Does Vehicle Intrusion Alone Still Predict Injury: A Retrospective Analysis of Mechanism as Trauma Activation Criteria

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Introduction:

National Guidelines for the Field Triage of Injured Patients have been widely adopted with the goal of ensuring seriously injured patients are transported to trauma centers. Mechanism of injury (MOI) criteria which are designed to predict injury are a component of these guidelines.

As shown in Figure 1, vehicle intrusion is included in High-Risk Auto Crash MOI and is defined by >12 inches of intrusion on driver compartment or >18 inches anywhere on the vehicle.

Objectives:

Given the introduction of "crumple zones" to cars, the objective of this study was to determine if vehicle intrusion alone as MOI criteria necessitates trauma activation.

Methods:

- A retrospective, single center chart review was conducted to include all adult patients involved in motor vehicle collisions (MVC) presented to a Level 1 trauma center from July 2016 to March 2022
- After exclusion of pedestrians, motorcycles, ATV accidents, and those meeting A&P criteria 2940 patients were included
- Patients were divided by MOI Criteria: Vehicle Intrusion alone vs. Multiple activation criteria.
- Univariate analyses were conducted to evaluate clinical outcomes with statistical significance set at p<0.05.

Falls
- Adults > 20ft (one story equal to 10 feet
- Children > 10 ft or two or three times the height of the child

High-risk auto crash
- Intrusion, including roof: > 12inches occupant site, >18 inches any site
- Ejection (partial or complete) from automobile
- Death in same passenger compartment
- Vehicle telemetry data consistent with a high risk of injury

Auto vs pedestrian/bicyclist thrown, run over, or with significant(>20mph) impact Motorcycle crash > 20 mph

Figure 1: Mechanism of Injury criteria as a component of the field triage of Injured Patients

Results:

Patient Demographics Total n=2940	Intrusion Mechanism only n= 2098	Other Mechanisms + Intrusion Mechanism with additional MOI n=842	p value
Age, avg yrs (SD)	37.6 (15.6)	38.7 (16.4)	0.09
Male gender, n (%)	1215 (57.9)	494 (58.7)	0.71
Initial Vital Signs			
Initial GCS, avg (SD)	14.8 (0.8)	14.7 (1.2)	0.009
Initial SBP, avg (SD)	138 (23)	139 (24)	0.29
Initial HR, avg (SD)	93 (19)	93 (19)	1.0
Injury Information			
Seatbelt use, n (%)	1589 (75.7)	525 (62.4)	0.001
Airbag deployment, n (%)	1736 (82.8)	676 (80.1)	0.12
Injury severity score, avg (SD)	5.3 (6.6)	6.3 (7.5)	0.004
TBI, n (%)	198 (9.4)	94 (11.2)	0.17
Spinal cord injury, n (%)	8 (0.4)	6 (0.7)	0.24
Number of CT scans in trauma bay, avg (SD)	3.1 (1.5)	3.3 (1.5)	0.001
Hospital Outcomes			
ED discharge, n (%)	1335 (63.6)	450 (53.4)	0.001
ICU admission, n (%)	210 (10.1)	116 (13.8)	0.004
Intubation, n (%)	21 (1.0)	18 (2.4)	0.02
Operative procedure, n (%)	345 (16.4)	168 (20.0)	0.03
Hospital length of stay, avg days (SD)	2.6 (4.7)	3.0 (5.3)	0.04
Mortality, n (%)	11 (0.5)	13 (1.5)	0.01

SD=standard deviation   CT=Computed tomography   ED=Emergency Department
GCS=Glasgow Coma Scale   SBP= systolic blood pressure   HR= Heart rate
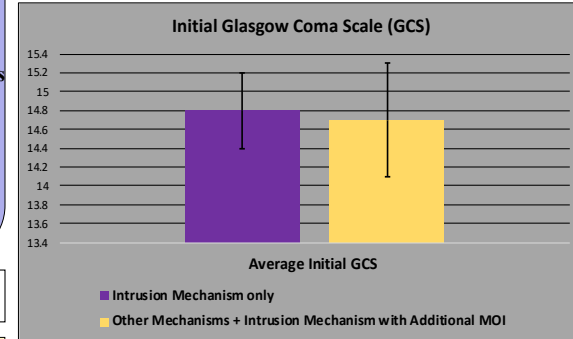ICU=Intensive Care Unit

Results Continued:

Initial Glasgow Coma Scale (GCS)

Average Initial GCS
- Intrusion Mechanism only
- Other Mechanisms + Intrusion Mechanism with Additional MOI

Figure 2: Comparison of initial Glasgow Coma Scale (GCS) for Intrusion alone vs multiple MOI.

Hospital Outcomes for Intrusion Only and Multiple MOI

- Intrusion Mechanism only
- Other Mechanisms + Intrusion Mechanism with additional MOI
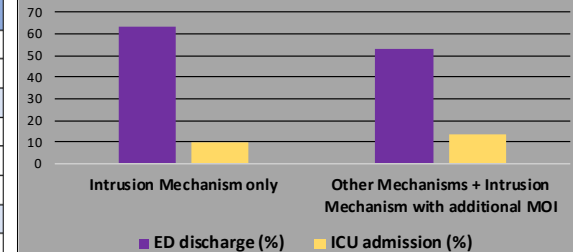- ED discharge (%)
- ICU admission (%)

Figure 3: Hospital Outcomes for Intrusion alone and multiple MOI criteria.

Discussion:

Vehicle intrusion criteria alone had statistically significant differences in discharge results, injury profiles, CT scans, ICU admissions, and mortality as compared to other mechanism criteria. With increasing demand to optimize resource utilization, the results from this study suggest that vehicle intrusion MOI criteria alone may not be an accurate predictor for trauma center transport

References:

1.American College of Surgeons https://www.facs.org/quality-programs/trauma/systems/field-triage-guidelines/
2.Stuke LE, Duchesne JC, Hunt JP, Marr AB, Meade PC, McSwain NE. Mechanism of injury is not a predictor of trauma center admission. Am Surg. 2013 Nov;79(11):1149-53. PMID: 24165248.