Thoracic Injuries to Children Restrained in Motor Vehicle Crashes

Children's National Medical Center

CIREN

Washington, DC

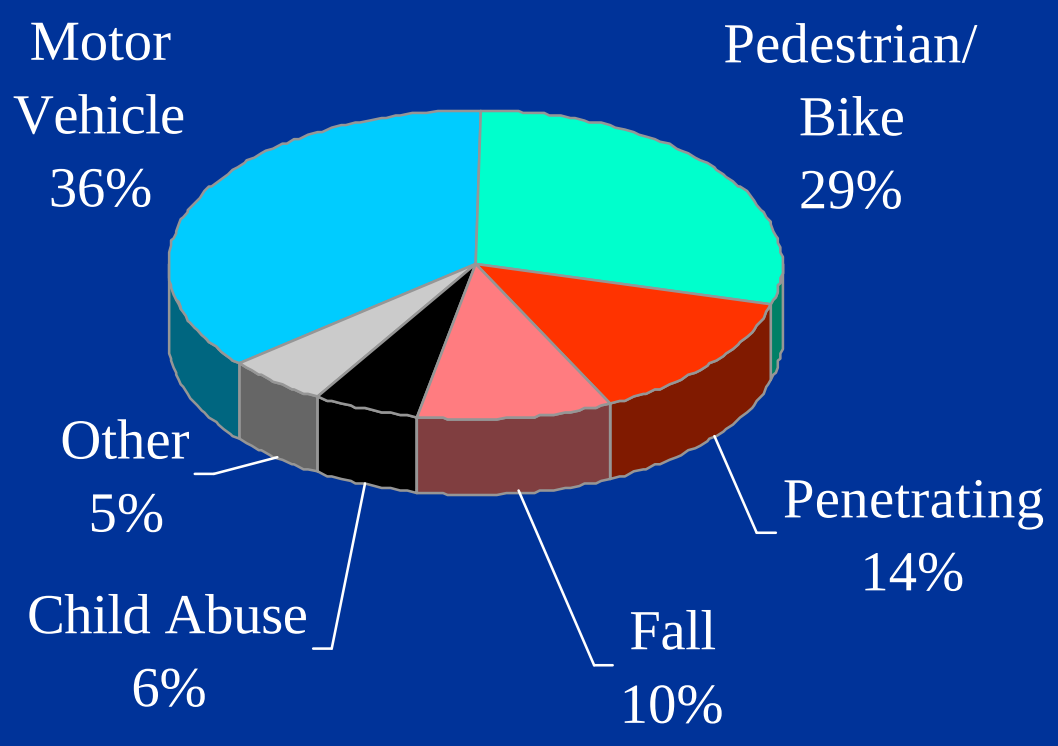
Thoracic Trauma Cases

- **CNMC Trauma database - 1988-98**
- **AIS > 2, Age < 16**
- **Consecutive Admissions**

