ACS tqip® TRAUMA QUALITY IMPROVEMENT PROGRAM

ACS TQIP Benchmark Report: All Patients

2010 Admissions

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2010 Admissions

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Introduction

This is the third benchmark report for the 2011 program year. Thus far in 2011, we have presented reports on patients with TBI, and shock from 2009. This report represents the first to use data from 2010 admissions. The next report will present outcomes in the elderly trauma patient.

The ACS TQIP analysis is based on selected trauma incidents submitted to NTDB. By choosing incidents based on standard selection criteria, we minimize variability across trauma centers in the analysis and provide more accurate inter-facility comparisons. This report is based on 2010 NTDB admissions, including a total of 85,569 incidents that meet TQIP inclusion/exclusion criteria (see Appendix B), from 113 TQIP centers.

The ACS TQIP reports on all incidents that meet the inclusion criteria and on two distinct subsets of severely injured patients derived from this population. These subsets were selected to reflect the wide spectrum of trauma patients and their varied challenges. It also provides an opportunity for centers with significant over-representation of a particular type of patient to better understand their performance relative to their peers. The subsets are as follows:

Subset 1- Blunt multisystem injury: Trauma type classified as blunt with injuries of AIS ≥ 3 in at least two of the following AIS body regions: head, face, neck, thorax, abdomen, spine, and upper and lower extremities.

Subset 2 – Penetrating truncal injury: Trauma type classified as penetrating with injuries of AIS ≥ 3 in at least one of the following AIS body regions: neck, chest, or abdomen.

The selection of the blunt multisystem trauma subset allows for the assessment of many processes and outcomes related to inter-disciplinary management including critical care, neurosurgery, and orthopedic surgery. By contrast, the penetrating trauma subset allows for evaluation of processes and outcomes related to clinical judgment, timely operative management, and general surgical technical skills.

In addition, to allow for more meaningful length of stay (LOS) comparisons, we present excess length of stay for two homogeneous patient populations: isolated pneumothorax and isolated midshaft femur fractures.

New in this report

We no longer present data on the subset of patients previously identified as “blunt single system injury”. Injuries in this category varied dramatically across centers, with some centers having a preponderance of lower extremity injuries and others were primarily traumatic brain injuries. As a result, we concluded that the inter-hospital comparisons of this subset did not help identify opportunities for improvement.

This report begins by presenting aggregate information about TQIP hospitals and patients. The analysis that follows focuses on risk adjusted models for mortality and length of stay. Inter-hospital comparisons are illustrated on a series of caterpillar graphs, with more detailed information available in tabular form.

Thanks to all of you for participating in the ACS TQIP this year. We look forward to your thoughts about this report and to our continued work together on improving the care of injured patients.

Facility Characteristics

Figure 1. Trauma Level

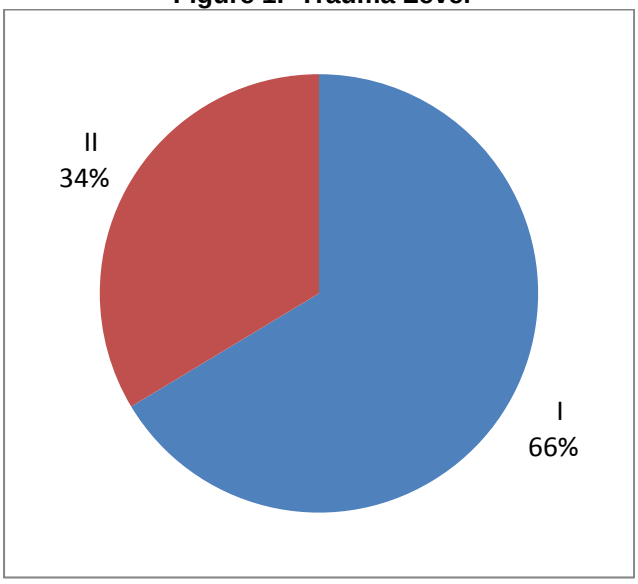
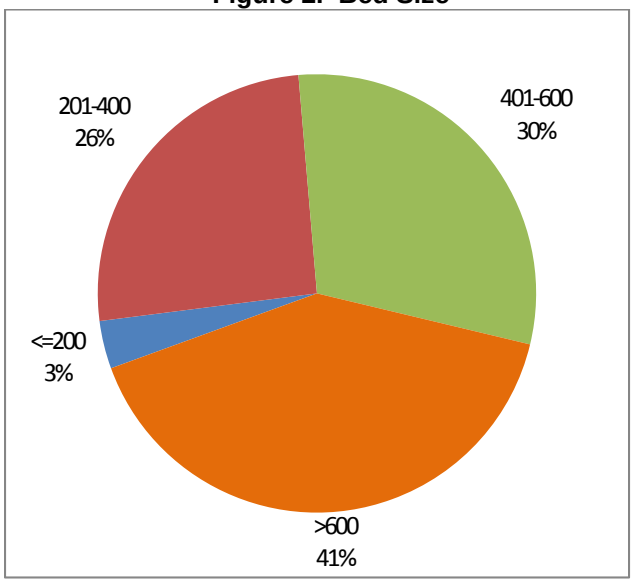


Figure 2. Bed Size



Two-thirds of TQIP trauma centers are ACS verified or state designated Level I centers. Over 40% of TQIP centers have a bed size of more than 600.

Figure 3. Teaching Type

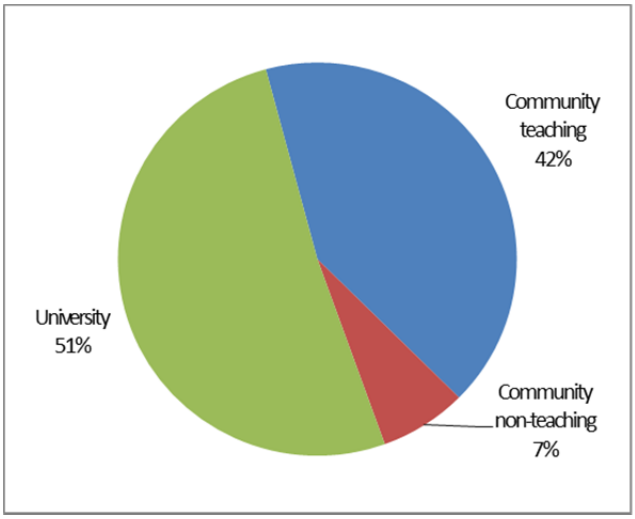
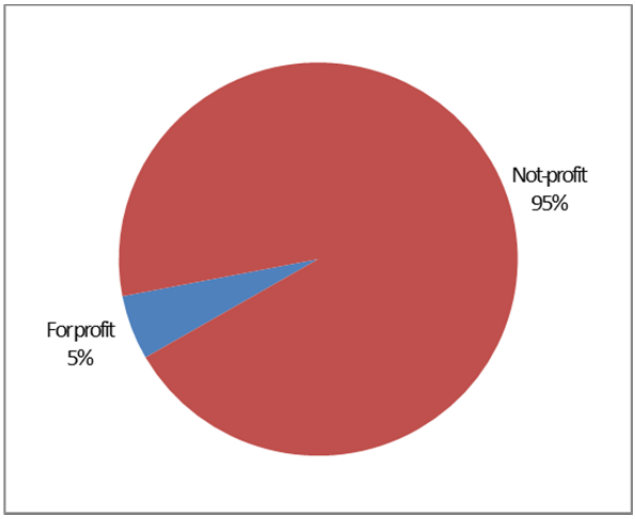


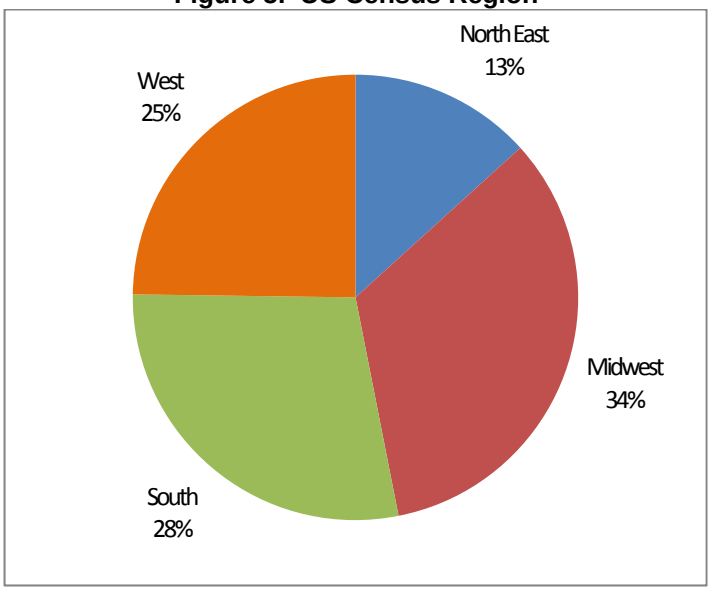
Figure 4. Hospital Type



Most TQIP centers are university teaching hospitals, and nearly as many are community teaching hospitals. 95% of TQIP centers are not-profit.

Facility Characteristics

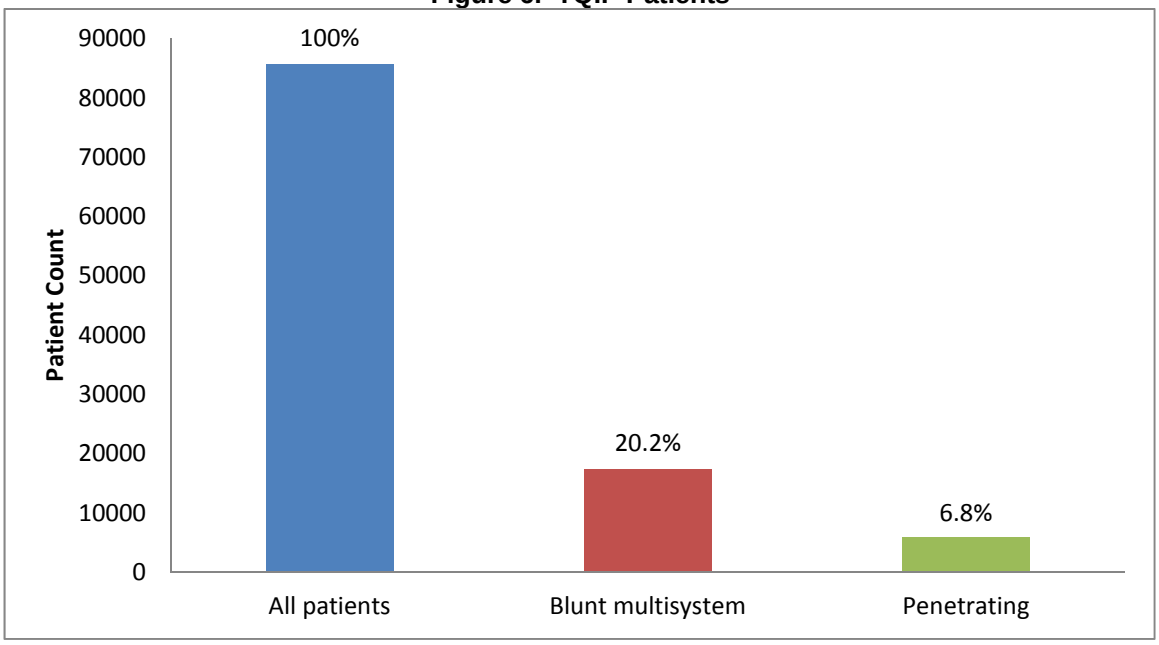
Figure 5. US Census Region



TQIP centers are distributed throughout the US, with most centers situated in the Midwest and South. See Appendix A for a listing of all participating centers.

Patient Characteristics

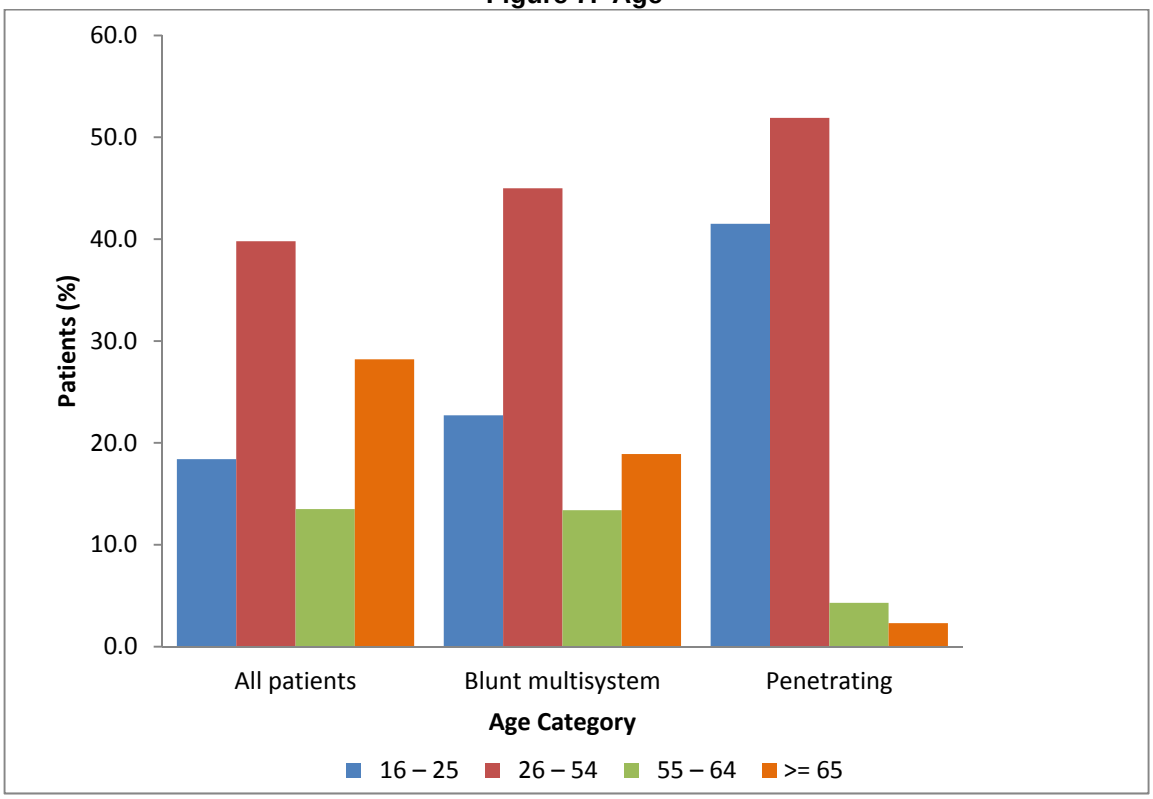
Figure 6. TQIP Patients



There were 85,569 patients from participating centers that met TQIP inclusion criteria and were admitted in 2010. (See Appendix B). Of those 85,569 patients, about 20% sustained blunt multisystem injuries. Only 6.8% sustained penetrating injuries.

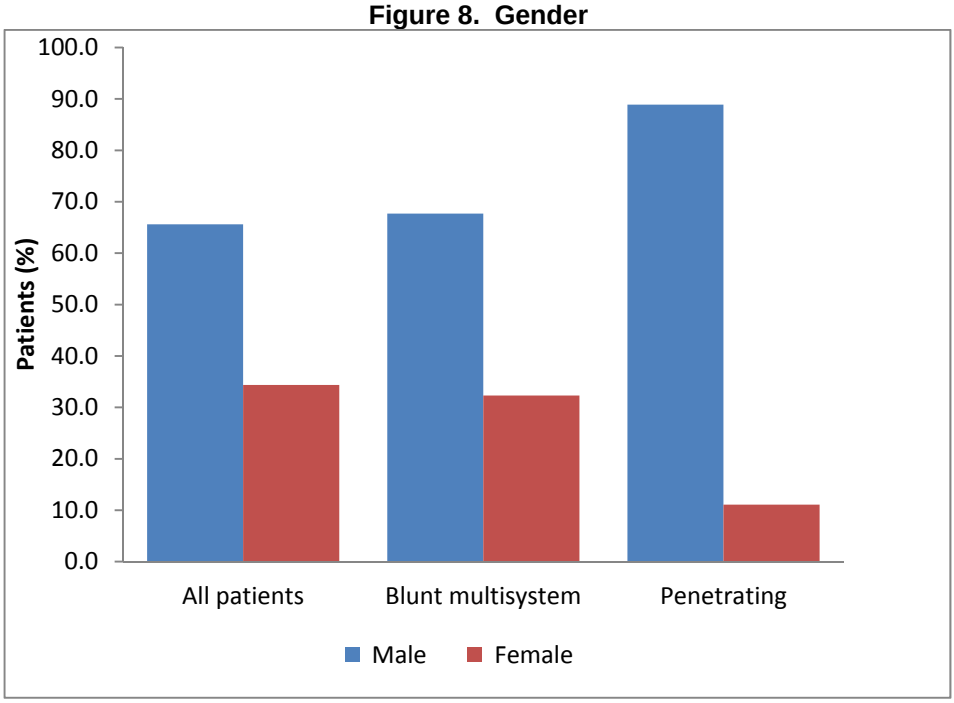
Patient Characteristics

Figure 7. Age



The mean age of TQIP patients was 50. Penetrating injuries were most common in younger age groups.

Figure 8. Gender



Males comprise 67% of all patients and predominate in each subset.

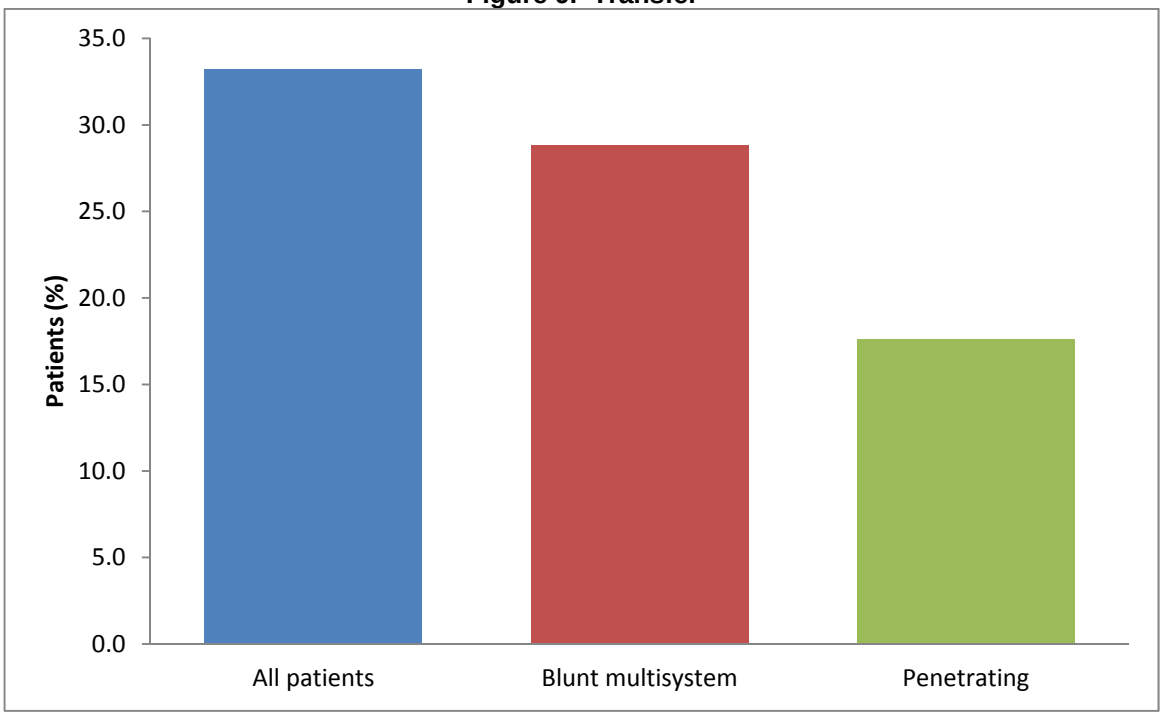
Patient Characteristics

Table 1. Comorbid Conditions

	All patients		Blunt multisystem		Penetrating	
	N	%	N	%	N	%
All Patients	85,569	100.0	17,270	20.2	5,832	6.8
Alcoholism	8,597	10.0	1,839	10.6	531	9.1
Ascites within 30 days	67	0.1	16	0.1	5	0.1
Bleeding Disorder	3,941	4.6	525	3.0	41	0.7
Chemotherapy for cancer within 30 days	161	0.2	16	0.1	0	0.0
Congenital Anomalies	234	0.3	37	0.2	11	0.2
Congestive heart failure	2,677	3.1	287	1.7	19	0.3
Current smoker	11,838	13.8	2,447	14.2	910	15.6
Currently requiring or on dialysis	591	0.7	73	0.4	6	0.1
CVA/residual neurological deficit	1,897	2.2	205	1.2	17	0.3
Diabetes mellitus	9,334	10.9	1,391	8.1	127	2.2
Disseminated cancer	634	0.7	95	0.6	4	0.1
Do Not Resuscitate (DNR) status	0	0.0	0	0.0	0	0.0
Esophageal varices	83	0.1	13	0.1	3	0.1
Functionally dependent health status	879	1.0	88	0.5	8	0.1
History of angina within past 1 month	131	0.2	11	0.1	2	0.0
History of myocardial infarction within past 6 mos	1,024	1.2	123	0.7	5	0.1
History of revascularization / amputation for PVD	94	0.1	14	0.1	1	0.0
Hypertension requiring medication	23,906	27.9	3,561	20.6	390	6.7
Impaired sensorium	6,418	7.5	965	5.6	236	4.0
Prematurity	2,366	2.8	3	0.0	0	0.0
Respiratory Disease	5,577	6.5	933	5.4	221	3.8
Steroid use	345	0.4	54	0.3	5	0.1

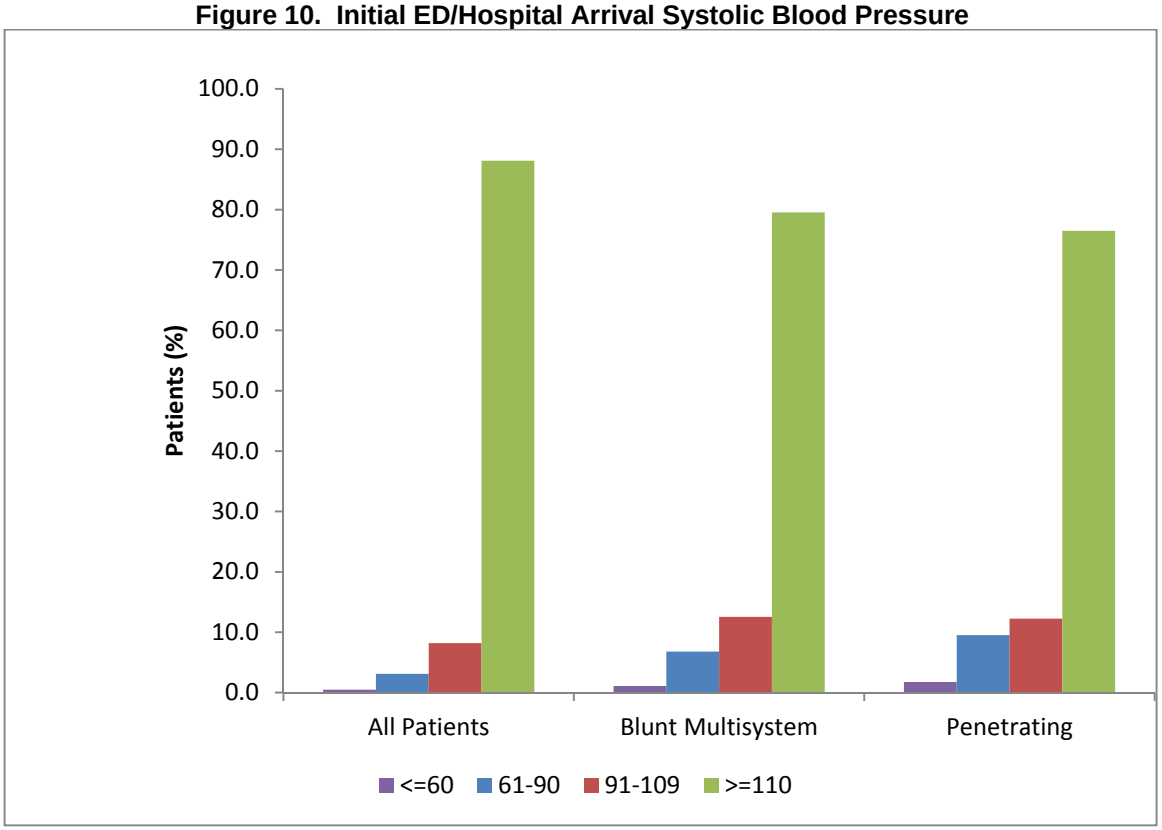
Patient Characteristics

Figure 9. Transfer



Over one-third of TQIP patients were transferred from another facility to the reporting facility.

