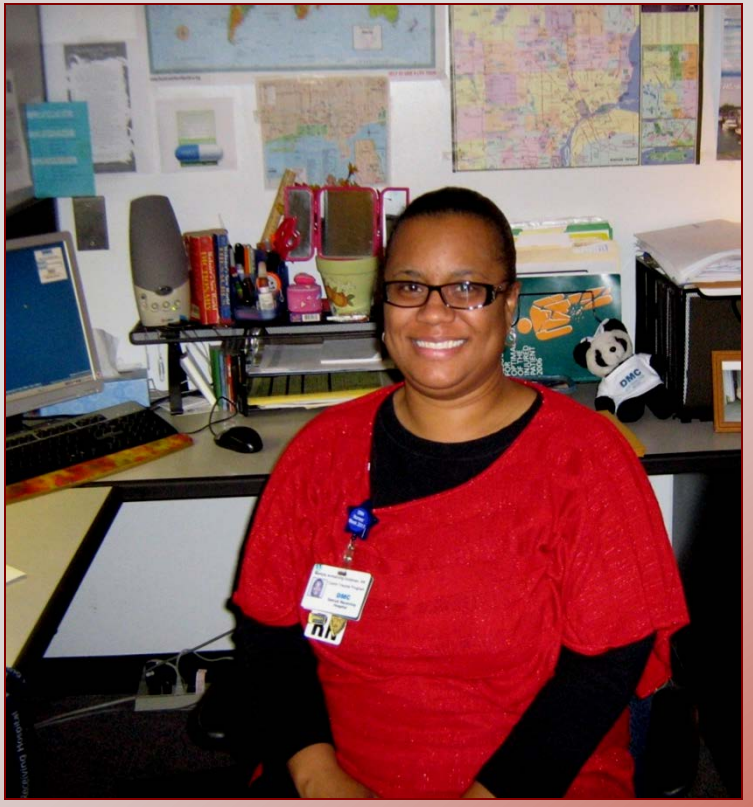
The Trauma

Trauma Medical Director

- Oversees the operation & function of the Trauma Program.
- Manages all medical trauma activities:
  - Trauma M&M
  - Physician Outreach
  - Physician to Physician follow-up
- Is an ACS Site Reviewer for Trauma Verifications

Trauma Program Coordinator

- Implements, Coordinates, Monitors Trauma Activities
- Provides Loop Closure for System Issues (ED nursing issues, Soc. Serv., Lab, etc)
- Oversees and Maintains Level I ACS Verification
- Trauma PI – TQIP, NTDB, etc



Trauma Program Specialist

- Coordination of Trauma Rounds
- Lead ATLS coordinator
- Injury Prevention & Community Outreach
- Assist with PI loop closure
- Covers Case Management

