Traumatic Brain Injury and Outcomes Associated with Motor Vehicle Crashes

University of Maryland CIREN Center

Epidemiology of Traumatic Brain Injury (TBI)

Annual incidence (from the Center for Disease Control (CDC)

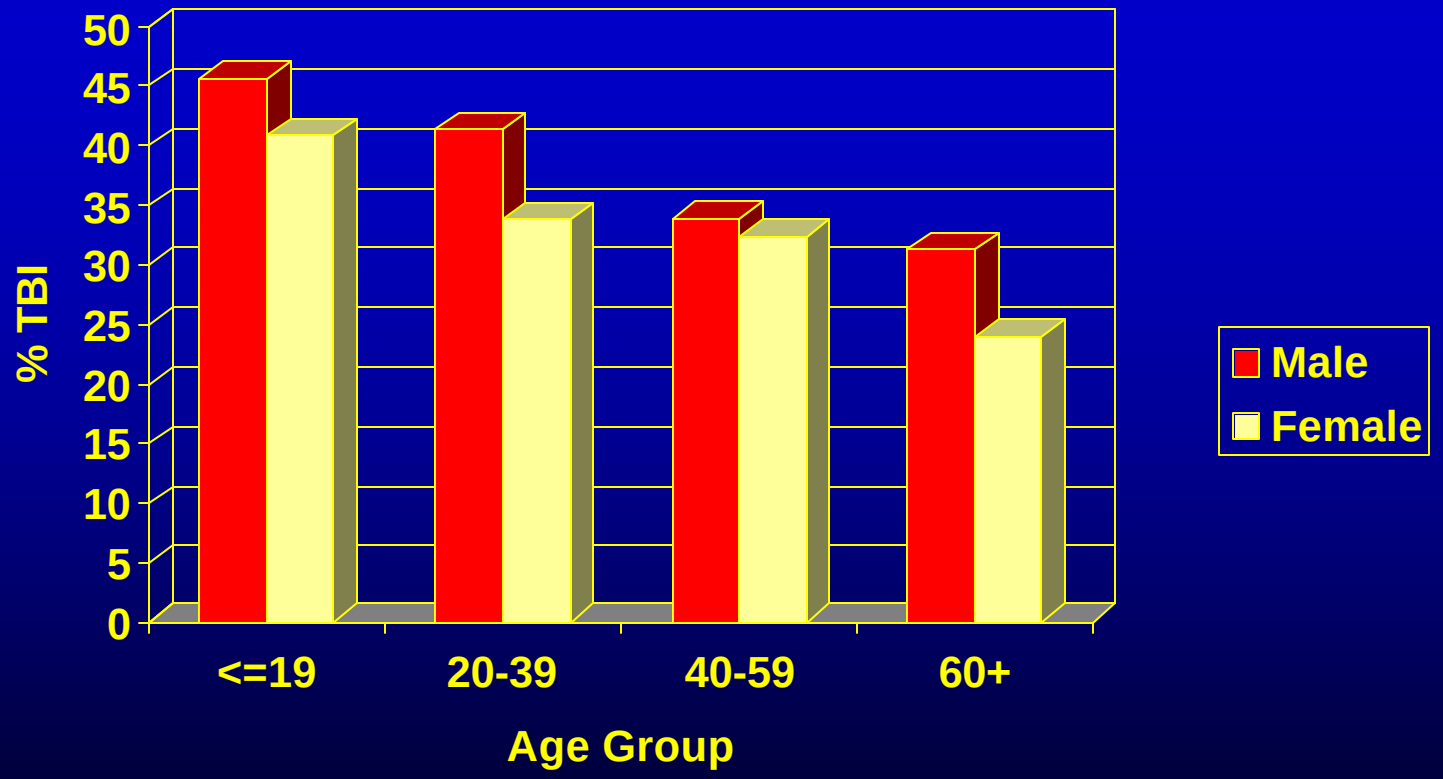
- 1 million people treated and released from hospital Emergency Departments
- 230,000 people are hospitalized & survive
- 50,000 people die

Risk Factors and Causes of Traumatic Brain Injury (TBI)

- High risk especially among adolescents, young adults, and people >75 years of age
- Risk among males is twice that for females
- Motor Vehicle Crashes (MVCs) are a major cause for ages 5-64