Figure 10. Initial ED/Hospital Arrival Systolic Blood Pressure



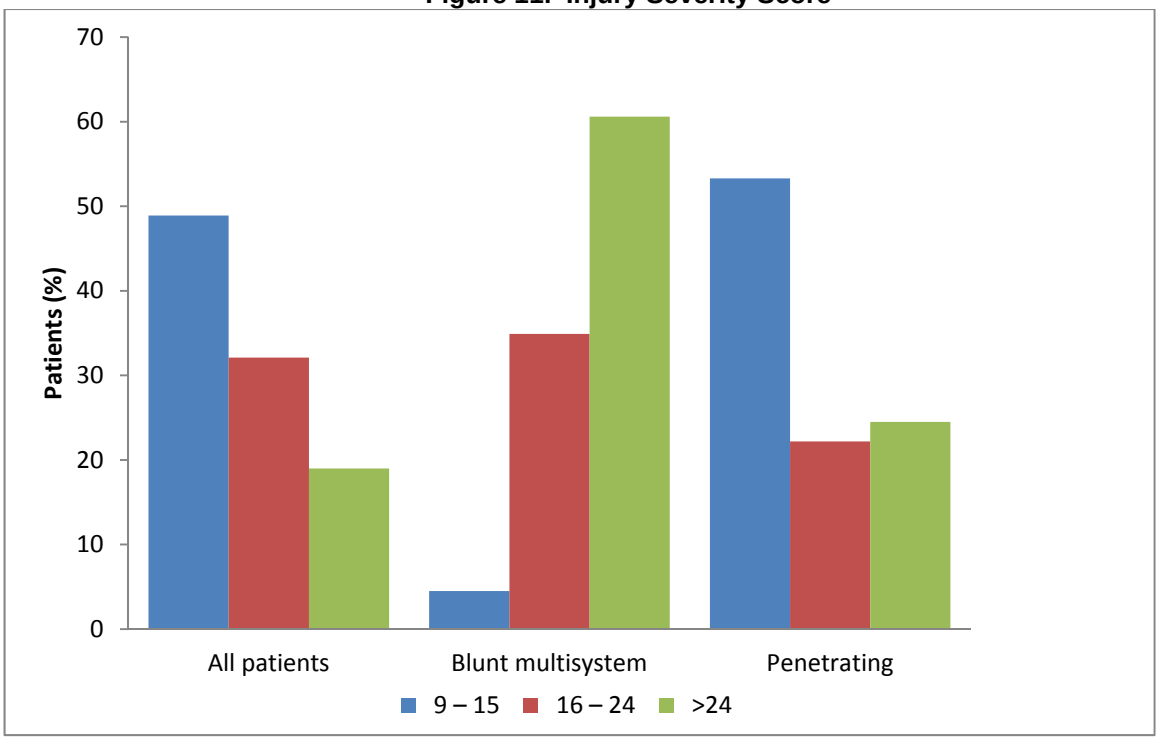
Injury Characteristics

Table 2. Mechanism of Injury

	All patients		Blunt multisystem		Penetrating	
Mechanism	N	%	N	%	N	%
Cut/pierce	2,490	2.9	0	0.0	2,490	42.7
Fall	33,290	38.9	3,241	18.8	0	0.0
Firearm	3,341	3.9	0	0.0	3,341	57.3
MVT Motorcyclist	6,573	7.7	2,346	13.6	0	0.0
MVT Occupant	21,389	25.0	7,693	44.5	0	0.0
MVT Pedestrian & Pedal	4,343	5.1	1,602	9.3	0	0.0
Struck by, Against	5,603	6.5	550	3.2	0	0.0
Other	8,540	10.0	1,838	10.6	1	0.0

Falls and MVT (motor-vehicle-traffic) related incidents were the most common mechanisms of injury.
*Values are shown as column percent.

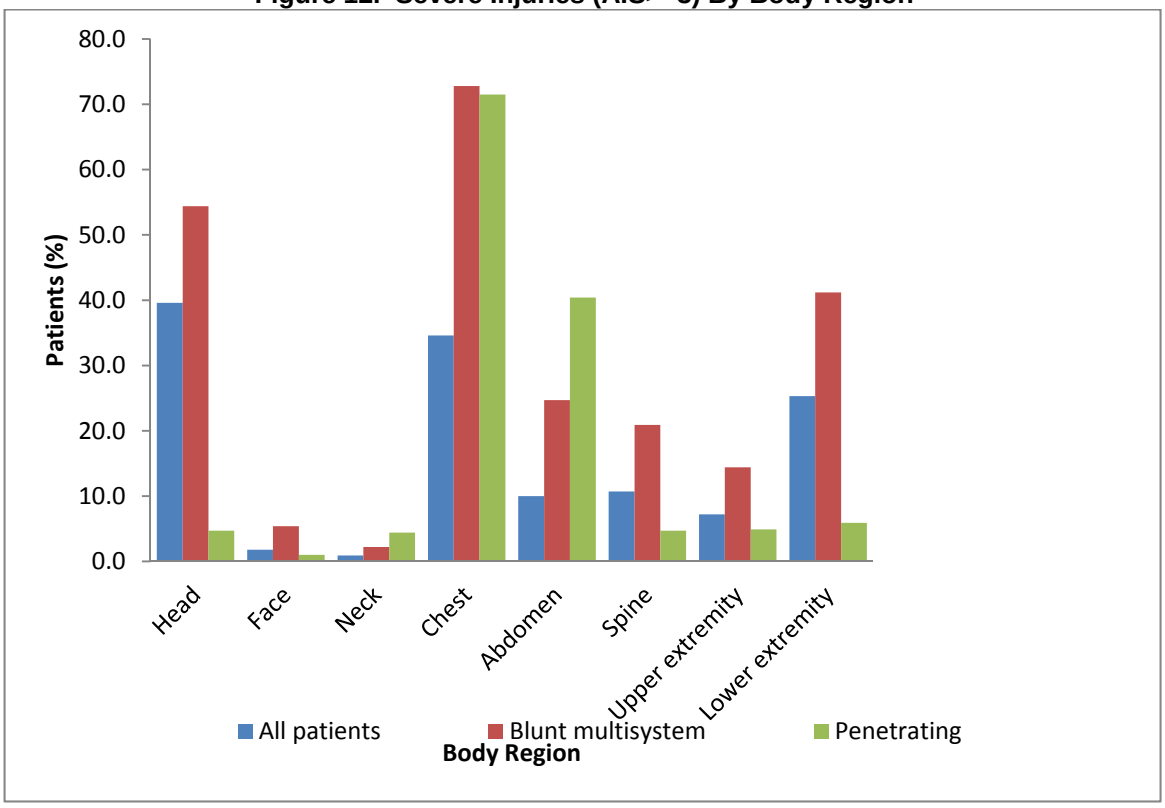
Figure 11. Injury Severity Score



The average ISS for all TQIP patients was 17.3. The mean ISS was 28.3 for the blunt multisystem subset, and 18.5 for penetrating. Almost 50% of TQIP patients had an injury severity score in the 9 – 15 category. The blunt multisystem category has the highest proportion of patients with ISS>24.

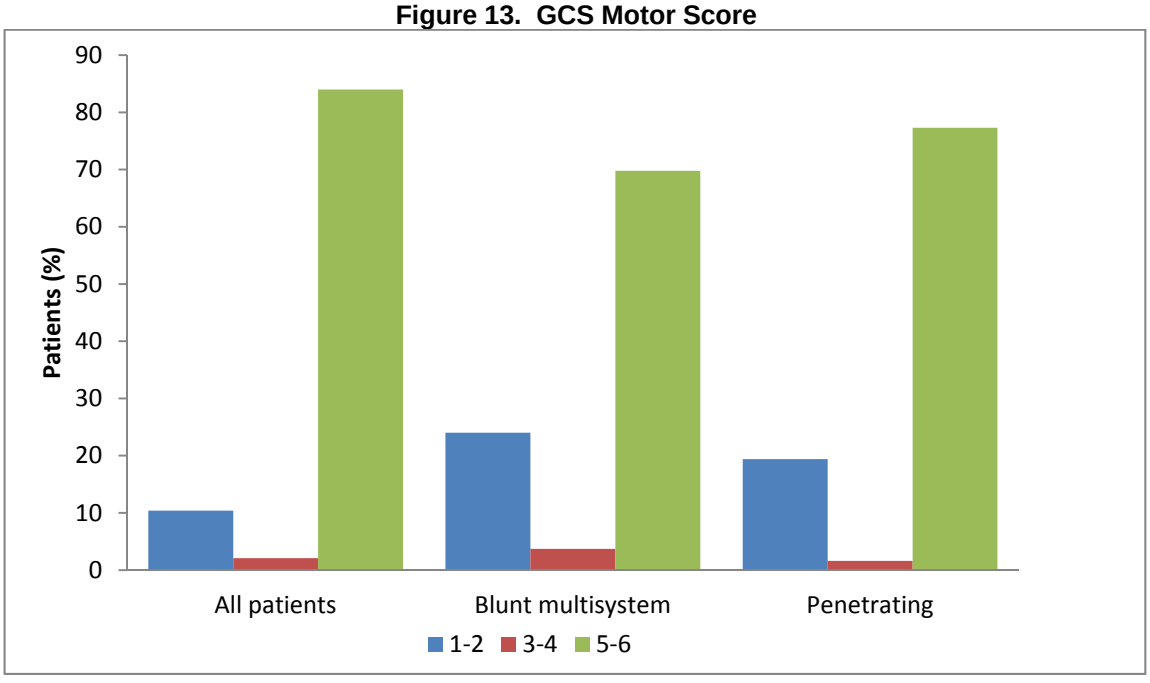
Injury Characteristics

Figure 12. Severe Injuries (AIS>=3) By Body Region



Overall, head and chest injuries were the most common. Injuries from penetrating trauma predominantly affected the chest and abdomen.

Figure 13. GCS Motor Score



Most patients either localized or followed commands (GCS motor 5-6).

Outcomes

Note that TQIP follows patients only to the point of discharge from the ED or hospital. Post discharge outcomes are not available.

Table 3. Hospital Incidents

	All patients		Blunt multisystem		Penetrating	
	N	%	N	%	N	%
All Patients	85,569	100.0	17,270	100.0	5,832	100.0
Abdominal compartment syndrome	222	0.3	127	0.7	30	0.5
Abdominal fascia left open	327	0.4	179	1.0	98	1.7
Acute renal failure	1,118	1.3	400	2.3	127	2.2
Acute respiratory distress syndrome (ARDS)	1,727	2.0	860	5.0	143	2.5
Base deficit	2,986	3.5	1,399	8.1	384	6.6
Bleeding	1,242	1.5	659	3.8	239	4.1
Cardiac arrest with CPR	1,079	1.3	518	3.0	176	3.0
Coagulopathy	784	0.9	355	2.1	130	2.2
Coma	401	0.5	207	1.2	12	0.2
Decubitus ulcer	941	1.1	455	2.6	60	1.0
Deep surgical site infection	200	0.2	86	0.5	49	0.8
Drug or alcohol withdrawal syndrome	1,030	1.2	254	1.5	45	0.8
Deep Vein Thrombosis (DVT) / thrombophlebitis	1,543	1.8	746	4.3	107	1.8
Extremity compartment syndrome	268	0.3	101	0.6	28	0.5
Graft/prosthesis/flap failure	39	0.0	10	0.1	3	0.1
Myocardial infarction	333	0.4	87	0.5	14	0.2
Organ/space surgical site infection	335	0.4	120	0.7	93	1.6
Pneumonia	4,163	4.9	1,921	11.1	267	4.6
Pneumonia (intubated)*	3,225	25.2	1,656	28.1	197	17.4
Pulmonary embolism	610	0.7	259	1.5	50	0.9
Stroke / CVA	270	0.3	117	0.7	10	0.2
Superficial surgical site infection	349	0.4	139	0.8	91	1.6
Systemic sepsis	1,140	1.3	558	3.2	155	2.7
Unplanned intubation	1,297	1.5	489	2.8	139	2.4
Wound disruption	203	0.2	86	0.5	67	1.1

*Intubated is defined as patients with ventilator days > 1, and the percentages for this row are calculated based on the patients that met the definition for intubation: 12,822 patients total with ventilator days >1; 5,896 blunt multisystem patients; and 1,134 penetrating patients.

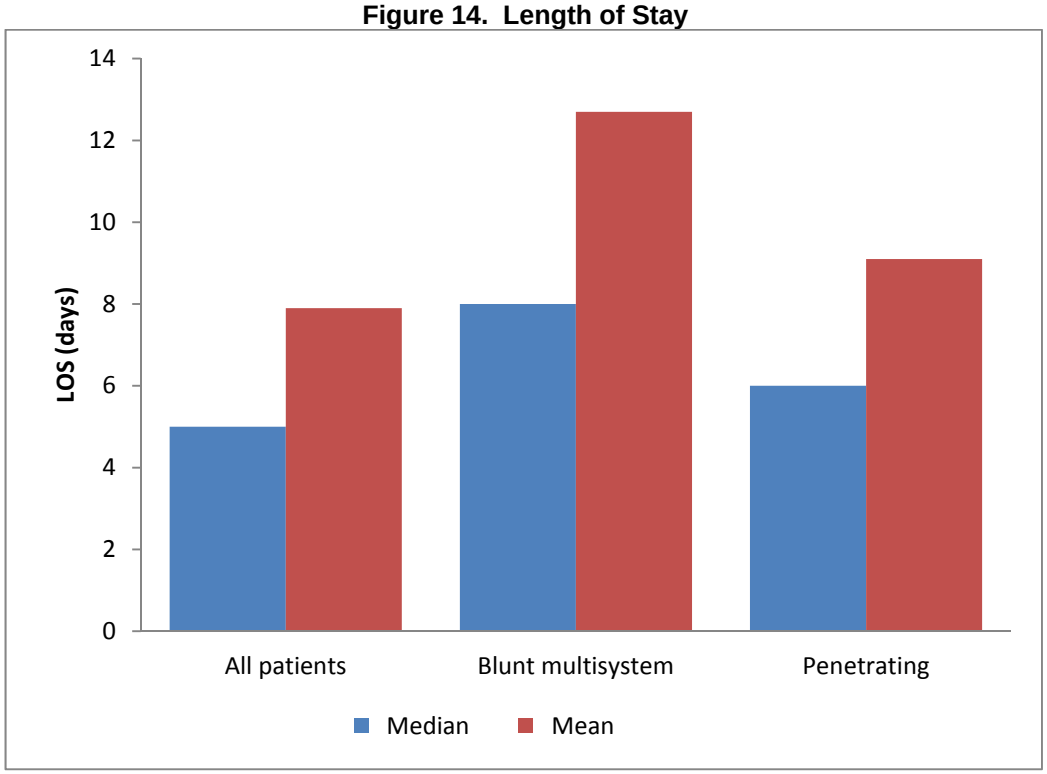
Outcomes

Table 4. Mortality

	All patients	*Blunt multisystem*	*Penetrating*
Overall mortality	7.1	13.9	16.5
ED mortality	1.8	3.3	9.6
In-hospital mortality	5.3	10.6	6.9

Overall mortality for TQIP patients was 7%. Patients with penetrating injuries have the highest mortality. Most of these patients died in the ED.

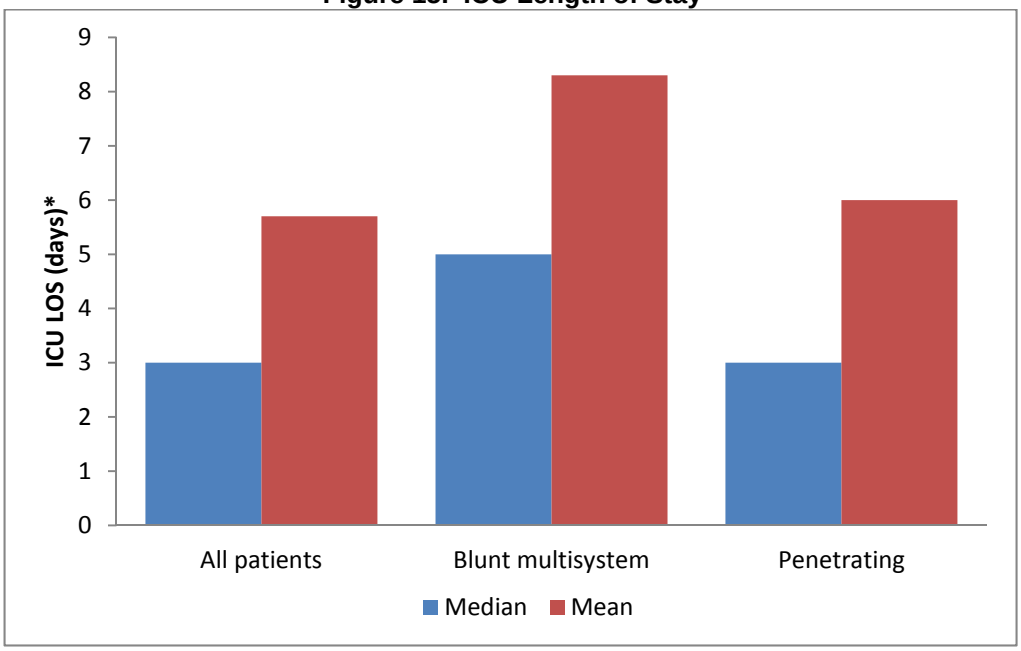
Figure 14. Length of Stay



Overall mean length of stay for all TQIP patients is eight days (median is 5 days). Patients with blunt multisystem injuries had the longest length of stay.

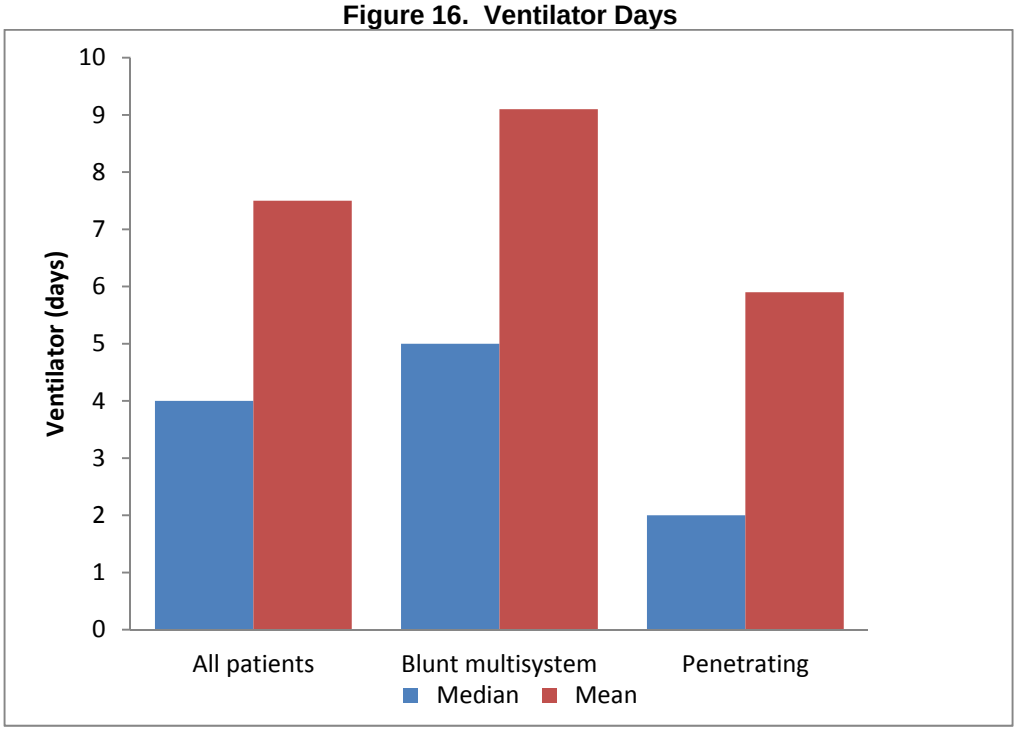
Outcomes

Figure 15. ICU Length of Stay



Among patients with an ICU stay, the mean ICU length of stay was six days (median was three days). Patients with blunt multisystem injuries had the longest lengths of stay in the ICU.

Figure 16. Ventilator Days



Among patients with an ICU stay and who were on the ventilator, the mean number of days on the ventilator was over 7 days (median was 4 days). Patients with blunt multisystem injuries had the highest number of ventilator days.

Inter-Hospital Comparisons

Patient characteristics and injury severity differ across trauma centers. These differences may affect the risk profile of patients at one center compared to another. Therefore, comparing crude mortality rates across centers is not a valid method for making inter-hospital comparisons. To account for these differences, statistical models were developed to estimate the outcomes of mortality and length of stay for each hospital based on patient characteristics (see Appendix C).

Data Quality

Missing Data
Missing data has significant implications for inter-facility comparisons. Of the 85,569 2010 admissions that met TQIP inclusions criteria, 4% had missing data in fields that might affect our ability to risk-adjust. The distribution of missing values for the covariates ranged from 0 to 4%. Records with missing data are not excluded from analyses. Rather, we use multiple imputation to provide the best estimates of what the true values might be.

By design, all deaths were excluded from the LOS analysis. In addition, 1,427 (0.5%) records with a missing length of stay were also excluded. Payment status (insurance status) was missing in a small number of centers. Rather than impute the missing payment status, we used a "missing" category in the risk adjustment models, while all other missing variables were imputed.

Injury Severity
AIS is not currently required by NTDB. Not all centers contribute the full AIS score to NTDB. Moreover, those that do provide AIS use a variety of versions and coding methods. To overcome these variations, we convert all submitted AIS to AIS 98 as follows:

- AIS 05 is crosswalked to AIS 98 based on AAAM AIS 05 Manual
- AIS 90 or 95 is crosswalked to AIS 98
- ICD-90 Map is used if no AIS is submitted (to convert ICD-9 codes to AIS)

Limitations of Interfacility Comparisons

The ACS TQIP report allows centers to compare their outcomes with other hospitals. However, it is possible that factors other than quality of care may influence the risk-adjusted mortality rates. The following limitations must be kept in mind when interpreting your data:

- Data quality: It is possible that differences in data quality, such as capture of complications or coding of injury diagnosis, might contribute to any observed differences in O/E mortality ratios or complication rates. For example, if patients are identified as not having complications yet had experienced significant complications that prolonged their length of stay; these patients would be identified as those with excess LOS.
- Performance over time: A trauma center's performance may vary over time. The current report presents a single snapshot in time.
- Chance: Statistical models are simply estimates. It is possible that chance alone led to the position of your center's performance relative to its peers. However, the likelihood of this occurrence by chance alone is less than 10% (based on 90% confidence intervals).
- In hospital outcomes: O/E mortality ratios are based upon in-hospital mortality. Differences in discharge disposition or access to alternate levels of care might influence in-hospital mortality rates.

Risk Adjusted Mortality

Multivariate logistic regression models were used to estimate expected number of deaths for each hospital based on patient characteristics. For each trauma center, the observed mortality rate was then divided by the expected mortality rate to obtain the Observed-to-Expected (O/E) ratio with their 95% confidence intervals. O/E ratios were plotted on a chart in increasing order. The large number of centers make interpretation of the graphs challenging. To overcome this issue, we present graphs for odd and even numbered centers separately. Model performance was evaluated with the C-statistic and calibration curve (Appendix C).

We acknowledge there are differences in the way DOA (dead on arrival) and DIE (died in the emergency department) patients are captured across institutions. We also acknowledge that the proportion of patients DOA or DIE will be higher for inner city trauma centers than suburban centers due to shorter transport times. Other system factors might also play a role in the proportion of deaths that might be considered DOA, DIE or in-hospital. To overcome this variation we have produced O/E ratios both including and excluding all deaths in the emergency department (DIE and DOA).

Interpretation of the caterpillar graphs and O/E ratio

- Refer to the TQIP report ID that we have provided to you this year. If you do not know your TQIP report ID, then please contact us at tqip@facs.org.
- Find your own center on the caterpillar graphs using your TQIP report ID.
- Is the confidence interval for your facility completely above the line?
    - If yes, then your facility has more deaths than expected based on the risk adjustment model
- Is the confidence interval for your facility completely below the line?
    - If yes, then your facility has fewer deaths than expected based on the risk adjustment model
- If the confidence interval for your facility touching the line?
    - If yes, then your facility had the expected number of deaths based on the risk adjustment model

Please note that centers with less than 10 patients in a particular subgroup are not shown on the following graphs, yet are included in the risk adjustment models.

