

Linked trauma registry and emergency medical services (EMS) data establishes baseline for implementing traumatic brain injury (TBI) treatment guidelines in Montana



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Background

In 2021, Montana began implementing a new TBI program, known as EPIC*

EPIC was first piloted in Arizona, where adjusted survival doubled among severe TBI patients following implementation of EPIC TBI treatment guidelines [1]

This analysis used pre-implementation data from 2020 to set the baseline for evaluating the impact of the program in the future

*Excellence in pre-hospital injury care

EPIC TBI Program



- Goal: To improve severe* TBI outcomes
- Trains EMS and facility-based providers to recognize, manage, and avoid the 3 H's

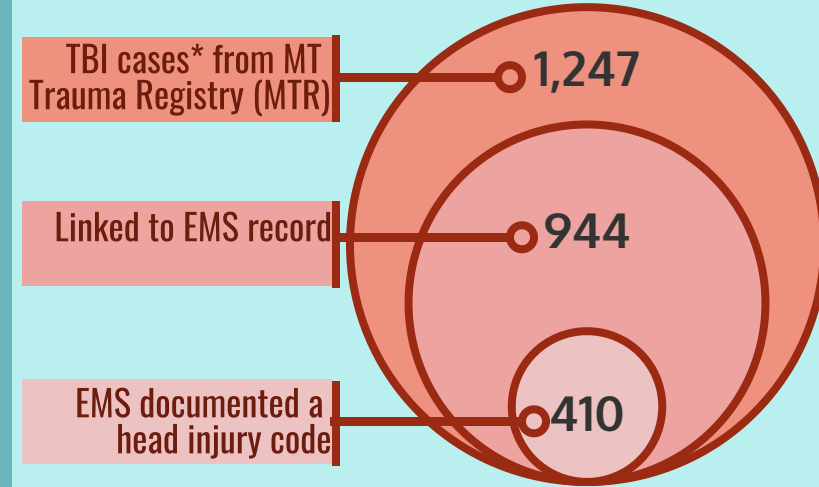
Hypotension (Systolic Blood Pressure <90mmHg)

Hypoxia (Oxygen Saturation <90%)

Hyperventilation (End Tidal CO₂ <35mmHg)

*Severity level based on Abbreviated Injury Scale [AIS]-Head:
1=Minor, 2=Moderate, 3-4=Severe, 5-6=Critical