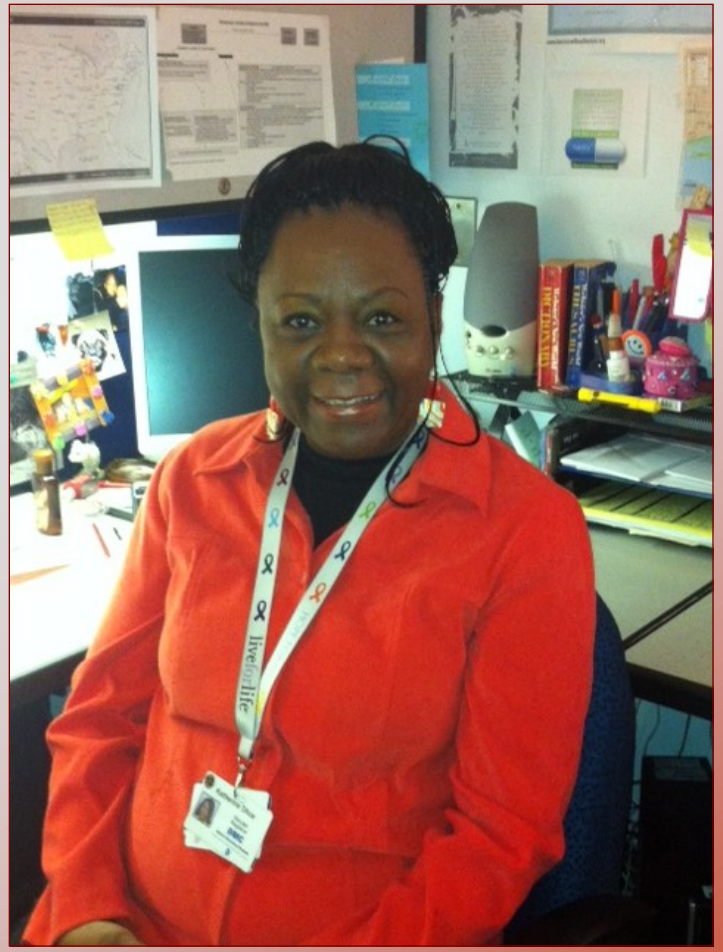
Trauma Case Managers

- Assessment of all trauma and surgical patients for discharge planning/case management needs
- Brief Alcohol Intervention and monitoring
- Data abstraction of inpatient trauma cases for Trauma Registry and summary write-ups for Trauma M&M

Detroit Receiving Hospital
Trauma Program
DMC
Detroit Receiving Hospital

Trauma Registrar

- Coding and data entry of all trauma cases
- Updates Trauma Registry at patient discharge
- Creates & presents monthly reports at Trauma Systems
- PI Data Abstraction and data entry for MTQIP
- NTDB Submission
- Provides Trauma Registry requests reports

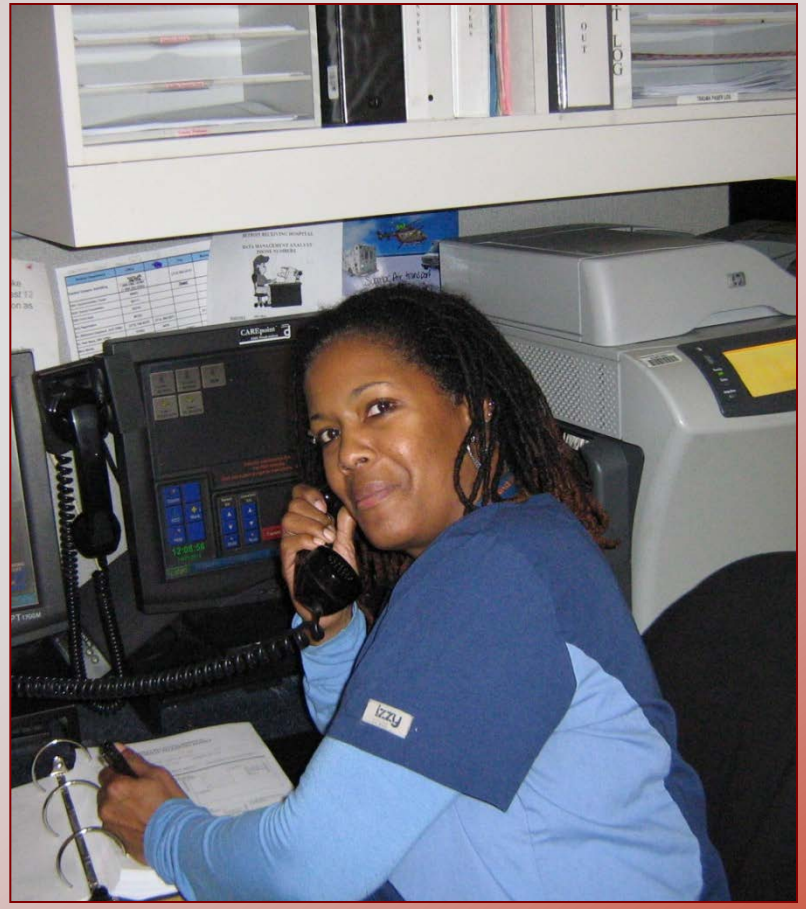


Trauma Department Secretary

- Assist with the planning and coordination of ATLS
- Coordinating and obtaining Trauma Autopsies
- Secretarial support for Trauma M&M meeting and Trauma Rounds
- Follow-up support with Trauma department activities

Communication Center Tech.