Table 5. Unadjusted Mortality, Including Patients Classified as DOA or Died in the ED

	All patients		Blunt multisystem		Penetrating	
TQIP Report ID	N	%	N	%	N	%
All	6,077	7.1	2,397	13.9	962	16.5
1	3	1.5	0	0	1	6.7
2	87	7.0	39	18.8	13	14.1
3	32	4.1	11	6.7	5	8.3
4	42	6.1	18	11.4	4	15.4
5	24	5.1	7	9.6	2	7.7
6	45	7.5	15	17.6	8	8.1
7	13	4.5	7	16.3	1	20.0
8	27	8.3	9	15.5	5	12.5
9	35	8.9	22	21.4	12	19.7
10	17	4.6	8	10.1	3	25.0
11	64	9.3	22	22.7	7	23.3
12	94	6.5	30	11.1	17	25.0
13	58	6.6	29	12.2	6	14.0
14	29	7.7	9	16.4	1	2.2
15	27	5.5	5	6.2	1	33.3
16	13	3.5	4	7.3	2	11.1
17	31	6.4	11	17.5	4	28.6
18	25	7.2	6	11.8	2	22.2
19	6	3.2	1	12.5	0	0
20	29	4.7	15	14.4	0	0
21	147	6.7	74	12.7	14	16.9
22	41	6.2	8	7.5	11	31.4
23	41	8.7	15	14.2	14	19.2
24	41	6.9	15	16.9	0	0
25	231	8.2	105	13.3	55	17.7
26	60	8.3	20	14.3	7	14.6
27	68	6.0	29	11.2	5	12.8
28	21	4.9	7	16.7	0	0
29	35	5.6	26	14.8	0	0
30	12	4.7	6	22.2	0	0
31	10	4.9	2	11.1	2	14.3
32	74	9.3	34	21.4	3	5.4
33	33	5.1	15	12.1	1	7.7
34	22	10.4	7	21.2	10	26.3
35	88	7.3	23	11.9	32	22.9
36	43	8.6	23	27.7	3	9.7
37	131	11.4	68	22.8	29	25.2
38	44	6.1	10	8.9	7	25.9
39	60	7.4	19	10.5	12	15.6
40	50	7.3	18	20.0	8	21.6
41	106	7.9	49	15.8	10	15.2
42	141	7.1	38	9.1	17	11.1
43	64	9.3	22	19.5	8	22.2
44	53	9.0	14	18.9	1	5.0
45	121	7.7	52	13.9	25	15.5
46	55	7.4	12	9.9	5	15.6
47	73	5.1	26	9.2	6	16.2
48	81	9.0	34	14.0	11	14.9
49	32	6.3	10	13.0	8	15.1

TQIP Report ID	All patients		Blunt multisystem		Penetrating	
	N	%	N	%	N	%
50	25	5.2	14	13.9	4	17.4
51	87	6.8	44	14.7	8	11.8
52	205	7.7	109	14.7	22	12.1
53	65	9.4	38	25.5	5	16.1
54	128	9.7	49	19.4	43	34.7
55	43	6.2	15	10.7	3	10.3
56	38	5.7	11	10.7	2	9.5
57	44	5.2	25	13.3	1	3.6
58	19	3.7	8	7.0	0	0
59	93	7.4	34	11.3	23	18.7
60	46	6.0	24	14.0	1	6.3
61	88	6.9	37	17.6	3	7.0
62	48	6.8	14	14.3	5	8.9
63	44	3.2	21	8.1	5	16.1
64	46	5.0	19	10.4	3	13.6
65	81	11.8	45	16.9	8	12.3
66	24	5.0	9	17.6	2	20.0
67	38	7.9	10	13.2	5	14.3
68	26	8.0	4	7.8	9	22.0
69	162	11.1	62	17.6	61	23.2
70	22	6.9	6	15.0	3	14.3
71	14	3.5	6	10.2	0	0
72	79	7.6	44	19.4	4	14.3
73	26	7.0	7	14.0	6	12.8
74	71	6.7	31	15.3	11	22.9
75	62	7.1	19	10.7	4	7.8
76	55	5.9	9	4.2	31	19.3
77	31	5.4	14	15.7	0	0
78	12	4.4	6	9.4	0	0
79	31	6.6	9	10.1	5	27.8
80	46	6.2	17	9.7	3	14.3
81	95	8.1	37	15.8	8	9.6
82	60	6.0	22	20.6	5	9.3
83	94	11.0	44	25.9	10	23.3
84	51	6.8	14	9.8	1	6.3
85	31	7.6	12	24.5	1	14.3
86	72	10.3	15	21.1	30	30.6
88	77	7.9	21	9.3	17	16.0
89	108	6.6	55	11.9	7	10.4
90	34	6.8	13	8.4	7	25.0
91	14	4.5	3	7.0	0	0
92	52	6.5	22	15.0	4	10.3
93	36	11.8	15	19.0	9	25.0
94	73	11.2	21	19.3	26	17.9
95	69	7.9	34	18.5	11	16.7
96	70	10.0	16	13.8	31	17.5
97	24	3.2	6	10.0	0	0
98	102	6.8	42	13.0	12	10.1
99	9	4.6	4	12.5	1	5.6
100	22	8.3	9	19.6	1	33.3
101	26	5.8	14	13.6	6	16.2

TQIP Report ID	All patients		Blunt multisystem		Penetrating	
	N	%	N	%	N	%
102	31	7.4	13	14.8	4	20.0
103	33	5.8	15	11.4	1	3.7
104	30	4.1	8	7.6	5	7.7
105	53	10.3	23	22.1	20	21.1
106	35	4.4	11	9.9	4	11.1
107	36	4.1	11	6.1	0	0
108	67	16.5	16	33.3	42	30.2
109	51	9.9	14	19.7	4	14.8
110	34	6.3	10	14.5	6	8.2
111	14	4.3	4	7.4	2	28.6
112	29	6.5	10	10.4	7	16.7
113	13	5.9	6	15.4	0	0
114	54	8.5	28	14.9	2	14.3

Table 6. Unadjusted Mortality, Excluding Patients Classified as DOA or Died in the ED

TQIP Report ID	All Patients		Blunt multisystem		Penetrating	
	N	%	N	%	N	%
ALL	4,530	5.4	1,829	11.0	404	7.7
1	3	1.5	0	0	1	6.7
2	53	4.4	19	10.2	4	4.8
3	30	3.9	10	6.1	5	8.3
4	33	4.8	12	7.9	2	8.3
5	21	4.5	7	9.6	0	0
6	30	5.1	7	9.1	2	2.2
7	9	3.1	5	12.2	0	0
8	20	6.3	8	14.0	2	5.4
9	18	4.8	15	15.6	3	5.8
10	10	2.7	5	6.6	0	0
11	52	7.7	17	18.5	2	8.0
12	73	5.1	26	9.7	4	7.3
13	51	5.9	28	11.9	3	7.5
14	19	5.2	5	9.8	1	2.2
15	22	4.6	4	5.0	1	33.3
16	8	2.2	1	1.9	1	5.9
17	24	5.1	8	13.3	3	23.1
18	23	6.6	5	10.0	1	12.5
19	5	2.6	1	12.5	0	0
20	26	4.3	13	12.7	0	0
21	107	5.0	51	9.1	7	9.2
22	30	4.6	6	5.7	6	20.0
23	21	4.7	11	10.8	3	4.8
24	34	5.8	12	14.0	0	0
25	146	5.3	68	9.0	15	5.5
26	59	8.2	19	13.7	7	14.6
27	56	5.0	26	10.2	4	10.5
28	18	4.2	5	12.5	0	0
29	27	4.4	18	10.7	0	0
30	8	3.2	3	12.5	0	0
31	7	3.4	2	11.1	0	0
32	62	7.9	29	18.8	0	0
33	30	4.7	13	10.7	1	7.7
34	13	6.4	5	16.1	3	9.7
35	52	4.5	15	8.1	10	8.5
36	31	6.3	16	21.1	1	3.4
37	74	6.8	38	14.2	14	14.0
38	38	5.3	10	8.9	3	13.0
39	39	4.9	11	6.4	4	5.8
40	34	5.1	14	16.3	3	9.4
41	85	6.4	40	13.3	5	8.2
42	123	6.3	36	8.7	11	7.5
43	52	7.7	16	15.0	4	12.5
44	48	8.2	12	16.7	1	5.0
45	86	5.6	41	11.3	7	4.9
46	46	6.3	9	7.6	3	10.0
47	68	4.8	24	8.5	5	13.9

TQIP Report ID	All Patients		Blunt multisystem		Penetrating	
	N	%	N	%	N	%
48	55	6.3	28	11.9	4	6.0
49	21	4.2	6	8.2	4	8.2
50	15	3.2	8	8.4	2	9.5
51	71	5.6	38	12.9	5	7.7
52	146	5.6	71	10.1	11	6.4
53	48	7.1	27	19.6	0	0
54	72	5.7	25	10.9	15	15.6
55	36	5.3	14	10.1	3	10.3
56	34	5.2	11	10.7	1	5.0
57	42	4.9	25	13.3	1	3.6
58	12	2.3	5	4.5	0	0
59	60	4.9	30	10.1	8	7.4
60	39	5.2	20	12.0	0	0
61	81	6.4	34	16.4	3	7.0
62	45	6.4	13	13.4	5	8.9
63	43	3.1	21	8.1	5	16.1
64	39	4.3	18	9.9	2	9.5
65	69	10.2	41	15.6	3	5.0
66	18	3.8	6	12.5	0	0
67	29	6.1	9	12.0	4	11.8
68	22	6.8	4	7.8	7	17.9
69	98	7.0	48	14.2	17	7.8
70	18	5.7	5	12.8	2	10.0
71	11	2.8	3	5.4	0	0
72	58	5.7	28	13.3	2	7.7
73	23	6.3	6	12.2	5	10.9
74	50	4.8	25	12.8	4	9.8
75	48	5.6	17	9.7	3	6.0
76	33	3.6	9	4.2	11	7.8
77	26	4.5	11	12.8	0	0
78	7	2.6	2	3.3	0	0
79	25	5.4	7	8.0	2	13.3
80	43	5.8	17	9.7	2	10.0
81	82	7.1	34	14.7	6	7.4
82	42	4.2	12	12.4	2	3.9
83	76	9.0	32	20.3	6	15.4
84	43	5.8	13	9.2	0	0
85	22	5.5	6	14.0	1	14.3
86	34	5.2	9	13.8	8	10.5
88	53	5.6	16	7.2	8	8.2
89	82	5.1	43	9.6	5	7.7
90	27	5.5	10	6.6	5	19.2
91	13	4.2	2	4.8	0	0
92	41	5.2	18	12.6	1	2.8
93	27	9.2	13	16.9	5	15.6
94	39	6.3	13	12.9	4	3.3
95	32	3.8	19	11.2	1	1.8
96	47	6.9	14	12.3	19	11.5
97	24	3.2	6	10.0	0	0
98	96	6.4	41	12.7	10	8.5
99	9	4.6	4	12.5	1	5.6

TQIP Report ID	All Patients		Blunt multisystem		Penetrating	
	N	%	N	%	N	%
100	14	5.4	5	11.9	1	33.3
101	12	2.7	7	7.3	1	3.1
102	23	5.6	10	11.8	2	11.1
103	33	5.8	15	11.4	1	3.7
104	30	4.1	8	7.6	5	7.7
105	26	5.3	14	14.7	4	5.1
106	28	3.6	9	8.3	2	5.9
107	33	3.7	11	6.1	0	0
108	24	6.6	9	22.0	11	10.2
109	40	8.0	14	19.7	2	8.0
110	27	5.1	7	10.6	5	6.9
111	10	3.1	2	3.8	1	16.7
112	20	4.6	6	6.5	3	7.9
113	11	5.1	4	10.8	0	0
114	49	7.8	25	13.5	1	7.7

Figure 17a. Risk Adjusted Mortality – All patients including DIE/DOA (odd numbered IDs)

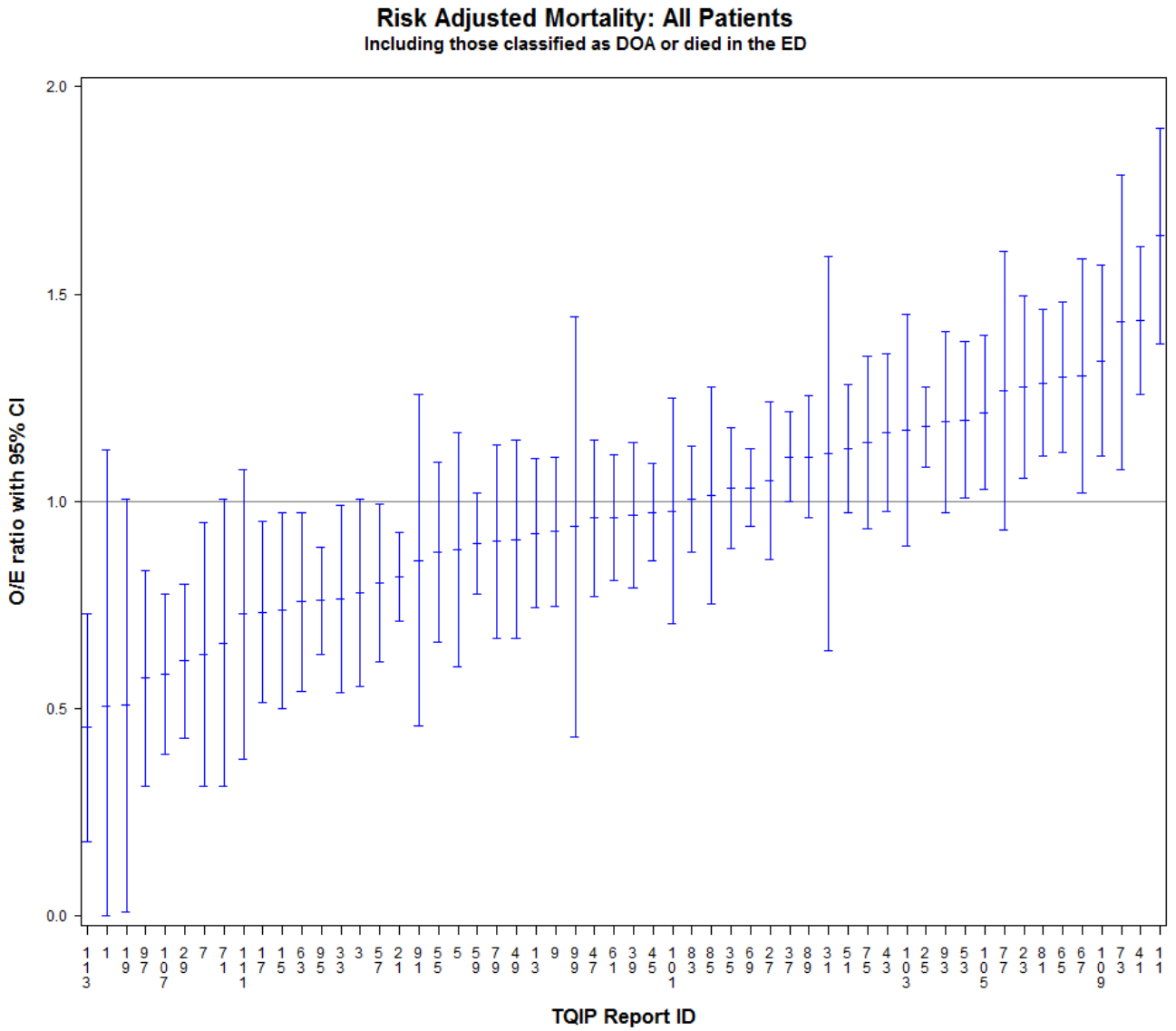


Figure 17b. Risk Adjusted Mortality – All patients including DIE/DOA (even numbered IDs)

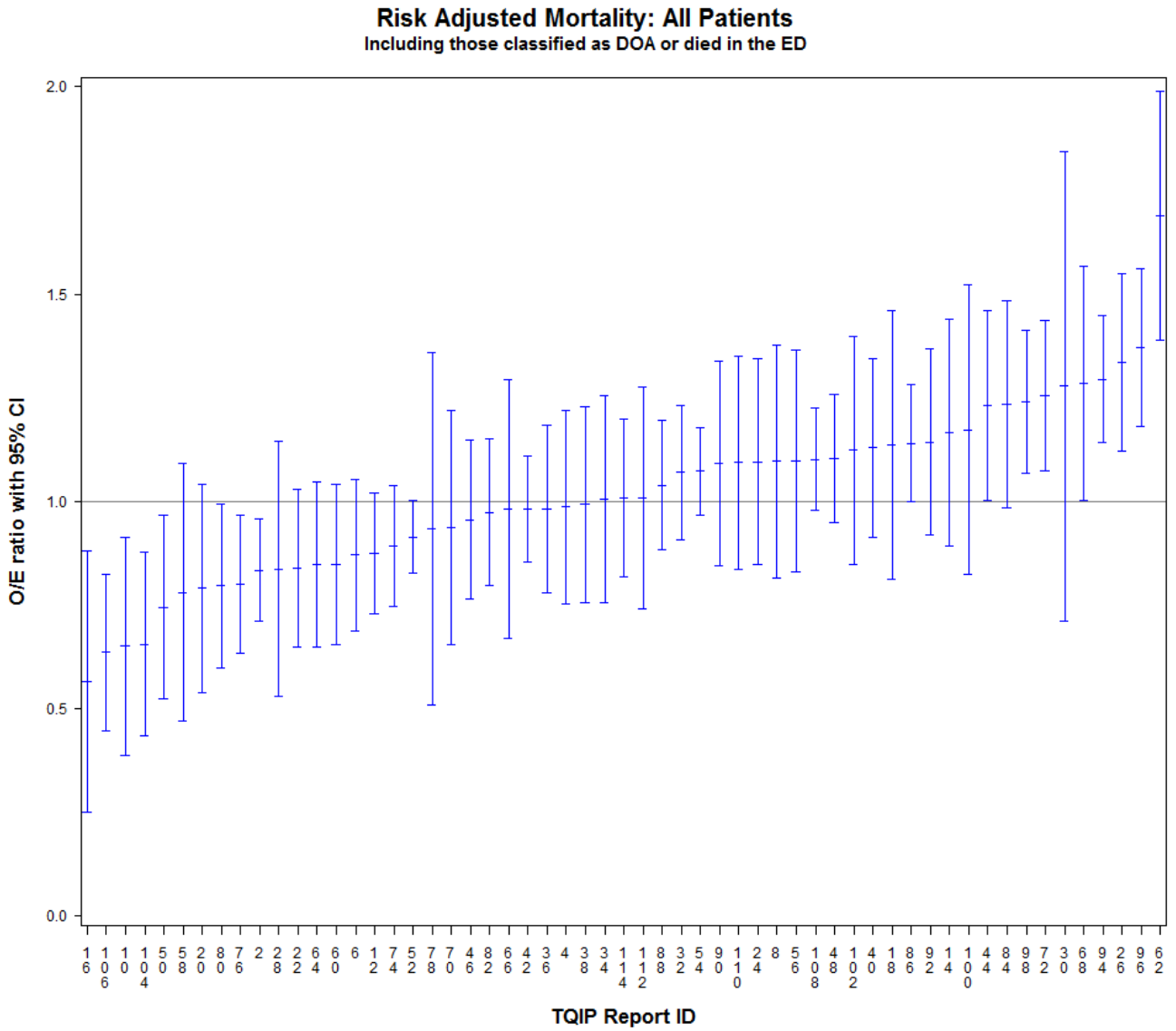


Figure 18a. Risk Adjusted Mortality – All patients excluding DIE/DOA (odd numbered IDs)

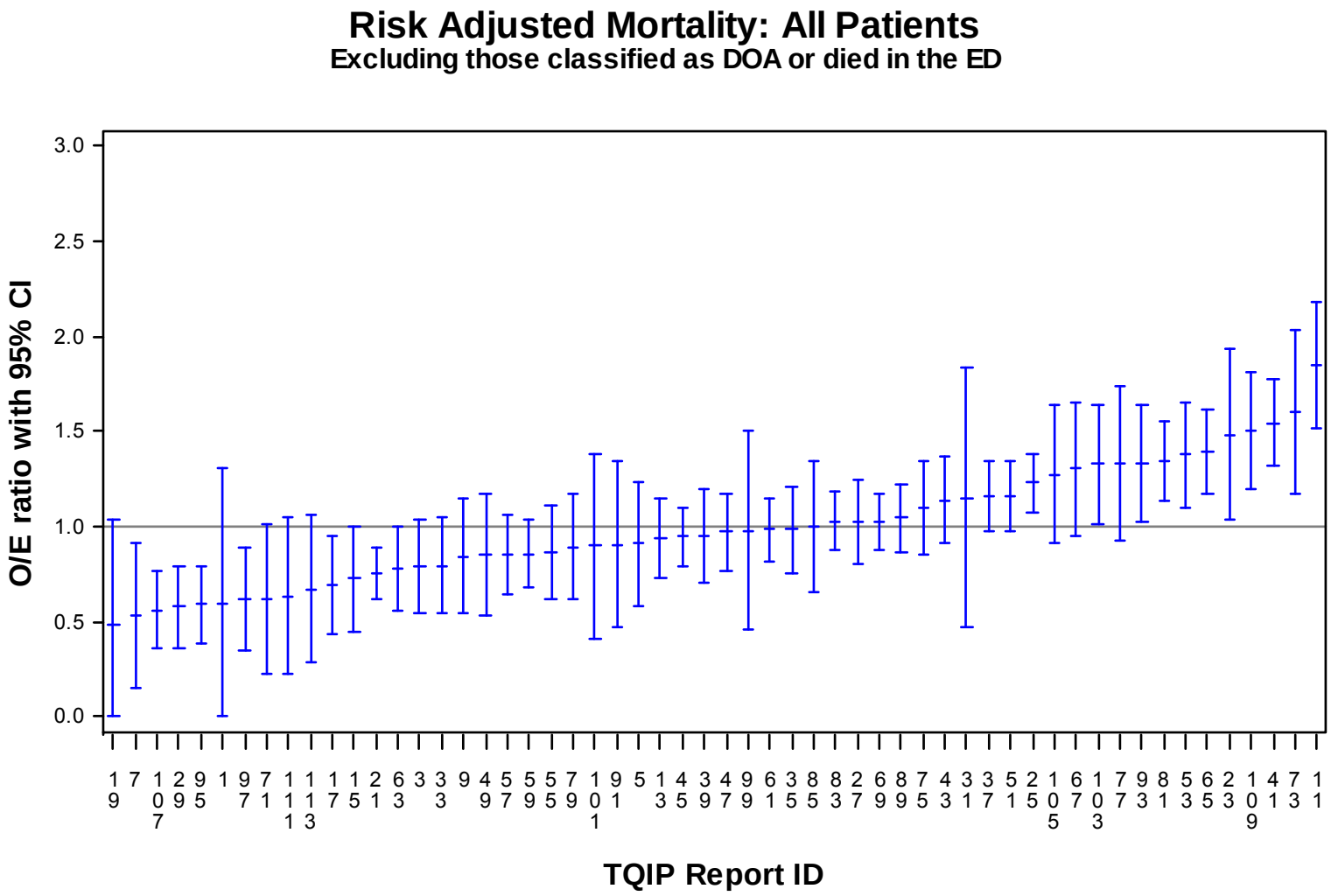


Figure 18b. Risk Adjusted Mortality – All patients excluding DIE/DOA (even numbered IDs)