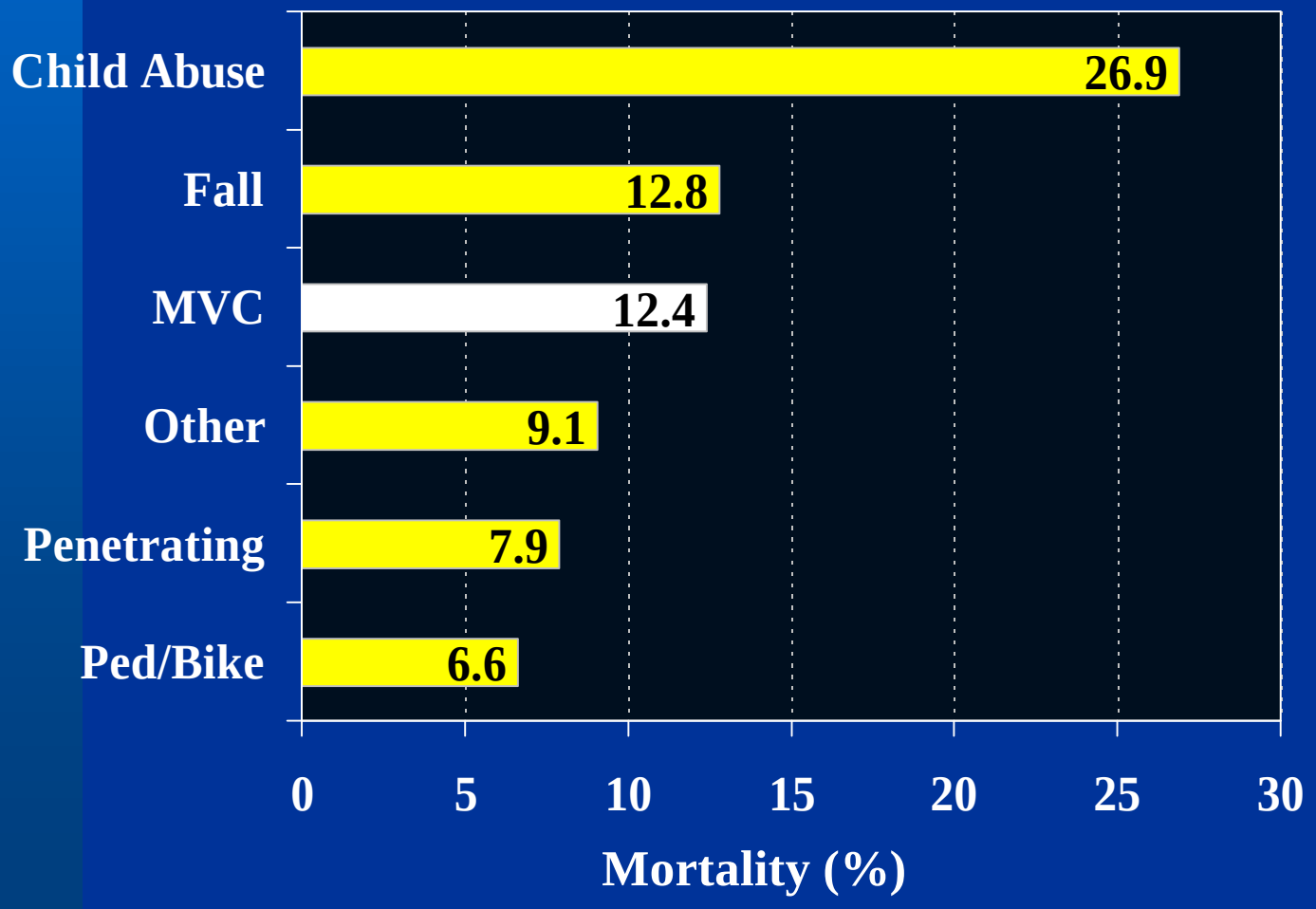
Results

- 10,575 Patients
- 460 Cases (4.3%)
- 667 Thoracic injuries
- Mean Age 8 years
- 64% Males
- 72 Deaths - mortality rate 15.6%