- Dedicated EMT/Paramedic answers all EMS calls
- Documents pre-hospital information (MIST form)
- Activates trauma pager
- Handles all ED transfers
- Facilitate 3-way communication with referring physicians
- Obtains runsheets



Detroit Receiving Hospital
Trauma Program
DMC
Detroit Receiving Hospital

Trauma Surgical Team

- 3 Trauma Divisions – each division covers every 3rd 24 hours – does trauma, acute & critical care
- Autonomous fixed Staff/Attending for each division (ex. L/L = green surgery) that care for patients from ED to Outpatient.
- Ortho., NeuroSurg., OMFS, Oral Surgery, Burns, Medicine, Plastics, etc. all involved in the trauma team process as indicated by the American College of Surgeon for a Level One Trauma Facility.

Trauma Team

- Everyone participates & contributes
- All are crucial to success of program
- TPM is the “glue” that gets program to stick together/“cheer leader” that gets program to move forward
- Need everyone to know their “job” and take pride in getting the job done – need recognition goal is achieved.

Weekly Trauma Rounds

Trauma Performance Improvement

Trauma Rounds

Frequency:

- Weekly Rounds, sit down conference presentation, 1-1 ½ hrs in duration – 1 CEU provided for each meeting to Attendings and nursing.
- Reports to Medical Staff Operations Committee (MSOC) – Hospital Administration Leadership.

Purpose:

- To review care of every trauma patient from the previous week and to follow the care of in-house patients for each service.
- To serve as a teaching opportunity / tool for attending staff to educate the participants and the residents that present the patient cases.

Trauma Rounds - Preparation

Preparation: The Trauma Services Staff complete data abstractions on all trauma cases that present to facility from Monday 8am- Monday 8am.

Trauma Director – is able to oversee the function and operations of the program on a weekly basis.

Outreach – with Referring facilities & EMS providers: Any issues with transport or care prior to arrival is discussed & a letter is sent to the provider regarding compliments or suggestions for improvement.

Weekly Trauma Rounds Report

Room	Name, SSN, Admit Date, Attending, TC, TL	Mechanism of Injury/ Diagnosis	Complication Morbidity	System Issues	Action/ Discussion
5U2B	Ivana Drink 51yo 688000000 5/15 1514 Ledgerwood **TC2 Tl Wood**	Fall down stairs at home Bilat quadriceps tendon rupture, Acute TIA	**5/17 UTI –** prior to arrival	Ed los 8 Hr 16 Min Ortho 1629/ND Orders 1925 PCMS 2206 *1510 TC2 eta 3min, fall down stairs, gcs 7, bp 98/56, r 14, hr 63*	**5/15** ETOH 289, Brief screening complete. Intubated in resus by ED resident. Admitted to med. w/consult to neurology **5/16** Developed aphasia – CT scan negative-> TIA – Ortho fixed tendon yesterday – plan to RIM, carotid duplex done **5/17** D/C RIM

Trauma Rounds – Loop Closure

Loop Closure: Problems with documentation or with trauma care are identified and often the loop is closed at this meeting.

Trending: As each patient case is discussed, common or similar issues are monitored and tracked for trending. If a trend is apparent in weekly Trauma Rounds, the issue is discussed for recommendations for improvement and sent to Trauma Systems Committee for further loop closure/resolution.

Trauma Rounds - Examples

1. Length of stay in the ED for trauma admissions:
    - This issue became apparent in weekly trauma rounds. If the ED LOS is prolonged, then the issue is discussed to determine if it played a part in the morbidity or mortality of the patient.
2. Ideas for injury prevention presentations for the community:
    - Trending of common preventative mechanisms of injury like: smoking on home O2; not wearing a seat belt and improper cooking techniques with grease, grilling, boiling.

Trauma Rounds - Registry

Registry validation – The trauma registrar is present and participates by asking for additional information that is needed for the registry which may not be documented in the medical record – this also serves as an educational opportunity for the residents to document appropriately to satisfy the trauma re-verification criterion.

Trauma Rounds – Post Meeting

Completion of Rounds: Upon completion of the meeting – rounds are updated and new cases are added for the upcoming week.

- Any further follow-up or loop closure is done and reported to the Trauma Director during the week or in the trauma rounds for the next week.