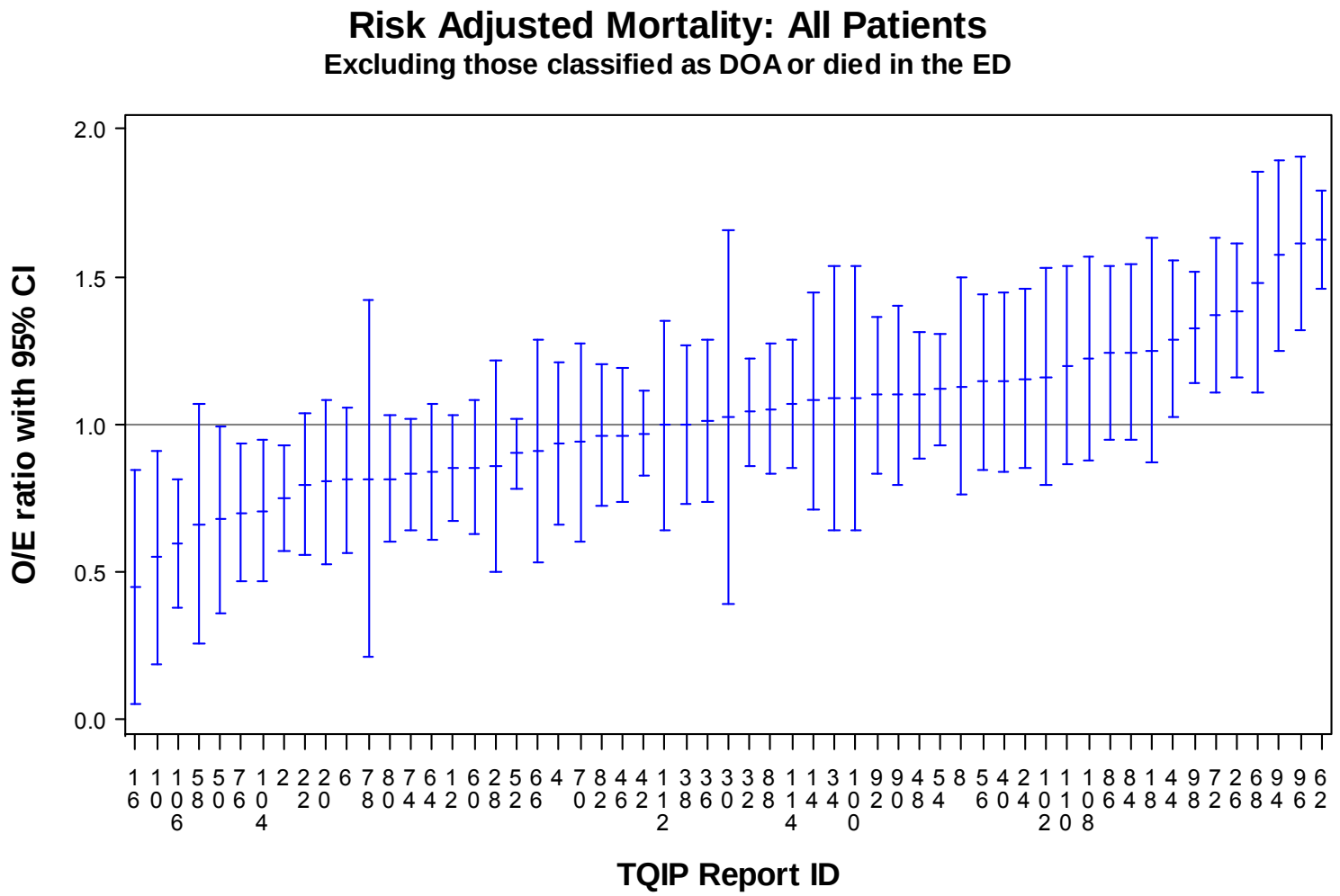
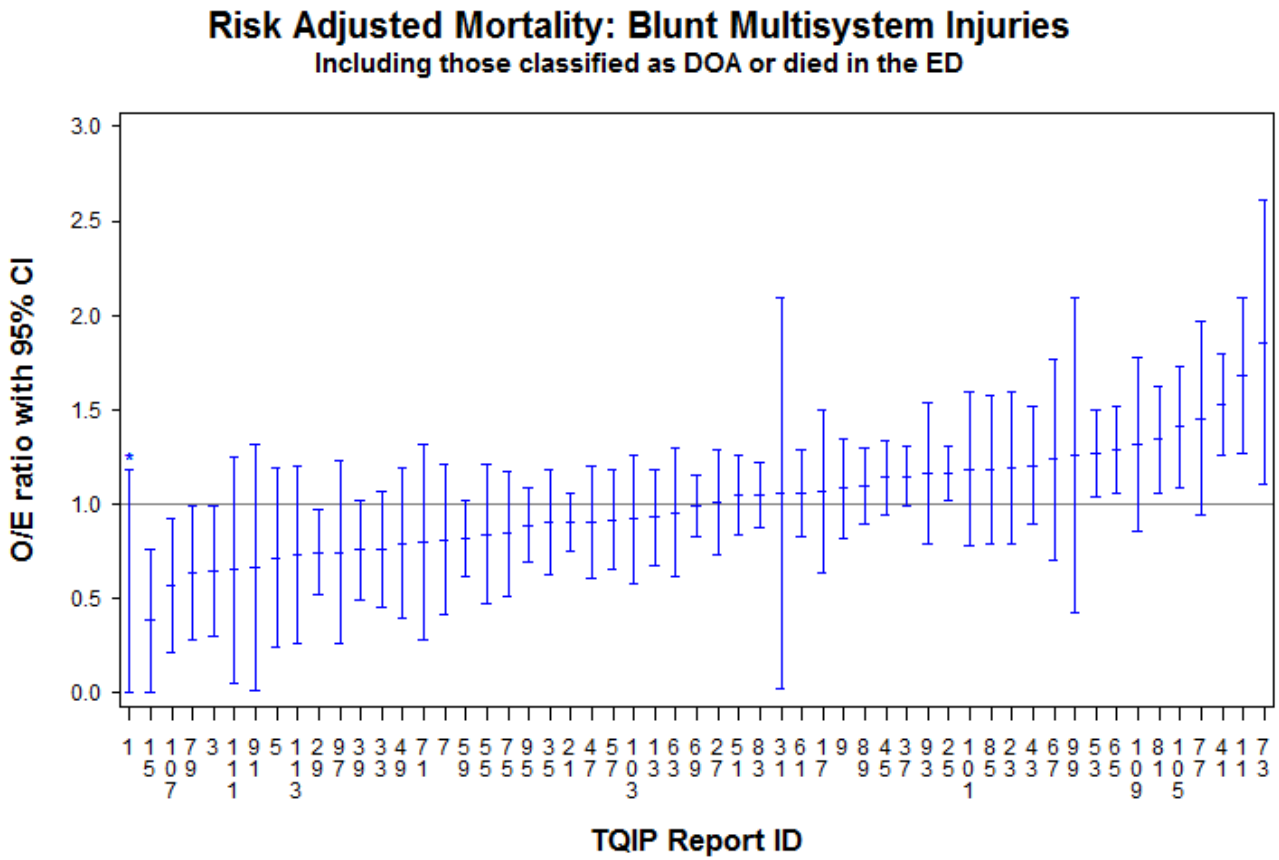


Figure 19a. Risk Adjusted Mortality – Blunt multisystem including DIE/DOA (odd numbered IDs)



* Centers with estimated O/E ratios of zero.

Figure 19b. Risk Adjusted Mortality – Blunt multisystem including DIE/DOA (even numbered IDs)

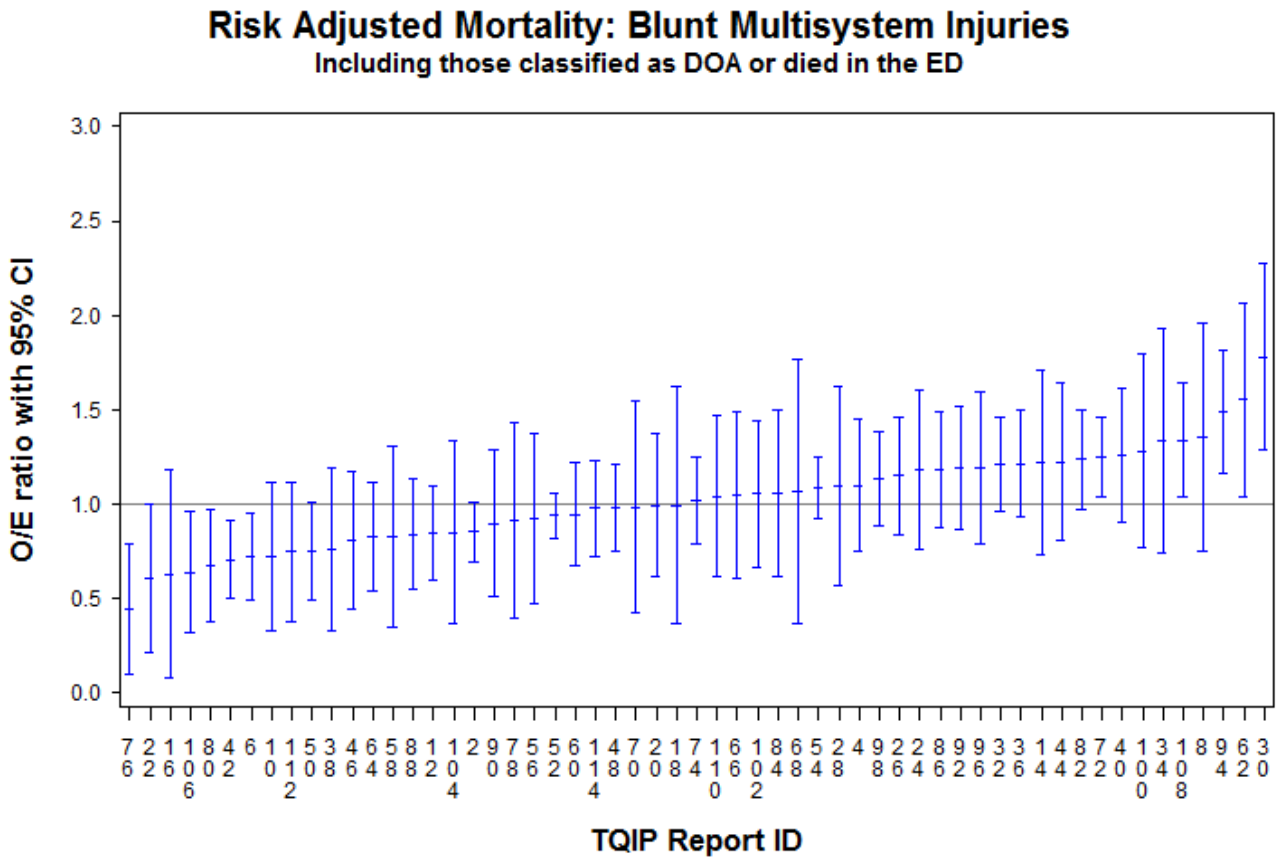
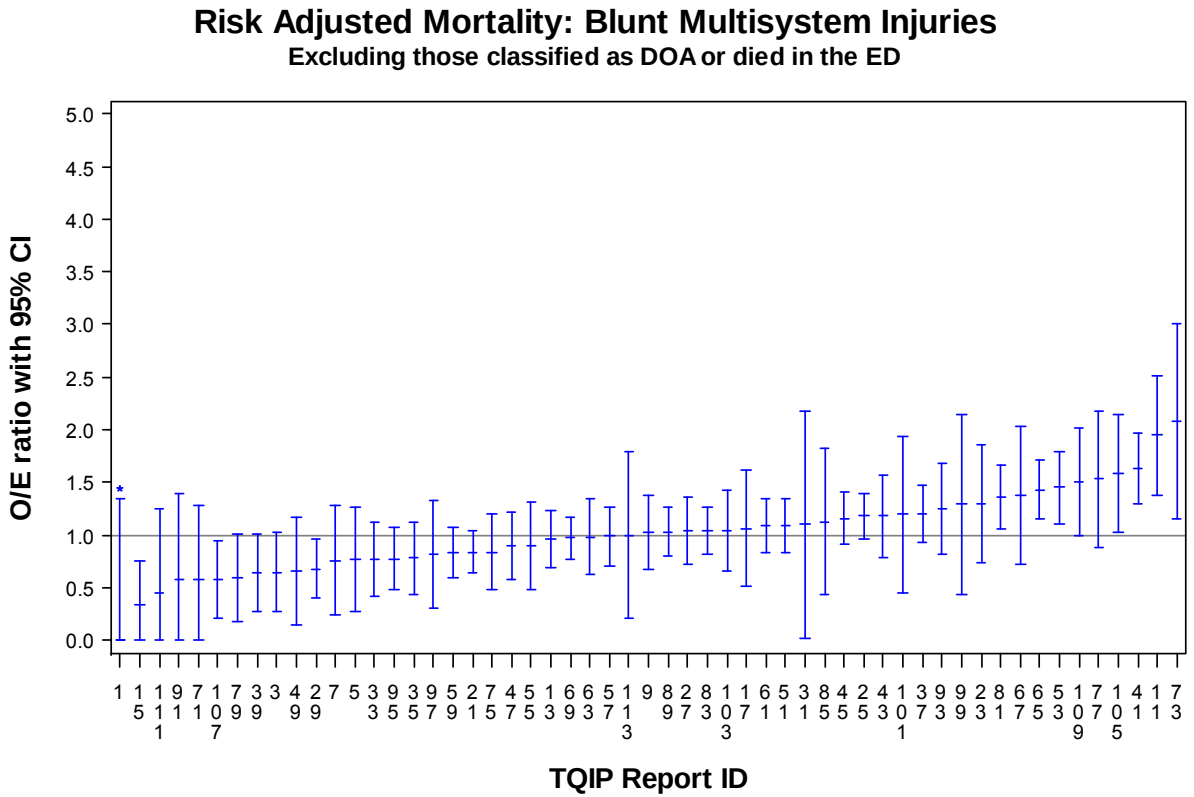


Figure 20a. Risk Adjusted Mortality – Blunt multisystem excluding DIE/DOA (odd numbered IDs)



* Centers with estimated O/E ratios of zero.

Figure 20b. Risk Adjusted Mortality – Blunt multisystem excluding DIE/DOA (even numbered IDs)

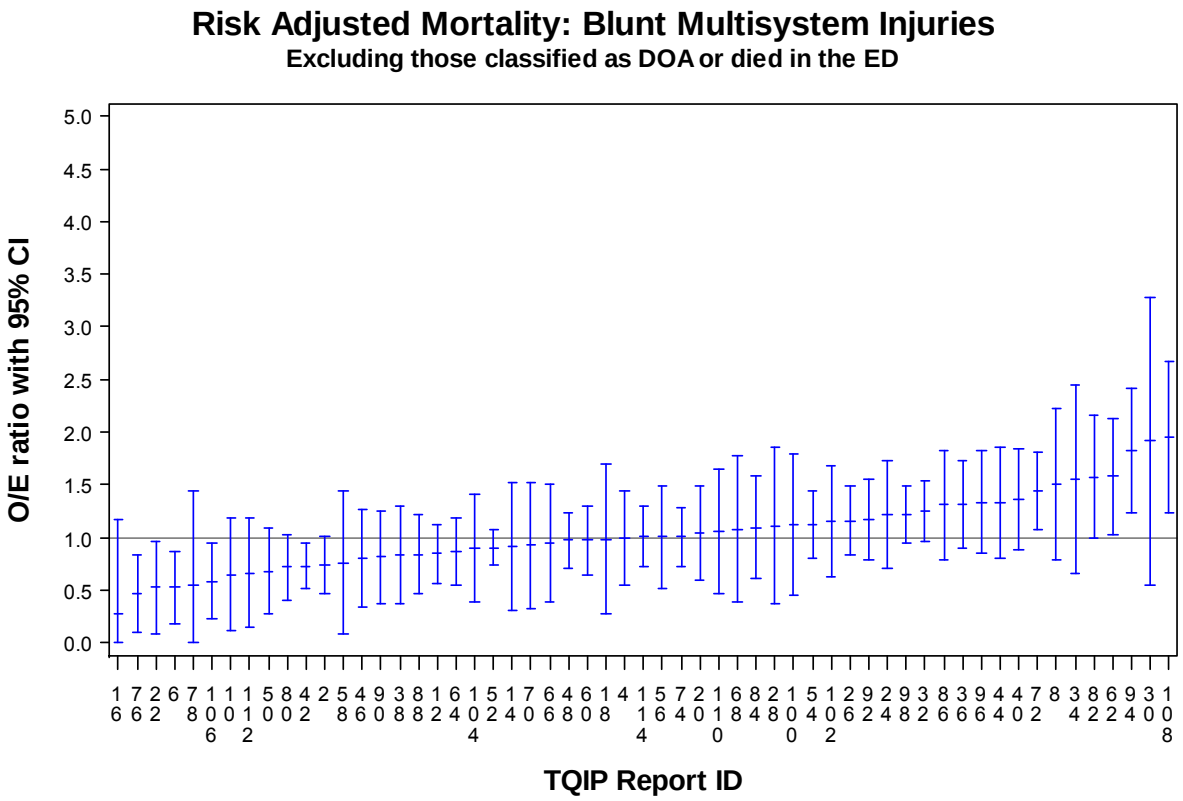
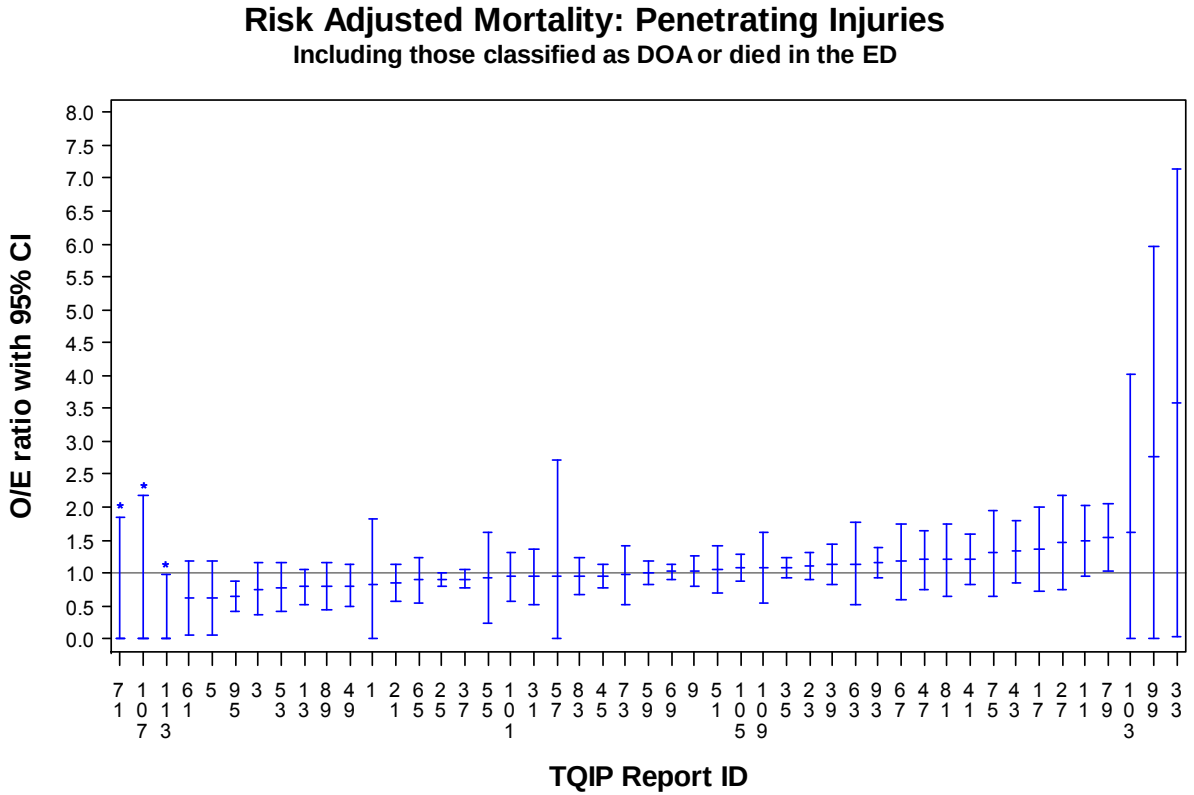


Figure 21a. Risk Adjusted Mortality – Penetrating including DIE/DOA (odd numbered IDs)



* Centers with estimated O/E ratios of zero.

Figure 21b. Risk Adjusted Mortality – Penetrating Including DIE/DOA (even numbered IDs)

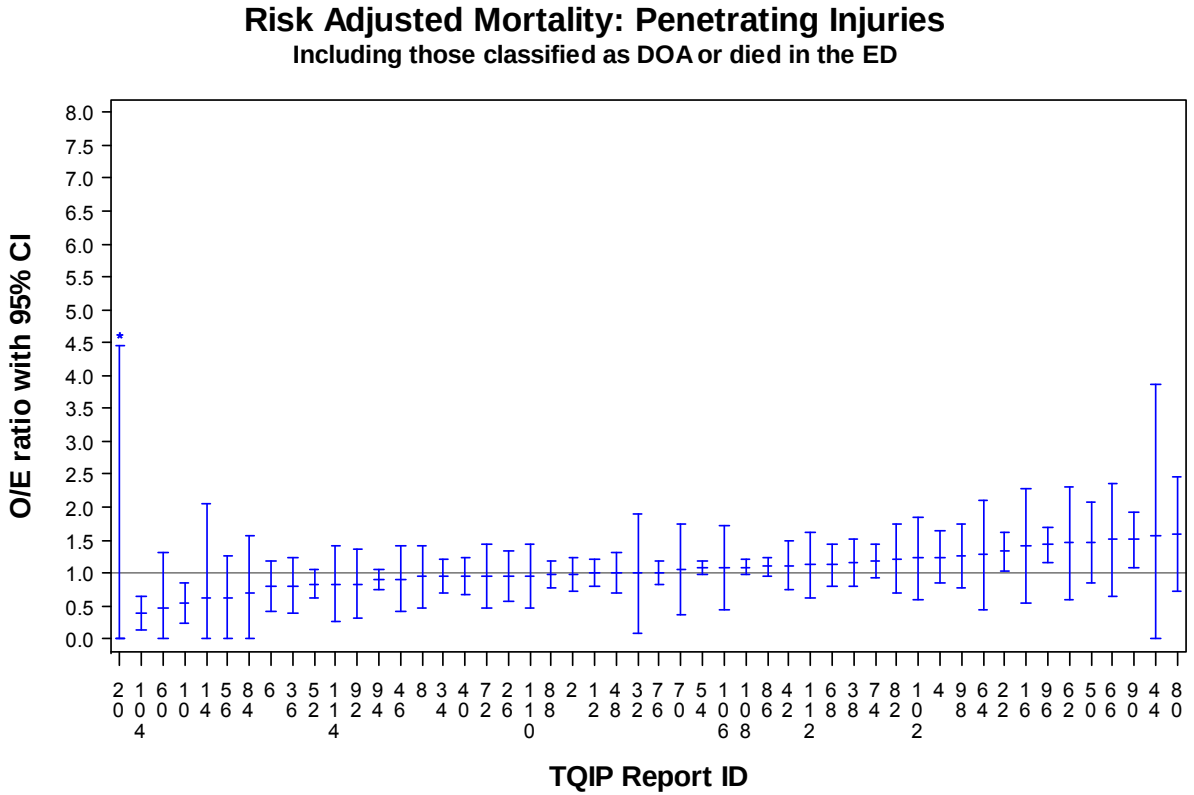
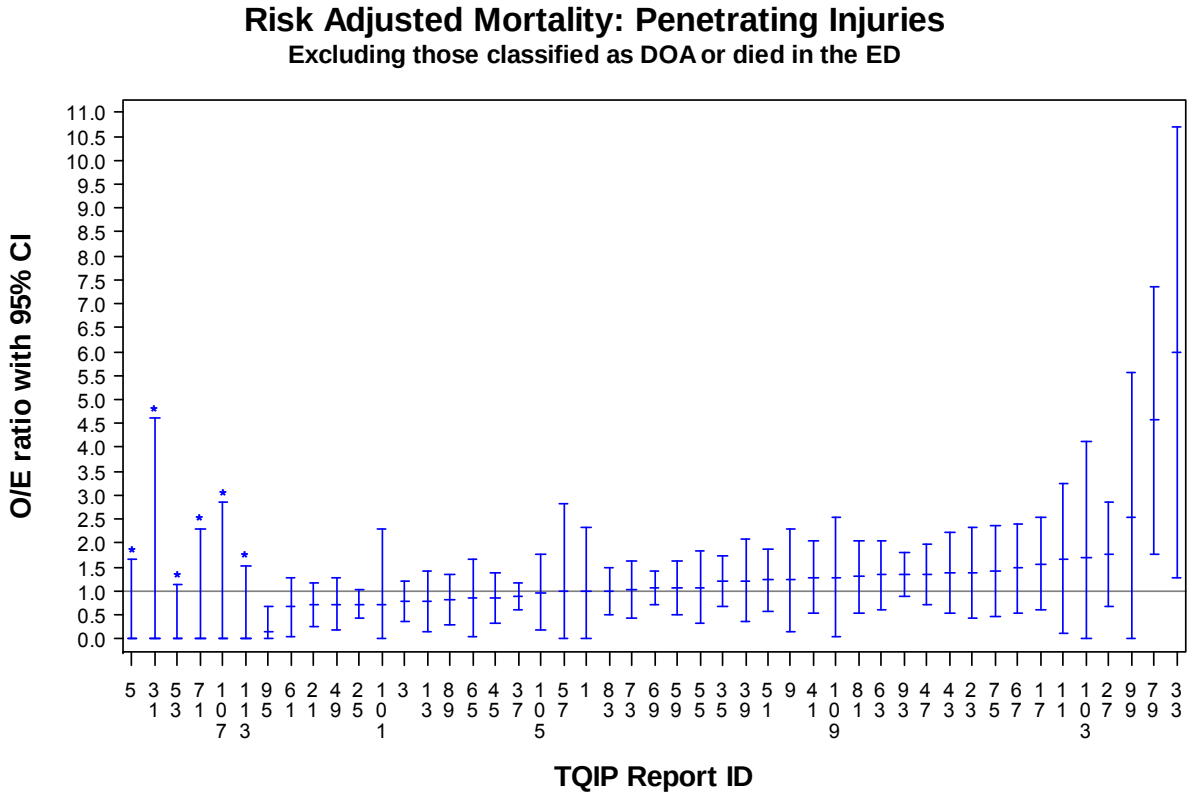
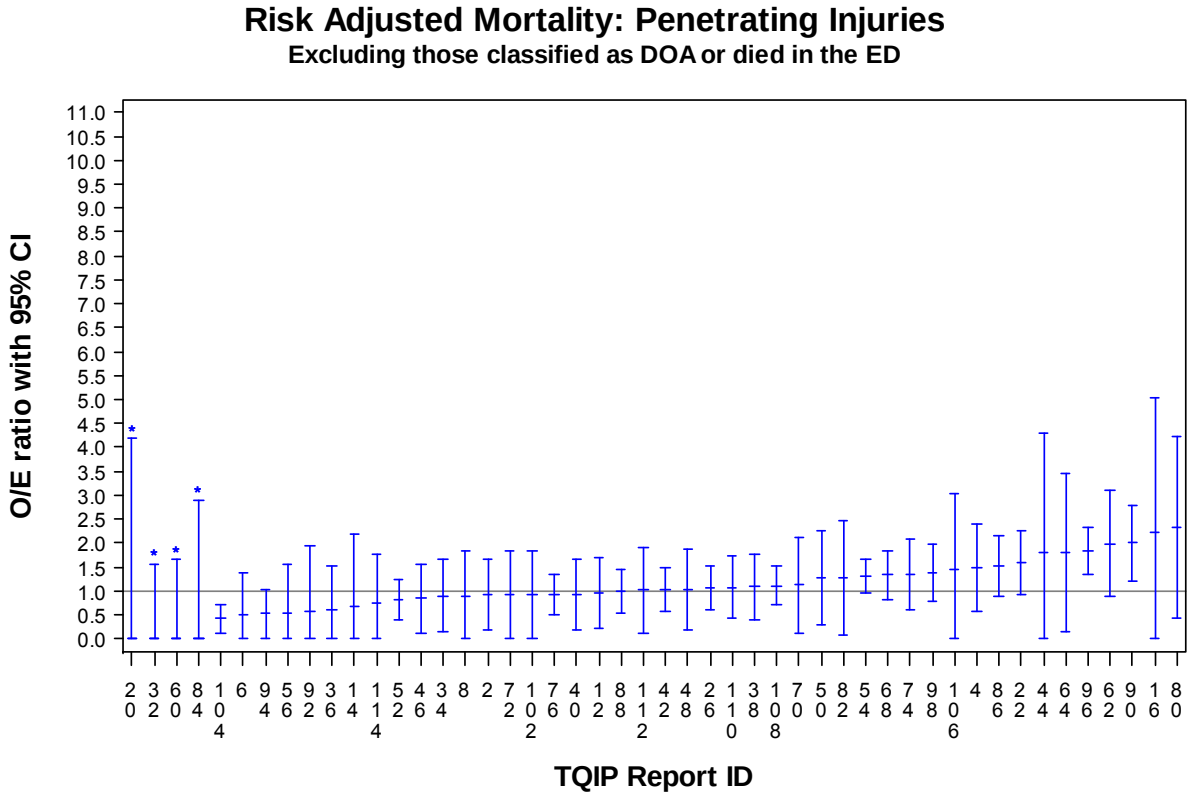


Figure 22a. Risk Adjusted Mortality – Penetrating excluding DIE/DOA (odd numbered IDs)



* Centers with estimated O/E ratios of zero.

