

Concurrent Hemorrhage and Traumatic Brain Injury Increases Mortality Three-Fold: Findings from a Prolonged Care Setting

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- The views and conclusions contained herein are those of the author(s) and should not be interpreted as representing the official policies or endorsements, either expressed or implied, of the U.S. Government.

Why South Africa?



Highest injury incidence globally
50% injuries penetrating
8x mortality to global average





World class
trauma care
with unique
innovations





Tiered health system
analogous to
US MIL Role 1, 2, 3.

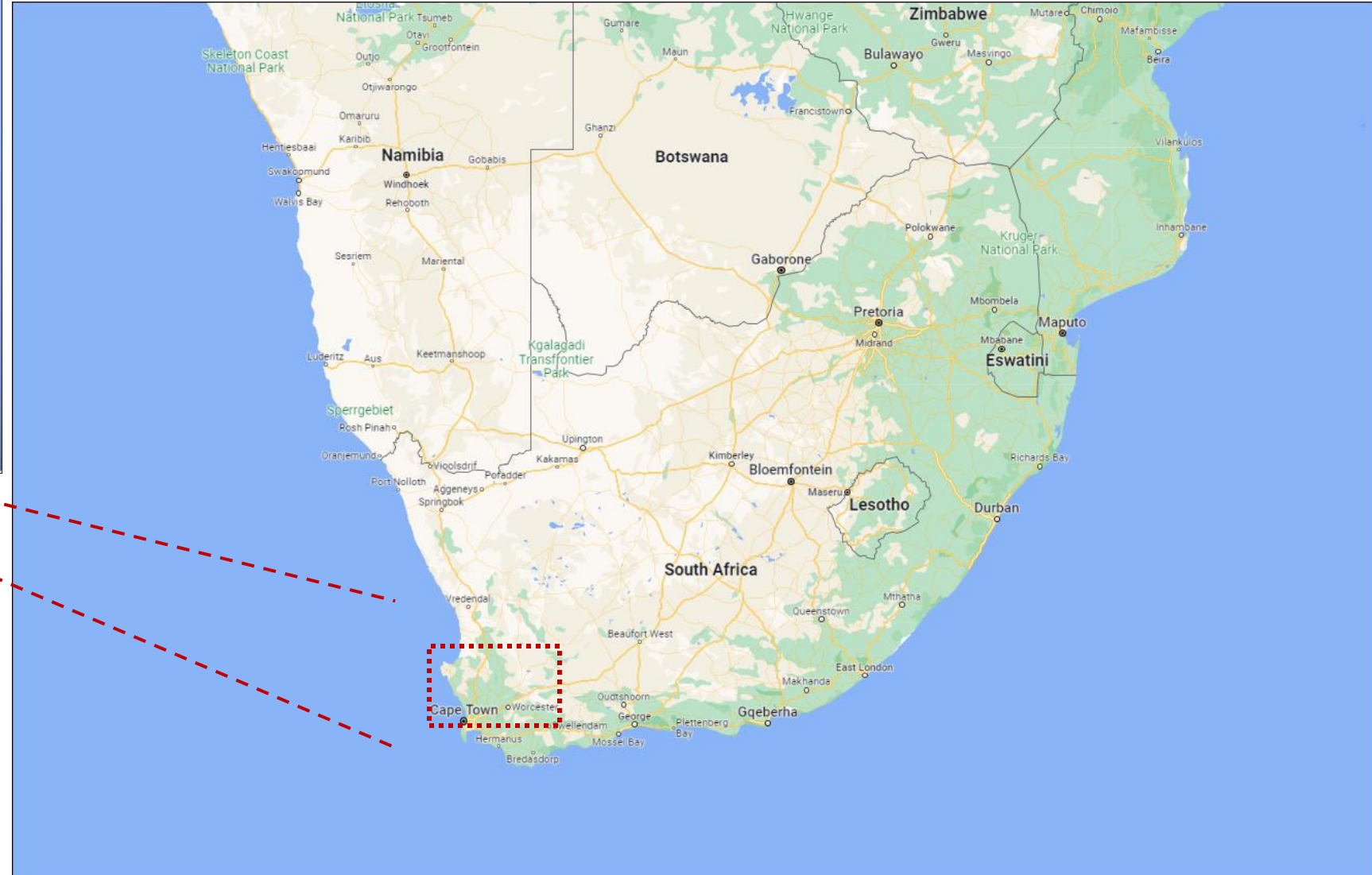
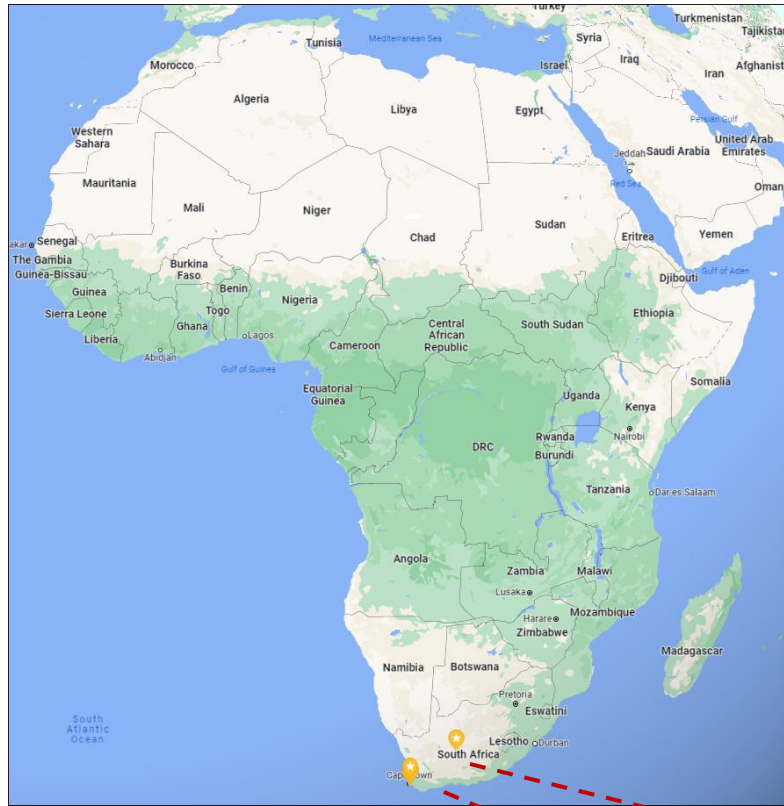