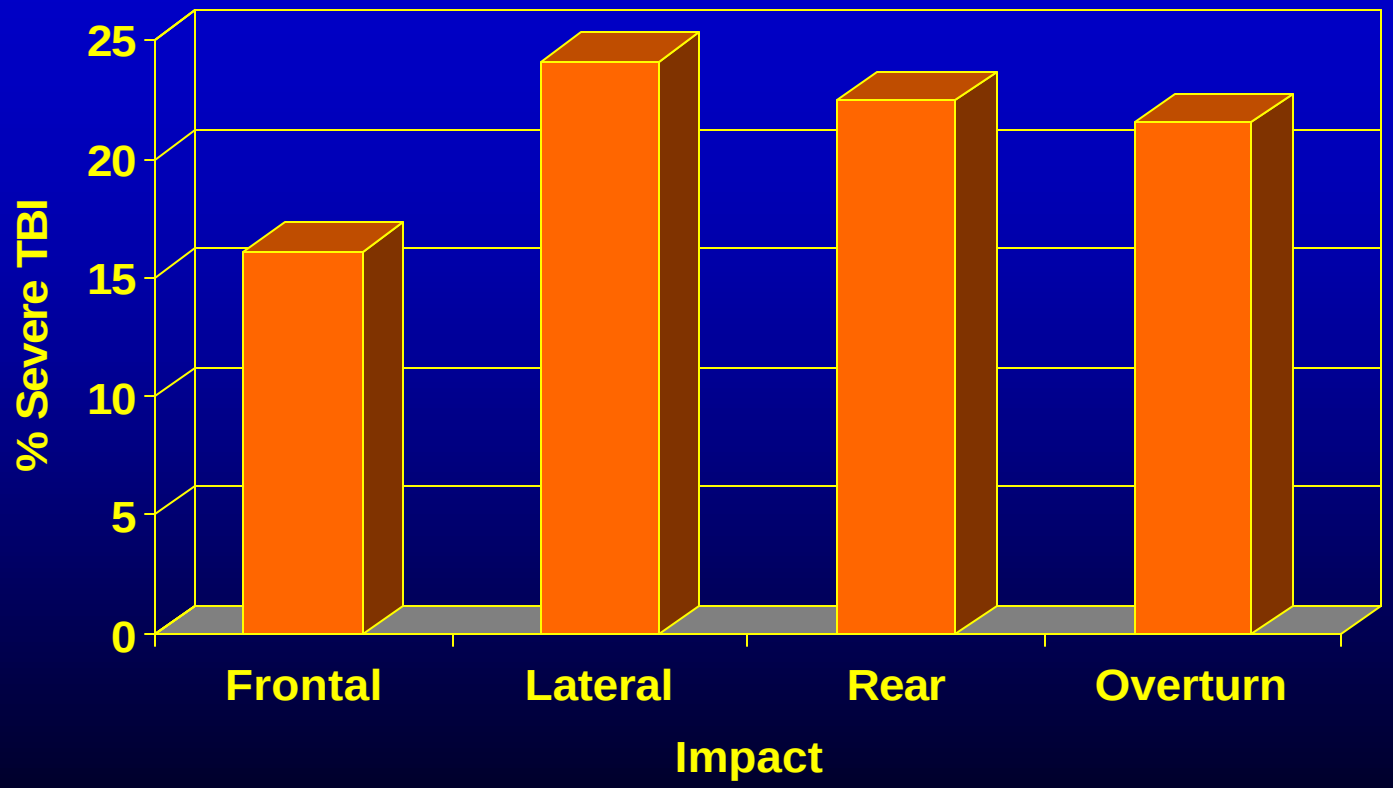
Proportion of Patients with TBI: All Drivers Hospitalized in Maryland

(Maryland CODES Data)