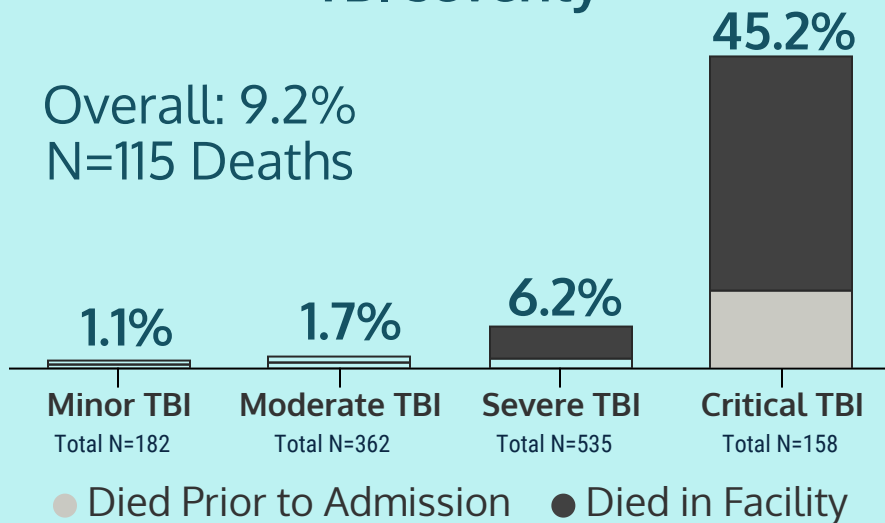
2020 Data Linkage



*Identified using CSTE's proposed TBI case definition

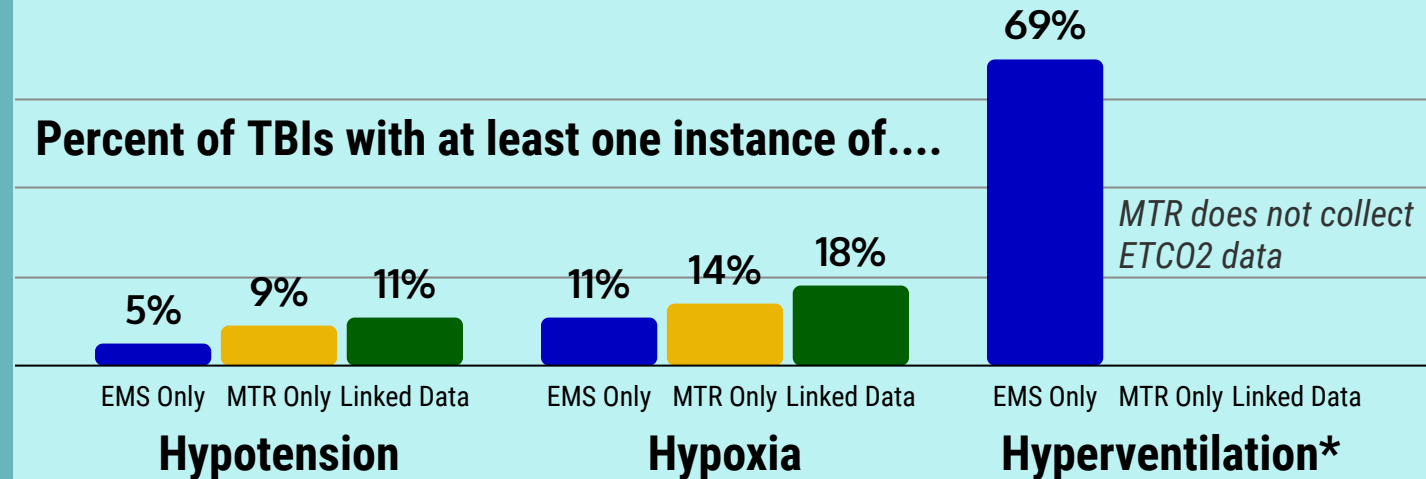
Case fatality rate varied by TBI severity

Overall: 9.2%
N=115 Deaths



Data linkage between MTR and EMS improved capture of the 3 H's

Percent of TBIs with at least one instance of....



*ETCO₂ measured in N=147 TBI patients

[1] Spaite, D. W., et al. (2019). Association of Statewide Implementation of the Prehospital Traumatic Brain Injury Treatment Guidelines with Patient Survival Following Traumatic Brain Injury: The Excellence in Prehospital Injury Care (EPIC) Study. JAMA Surgery, 154(7), 1-11. <https://doi.org/10.1001/jamasurg.2019.1152>

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TABLE 1. Outcomes for TBI trauma cases, by severity level, Montana, 2020

TBI Severity	Total N	Deaths	Case Fatality Rate	Mean injury severity score (ISS)*	Mean inpatient length of stay (LOS)*	Mean discharge Glasgow Coma Score (GCS)*	Mean functional independence measure (FIM) score at discharge*
Minor (AIS-Head=1)	182	2	1.1%	8.0	3.3	14.9	11.0
Moderate (AIS-Head=2)	362	6	1.7%	10.2	3.2	14.2	10.7
Severe (AIS-Head=3-4)	535	33	6.2%	15.5	4.3	14.2	10.1
Critical (AIS-Head=5-6)	158	73	46.2%	29.3	7.5	8.0	6.9
Not Documented	10	1	10.0%	19.6	4.3	15.0	12.0
Total	1,247	115	9.2%	14.6	4.2	14.2	10.4

*at final treatment facility

TABLE 2. EMS provider impression among N=944 EMS records linked with TBI cases from Montana Trauma Registry, Montana, 2020

EMS Impression	ICD-10-CM Code	N	%
TBI/head injury	S02, S04.02-S04.04, S06, S07.1, T74.4, S09.90	410	43%
Unspecified injury	T14.90, T07	136	14%
Acute pain	G89	85	9%
Altered mental status, unconscious, disorientation	R40, R41	71	8%
Not recorded		43	5%
Other		199	21%
Total		944	100%