Epidemiology and Outcomes of Prolonged Trauma Care (Epic)

- Answers globally-relevant trauma questions
- Enrolls patients (age ≥ 18) from 12 sites in the Western Cape, South Africa
- Collects data on injuries, vital signs, labs, imaging, complications, outcomes and cause of death (approx. 3000 variables/patient)



South Africa – Trauma Epi-center



- ✚ Pathology Lab
- ★ Hospital Facility
- ★ Community Health Centre
- ★ EMS Facility



**Western Cape Government
Emergency Medical Services**
Site Lead: Craig Wylie



Tygerberg Hospital
Site Lead: Hendrick Lategan

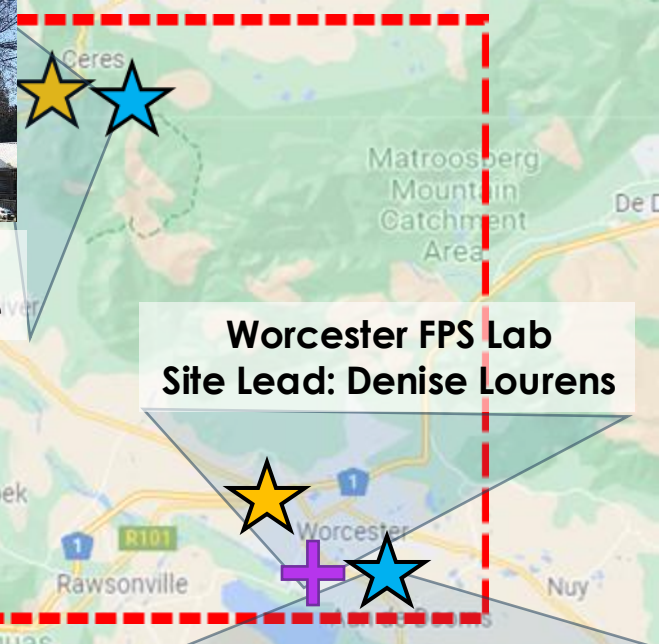
Tygerberg FPS Lab
Site Lead: Janette Verster



Delft Community Health Center
Site Lead: Loreal Snyders



Ceres Hospital
Site Lead: Karlien Doubelle



Worcester FPS Lab
Site Lead: Denise Lourens



Worcester Hospital
Site Lead: Lesley Hodsdon



**Khayelitsha Site-B
Community Health Center**
Site Lead: Leigh Wagner



Khayelitsha Hospital
Site Lead: Mohammed Mayet



EpiC Trauma Cohorts Study Objectives

- Describe the definitions, prevalence, clinical characteristics, critical interventions, and mortality across 3 key trauma cohorts:

