TBI and Anticoagulation Decision Support

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M·TQIP

Clinical Decision Support Intervention Decreases Time to Imaging in Elderly Patients with Traumatic Brain Injuries
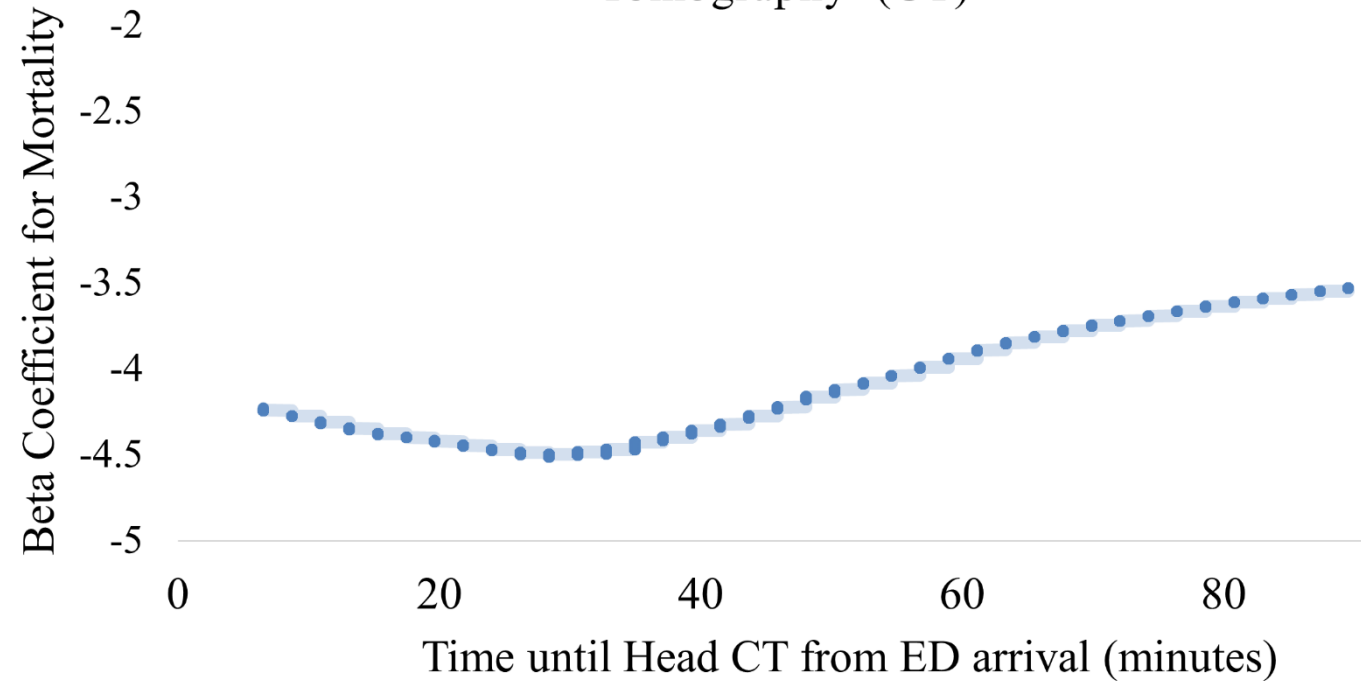
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Conflicts of Interest

No conflicts of interest or disclosures

Early Imaging Improves Survival for Elderly Patients with Mild Traumatic Brain Injuries

Figure 2. Lowess Graph for time until Head Computed Tomography (CT)

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Early Imaging Improves Survival for Elderly Patients with Mild Traumatic Brain Injuries

Primary Outcome	Odds Ratio (OR)	95% CI	p value
All cause in-hospital mortality	0.58	0.35 – 0.95	0.03
Secondary Outcomes	**OR**	**95% CI**	**p value**
Any complication	0.96	0.76 – 1.2	0.8
Major complication	0.83	0.6 – 1.2	0.3
Received FFP within 4 hours for anticoagulated patients	1.5	1.04 – 2.2	0.03
	Incident Rate Ratio	**95% CI**	**p value**
Hospital length of stay	1.0	0.95 – 1.04	0.9
Time to neurosurgical intervention	0.76	0.48 – 1.2	0.2
ED length of stay	0.9	0.87 – 0.92	< 0.001

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Local needs assessment identifed long time to imaging

GOLD STANDARD

Historic time to imaging in ED:

Age > 70: 85 Minutes

21% were positive

ED Triage Nurse/Triage MD
Mechanism for TBI in patient ≥ 70 or anticoagulated

GCS <9 or deteriorating by 2
Full Trauma Activation
(see policy for full criteria)