Figure 22b. Risk Adjusted Mortality – Penetrating excluding DIE/DOA (even numbered IDs)



Risk Adjusted Length of Stay

All TQIP patients with a known length of stay (LOS) who did not have an ED or hospital discharge status of died were included in this analysis. A predicted length of stay for each patient was estimated. If a patient remained in hospital more than 25% longer than their predicted LOS, they were considered to have an excess LOS (ELOS). Table 7 shows the mean and median LOS for each trauma center, for all patients and subsets.

The proportion of patients in each center with an ELOS was compared to the average proportion of patients with an ELOS at all centers and presented on a caterpillar graph. If the confidence interval for the proportion of cases with ELOS includes the average proportion of ELOS, then the center has equivalent performance to the average center (proportion of ELOS of 17.9). We use confidence intervals ranging from 90 to 99%, depending on the sample size for each of the subgroups.

Results are presented for all TQIP patients, the two subsets, and for the following two populations with isolated injuries:

- Thoracic injury – pneumothorax, not further specified: AIS code - 442202
- Midshaft femur fracture: AIS code - 851814

Table 7 shows the unadjusted length of stay by center, and Table 8 shows the proportion of patients with ELOS. To interpret the ELOS:

- Refer to the TQIP report ID that we have provided to you this year. If you do not know your TQIP report ID, then please contact us at tqip@facs.org.
- If the lower limit of your confidence interval is above the average proportion of ELOS, then your center has more patients with ELOS than expected.
- If the upper limit of your confidence interval is below the average proportion of ELOS, then your center has fewer patients with ELOS than expected.
- If the average proportion of ELOS falls within your confidence interval, then your center's performance is equivalent to the average center.

Table 7. Unadjusted Length of Stay (days)
These data calculated from patients whose LOS is known and excluding patients who died

	All patients			Blunt multisystem			Penetrating			Isolated pneumothorax			Isolated mid-shaft femur fracture		
	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
All Patients	79434	8.1	5.0	14868	13.9	9.0	4870	10.3	6.0	6380	6.9	5.0	2420	7.3	5.0
TQIP Report ID															
1	198	8.5	5.0	15	21.9	17.0	14	9.7	4.5	11	10.4	8.0	4	5.8	6.0
2	1154	7.1	5.0	168	12.0	9.0	79	9.0	7.0	90	5.5	4.0	27	5.3	6.0
3	743	7.5	4.0	153	12.0	7.0	55	7.5	5.0	10	4.6	3.0	18	7.3	6.5
4	644	6.2	4.0	140	10.0	7.0	22	6.5	5.5	68	4.4	3.0	16	6.4	4.5
5	443	8.4	5.0	66	15.2	11.5	24	8.3	6.5	33	8.3	6.0	10	10.3	9.5
6	556	9.7	6.0	70	19.3	11.0	91	9.4	6.0	51	8.5	4.0	11	6.6	4.0
7	279	4.8	3.0	36	12.6	7.0	4	5.3	5.5	7	3.9	4.0	5	4.0	5.0
8	300	9.8	5.5	49	17.6	10.0	35	8.3	5.0	21	9.8	6.0	6	4.7	5.0
9	357	8.4	4.0	81	19.3	8.0	49	7.3	5.0	30	5.2	3.0	8	5.8	5.0
10	356	5.8	4.0	71	8.9	7.0	9	9.2	5.0	28	7.5	4.0	11	4.5	5.0
11	624	9.8	6.0	75	18.4	11.0	23	11.3	7.0	23	3.4	3.0	30	13.4	8.0
12	1357	7.7	5.0	241	14.2	9.0	51	15.0	9.0	78	5.7	4.0	29	6.2	5.0
13	820	8.8	6.0	208	13.9	10.0	37	9.5	8.0	75	7.9	6.0	34	8.0	6.0
14	347	8.8	6.0	46	11.8	9.0	45	11.8	9.0	19	7.5	6.0	8	9.9	7.5
15	460	8.5	6.0	76	17.1	15.0	2	6.5	6.5	33	10.5	6.0	15	9.9	7.0
16	356	7.5	5.0	51	13.6	9.0	16	11.0	6.0	31	6.2	4.0	8	6.5	6.5
17	450	10.4	6.0	52	21.7	16.0	10	12.6	10.0	21	6.3	5.0	25	8.9	6.0
18	323	6.3	5.0	45	12.0	9.0	7	6.9	6.0	18	8.8	5.0	11	4.7	5.0
19	184	5.0	4.0	7	8.3	9.0	0	0	0	17	4.2	4.0	11	6.1	5.0
20	583	7.3	5.0	89	12.3	9.0	11	12.8	7.0	60	7.1	5.0	19	8.9	7.0
21	2052	7.3	5.0	510	11.3	7.5	69	10.8	7.0	160	5.5	4.0	35	6.1	5.0
22	617	7.5	5.0	99	12.3	9.0	24	7.7	5.0	54	7.7	5.5	43	6.6	5.0
23	428	9.1	5.0	91	14.4	10.0	59	7.5	4.0	24	4.9	3.5	6	14.7	12.0
24	552	10.1	5.0	74	20.9	13.5	8	6.4	5.0	79	9.0	5.0	16	6.6	5.0
25	2593	6.8	4.0	684	10.1	6.0	256	9.1	6.0	175	6.5	3.0	70	7.0	5.0
26	662	7.0	4.0	120	12.2	9.0	41	7.6	6.0	52	5.8	5.5	12	5.3	5.0
27	1070	7.2	5.0	229	12.0	8.0	34	8.0	5.5	13	4.8	3.0	27	6.1	5.0
28	366	4.2	1.0	30	7.5	6.0	5	4.4	6.0	4	1.0	1.0	11	5.7	1.0
29	593	8.6	6.0	150	14.9	12.0	9	17.6	15.0	34	4.9	4.0	12	8.2	5.0
30	241	5.5	5.0	21	9.3	6.0	1	4.0	4.0	28	6.2	6.5	15	4.4	5.0

	All patients			Blunt multisystem			Penetrating			Isolated pneumothorax			Isolated mid-shaft femur fracture		
	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
31	196	5.1	4.0	16	10.9	6.0	12	4.8	4.5	17	5.4	3.0	8	3.9	4.0
32	717	8.3	5.0	125	13.3	10.0	53	7.8	5.0	53	7.3	5.0	26	9.0	5.0
33	613	7.8	5.0	109	14.7	11.0	12	15.0	4.0	68	6.4	4.0	21	8.4	4.0
34	189	7.4	5.0	26	7.7	6.0	28	11.6	6.5	13	4.3	4.0	7	9.1	6.0
35	1112	8.4	5.0	171	13.7	9.0	108	10.9	7.0	46	6.7	5.5	34	7.1	5.0
36	459	7.8	5.0	60	16.1	11.0	28	6.6	5.0	49	5.8	5.0	19	5.9	5.0
37	1015	10.5	5.0	230	18.0	10.0	86	15.2	7.5	143	8.0	4.0	33	9.2	6.0
38	676	8.8	5.0	102	18.1	11.5	20	13.9	10.5	20	4.3	3.0	6	10.8	10.5
39	755	9.2	6.0	162	14.5	10.5	65	8.5	5.0	73	7.5	5.0	24	7.3	5.5
40	634	7.4	5.0	72	13.2	9.0	29	8.1	8.0	64	6.6	4.0	34	5.9	5.0
41	1243	9.6	6.0	261	15.2	9.0	56	10.4	7.5	157	9.1	6.0	48	9.4	7.0
42	1836	9.0	5.0	380	15.9	11.0	136	11.0	8.0	122	7.7	5.0	84	6.5	5.0
43	625	6.0	4.0	91	10.3	7.0	28	7.2	5.0	72	6.2	4.0	17	5.5	4.0
44	537	9.1	6.0	60	16.4	14.0	19	13.2	10.0	50	10.5	7.0	16	7.4	6.0
45	1453	6.5	4.0	321	9.9	8.0	136	8.1	6.0	158	5.3	4.0	52	6.8	5.0
46	689	6.1	4.0	109	11.1	7.0	27	8.6	7.0	44	5.9	4.0	30	5.6	4.0
47	1353	6.5	4.0	258	11.1	8.0	31	10.4	6.0	103	5.0	4.0	29	6.1	4.0
48	817	10.2	5.0	208	17.7	10.0	63	11.1	7.0	58	9.6	6.0	33	6.0	5.0
49	476	9.1	6.0	67	18.4	11.0	45	11.4	6.0	40	8.9	5.5	20	5.7	4.0
50	453	8.3	5.0	87	16.5	10.0	19	6.8	6.0	25	6.6	4.0	6	6.2	6.0
51	1190	8.1	5.0	256	13.9	11.0	60	10.4	5.0	41	4.7	3.0	30	7.9	5.5
52	2442	10.5	7.0	631	16.1	12.0	160	13.2	9.0	157	9.8	7.0	87	9.4	8.0
53	626	8.1	5.0	111	14.5	12.0	26	9.8	6.5	40	8.1	4.0	7	5.4	5.0
54	1194	8.0	5.0	204	13.2	9.0	81	9.7	7.0	90	5.9	4.0	28	6.0	5.0
55	647	9.4	6.0	125	15.6	12.0	26	12.5	11.5	53	10.5	8.0	26	5.7	5.5
56	624	6.7	5.0	92	10.6	8.5	19	9.5	5.0	23	6.0	4.0	30	7.1	6.0
57	809	6.5	5.0	163	10.3	8.0	27	8.0	6.0	70	6.2	5.0	28	5.1	4.5
58	499	7.6	5.0	107	13.5	9.0	3	3.0	3.0	44	6.2	4.5	13	5.3	5.0
59	1159	8.3	5.0	267	13.9	9.0	100	9.5	6.0	127	5.6	4.0	27	7.0	5.0
60	718	9.1	6.0	147	15.5	10.0	15	14.6	7.0	82	8.0	6.0	22	5.3	5.0
61	1179	7.5	5.0	173	13.8	9.0	40	11.3	4.0	131	5.5	4.0	39	7.3	5.0
62	654	7.9	5.0	84	13.7	9.0	51	6.8	4.0	67	8.8	6.0	31	10.4	8.0
63	1325	6.9	4.0	239	11.6	9.0	26	12.5	9.5	12	5.7	3.5	36	7.2	6.0
64	876	7.1	5.0	164	12.6	9.0	19	9.1	7.0	90	5.7	5.0	27	6.8	5.0
65	608	12.3	7.0	222	16.0	10.0	57	8.3	5.0	8	10.5	5.5	6	7.7	6.0

	All patients			Blunt multisystem			Penetrating			Isolated pneumothorax			Isolated mid-shaft femur fracture		
	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
66	454	6.5	5.0	42	11.8	7.5	8	8.8	7.5	43	4.8	4.0	22	5.5	5.0
67	446	10.1	6.0	66	20.2	12.5	30	11.8	6.0	23	9.7	6.0	20	7.8	5.0
68	301	8.5	6.0	47	14.4	9.0	32	12.9	6.5	24	6.8	6.5	11	6.1	4.0
69	1302	13.8	7.0	290	21.1	12.5	202	18.4	10.0	84	12.0	8.0	46	10.8	8.0
70	296	6.9	4.5	34	14.5	11.0	18	8.7	6.0	39	6.9	5.0	9	8.1	7.0
71	386	7.3	5.0	53	14.4	11.0	10	10.3	9.0	50	7.7	6.0	12	6.3	4.0
72	958	6.3	4.0	183	10.4	7.0	24	7.7	5.0	18	4.4	4.5	28	5.7	5.0
73	343	6.2	4.0	43	9.4	5.0	41	9.1	8.0	37	5.3	4.0	17	6.8	4.0
74	992	7.7	5.0	171	12.7	9.0	37	11.3	6.0	109	6.2	4.0	22	6.9	5.0
75	811	9.6	6.0	159	18.6	11.0	47	10.4	7.0	73	7.8	5.0	43	7.1	5.0
76	874	9.8	7.0	205	15.1	11.0	130	11.9	9.5	52	6.5	4.5	21	7.4	7.0
77	547	6.6	4.0	75	13.2	9.0	6	15.8	6.0	14	6.9	6.0	6	5.7	5.0
78	260	6.9	5.0	58	10.5	9.0	8	3.8	4.0	27	8.0	5.0	8	4.6	5.0
79	440	5.7	4.0	80	10.6	8.0	13	5.1	5.0	39	5.1	4.0	16	5.2	5.0
80	694	9.5	5.0	159	16.8	11.0	18	8.2	5.0	44	8.0	6.0	31	8.0	8.0
81	1071	9.1	6.0	197	14.9	9.0	75	9.3	6.0	124	8.0	4.0	36	9.0	6.0
82	947	6.1	4.0	85	12.2	8.0	49	6.1	5.0	115	5.4	4.0	19	6.7	5.0
83	764	7.5	5.0	126	13.9	11.0	33	9.9	7.0	68	7.3	5.0	26	5.8	5.0
84	699	5.5	4.0	129	7.7	6.0	15	5.6	3.0	44	5.3	4.0	21	6.2	4.0
85	378	7.3	5.0	37	15.6	7.0	6	9.5	7.0	28	6.6	5.5	14	4.8	4.5
86	626	8.7	6.0	56	14.6	11.0	68	9.7	6.5	67	8.5	5.0	38	8.4	7.0
88	895	10.8	6.0	205	17.1	13.0	89	11.5	7.0	71	10.6	6.0	28	7.9	6.0
89	1538	8.5	5.0	407	14.3	10.0	60	8.7	5.5	194	6.2	4.0	57	10.5	7.0
90	463	12.4	8.0	142	20.6	14.0	21	11.5	11.0	40	8.4	6.0	8	7.3	7.5
91	300	6.2	4.0	40	11.3	8.5	2	7.0	7.0	26	6.2	5.0	4	6.3	4.0
92	749	6.4	4.0	125	9.7	7.0	35	10.6	5.0	89	5.7	4.0	25	5.8	6.0
93	268	11.5	8.0	64	15.8	12.0	27	9.6	7.0	32	8.8	5.0	10	9.4	9.0
94	581	8.1	5.0	88	18.4	9.0	119	8.1	5.0	58	5.8	3.5	13	5.7	6.0
95	806	7.2	5.0	150	11.8	9.0	55	10.2	7.0	91	5.4	4.0	14	7.9	6.5
96	631	12.7	7.0	100	19.3	16.0	146	14.3	8.0	35	9.5	7.0	18	14.3	5.5
97	733	7.9	6.0	54	17.0	11.0	7	7.9	8.0	57	7.4	5.0	17	6.5	5.0
98	1400	8.8	5.0	281	15.3	10.0	107	11.7	6.0	110	7.8	5.0	39	6.1	5.0
99	187	6.9	5.0	28	10.3	7.0	17	7.4	6.0	21	6.4	5.0	6	4.8	4.0
100	244	8.4	6.0	37	13.8	11.0	2	6.0	6.0	8	6.8	6.5	10	8.5	7.0
101	426	7.5	5.0	89	14.0	9.0	31	6.3	4.0	33	6.3	4.0	10	4.6	4.5

	All patients			Blunt multisystem			Penetrating			Isolated pneumothorax			Isolated mid-shaft femur fracture		
	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
102	387	5.7	4.0	75	8.5	6.0	16	9.6	7.0	36	5.5	4.0	10	5.2	4.0
103	535	6.0	4.0	117	9.2	7.0	26	5.2	4.5	59	4.7	4.0	5	4.6	4.0
104	705	6.5	4.0	97	11.6	8.0	60	7.2	4.5	62	3.8	3.0	3	7.7	8.0
105	463	8.9	6.0	81	14.3	10.0	75	11.8	8.0	41	6.9	6.0	4	5.5	6.0
106	758	7.6	5.0	100	13.8	10.0	32	8.8	5.0	70	6.6	5.0	31	6.1	5.0
107	851	6.3	5.0	169	11.1	8.0	11	7.0	8.0	53	5.8	4.0	21	5.8	5.0
108	339	10.1	6.0	32	14.5	12.0	97	11.0	7.0	27	7.3	6.0	16	7.2	7.5
109	461	7.2	4.0	57	14.0	13.0	23	5.6	5.0	63	7.8	5.0	16	10.4	5.5
110	506	7.8	5.0	59	12.4	8.0	67	10.1	5.0	58	6.3	4.0	21	7.1	7.0
111	311	5.1	4.0	50	6.9	5.0	5	4.6	7.0	33	5.1	4.0	10	6.5	5.5
112	414	8.6	5.0	86	15.2	10.0	35	6.8	6.0	51	5.5	5.0	10	9.4	7.0
113	206	8.1	4.0	33	11.5	8.0	22	11.5	4.0	10	5.2	2.0	3	12.7	3.0
114	582	7.9	6.0	160	12.2	10.0	12	7.9	6.0	73	6.7	5.0	8	13.5	11.0

Table 8. Excess Length of Stay
These data represent the proportion of patients with an excess LOS

TQIP Report ID	All Patients	Blunt multisystem	Penetrating	Isolated pneumothorax	Isolated mid-shaft femur fracture
1	38.6 (32.8 - 44.6)	35.7 (12.8 - 64.9)	28.6 (10.4 - 54.0)	63.6 (30.8 - 89.1)	50.0 (9.8 - 90.2)
2	25.1 (23.0 - 27.3)	19.2 (13.5 - 26.0)	26.6 (18.6 - 36.0)	26.7 (17.9 - 37.0)	11.1 (3.1 - 26.3)
3	19.5 (17.1 - 22.0)	20.8 (14.6 - 28.2)	18.2 (10.2 - 28.9)	20.0 (2.5 - 55.6)	11.1 (2.0 - 31.0)
4	16.8 (14.4 - 19.4)	15.7 (10.1 - 22.8)	18.2 (6.5 - 36.9)	13.2 (6.2 - 23.6)	12.5 (2.3 - 34.4)
5	29.4 (25.8 - 33.2)	31.3 (20.2 - 44.1)	33.3 (17.8 - 52.1)	27.3 (13.3 - 45.5)	40.0 (15.0 - 69.6)
6	27.9 (24.8 - 31.3)	27.0 (16.6 - 39.7)	15.6 (9.7 - 23.2)	28.0 (16.2 - 42.5)	18.2 (3.3 - 47.0)
7	10.8 (7.9 - 14.4)	14.3 (4.8 - 30.3)	0.0 (0.0 - 52.7)	28.6 (3.7 - 71.0)	0.0 (0.0 - 45.1)
8	29.4 (25.0 - 34.0)	28.9 (16.4 - 44.3)	28.6 (16.4 - 43.6)	40.0 (19.1 - 63.9)	0.0 (0.0 - 39.3)
9	20.3 (16.9 - 24.2)	20.3 (11.8 - 31.2)	16.7 (8.6 - 28.1)	26.7 (12.3 - 45.9)	12.5 (0.6 - 47.1)
10	19.9 (16.5 - 23.7)	12.7 (6.0 - 22.7)	11.1 (0.6 - 42.9)	32.1 (15.9 - 52.4)	9.1 (0.5 - 36.4)
11	33.7 (30.5 - 36.9)	31.0 (20.5 - 43.1)	27.3 (12.6 - 46.8)	13.0 (2.8 - 33.6)	48.3 (32.0 - 64.8)
12	22.7 (20.8 - 24.6)	30.9 (25.1 - 37.3)	22.9 (13.4 - 35.1)	23.4 (14.5 - 34.4)	20.7 (9.4 - 36.8)
13	21.6 (19.3 - 24.1)	11.7 (7.6 - 16.9)	25.0 (13.7 - 39.6)	28.0 (18.2 - 39.6)	23.5 (12.3 - 38.5)
14	34.8 (30.5 - 39.3)	30.4 (17.7 - 45.8)	36.4 (24.3 - 49.9)	52.6 (28.9 - 75.6)	62.5 (28.9 - 88.9)
15	27.1 (23.7 - 30.8)	44.6 (33.0 - 56.6)	50.0 (2.5 - 97.5)	40.6 (23.7 - 59.4)	20.0 (5.7 - 44.0)
16	26.3 (22.4 - 30.4)	16.0 (7.2 - 29.1)	20.0 (5.7 - 44.0)	19.4 (7.5 - 37.5)	25.0 (4.6 - 60.0)
17	29.5 (25.9 - 33.2)	50.0 (35.2 - 64.8)	80.0 (49.3 - 96.3)	33.3 (14.6 - 57.0)	28.0 (13.9 - 46.2)
18	16.5 (13.1 - 20.2)	20.0 (9.6 - 34.6)	14.3 (0.7 - 52.1)	16.7 (3.6 - 41.4)	0.0 (0.0 - 23.8)
19	12.5 (8.7 - 17.2)	14.3 (0.4 - 57.9)	NA	11.8 (1.5 - 36.4)	18.2 (3.3 - 47.0)
20	27.9 (24.9 - 31.2)	19.3 (11.7 - 29.1)	50.0 (22.2 - 77.8)	33.3 (21.7 - 46.7)	21.1 (7.5 - 41.9)
21	21.1 (19.6 - 22.6)	18.4 (15.1 - 22.0)	23.2 (15.1 - 33.1)	18.9 (13.1 - 25.8)	14.3 (5.8 - 27.7)
22	28.1 (25.1 - 31.2)	24.5 (16.4 - 34.2)	20.8 (8.6 - 38.9)	31.5 (19.5 - 45.6)	18.6 (9.6 - 31.1)
23	30.7 (27.0 - 34.6)	37.1 (27.1 - 48.0)	19.3 (11.2 - 29.9)	33.3 (15.6 - 55.3)	50.0 (15.3 - 84.7)
24	29.8 (26.6 - 33.3)	37.3 (25.8 - 50.0)	37.5 (11.1 - 71.1)	26.3 (16.9 - 37.7)	12.5 (2.3 - 34.4)
25	21.2 (19.9 - 22.5)	20.6 (17.6 - 23.8)	23.4 (19.1 - 28.2)	20.1 (14.4 - 26.8)	21.4 (13.7 - 31.1)
26	26.2 (23.4 - 29.2)	29.7 (21.6 - 38.8)	24.4 (13.9 - 37.9)	28.8 (17.1 - 43.1)	25.0 (7.2 - 52.7)
27	20.0 (18.0 - 22.1)	19.5 (14.5 - 25.2)	20.6 (10.1 - 35.2)	38.5 (13.9 - 68.4)	22.2 (10.1 - 39.2)
28	16.4 (13.3 - 20.0)	13.3 (3.8 - 30.7)	20.0 (1.0 - 65.7)	0.0 (0.0 - 60.2)	27.3 (7.9 - 56.4)