Hemorrhage



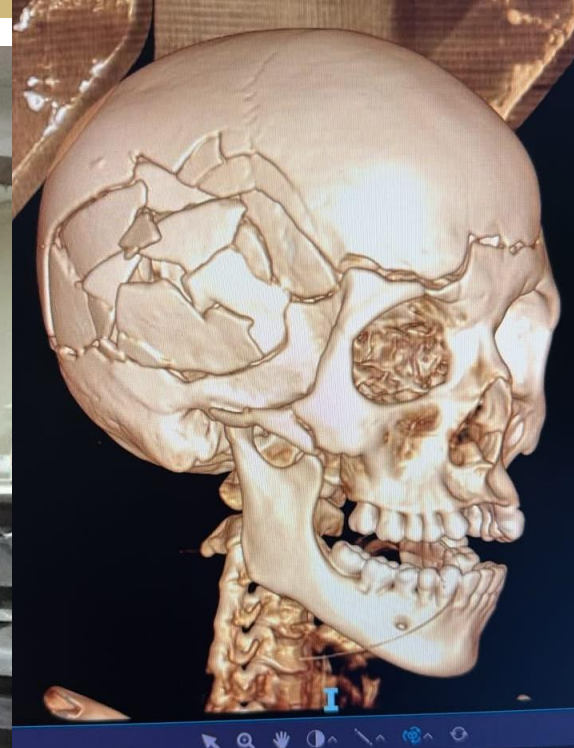
TBI



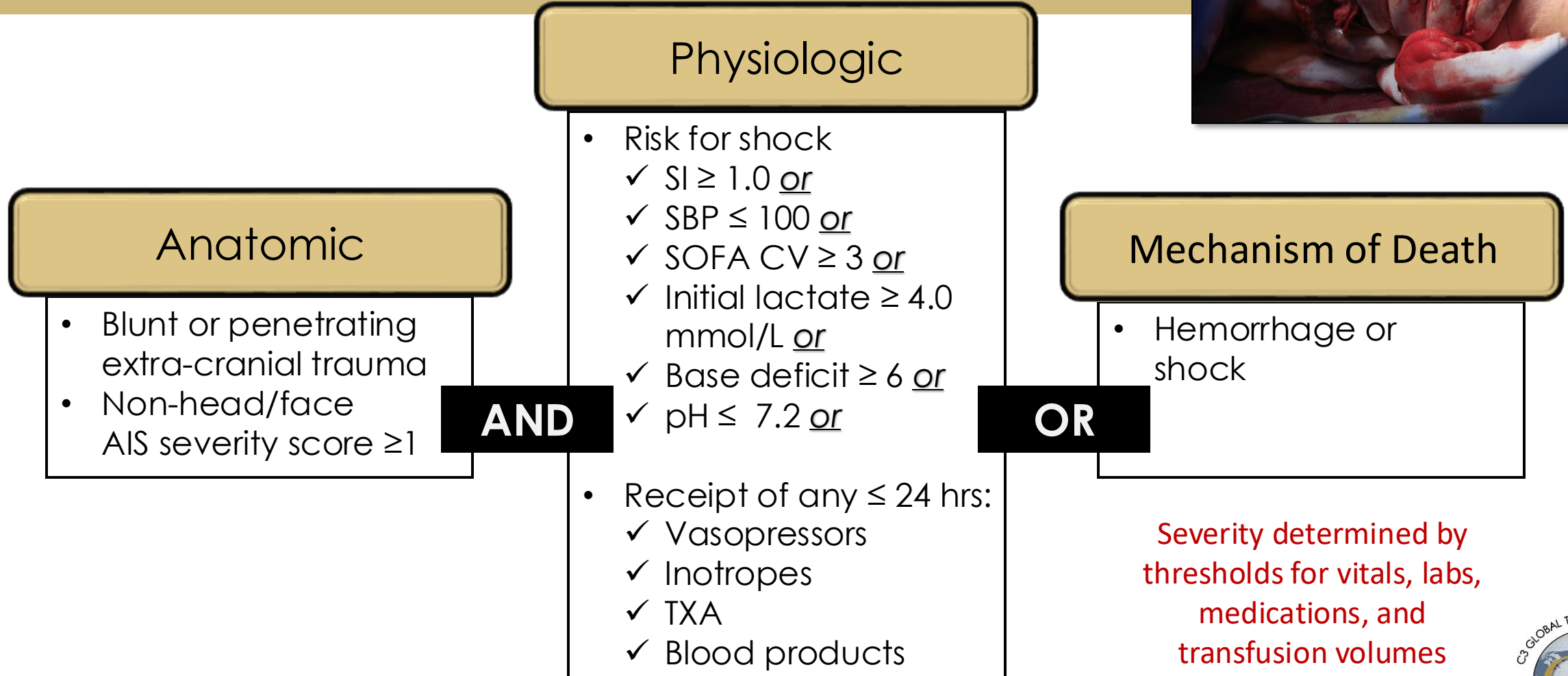
Hemorrhage+TBI



Concurrent Hemorrhage + TBI: A clinical challenge



Cohort Definition: Hemorrhage



Cohort Definition: TBI



Anatomic