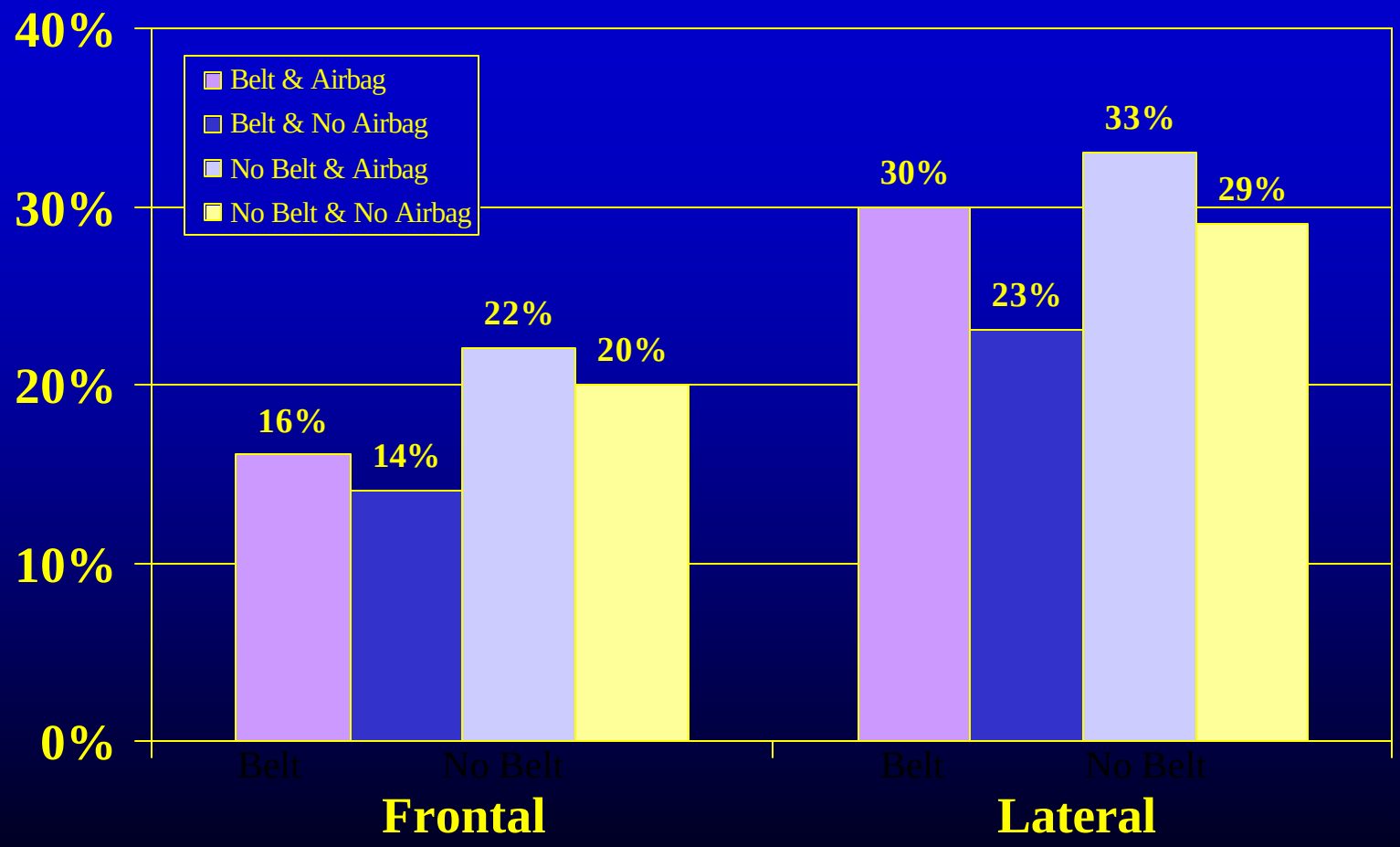
Proportion of Patients with Severe TBI (MAIS=4) by Point of Impact

(Maryland CODES Data)



% of Severe TBI (MAIS=4) by Safety Equipment Use and Point of Impact

(All Drivers Hospitalized with TBI, 1997-2002)



Brain Injury Data Across All CIREN Centers

- Data as of October 4, 2004
- 511 cases with brain injury
- 1,067 brain injuries
  - 60 diffuse axonal injuries (DAI)
  - 1,007 other brain injuries

Common Injury Source of TBI

(All CIREN Centers)

Rank	DAI (60 injuries)	%	Other Brain Injury (n=1,007 injuries)	%
1	Non-Contact Source	17	Non-contact Source	7
2	Right B-pillar	8	Injury Source Unknown	6
3	Left A (A1/A2) - Pillar	7	Other Vehicle / Object	6
4	Roof Left Side Rail	7	Air Bag – Driver Side	6
5	Right A (A1/A2)-Pillar	5	Left A (A1/A2) – Pillar	5

Head Injury Criterion (HIC)

The biomechanical criterion for head injury in crashworthiness tests is HIC, developed by NHTSA in 1972

- Currently used to assess head injury in crash test dummies
- Based on *contact injury*
- Mathematical formula based on head acceleration (as a function of time)
- Has no specific meaning in terms of injury mechanism

Psychosocial Consequences at 1 Year Within TBI Groupings (N=135)

	Moderate/ Severe TBI	Mild TBI	No TBI
	%	%	%
Cognitive problems	82	31	17
Behavioral changes	71	24	6
Depression	65	48	38
PTSD	35	24	21

Summary

- Even with modern occupant restraints, MV occupants still sustain brain injuries
- The most serious TBIs result from lateral impacts
- Long-term outcomes frequently include cognitive problems
- Current crashworthiness standards are still based on contact injuries only (HIC)