GCS 9-12
Partial Trauma Activation
(see policy for full criteria)

GCS 13-15
Not Meeting Full/Partial Activation Criteria

TBI TRACK
STAT Head CT (CT Head Elderly Trauma Order)
within 45 minutes
STAT PTT/INR/CBC

CT Negative

CT Positive

Provider Discretion

Trauma Activation
Neurosurgery Consult
Trauma Surgery Consult

If Platelets <100k:
Consider platelet transfusion

If on Coumadin:
See anticoagulation reversal order set

If on Pradaxa:
5g idarucizumab
(Praxbind) IV STAT

If on Eliquis/Xarelto:
Kcentra STAT (35 U/kg, Max 3500 U)

Head CT Protocol and CDS-I Development

- Developed and integrated a radiology technician CDS-I
  - A radiology technician visualization triage tool was developed linked to the TBI track orderset which allows rapid identification of TBI CT orders in a sea of STAT imaging requests

- Protocol was developed, disseminated, and implemented by a multidisciplinary team in September 2018
  - Radiology, ED, Informatics, Surgery, Trauma, and Nursing

- Primary objective:
  - Reduce Time from ED arrival to head CT imaging < 35 minutes for highest risk patients (Age > 70 and on anticoagulants)

Intervention Associated With Significant Reduction in Time to Imaging
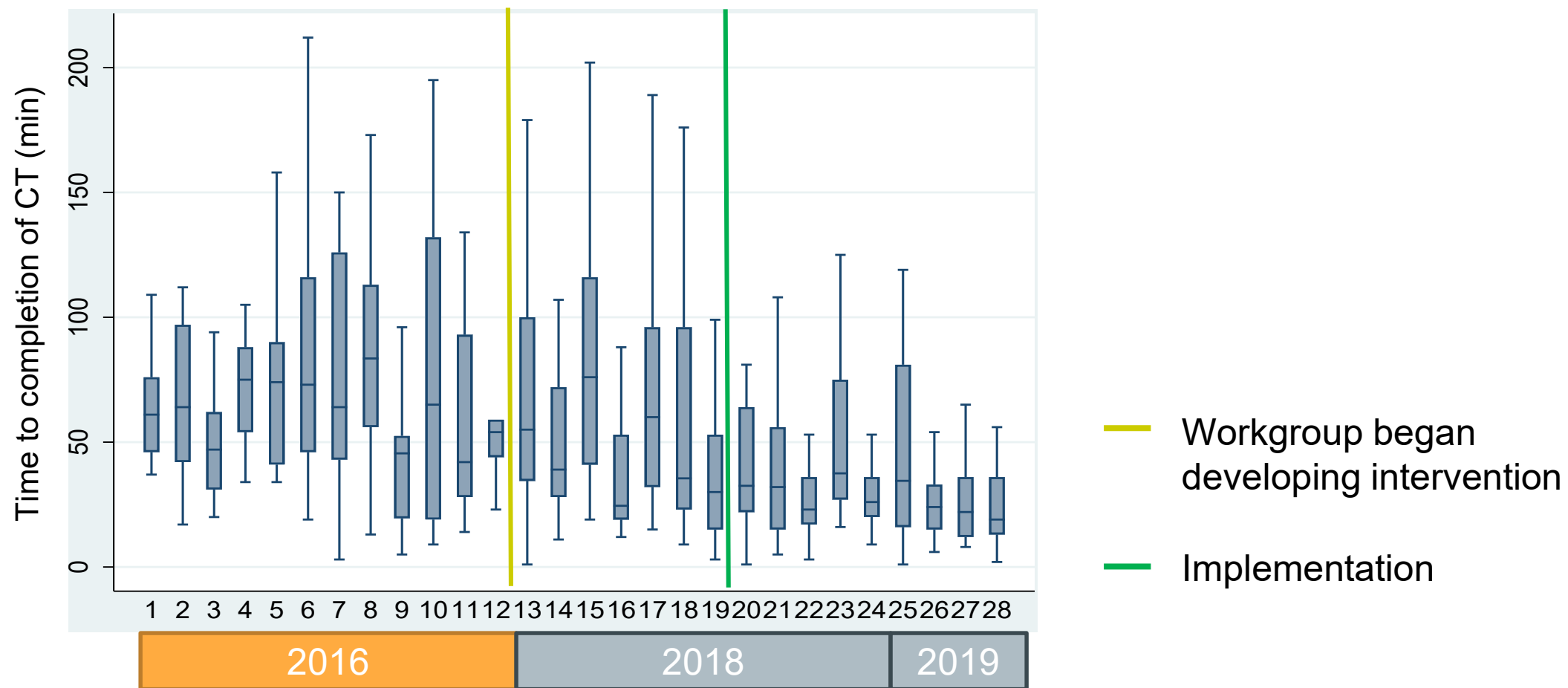
Patients 70 years or older AND on anticoagulants