- Head AIS severity score ≥ 2

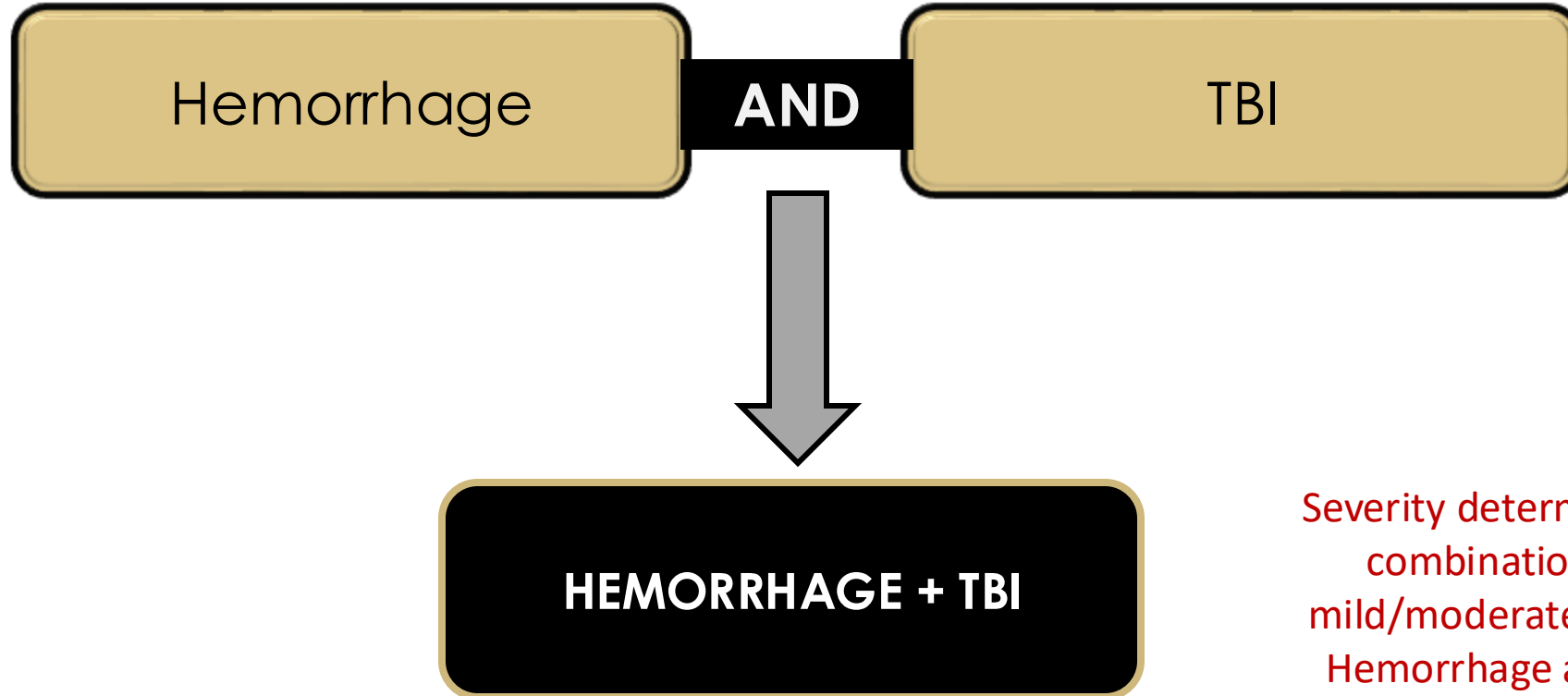
**AND/
OR**

Mechanism of Death

- CNS injury or catastrophic tissue damage to brain or brain stem

Severity determined by Glasgow
Coma Scale (GCS) scores and CT
brain imaging findings