TQIP Report ID	All Patients	Blunt multisystem	Penetrating	Isolated pneumothorax	Isolated mid-shaft femur fracture
29	22.5 (19.7 - 25.5)	20.9 (14.7 - 28.4)	11.1 (0.6 - 42.9)	11.8 (3.3 - 27.5)	16.7 (3.0 - 43.8)
30	26.7 (22.0 - 31.8)	30.0 (11.9 - 54.3)	0.0 (0.0 - 95.0)	46.4 (27.5 - 66.1)	13.3 (2.4 - 36.3)
31	13.3 (9.5 - 17.9)	0.0 (0.0 - 20.6)	0.0 (0.0 - 22.1)	29.4 (10.3 - 56.0)	0.0 (0.0 - 31.2)
32	31.4 (28.5 - 34.4)	28.7 (20.9 - 37.6)	20.8 (12.1 - 32.0)	28.3 (16.8 - 42.3)	30.8 (16.3 - 48.7)
33	23.0 (20.2 - 26.0)	26.2 (18.1 - 35.6)	9.1 (0.5 - 36.4)	19.1 (10.6 - 30.5)	10.0 (1.8 - 28.3)
34	24.6 (19.5 - 30.3)	19.2 (6.6 - 39.4)	19.2 (7.9 - 36.3)	23.1 (5.0 - 53.8)	28.6 (5.3 - 65.9)
35	30.4 (28.1 - 32.8)	30.2 (23.4 - 37.7)	29.0 (21.8 - 37.0)	43.5 (28.9 - 58.9)	20.6 (10.1 - 35.2)
36	23.9 (20.6 - 27.4)	27.3 (16.1 - 41.0)	25.0 (12.4 - 41.9)	22.4 (11.8 - 36.6)	21.1 (7.5 - 41.9)
37	30.0 (27.6 - 32.5)	30.9 (24.8 - 37.5)	28.4 (20.2 - 37.8)	26.4 (19.3 - 34.5)	39.4 (25.1 - 55.2)
38	37.6 (34.5 - 40.8)	48.5 (38.2 - 58.8)	65.0 (44.2 - 82.3)	20.0 (5.7 - 43.7)	83.3 (41.8 - 99.1)
39	32.4 (29.6 - 35.4)	32.3 (25.1 - 40.2)	26.2 (17.4 - 36.6)	32.9 (22.3 - 44.9)	37.5 (21.2 - 56.3)
40	25.8 (22.9 - 28.8)	24.3 (14.8 - 36.0)	24.1 (11.9 - 40.6)	20.6 (11.5 - 32.7)	17.6 (8.0 - 31.9)
41	37.8 (35.5 - 40.1)	34.9 (29.0 - 41.2)	39.3 (28.3 - 51.1)	37.4 (29.8 - 45.5)	37.5 (25.8 - 50.4)
42	23.1 (21.5 - 24.8)	21.5 (17.4 - 26.0)	20.7 (15.2 - 27.3)	24.0 (16.7 - 32.6)	21.4 (14.3 - 30.1)
43	17.5 (15.0 - 20.2)	13.3 (7.1 - 22.1)	14.3 (5.0 - 29.8)	27.8 (17.9 - 39.6)	0.0 (0.0 - 16.2)
44	37.4 (33.9 - 41.0)	45.8 (32.7 - 59.2)	36.8 (18.8 - 58.2)	49.0 (34.4 - 63.7)	31.3 (13.2 - 54.8)
45	14.2 (12.7 - 15.8)	13.4 (9.9 - 17.6)	13.3 (8.8 - 19.1)	12.0 (7.4 - 18.1)	11.5 (5.1 - 21.5)
46	16.0 (13.7 - 18.5)	27.5 (19.4 - 36.9)	33.3 (18.6 - 50.9)	20.5 (9.8 - 35.3)	13.3 (4.7 - 28.0)
47	18.6 (16.9 - 20.5)	18.8 (14.2 - 24.2)	30.0 (16.6 - 46.5)	20.4 (13.1 - 29.5)	10.3 (2.9 - 24.6)
48	28.3 (25.7 - 31.1)	29.4 (23.2 - 36.3)	18.0 (10.5 - 28.1)	31.0 (19.5 - 44.5)	24.2 (12.7 - 39.5)
49	30.1 (26.6 - 33.8)	35.5 (23.7 - 48.7)	22.7 (12.9 - 35.5)	42.5 (27.0 - 59.1)	30.0 (14.0 - 50.8)
50	28.5 (25.0 - 32.2)	27.2 (17.9 - 38.2)	21.1 (7.5 - 41.9)	20.0 (6.8 - 40.7)	16.7 (0.9 - 58.2)
51	26.0 (23.9 - 28.2)	23.1 (18.0 - 28.8)	24.1 (15.2 - 35.1)	14.6 (5.6 - 29.2)	23.3 (11.5 - 39.4)
52	36.8 (35.2 - 38.4)	29.7 (26.1 - 33.5)	27.7 (21.9 - 34.3)	38.7 (31.0 - 46.9)	39.5 (30.7 - 49.0)
53	34.1 (30.9 - 37.3)	38.9 (29.7 - 48.7)	38.5 (22.6 - 56.4)	25.6 (13.0 - 42.1)	14.3 (0.7 - 52.1)
54	28.0 (25.8 - 30.2)	21.9 (16.4 - 28.3)	19.8 (12.8 - 28.4)	18.9 (11.4 - 28.5)	28.6 (15.1 - 45.7)
55	27.9 (24.9 - 30.9)	26.0 (18.5 - 34.7)	38.5 (22.6 - 56.4)	40.4 (27.0 - 54.9)	11.5 (3.2 - 27.2)
56	22.6 (19.9 - 25.6)	19.6 (12.0 - 29.1)	26.3 (11.0 - 47.6)	8.7 (1.1 - 28.0)	26.7 (14.0 - 43.0)
57	17.2 (15.1 - 19.6)	13.0 (8.2 - 19.1)	18.5 (7.6 - 35.1)	21.4 (12.5 - 32.9)	3.6 (0.2 - 15.9)
58	23.2 (20.1 - 26.5)	28.8 (20.4 - 38.6)	0.0 (0.0 - 63.2)	13.6 (5.2 - 27.4)	0.0 (0.0 - 20.6)

TQIP Report ID	All Patients	Blunt multisystem	Penetrating	Isolated pneumothorax	Isolated mid-shaft femur fracture
59	21.4 (19.4 - 23.5)	19.4 (14.7 - 24.7)	28.3 (20.9 - 36.7)	18.1 (11.8 - 25.9)	11.1 (3.1 - 26.3)
60	25.6 (22.9 - 28.4)	26.1 (19.1 - 34.1)	21.4 (6.1 - 46.6)	23.2 (14.6 - 33.8)	4.5 (0.2 - 19.8)
61	22.3 (20.4 - 24.4)	21.3 (15.4 - 28.3)	23.7 (12.9 - 37.7)	15.3 (9.6 - 22.6)	25.6 (14.6 - 39.6)
62	28.3 (25.4 - 31.4)	35.4 (25.1 - 46.7)	12.0 (5.4 - 22.3)	23.1 (13.5 - 35.2)	41.9 (26.9 - 58.2)
63	21.2 (19.4 - 23.2)	22.5 (17.3 - 28.3)	28.0 (13.9 - 46.2)	8.3 (0.2 - 38.5)	30.6 (18.2 - 45.5)
64	17.5 (15.5 - 19.8)	16.1 (10.8 - 22.8)	31.6 (14.7 - 53.0)	13.3 (7.1 - 22.1)	22.2 (10.1 - 39.2)
65	28.6 (25.6 - 31.8)	20.6 (15.3 - 26.7)	14.0 (7.2 - 23.9)	12.5 (0.3 - 52.7)	0.0 (0.0 - 39.3)
66	22.3 (19.2 - 25.8)	16.7 (7.0 - 31.4)	25.0 (4.6 - 60.0)	20.9 (10.0 - 36.0)	9.1 (1.6 - 25.9)
67	31.9 (28.2 - 35.8)	35.6 (23.6 - 49.1)	26.7 (14.0 - 43.0)	39.1 (19.7 - 61.5)	20.0 (7.1 - 40.1)
68	38.0 (33.3 - 42.9)	33.3 (20.0 - 49.0)	30.0 (16.6 - 46.5)	45.8 (25.6 - 67.2)	27.3 (7.9 - 56.4)
69	36.2 (33.9 - 38.5)	31.9 (26.3 - 38.0)	31.1 (25.5 - 37.3)	53.7 (42.3 - 64.7)	46.7 (33.8 - 59.9)
70	23.1 (19.1 - 27.5)	18.2 (7.0 - 35.5)	27.8 (11.6 - 49.8)	23.1 (11.1 - 39.3)	22.2 (4.1 - 55.0)
71	19.0 (15.8 - 22.6)	27.5 (15.9 - 41.7)	20.0 (3.7 - 50.7)	26.0 (14.6 - 40.3)	16.7 (3.0 - 43.8)
72	19.5 (17.4 - 21.8)	16.2 (11.1 - 22.4)	12.5 (3.5 - 29.2)	27.8 (9.7 - 53.5)	14.3 (5.0 - 29.8)
73	17.8 (14.5 - 21.6)	11.9 (4.0 - 25.6)	12.2 (4.9 - 23.9)	10.8 (3.0 - 25.4)	29.4 (12.4 - 52.2)
74	27.2 (24.9 - 29.7)	26.0 (19.6 - 33.3)	30.6 (18.2 - 45.5)	30.3 (21.8 - 39.8)	13.6 (3.8 - 31.6)
75	26.3 (23.8 - 29.0)	28.7 (21.6 - 36.6)	31.9 (20.8 - 44.8)	32.9 (22.3 - 44.9)	25.6 (15.1 - 38.8)
76	29.5 (26.9 - 32.1)	25.0 (19.2 - 31.6)	24.0 (18.0 - 31.0)	30.8 (18.7 - 45.1)	28.6 (13.2 - 48.7)
77	25.7 (22.7 - 29.0)	37.8 (26.8 - 49.9)	20.0 (1.0 - 65.7)	35.7 (12.8 - 64.9)	16.7 (0.9 - 58.2)
78	24.2 (19.9 - 29.0)	24.1 (13.9 - 37.2)	0.0 (0.0 - 31.2)	29.6 (13.8 - 50.2)	25.0 (4.6 - 60.0)
79	8.9 (6.7 - 11.4)	6.3 (2.1 - 14.0)	7.7 (0.4 - 31.6)	15.4 (5.9 - 30.5)	0.0 (0.0 - 17.1)
80	20.4 (17.9 - 23.1)	21.7 (15.4 - 29.1)	16.7 (4.7 - 37.7)	25.0 (13.2 - 40.3)	16.1 (6.6 - 31.0)
81	27.7 (25.5 - 30.1)	27.7 (21.5 - 34.7)	24.0 (16.1 - 33.5)	23.0 (15.8 - 31.4)	28.6 (16.4 - 43.6)
82	24.2 (21.9 - 26.6)	24.7 (15.8 - 35.5)	18.4 (9.9 - 29.9)	30.4 (22.2 - 39.7)	15.8 (4.4 - 35.9)
83	25.2 (22.6 - 27.9)	36.3 (27.8 - 45.4)	25.0 (13.1 - 40.6)	29.9 (19.3 - 42.3)	19.2 (7.9 - 36.3)
84	15.2 (13.0 - 17.6)	10.9 (6.1 - 17.5)	6.7 (0.3 - 27.9)	15.9 (6.6 - 30.1)	9.5 (1.7 - 27.1)
85	26.2 (22.5 - 30.2)	14.3 (4.8 - 30.3)	33.3 (6.3 - 72.9)	32.1 (15.9 - 52.4)	0.0 (0.0 - 19.3)
86	44.0 (40.6 - 47.3)	40.7 (27.6 - 55.0)	32.4 (23.0 - 42.9)	41.8 (29.8 - 54.5)	31.6 (19.3 - 46.1)
88	38.8 (36.0 - 41.5)	44.7 (37.6 - 51.9)	38.6 (29.9 - 47.9)	44.3 (32.4 - 56.7)	28.6 (15.1 - 45.7)
89	24.3 (22.5 - 26.2)	25.3 (21.1 - 29.9)	18.3 (10.6 - 28.5)	20.6 (15.2 - 27.0)	29.1 (19.2 - 40.8)

TQIP Report ID	All Patients	Blunt multisystem	Penetrating	Isolated pneumothorax	Isolated mid-shaft femur fracture
90	38.5 (34.7 - 42.5)	41.2 (32.7 - 50.2)	33.3 (16.8 - 53.6)	32.5 (18.6 - 49.1)	37.5 (11.1 - 71.1)
91	28.0 (23.7 - 32.6)	32.5 (18.6 - 49.1)	50.0 (2.5 - 97.5)	34.6 (17.2 - 55.7)	0.0 (0.0 - 52.7)
92	22.0 (19.5 - 24.6)	21.6 (14.7 - 29.8)	23.5 (12.3 - 38.5)	28.1 (19.1 - 38.6)	20.0 (8.2 - 37.5)
93	41.1 (36.0 - 46.3)	39.7 (27.6 - 52.8)	14.8 (5.2 - 30.8)	31.3 (16.1 - 50.0)	50.0 (22.2 - 77.8)
94	25.6 (22.6 - 28.7)	38.3 (27.7 - 49.7)	16.9 (11.5 - 23.7)	13.8 (6.1 - 25.4)	30.8 (11.3 - 57.3)
95	21.0 (18.7 - 23.6)	18.2 (12.4 - 25.4)	16.4 (8.8 - 26.8)	22.0 (14.0 - 31.9)	28.6 (10.4 - 54.0)
96	39.6 (36.3 - 43.0)	47.4 (37.0 - 57.9)	29.1 (22.8 - 36.0)	40.0 (23.9 - 57.9)	23.5 (8.5 - 46.1)
97	37.9 (34.9 - 40.9)	40.0 (26.4 - 54.8)	71.4 (34.1 - 94.7)	29.8 (18.4 - 43.4)	17.6 (5.0 - 39.6)
98	27.7 (25.7 - 29.7)	31.1 (25.7 - 37.0)	29.8 (22.5 - 38.0)	26.4 (18.4 - 35.6)	12.8 (5.2 - 25.1)
99	28.3 (22.9 - 34.3)	25.0 (10.7 - 44.9)	23.5 (8.5 - 46.1)	42.9 (21.8 - 66.0)	0.0 (0.0 - 39.3)
100	39.9 (34.7 - 45.4)	43.2 (27.1 - 60.5)	0.0 (0.0 - 77.6)	37.5 (8.5 - 75.5)	20.0 (3.7 - 50.7)
101	25.1 (21.6 - 28.8)	37.9 (27.7 - 49.0)	12.9 (4.5 - 27.1)	24.2 (11.1 - 42.3)	10.0 (0.5 - 39.4)
102	17.1 (14.0 - 20.6)	14.9 (7.7 - 25.0)	25.0 (9.0 - 48.4)	16.7 (6.4 - 32.8)	20.0 (3.7 - 50.7)
103	23.5 (20.5 - 26.7)	21.6 (14.5 - 30.1)	23.1 (10.6 - 40.5)	20.3 (11.0 - 32.8)	0.0 (0.0 - 45.1)
104	16.7 (14.4 - 19.2)	15.8 (9.1 - 24.7)	13.3 (6.8 - 22.8)	16.1 (8.0 - 27.7)	33.3 (1.7 - 86.5)
105	23.2 (20.0 - 26.7)	21.5 (13.1 - 32.2)	20.5 (13.1 - 29.9)	39.0 (24.2 - 55.5)	25.0 (1.3 - 75.1)
106	24.2 (21.7 - 26.9)	17.3 (10.4 - 26.3)	12.5 (4.4 - 26.4)	24.3 (14.8 - 36.0)	16.1 (6.6 - 31.0)
107	16.3 (14.2 - 18.5)	15.0 (9.9 - 21.3)	18.2 (3.3 - 47.0)	15.1 (6.7 - 27.6)	23.8 (9.9 - 43.7)
108	37.3 (32.9 - 41.9)	43.8 (26.4 - 62.3)	33.0 (25.1 - 41.7)	55.6 (35.3 - 74.5)	56.3 (33.3 - 77.3)
109	26.0 (22.7 - 29.6)	29.8 (18.4 - 43.4)	13.0 (3.7 - 30.4)	31.7 (20.6 - 44.7)	18.8 (5.3 - 41.7)
110	25.9 (22.6 - 29.3)	28.1 (17.0 - 41.5)	19.7 (12.1 - 29.5)	25.9 (15.3 - 39.0)	28.6 (13.2 - 48.7)
111	15.4 (12.2 - 19.2)	4.0 (0.5 - 13.7)	40.0 (7.6 - 81.1)	21.2 (9.0 - 38.9)	20.0 (3.7 - 50.7)
112	29.8 (26.1 - 33.8)	23.2 (14.6 - 33.8)	20.0 (9.8 - 34.3)	27.5 (15.9 - 41.7)	50.0 (22.2 - 77.8)
113	24.6 (19.7 - 30.1)	24.2 (11.1 - 42.3)	23.8 (9.9 - 43.7)	30.0 (6.7 - 65.2)	33.3 (1.7 - 86.5)
114	29.1 (26.0 - 32.3)	32.1 (24.9 - 39.9)	16.7 (3.0 - 43.8)	26.0 (16.5 - 37.6)	37.5 (11.1 - 71.1)

Figure 23a. Excess Length of Stay – All patients excluding deaths (odd numbered IDs)

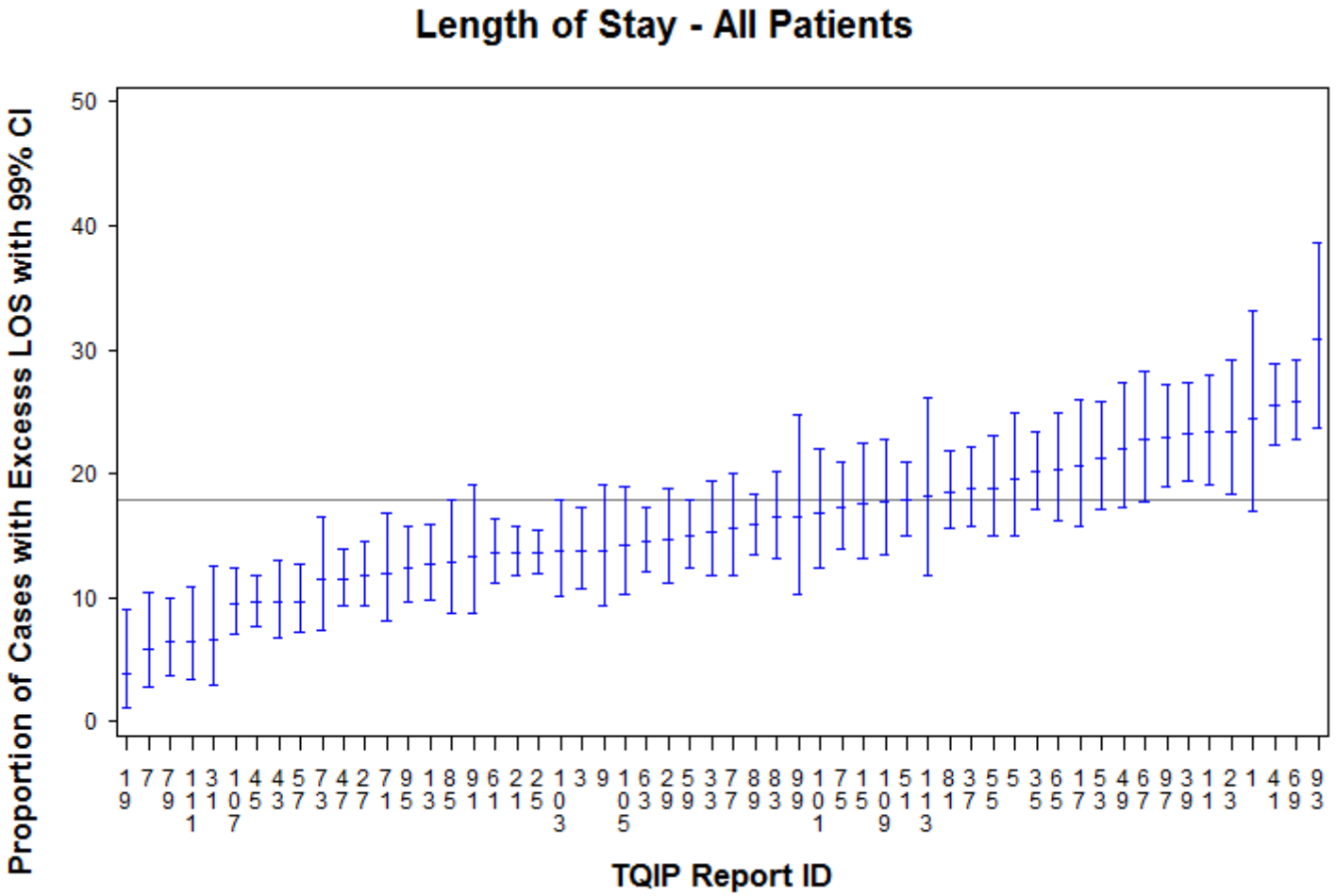


Figure 23b. Excess Length of Stay – All patients excluding deaths (even numbered IDs)

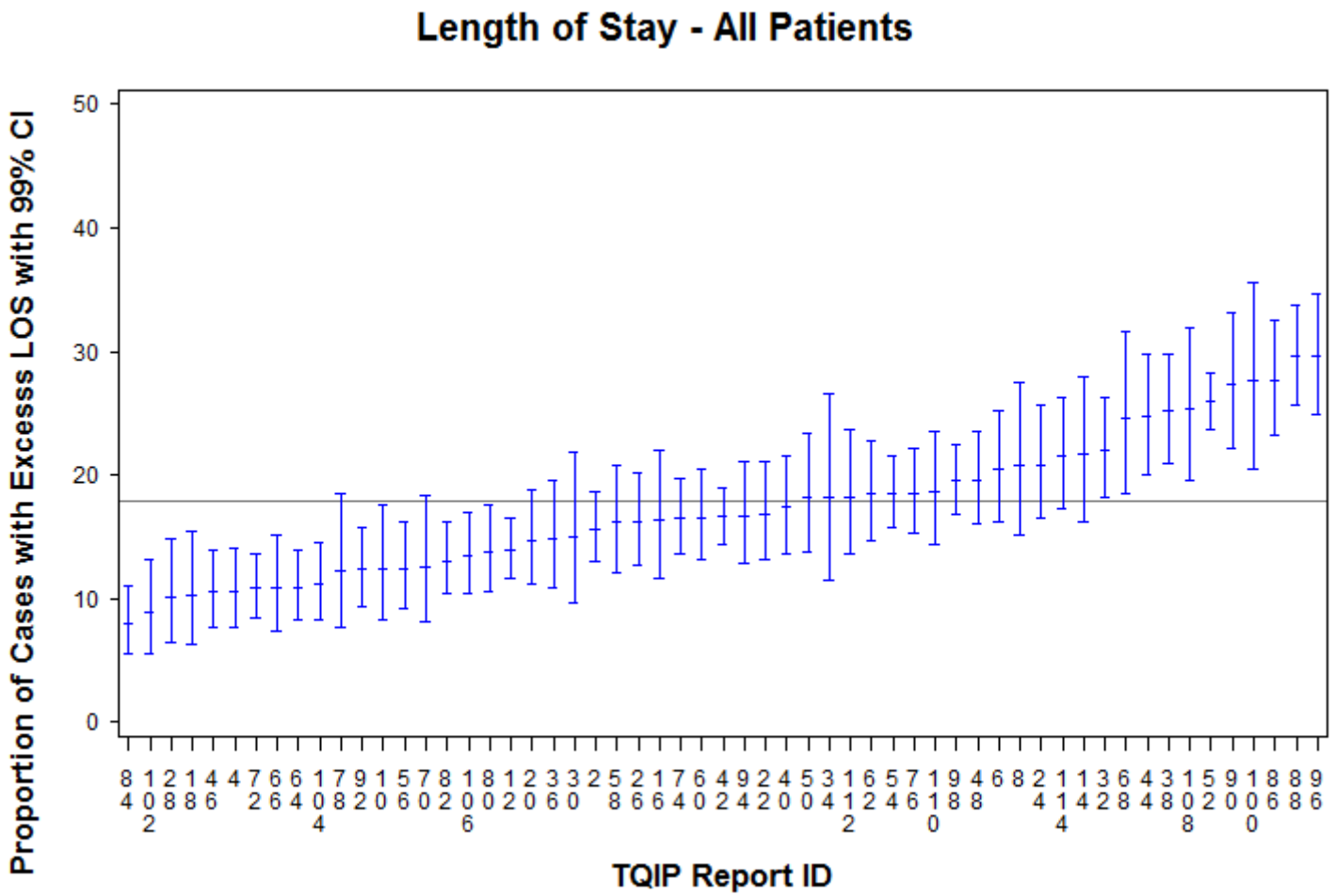
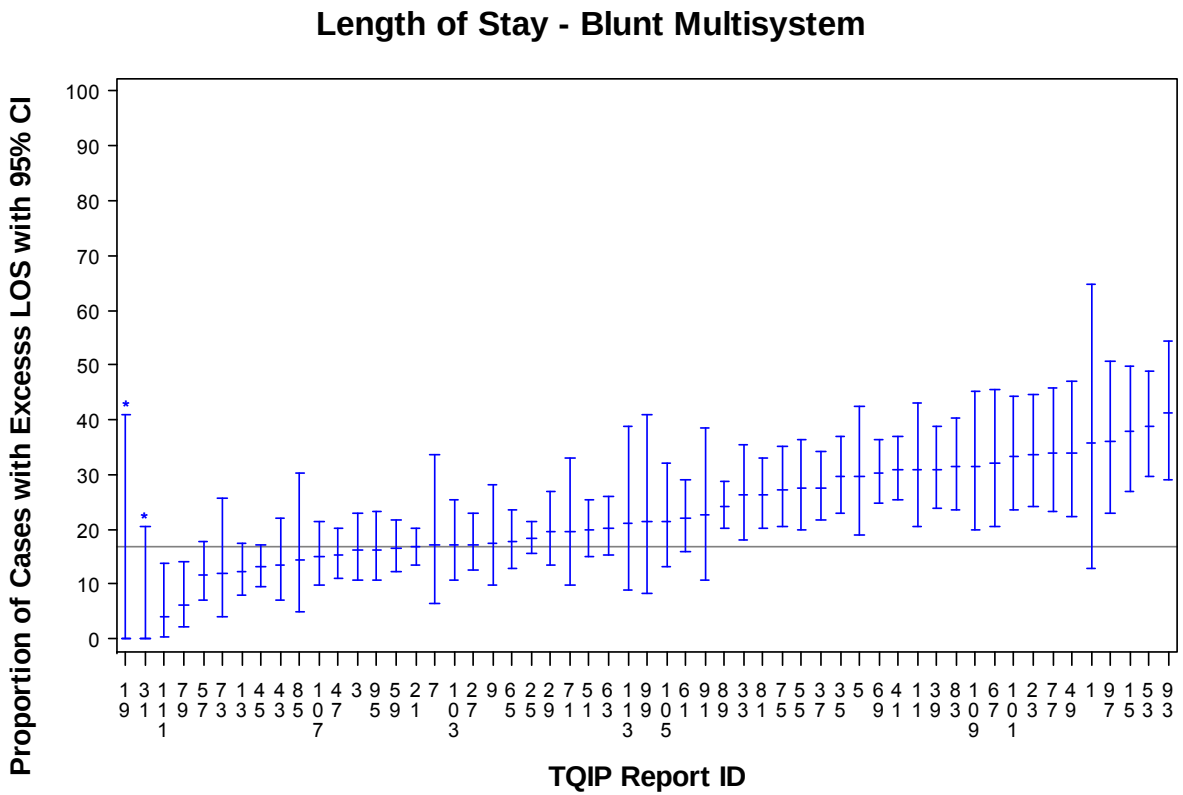
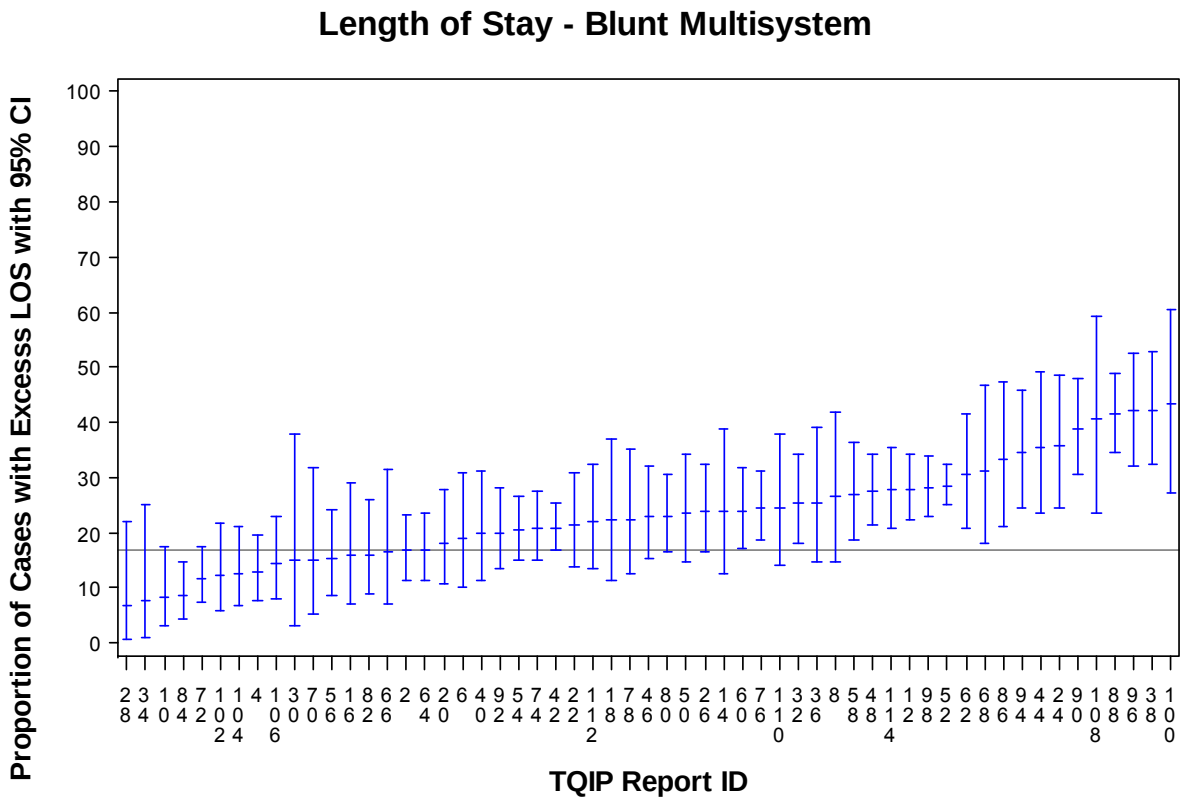