Trauma Morbidity & Mortality M&M

- All Core Trauma/Surgical Attendings
  - Specialty Liaisons,
  - TPM,
  - Risk Management,
  - Hospital Administrator,
  - and any other attending involved in trauma care -
- All Deaths, isolated cases from T. Rounds, or issues requiring attending T. Surgeon input are discussed at this meeting
- The Trauma Attending of record presents case, and an uninvolved peer is assigned to review care & documentation of the case.
- Differences in opinion are discussed & included in minutes; which are done by TMD as chair.
- Autopsy are presented and Cases are Classified.

Trauma M&M PI

Case #	DOS (Date of Service)	Date of Review	Date of Final Judgment	PI Issue – Care	PI – Issue Systems	Comments
14	2/16/2011 – 4/08/2011	5/10/2011	**1/10/2012** expected mortality with opportunity for improvement	▪ failure to communicate with the family when the patient was made DNR ▪ transferred to the floor with inadequate suctioning and Gram+ Cocci septicemia		Dr. Ledgerwood = Attending
30	8/17/2011 – 8/25/2011	9/13/2011	***Pending*** – *autopsy*	▪ Bradycardia ▪ Inability to clear secretions ▪ Inability to orally intubate ▪ No surgical airway		Dr. Diebel = Attending
36	9/7/2012 - 9/16/12	10/09/2012	**12/11/12** ▪ expected mortality without opportunity for improvement	▪ Should have been referred to Ethics – poor prognosis	▪ oscillator ventilator availability at DRH	Dr. Diebel = Attending ▪ Vent availability went to Trauma Systems on 12/18/2012

Trauma Systems

- A Multidisciplinary Performance Improvement/Quality Committee.
- A working committee that identifies issues, investigates root causes of issues, develops/modifies processes and monitors trends in the care of the trauma patient.
- The committee facilitates and propels change.

Topic	Responsibility	Action
LD BUSINESS		
1. BAL protocol (use of brushes)	Dr. Ledgerwood	Update
2. M.E. Office EMR access	Dr. Ledgerwood	Update
3. Oscillator Ventilator	Resp. Representative	Update
TANDING AGENDA		
1. Communications Center *a. Transfers-In –**Pg. 7*** *b. Transfers-out – **Pg. 9*** *c. Procedures outside DRH – **Pg. 10***	Communication Center Rep. M. Armstrong-Goldman Dr. Ledgerwood	Review
2. Laboratory Issues FFP – Blood Cooler & Plasma Monitor – • Massive Transfusion Activations (MTA) of month • FFP waste • Cell count & Gram Stain TAT for OR specimens • M&M Trauma Case – delay with FFP in MTA – John Doe #000 - issue with getting additional FFP for a MTA	K. Kangas S. Adams	Update
3. Hospital Course & Autopsy with Family of Deceased Patients ▪ Pt. ID forms	Dr. Ledgerwood M. Armstrong-Goldman	Update
4. Radiology Issues	Dr. Hillman/ G. Alexander	Review
5. Monthly Demographics Report - ***Pg. 12 & 12A (2012)***	K. Dhue	Review
6. Major Resuscitation Report – ***Pg. 13***	Dr. Ledgerwood	Review
7. Under and Over Triage Report – ***Pg. 14***	Dr. Ledgerwood	Review
8. Organ Donation	M. Armstrong-Goldman	Review
9. From Trauma Rounds: ▪ PCMS – Time of bed assignment	M. Armstrong-Goldman Dr. Ledgerwood	Review
0. SICU Bed Availability Report	S.E. Bennett	Review
1. ED LOS outliers (Registry PI)	M. Armstrong-Goldman	Review
2. State Trauma Activities: MCOT, DEMCA, R2S, etc. ▪ DEMCA	Dr. Ledgerwood / M. Armstrong-Goldman	Update
3. MTQIP P4P initiative	M. Armstrong-Goldman	Update
4. Trauma Admissions Per Year – Report – ***Pg. 17***	Dr. Ledgerwood / K. Dhue	Review
DUCATION/OUTREACH/INJURY PREVENTION		
1. TIPP	S. Maleyko-Jacob	Update
2. ATLS	S. Maleyko-Jacob	Update
3. Outreach Activities – ***Pg. 18***	Dr. Ledgerwood	Update
4. Trauma Symposium (Nov 14th & 15th, 2013 @ MGM)	M. Armstrong-Goldman	Update
EW BUSINESS		
1. IRB Proposals/Registry Requests	K. Dhue / M. Armstrong-Goldman	Review
2. Closed Reductions – ED vs. OR – criteria for process	Dr. Ledgerwood M. Armstrong-Goldman	Review