Intervention Associated With Significant Reduction in Time to Imaging

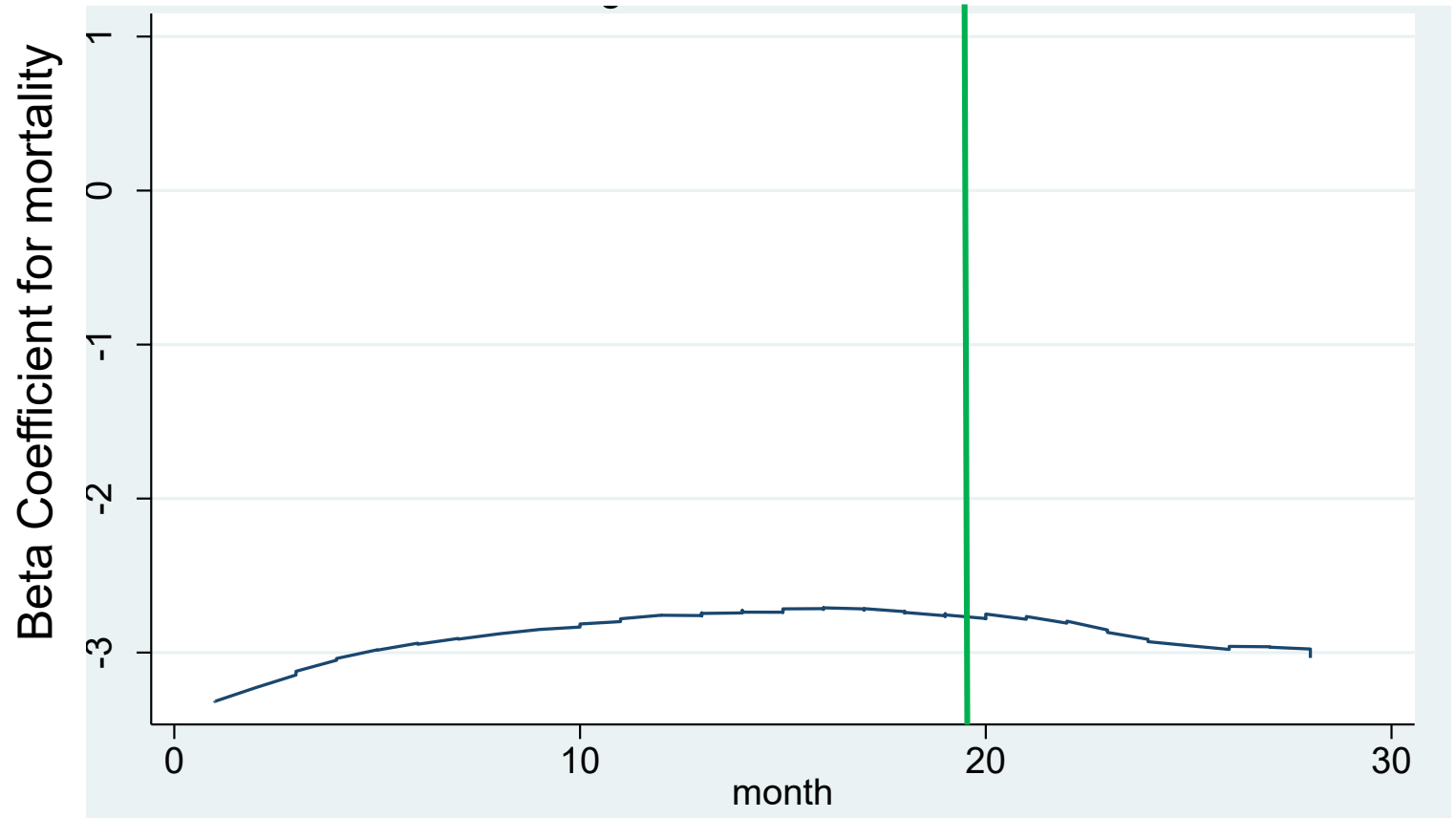|	IRR	95% CI	P value
All Patients	0.93	0.87 – 0.99	0.02
Age ≥ 70	0.78	0.71 – 0.86	< 0.001
Anticoagulation	0.65	0.56 – 0.74	< 0.001
Age ≥ 70 and Anticoagulation	0.59	0.51 – 0.68	< 0.001