Figure 24a. Excess Length of Stay – Blunt multisystem excluding deaths (odd numbered IDs)



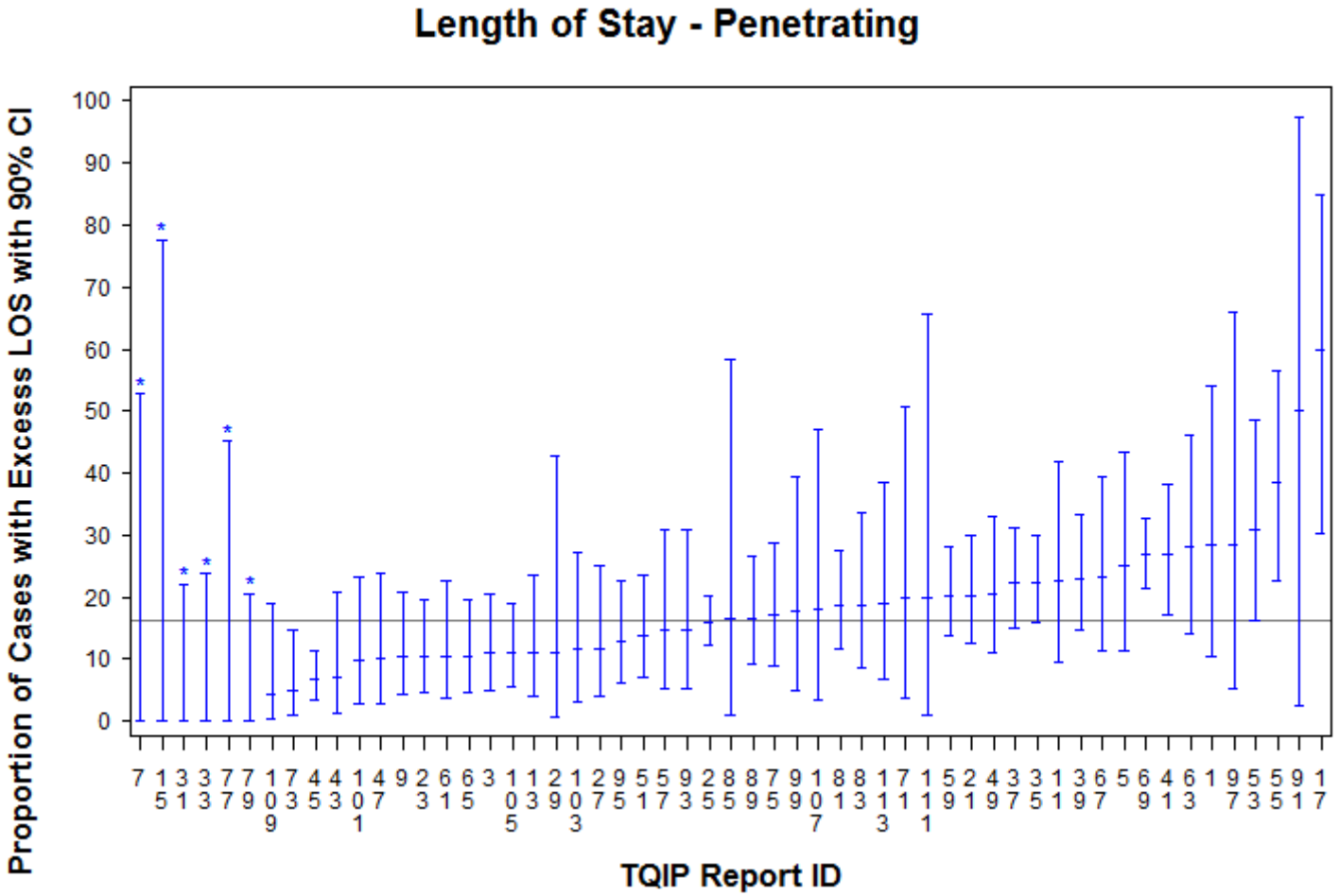
* Centers with estimated ELOS proportion of zero.

Figure 24b. Excess Length of Stay – Blunt multisystem excluding deaths (even numbered IDs)



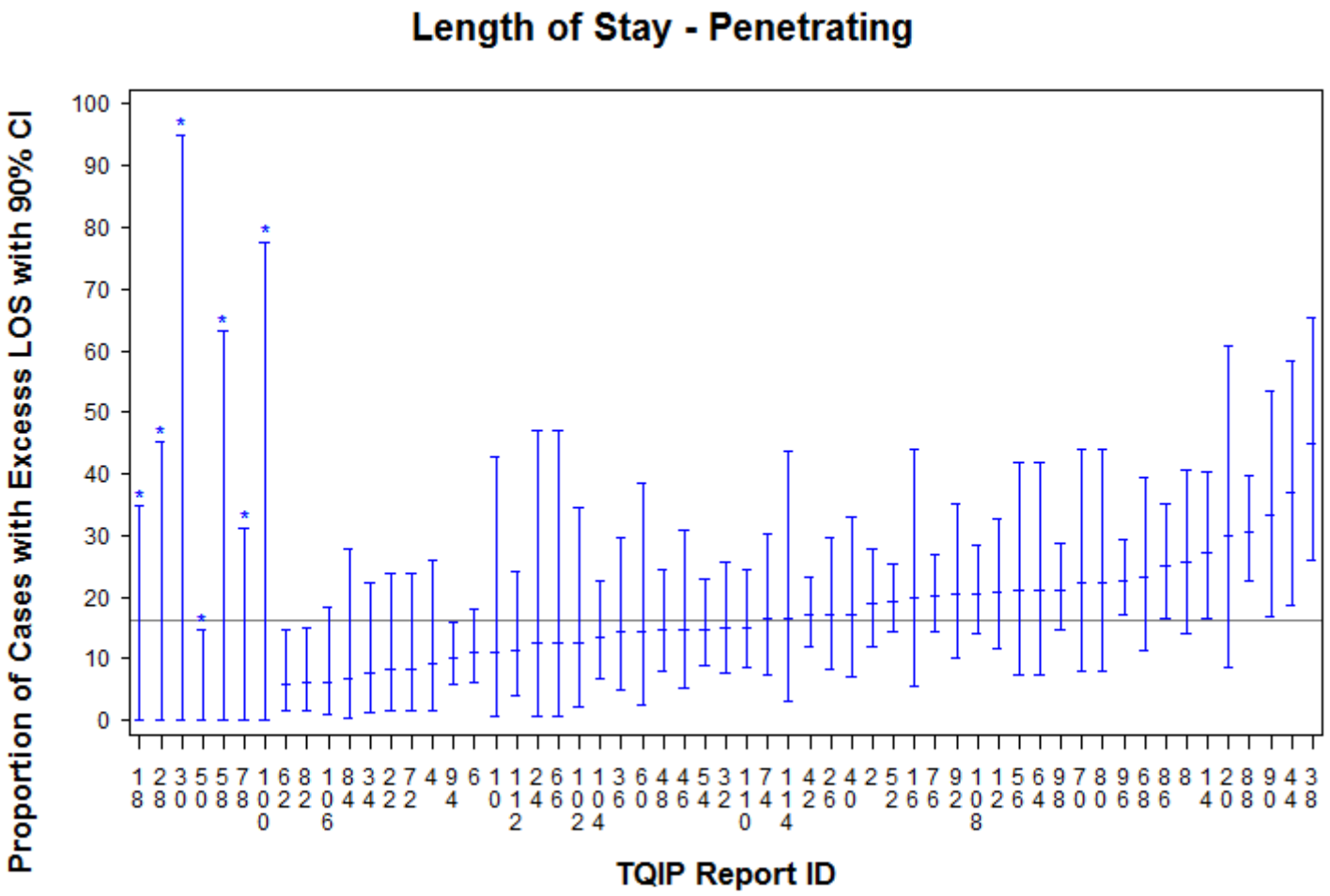
* Centers with estimated ELOS proportion of zero.

Figure 25a. Excess Length of Stay – Penetrating excluding deaths (odd numbered IDs)



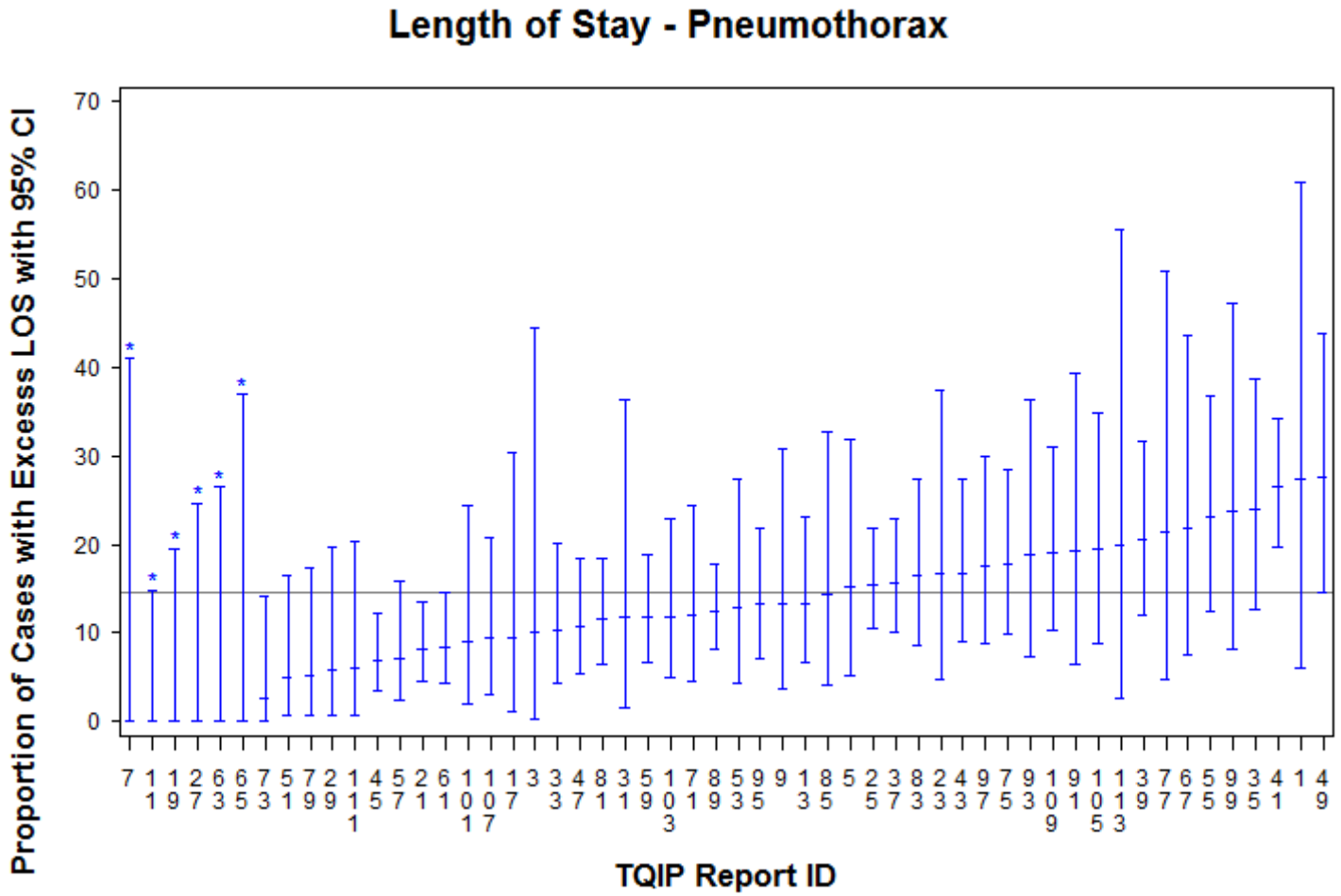
* Centers with estimated ELOS proportion of zero.

Figure 25b. Excess Length of Stay – Penetrating excluding deaths (even numbered IDs)



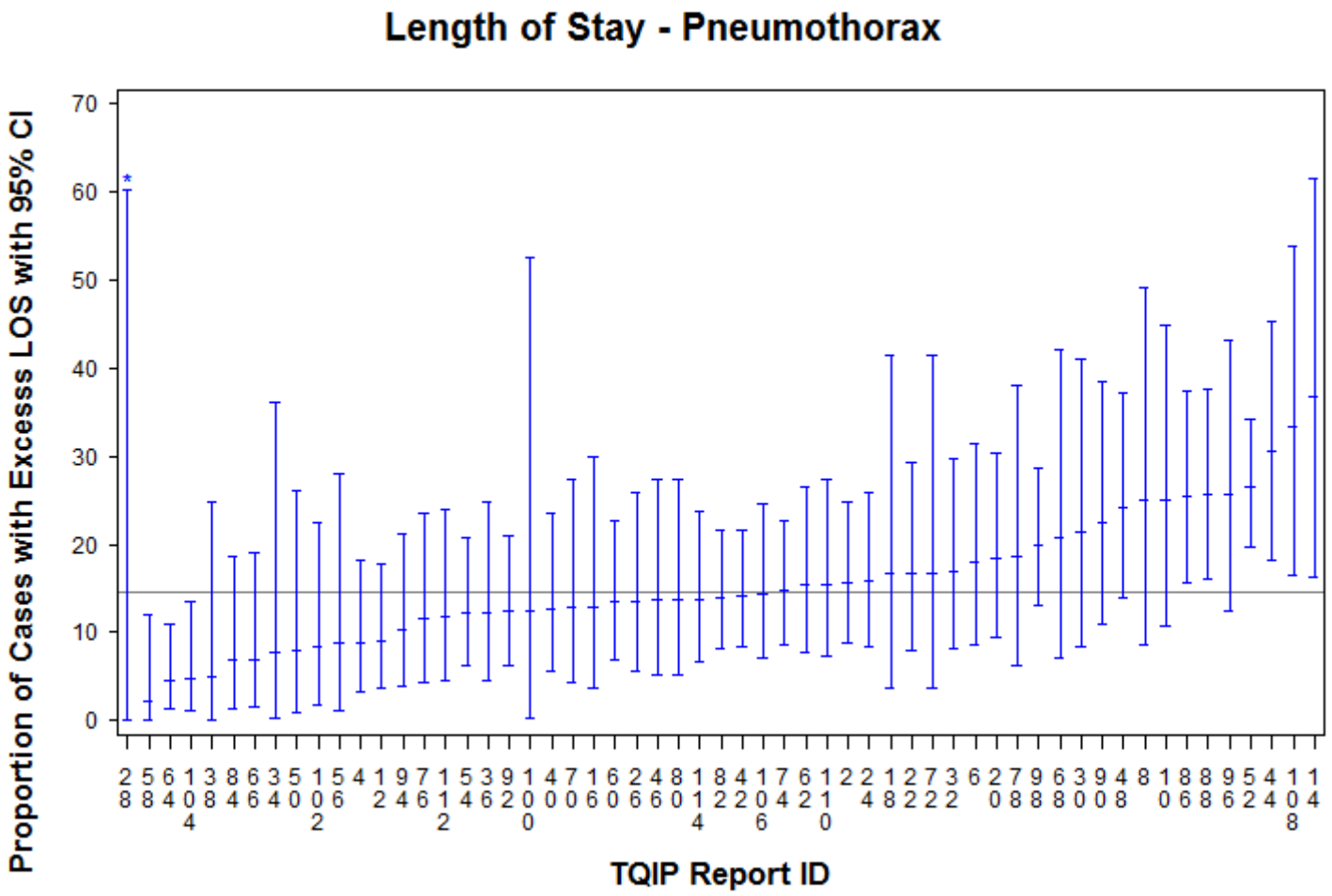
* Centers with estimated ELOS proportion of zero.

Figure 26a. Excess Length of Stay – Isolated pneumothorax excluding deaths (odd numbered IDs)



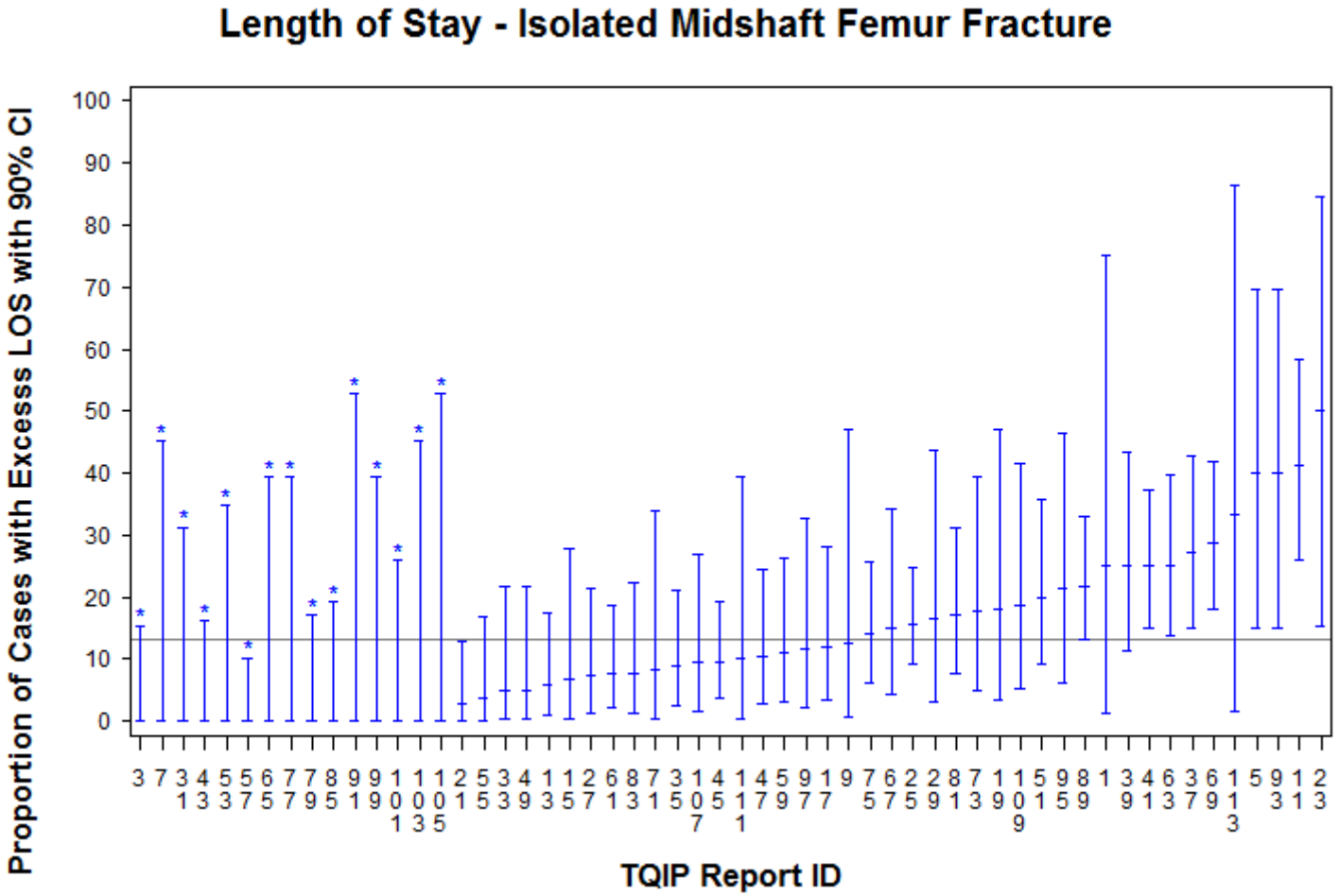
* Centers with estimated ELOS proportion of zero.