Trauma PI Issue

Identification of John & Mary Doe cases

- Issue discovered & discussed in Trauma Rounds -> identified as a possible recurrent issue as there was no known policy/procedure for identification process.
- Issue elevated to Trauma Systems (PI meeting) -> Concerns:
    1. Delay with treatment -> No family to discuss care
    2. Delay with placement -> No family to make placement decisions
    3. Delay with finances -> Insured vs. Medicaid application submission
- Current Resolution: Social Work Department has completed a policy that outlines the process of identifying the patient – desired turn-around-time goal = 24-48hrs from arrival.

Trauma PI Issue

Surgical ICU (SICU) Availability

- ED Length of stay & barriers that cause prolonged ED LOS (>4hrs) are discussed for each case at weekly Trauma Rounds
- Trending of the issue has found an issue with SICU Bed Availability -> which is discussed monthly at Trauma Systems
- Causes = Physician decision making, availability of acute care beds, appropriateness of ICU admissions.
- Resolution = pending – processes are being developed by Hospital Administration and other effected departments to streamline patient throughput process to improve availability of SICU and Acute Care Beds

What's the Key?

- Get all the "Stakeholders" involved and committed to the PI process.
- Get the support from Hospital Administration and the Chiefs of Staff for each medical division
- Be consistent & Persistent in the process and follow-through.
- Stay *DIPLOMATIC* and **focused** on the goal –> Optimal Care for the Injured Patient!

Questions???

Traumatic Brain Injury Monitor Project

Mark Hemmila, MD

02.12.13

Brain Injury Monitors

- 3/1/11 to 2/29/12
- Procedure Data – (ICD-9)
  - Ventriculostomy (2.20, 1.26, 1.28)
  - Intraparenchymal pressure monitor (1.10)
  - Brain tissue oxygen monitor (1.16)
- MTQIP Process Measures Data (7/1/11 to 2/29/11)
- Combined data for monitor type, date, time
  - Any Monitor, Vent, IPPM, O2Mon, JVB
  - Vent, IPPM, O2Mon, JVB
  - No assessment of injury (AIS Head or GCS)

Brain Monitors (3/1/11 to 2/29/12)

Trauma Center	Any Monitor	Ventriculostomy	IPPM	02 Monitor	Jugular Venous Bulb
21	37	16	37	1	0
27	34	25	16	0	0
11	22	8	14	1	0
1	18	5	14	1	0
18	18	7	13	5	0
3	15	2	13	0	0
20	13	1	12	0	0
6	13	3	13	0	0
15	13	4	6	3	6
17	13	13	1	0	0
19	12	9	5	0	0
5	10	10	1	1	0
4	10	6	6	1	1
8	8	6	7	0	0
9	7	1	6	4	0
2	7	6	6	0	0
22	6	1	6	0	0
7	6	1	4	3	0
16	5	3	4	0	0
12	3	3	0	0	0
13	3	3	0	0	0
14	2	1	1	0	0
Total	275	134	185	20	7

Brain Injury Monitors

- 7/1/11 to 10/31/11
- Exclude if AIS Head = 0
- AIS Head
  - N, Total
  - Without any monitor
  - With any monitor
- ED GCS
- Highest GCS within 24 hrs (Process measures)

Brain Monitors (3/1/11 to 2/29/12)

Exclude if AIS Head = 0

Summary

AIS Head	N	w/o Monitor	with Monitor	%
1	325	325	0	0.0%
2	1823	1817	6	0.3%
3	1059	1035	24	2.3%
4	695	636	59	8.5%
5	443	334	109	24.6%
6	11	10	1	9.1%
Total	4356	4157	199	

ED GCS	N	w/o Monitor	with Monitor	%
14-15	3380	3349	31	0.9%
9-13	303	286	17	5.9%
3-8	502	361	141	39.1%
Missing	171	161	10	6.2%
Total	4356	4157	199	