Negative Binomial Regression

Secondary Outcomes (Patients 70+ and anticoagulation)

	Pre-intervention	Post-Intervention	p-value
N	269	182	
Minutes until imaging completion, median (IQR)	**56.0 (32.0, 93.0)**	**27.0 (16.0, 44.0)**	**<0.001**
Age, years, mean (SD)	83.3 (6.8)	83.0 (7.3)	0.64
Male, n (%)	117 (43.5%)	75 (41.2%)	0.63
ISS, median (IQR)	5.0 (2.0, 10.0)	5.0 (2.0, 9.0)	0.13
ED GCS, median (IQR)	15.0 (15.0, 15.0)	15.0 (15.0, 15.0)	0.20
ED SBP, mean (SD)	145.2 (27.9)	147.6 (24.6)	0.34
Race: White, n (%)	261 (97.4%)	176 (96.7%)	0.62
Black	3 (1.1%)	4 (2.2%)	
Other	4 (1.5%)	2 (1.1%)	
Died, n (%)	17 (6.3%)	8 (4.4%)	0.38
Hospital LOS, median (IQR)	**4.0 (2.0, 6.0)**	**3.0 (1.0, 5.0)**	**0.004**
ICU LOS, median (IQR)	3.0 (2.0, 5.0)	3.0 (2.0, 5.0)	0.60
Vent Days, median (IQR)	2.0 (1.0, 4.0)	2.0 (2.0, 4.0)	0.96
Intubation, n (%)	15 (5.6%)	5 (2.7%)	0.15
ICU Utilization, n (%)	58 (21.6%)	33 (18.1%)	0.37

Univariate analysis (T-test, Mann Whitney U, Chi Squared)

Secondary Outcomes Mortality (Patients 70+ and anticoagulation)

Mortality increasing over time in this population

Post-intervention decreased

Lowess plot for mortality per month

(y-axis: Beta Coefficient for mortality, x-axis: month)

Secondary Outcomes Mortality (Patients 70+ and anticoag)

Post-Intervention	OR / IRR	95% CI	P value
Mortality	0.88	0.3 – 2.3	0.8
Intubation	0.61	0.18-2.07	0.4
Hospital LOS	**0.83**	**0.72 – 0.86**	**0.01**
ICU LOS	0.96	0.71-1.3	0.8
Vent Days	0.8	0.36-1.8	0.6

Adjusted for age, injury severity score (ISS), GCS, gender, ED systolic blood pressure
*Race not adjusted for due to collinearity*

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Positive Head CT

	Positive Head CT	Positive Head CT and GCS 14-15
Age ≥ 70	248 (20.2%)	178 (72%)
Anticoagulation	98 (17%)	73 (75%)
Age ≥ 70 AND Anticoagulation	**78 (18%)**	**57 (73%)**
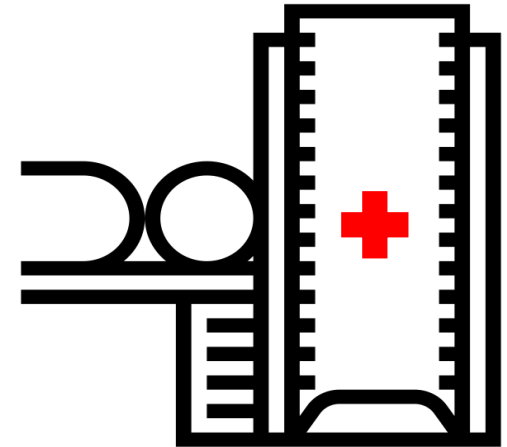
Trend towards reduced mortality in patients 70+ and on anticoagulation with a **positive** Head CT