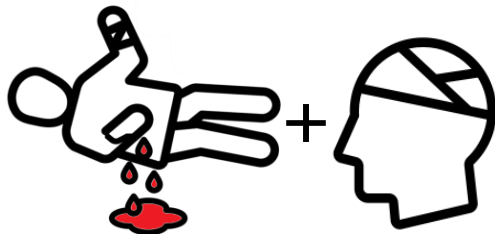
Cohort Definition: Hemorrhage+TBI



Severity determined by
combinations of
mild/moderate/severe
Hemorrhage and TBI

Results: Injury Characteristics

- **7,614 patients** met inclusion criteria
- Majority **young** (median age 31.3 years) adult **males** (85%)
- **Urban** injury location (60%) and **prolonged care** (64%)
- **39% penetrating injuries**



Hemorrhage + TBI
n = 912
(12%)

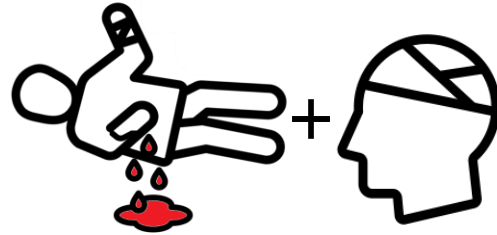


TBI
n = 1,556
(20%)



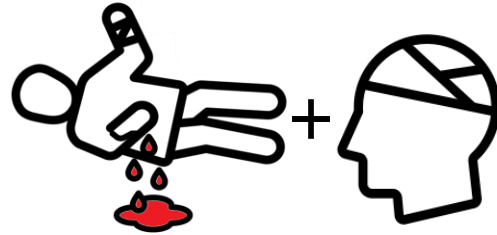
Hemorrhage
n = 5,146
(68%)

Patients were **more severe** and **experienced more critical interventions** in Hem+TBI compared to other cohorts



	Hem + TBI (n=912)	TBI (n=1,556)	Hemorrhage (n=5,146)
Injury Severity (Median NISS)	27	16	9
Delayed Care, n (%) (>6 hrs to initial care or first critical intervention)	621 (68%)	1,048 (67%)	3,211 (62%)
Critical interventions, n (%)			
Airway	346 (38%)	177 (11%)	335 (7 %)
Transfusions	378 (41%)	141 (9%)	1,411 (27%)

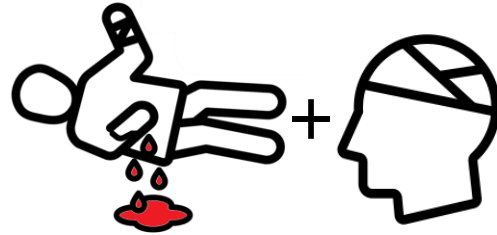
Greater resource consumption among Hem+TBI patients including IFTs, longer hospital stays and ICU admission



	Hem + TBI (n=912)	TBI (n=1,556)	Hemorrhage (n=5,146)
EMS Transport to Higher Level, n (%)	468 (51%)	818 (53%)	2,213 (33%)
Hospital Length of Stay, days [IQR]	4.4 [1.2,12.1]	1.7 [0.9,5]	2.7 [0.7,6.3]
ICU Admission, n (%)	327 (36%)	204 (13%)	504 (10%)
ICU Length of Stay, days [IQR]	2.6 [0.7,7.7]	1.8 [0.8,4.9]	2.4 [0.9,5.1]
Time to death, hours [IQR]	20 [4.6,99.9]	34.6 [8.3,92.2]	12.3 [2.6,100.4]

Median [Q1,Q3] presented for numeric variables

Hem+TBI patients represented **highest crude mortality** and **increased mortality risk** compared to other cohorts



	Hem + TBI (n=912)	TBI (n=1,556)	Hemorrhage (n=5,146)
Crude Mortality	285 (31%)	120 (8%)	278 (5%)
Injury severity-adjusted Mortality, RR (95% CI)			
Hem+TBI vs. TBI alone	1.87 (1.60-2.19) → 1.9 times higher mortality risk than TBI alone		
Hem+TBI vs. Hem alone	3.38 (2.96-3.85) → 3.4 times higher mortality risk than hem alone		

Conclusions

- Hemorrhage is bad
- TBI is bad
- Hemorrhage and TBI is worse + clinically difficult to manage
 - Increased EMS interfacility transports
 - Increased critical interventions
 - Increased number and longer ICU stay
 - Independent of severity → higher mortality
- We have quantified the relative risk of mortality among these three cohorts

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Thank you. Questions?

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