Highest GCS w/in 24 hrs	N	w/o Monitor	with Monitor	%
14-15	3532	3478	54	1.6%
9-13	96	85	11	12.9%
3-8	330	212	118	55.7%
Missing	398	382	16	4.2%
Total	4356	4157	199	

Monitor for Head Injury

- 7/1/11 to 10/31/11
- Include if AIS Head > 0
- Exclude if
  - No signs of life
  - ED GCS > 8 and TBI GCS > 8
- Eligible patients
  - Dead
  - Dead with and without any monitor
  - Alive with and without any monitor
  - Dead and monitor withheld
  - Any Monitor, Vent, IPPM, O2Mon, JVB
- Summary
- Reason monitor withheld

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:	Exclusion:
AIS Head > 0	No signs of life
	ED GCS > 8 & TBI GCS > 8

Trauma Center	N	Dead	Alive w/o Monitor	Alive with Monitor	Dead w/o Monitor	Dead with Monitor	Dead and Monitor Withheld	Any Monitor	Ventric	IPPM	02 Mon	JVB
27	65	14	33	18	7	7	5	25	18	13	0	0
21	61	31	11	19	18	13	8	32	14	32	1	0
19	38	12	21	5	11	1	0	6	5	2	0	0
3	34	13	16	5	10	3	0	8	2	6	0	0
18	32	15	12	5	11	4	0	9	3	8	3	0
17	31	4	25	2	3	1	1	3	3	0	0	0
1	30	12	11	7	11	1	3	8	1	7	1	0
4	26	13	10	3	10	3	1	6	5	4	1	0
13	23	11	11	1	11	0	0	1	1	0	0	0
11	20	7	9	4	4	3	1	7	1	6	1	0
15	18	5	10	3	4	1	1	4	2	1	1	1
6	18	7	7	4	4	3	0	7	2	7	0	0
2	18	6	8	4	4	2	3	6	5	6	0	0
20	16	5	4	7	3	2	0	9	0	9	0	0
9	15	8	5	2	7	1	7	3	0	3	1	0
8	15	9	5	1	8	1	5	2	2	2	0	0
7	13	6	5	2	5	1	0	3	0	2	1	0
5	13	3	6	4	3	0	1	4	4	1	1	0
14	12	4	7	1	4	0	0	1	0	1	0	0
22	9	5	2	2	5	0	0	2	1	2	0	0
12	8	6	1	1	6	0	1	1	1	0	0	0
16	6	1	4	1	1	0	0	1	0	1	0	0
Total	521	197	223	101	150	47	37	148	70	113	11	1

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:	Exclusion:
AIS Head > 0	No signs of life
	ED GCS > 8 & TBI GCS > 8

Summary

	N	%
Alive w/o Monitor	223	43%
Alive with Monitor	101	19%
Dead	197	38%
Total	521	

	N	%
Dead w/o Monitor	150	76%
Dead with Monitor	47	24%
Total	197	

	N	%
Dead and Monitor Withheld for reason	37	25%
Dead, no Monitor, not Withheld for reason	113	75%
Total	150	

	Alive	Dead	Total
Not known/Not recorded/Missing	214	113	327
Decision to withhold life sustaining measures	0	19	19
Death prior to correction of coagulopathy	0	14	14
Expected to improve within 8 hours due to effects of alcohol and/or drugs	3	0	3
Operative evacuation with improvement post-op	4	1	5
No ICP because of coagulopathy	2	3	5
Total	223	150	373

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:	Exclusion:
AIS Head > 0	No signs of life
	ED GCS > 8 & TBI GCS > 8

Summary

	N	%
Alive w/o Monitor	223	43%
Alive with Monitor	101	19%
Dead	197	38%
Total	521	

	N	%
Dead w/o Monitor	150	76%
Dead with Monitor	47	24%
Total	197	

	N	%
Dead and Monitor Withheld for reason	37	25%
Dead, no Monitor, not Withheld for reason	113	75%
Total	150	

	Alive	Dead	Total
Not known/Not recorded/Missing	214	113	327
Decision to withhold life sustaining measures	0	19	19
Death prior to correction of coagulopathy	0	14	14
Expected to improve within 8 hours due to effects of alcohol and/or drugs	3	0	3
Operative evacuation with improvement post-op	4	1	5
No ICP because of coagulopathy	2	3	5
Total	223	150	373