Lowess plot for mortality per month
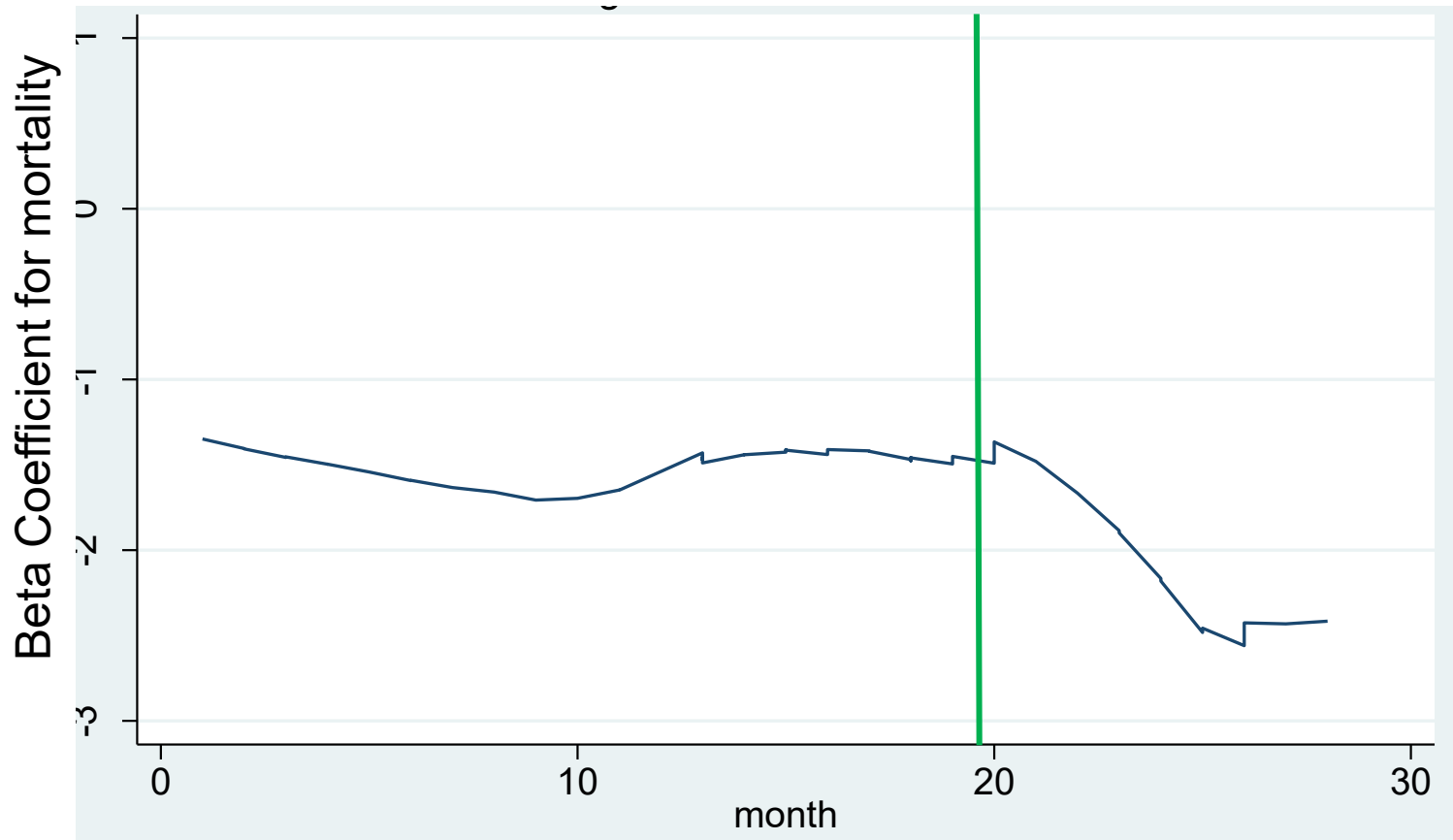
Outcomes among patients 70+ on anticoagulation with a positive head CT

Post-Intervention	OR / IRR	95% CI	P value
Mortality	0.27	0.03 – 2.2	0.2
Intubation	0.55	0.1-2.8	0.5
Hospital LOS	0.79	0.58 – 1.07	0.1
ICU LOS	0.92	0.64-1.31	0.6
Vent Days	1.06	0.42-2.71	0.9

Adjusted for age, injury severity score (ISS), GCS, gender, ED systolic blood pressure
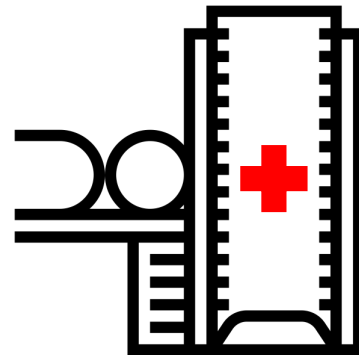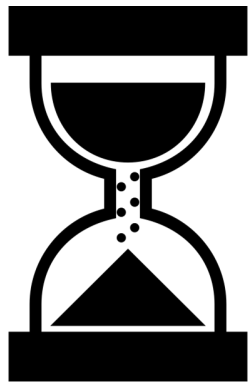*Race not adjusted for due to collinearity*

Conclusions

| Significantly reduced time to head CT for high risk populations with our protocol and CDS-I | Nearly 20% of elderly patients on anticoagulation with suspected head trauma will have a positive head CT

75% will have GCS 14-15 | Earlier imaging reduces hospital length of stay and may reduce mortality for highest risk population |

Hospital LOS

Questions