Figure 26b. Excess Length of Stay – Penetrating excluding deaths (even numbered IDs)



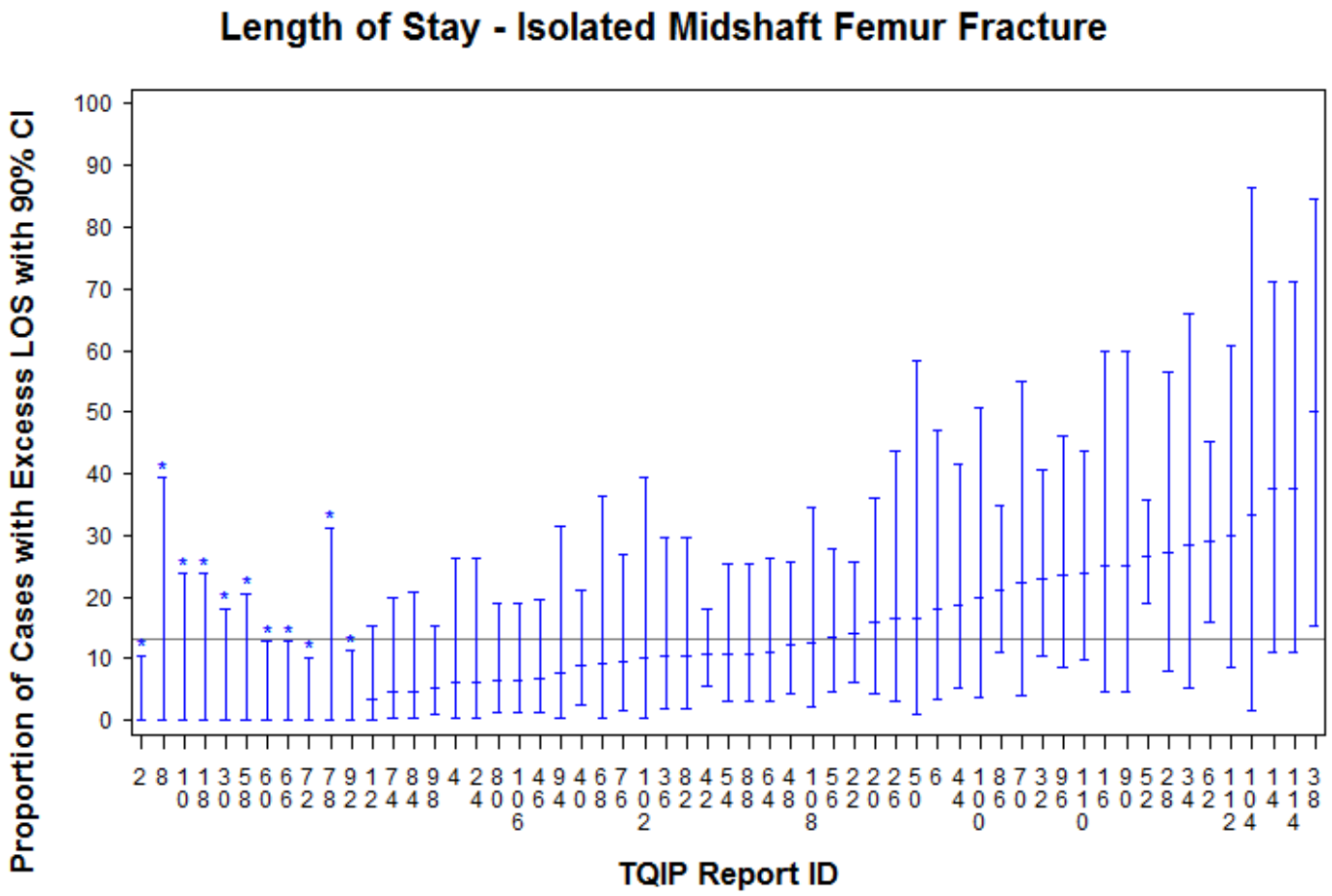
* Centers with estimated ELOS proportion of zero.

Figure 27a. Excess Length of Stay – Isolated mid-shaft femur fracture excluding deaths (odd numbered IDs)



* Centers with estimated ELOS proportion of zero.

Figure 27b. Excess Length of Stay – Isolated mid-shaft femur fracture excluding deaths (even numbered IDs)



* Centers with estimated ELOS proportion of zero.

Appendix A: Participating Hospitals

Advocate Condell Medical Center
Advocate Good Samaritan
Advocate Good Shepherd Hospital
Advocate Illinois Masonic Medical Center
Advocate Lutheran General Hospital
Akron City Hospital
Alaska Native Medical Center
AtlantiCare Regional Medical Center
Banner Good Samaritan Medical Center
Barnes-Jewish Hospital
Baylor University Medical Center Houston
Baystate Medical Center
Borgess Medical Center
Bronson Methodist Hospital
Carolinas Medical Center
Cedars-Sinai Medical Center
Charleston Area Medical Center
Christiana Care Health System
Deaconess Hospital, Inc.
Doctors Medical Center
East Texas Medical Center
Fletcher Allen Health Care
Genesys Regional Medical Center
Grady Memorial Hospital
Greenville Memorial Hospital
Hennepin County Medical Center
Henry Ford Hospital and Health System
Hospital of the University of Pennsylvania
Huntington Memorial Hospital
Hurley Medical Center
Indiana University Health Methodist
Inova Fairfax Hospital
Iowa Methodist Medical Center
IU/Wishard Memorial Hospital
John C. Lincoln Hospital
John Muir Medical Center - Walnut Creek Campus
Lahey Clinic
Lancaster General Hospital
Lee Memorial Hospital
Lehigh Valley Hospital
Loyola University Medical Center
LSU Hospital/Spirit of Charity Trauma Center
Pitt County Memorial Hospital
POH Regional Medical Center
R Adams Cowley Shock Trauma Center
Regional Medical Center of San Jose
Research Medical Center
Riverside Regional Medical Center (CA)
Riverside Regional Medical Center (VA)
Robert Wood Johnson University Hospital
Rockford Health System
Saint Louis University Hospital
Saint Mary's Health Care
Saint Mary’s Hospital
Santa Barbara Cottage Hospital
Scott & White Memorial Hospital
Scottsdale Healthcare Osborn Medical Center
Scripps Mercy Hospital
Sentara Norfolk General Hospital
Sharp Memorial Hospital
Sinai-Grace Hospital
Spartanburg Regional Healthcare System
St. Elizabeth Health Center
St. Joseph Mercy Hospital - Ann Arbor
St. Joseph's Hospital and Medical Center
St. Luke's Adult Level I Trauma Center
St. Mary's Medical Center
St. Michael's Hospital
St. Vincent Healthcare
St. Vincent Mercy Medical Center
Stanford University Medical Center
Stormont-Vail Regional Medical Center
Sunrise Hospital and Medical Center
The Queen's Medical Center
Truman Medical Center
UC San Diego Medical Center
UCLA
UMASS Memorial Medical Center
University Hospital - Cincinnati
University Medical Center - Lubbock
University Medical Center of Southern NV
University of Kansas Hospital
University of Kentucky Healthcare Enterprise
University of Michigan

Maine Medical Center
Medical Center of the Rockies
Medical University Medical Authority
Memorial Health University Medical Center
Memorial Hermann Hospital System
Memorial Medical Center - Modesto
Moses Cone Hospital
Munson Medical Center
New Hanover Regional Medical Center
North Colorado Medical Center
North Shore University Hospital
OSF St. Anthony Medical Center
Palomar Medical Center
Parkland Health and Hospital System
Parkview Trauma Center
University of Mississippi Medical Center
University of Missouri Health System
University of New Mexico Hospitals
University of North Carolina Hospitals
University of Texas Medical Branch, Galveston
University of Utah Hospitals & Clinics
University of Virginia Health System
Ventura County Medical Center
Virginia Commonwealth University Medical Center
Wake Forest University Baptist Medical Center
Washington Hospital Center
West Virginia University Trauma Center
Yale-New Haven Hospital
York Hospital

Appendix B: ACS TQIP Patient Inclusion/Exclusion Criteria

Inclusion Criteria: (must meet all of the following criteria)

- Age ≥ 16 years
- At least one valid trauma ICD-9 code in the range of 800–959.9 (excluding late effects (905-909.9), superficial injuries (910-924.9), and foreign bodies (930-930.9).
- Primary mechanism of injury classified as either blunt or penetrating:
    - Blunt is defined as an injury where the primary E-code is mapped to the following categories: fall, machinery, motor vehicle traffic, pedestrian, cyclist, and struck by or against
    - Penetrating is defined as an injury where the primary E-code is mapped to the following categories: cut/pierce and firearm
- Severely injured patients with at least one AIS ≥ 3:
    - For blunt injuries: at least one injury in any of the following AIS body regions: head, face, neck, thorax, abdomen, spine, or upper and lower extremity.
    - For penetrating injuries: at least one AIS ≥ 3 injury in any of the following AIS body regions: neck, thorax, and abdomen.
- Injury severity score (ISS)* ≥ 9
- ED discharge disposition AND hospital discharge disposition cannot both be unknown.

Exclusion Criteria:

- Comorbidity: pre-existing advanced directive to withhold life sustaining interventions
- Isolated hip fractures: defined as any traumatic injury with at least one of the following diagnosis codes:
    - 851810.3 Femur, Fracture, Intertrochanteric
    - 851812.3 Femur, Fracture, Neck
    - 851818.3 Femur, Fracture, Subtrochanteric

  AND all other injuries are in AIS body region 'External' (i.e., bruise, abrasion, or laceration). Inclusion was further limited to patients 65 years or older with an injury with mechanism of Fall.

*AIS and Injury severity score (ISS) were calculated by NTDB using ICD-90 map *only* if participating center did not provide AIS in NTDB data submission.

Appendix C: Prediction Models

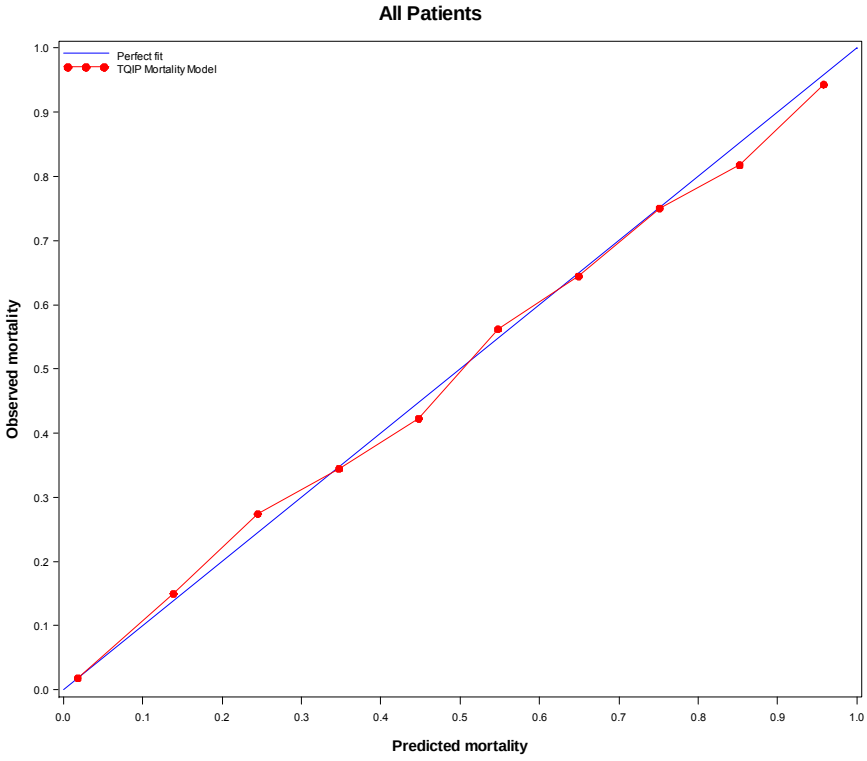
Mortality
The following explanatory variables were included in the stepwise selection procedure for mortality prediction models for all patients, and the sub-populations of blunt multisystem and penetrating injuries:

- Initial GCS motor score in ED
- Initial systolic BP in ED
- Initial pulse rate in ED
- Mechanism of injury
- Number of co-morbidities
- Transfer status
- Age (linear and quadratic terms)
- Gender
- Head injury severity (AIS)
- Neck injury severity (AIS)
- Chest injury severity (AIS)
- Abdominal injury severity (AIS)
- Lower extremity injury severity (AIS)
- Spine injury severity (AIS)
- Single Worst Injury (SWI)*

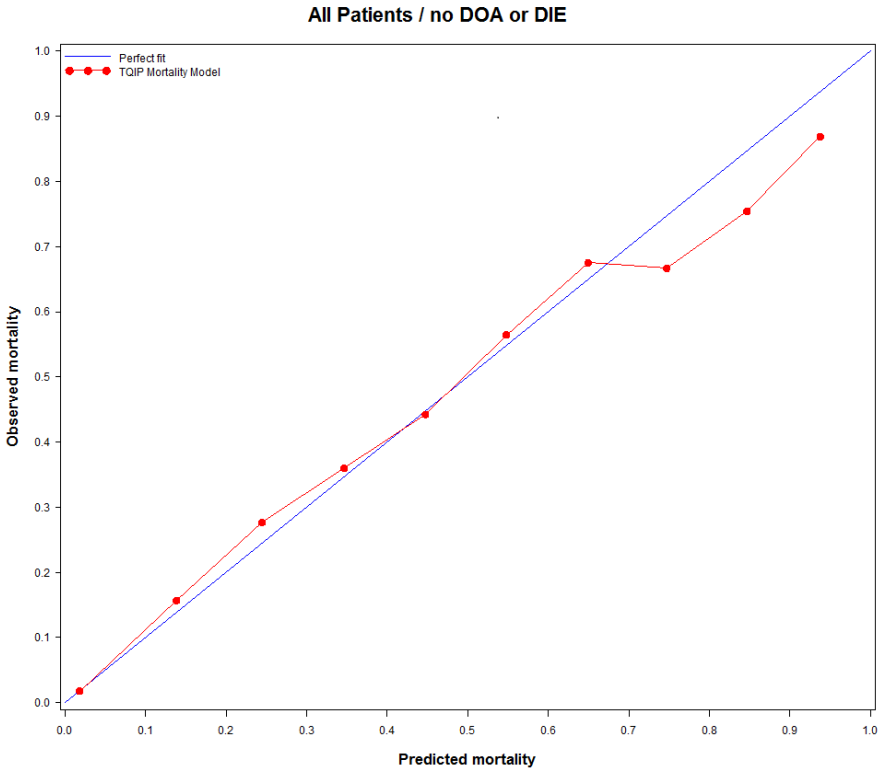
*The SRR is the number of patients with a particular ICD-9 code who survive divided by the total number of patients who had that ICD-9 code. SRRs were derived only for codes in the 800 – 959.9 range (consistent with acute injury diagnosis). SRRs were estimated for each injury diagnosis and the lowest SRR for each patient was used in the model. This lowest SRR is referred to as the SWI for mortality – single worst injury.

Model calibration and discrimination
Model calibration is used to measure how closely the number of observed deaths agrees with the number of predicted deaths across each decile of mortality risk. A calibration curve that is closer to the perfect fit indicates better model fit. Calibration curves, along with their C-statistic, are shown below. The C-statistic reflects the ability of the model to discriminate between survivors and deaths. A C-statistic of 0.5 indicates the model has a discrimination power no better than the flip of a coin; a C value between 0.6 and 0.7 has a limited discrimination power; a C value between 0.7 and 0.8 implies a moderate discrimination power; and a C value of 1.0 indicates the model has perfect discrimination power. For a model to have acceptable discrimination power, the C-statistic must exceed 0.7.

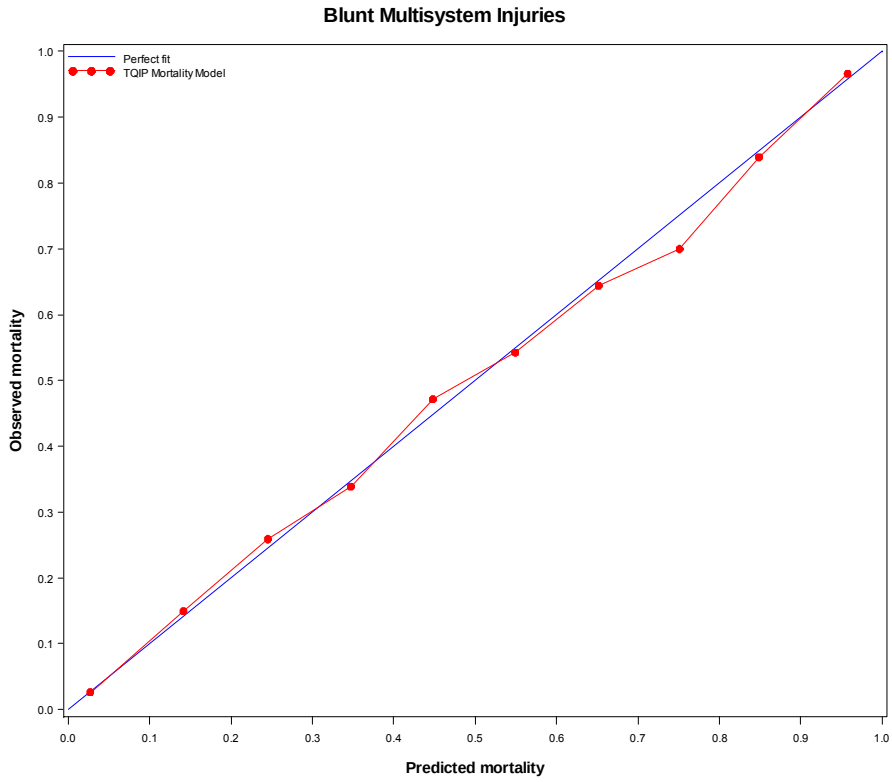
All patients including those classified as DOA or died in the ED
Model discrimination: C-statistic 0.932



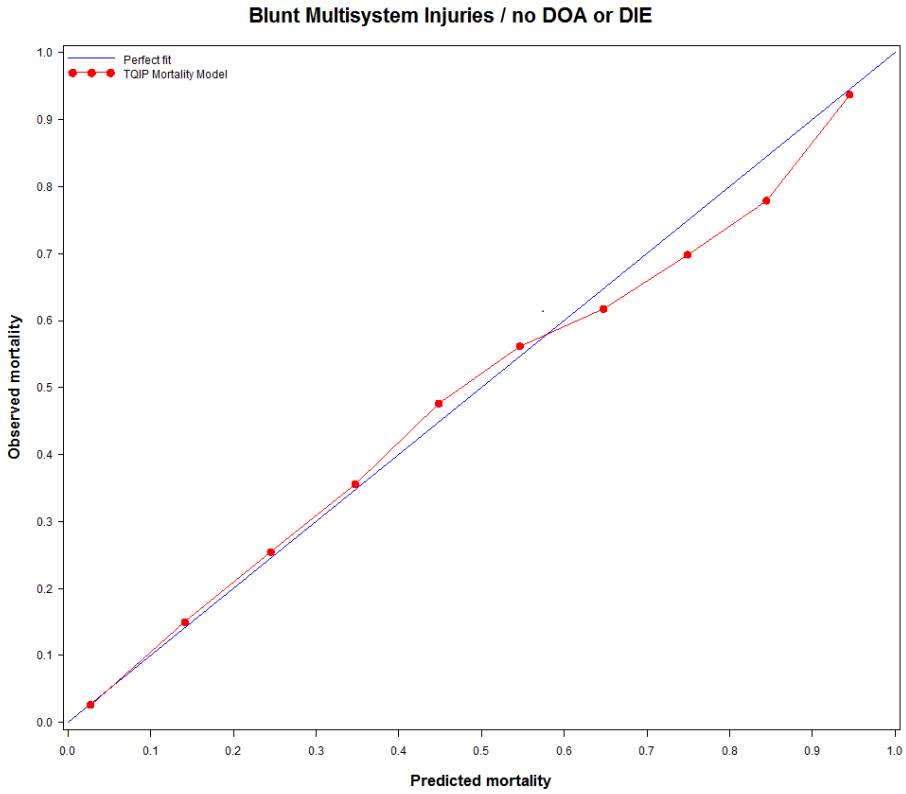
All patients excluding those classified as DOA or died in the ED
Model discrimination: C-statistic 0.915



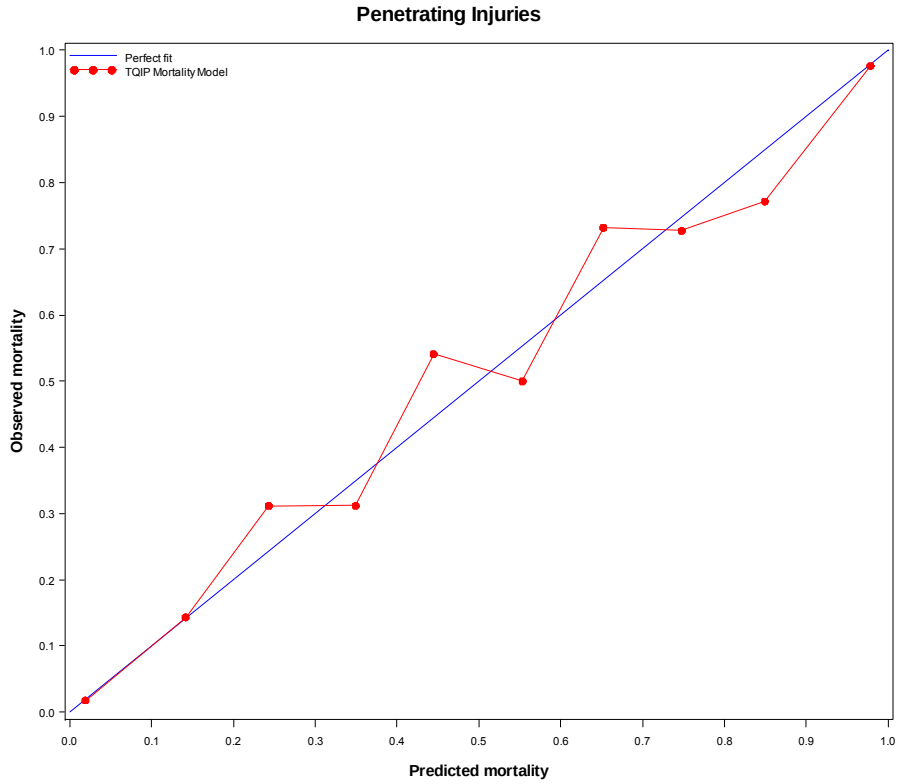
Blunt multisystem injuries including those classified as DOA or died in the ED
Model discrimination: C-statistic=0.913



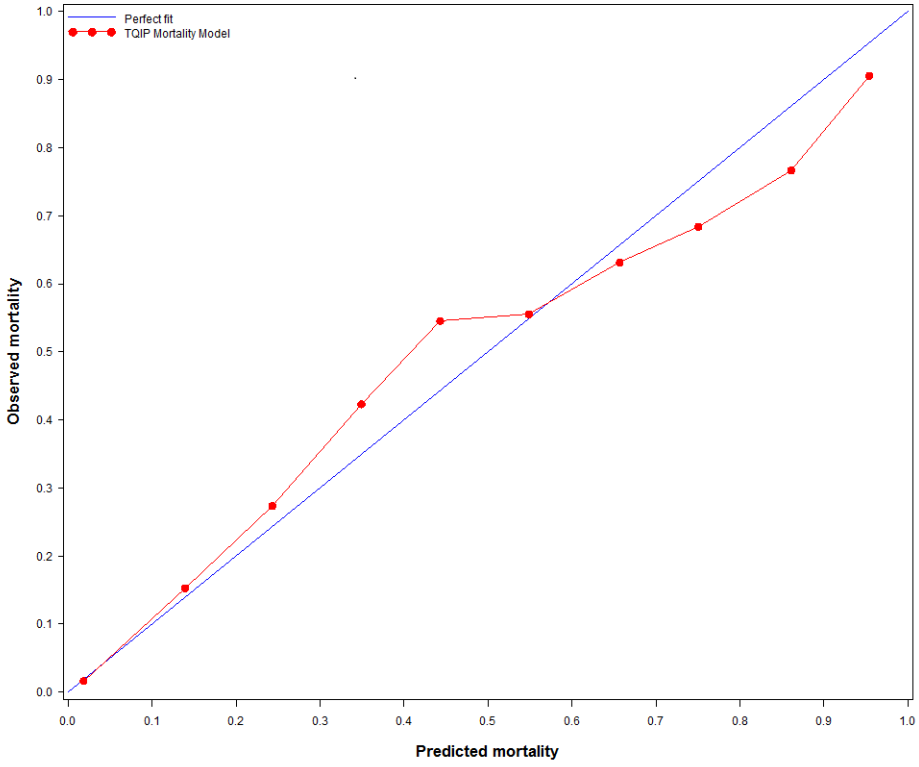
Blunt multisystem injuries excluding those classified as DOA or died in the ED
Model discrimination: C-statistic=0.895



Penetrating injuries including those classified as DOA or died in the ED
Model discrimination: C-statistic=0.969



Penetrating injuries excluding those classified as DOA or died in the ED
Model discrimination: C-statistic=0.936



Length of Stay

The following explanatory variables were included in the length of stay prediction models for all patients, and the sub-populations of blunt multisystem, penetrating, isolated pneumothorax, and isolated mid-shaft femur fracture injuries:

- Initial GCS motor score in ED
- Initial systolic BP in ED
- Initial pulse rate in ED
- Mechanism of injury
  Co-morbidities
- Complications
- Transfer status
- Age
- Payment type
- Gender
- Head injury severity (AIS)
- Neck injury (AIS)
- Chest injury severity (AIS)
- Abdominal injury severity (AIS)
- Lower extremity injury severity (AIS)
- Spine injury severity (AIS)

In addition to the variables listed above, injury severity adjustment variables were included in the model based on the ICD-9 injury diagnoses. A median LOS was estimated for each ICD-9 injury code. Each ICD-9 code was then assigned a weight based on its median LOS divided by the median LOS for the entire TQIP population. For each patient, the weights of the ICD-9 codes associated with the longest LOS were included in the model.

Model Fit

Generalized linear models with a negative binomial distributions and zero truncation were used to predict LOS. The degree of overdispersion did not permit the use of Poisson models. Manual backwards elimination of prediction variables in the model was used to identify the final model using all patients. The fit of the model was assessed by comparing the observed and expected number of cases with an ELOS.

Appendix D:

TQIP Team

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