Calculation of % Eligible w/o Monitor

- Eligible and no monitor = N - Alive w/o monitor - Alive with monitor - Dead with monitor - Dead and monitor withheld for reason

- Eligible = N - Alive w/o monitor - Dead and monitor withheld for reason

Monitor for Head Injury (3/1/2011 to 2/29/12)

Inclusion:
AIS Head > 0

Exclusion:
No signs of life
ED GCS > 8 & TBI GCS > 8

Trauma Center	N	Dead	Alive w/o Monitor	Alive with Monitor	Dead w/o Monitor	Dead with Monitor	Dead and Monitor Withheld	Eligible & no Monitor	Eligible	% Eligible w/no Monitor
27	65	14	33	18	7	7	5	2	27	7%
21	61	31	11	19	18	13	8	10	42	24%
19	38	12	21	5	11	1	0	11	17	65%
3	34	13	16	5	10	3	0	10	18	56%
18	32	15	12	5	11	4	0	11	20	55%
17	31	4	25	2	3	1	1	2	5	40%
1	30	12	11	7	11	1	3	8	16	50%
4	26	13	10	3	10	3	1	9	15	60%
13	23	11	11	1	11	0	0	11	12	92%
11	20	7	9	4	4	3	1	3	10	30%
15	18	5	10	3	4	1	1	3	7	43%
6	18	7	7	4	4	3	0	4	11	36%
2	18	6	8	4	4	2	3	1	7	14%
20	16	5	4	7	3	2	0	3	12	25%
9	15	8	5	2	7	1	7	0	3	0%
8	15	9	5	1	8	1	5	3	5	60%
7	13	6	5	2	5	1	0	5	8	63%
5	13	3	6	4	3	0	1	2	6	33%
14	12	4	7	1	4	0	0	4	5	80%
22	9	5	2	2	5	0	0	5	7	71%
12	8	6	1	1	6	0	1	5	6	83%
16	6	1	4	1	1	0	0	1	2	50%
Total	521	197	223	101	150	47	37	113	261	43%

Timing of Monitor for Head Injury

- 7/1/11 to 2/29/12
- Include if AIS Head > 0
- Exclude if
  - No signs of life
  - ED GCS > 8
  - Placement time > 5 days or negative
- Eligible patients
  - Any Monitor, Vent, IPPM, O2Mon, JVB
  - Mean time from ED admit to placement of first monitor
  - N, patients where time to placement of first monitor < 8 hrs

Timing of Monitor for Head Injury (7/1/2011 to 2/31/12)

Inclusion:
AIS Head > 0

Exclusion:
No signs of life
ED GCS > 8
Placement time > 5 days

Timely = Placement ≤ 8hrs after ED arrival

Trauma Center	N Any Monitor	Ventric	IPPM	02 Mon	JVB	Mean Time to Placement (hrs)	N Timely	% Timely
21	25	12	25	1	0	7.0	21	84%
27	23	18	10	0	0	5.8	18	78%
3	11	1	10	0	0	1.9	11	100%
18	9	2	8	3	0	23.6	6	67%
11	8	2	6	1	0	14.3	3	38%
6	8	2	8	0	0	2.5	8	100%
15	8	3	5	1	4	12.6	7	88%
5	7	7	1	1	0	6.4	6	86%
20	7	1	6	0	0	4.8	6	86%
2	6	5	5	0	0	7.0	5	83%
17	6	6	1	0	0	8.0	4	67%
1	5	0	5	0	0	4.8	4	80%
19	5	4	2	0	0	3.1	5	100%
4	4	2	4	0	0	12.7	1	25%
8	3	3	3	0	0	21.9	1	33%
9	2	0	2	0	0	6.3	1	50%
13	2	2	0	0	0	8.0	1	50%
22	2	1	2	0	0	4.3	2	100%
7	2	0	1	2	0	2.2	2	100%
12	1	1	0	0	0	10.8	0	0%
14	1	0	1	0	0	4.2	1	100%
Total	145	72	105	9	4	8.0	113	78%