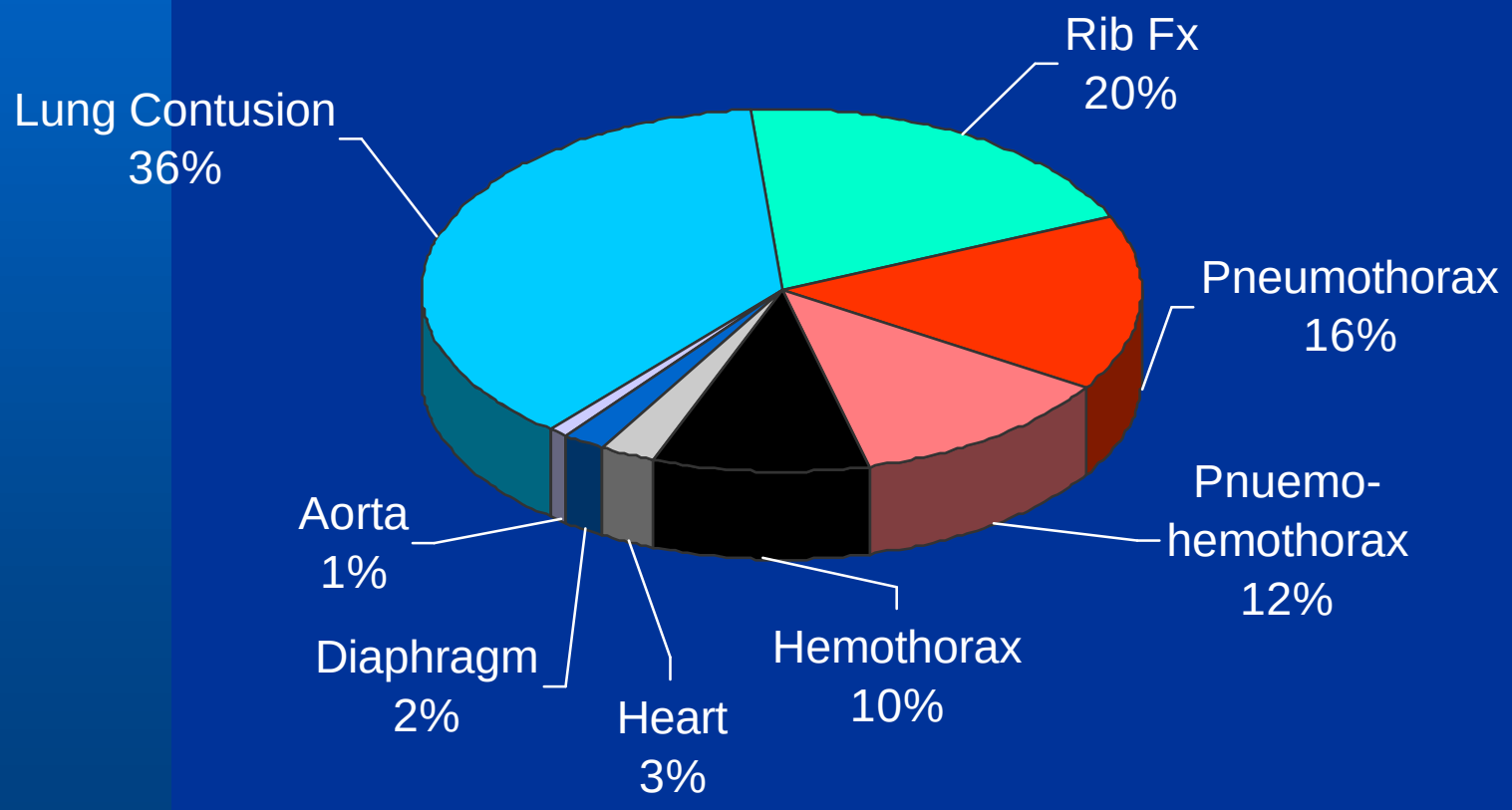
Mechanism of Injury



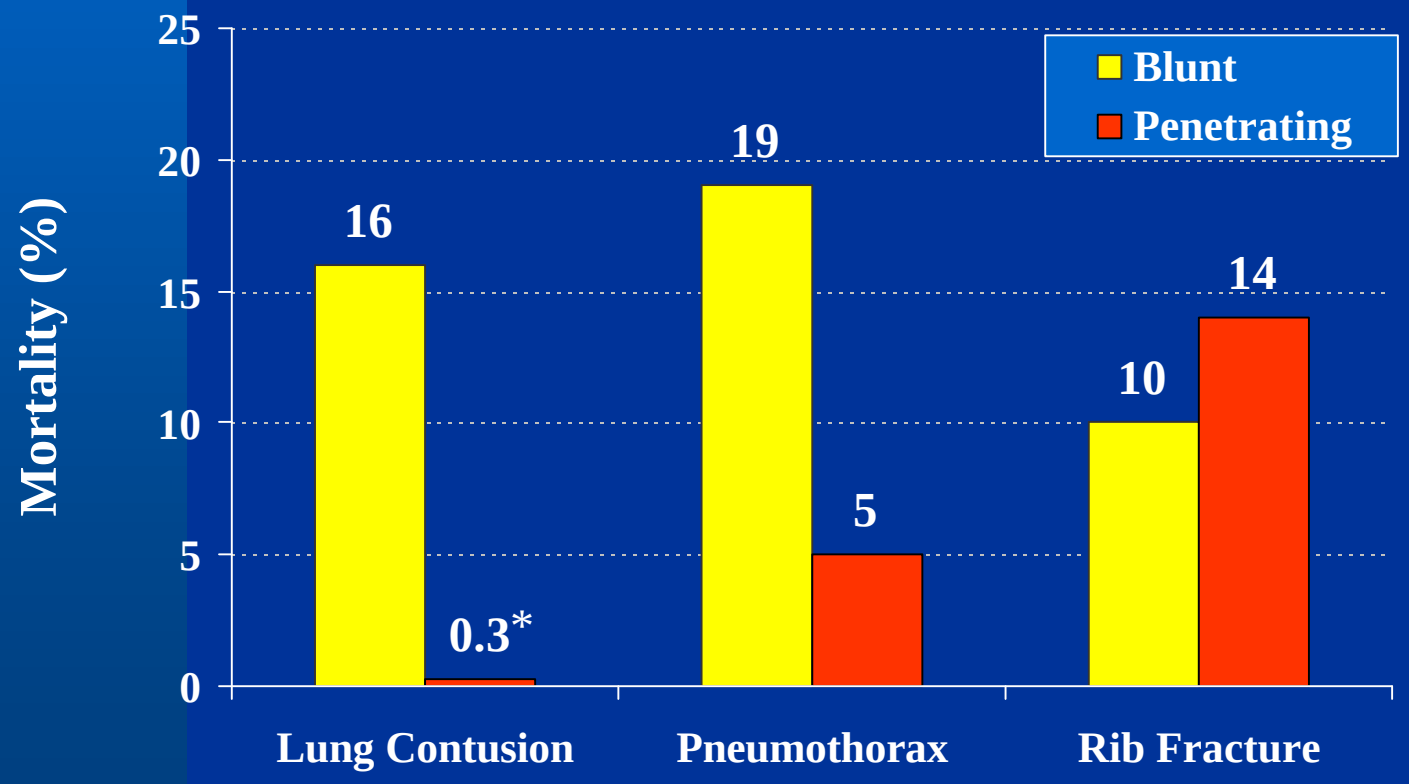
Mortality by Mechanism of Injury



Type of Thoracic Injury

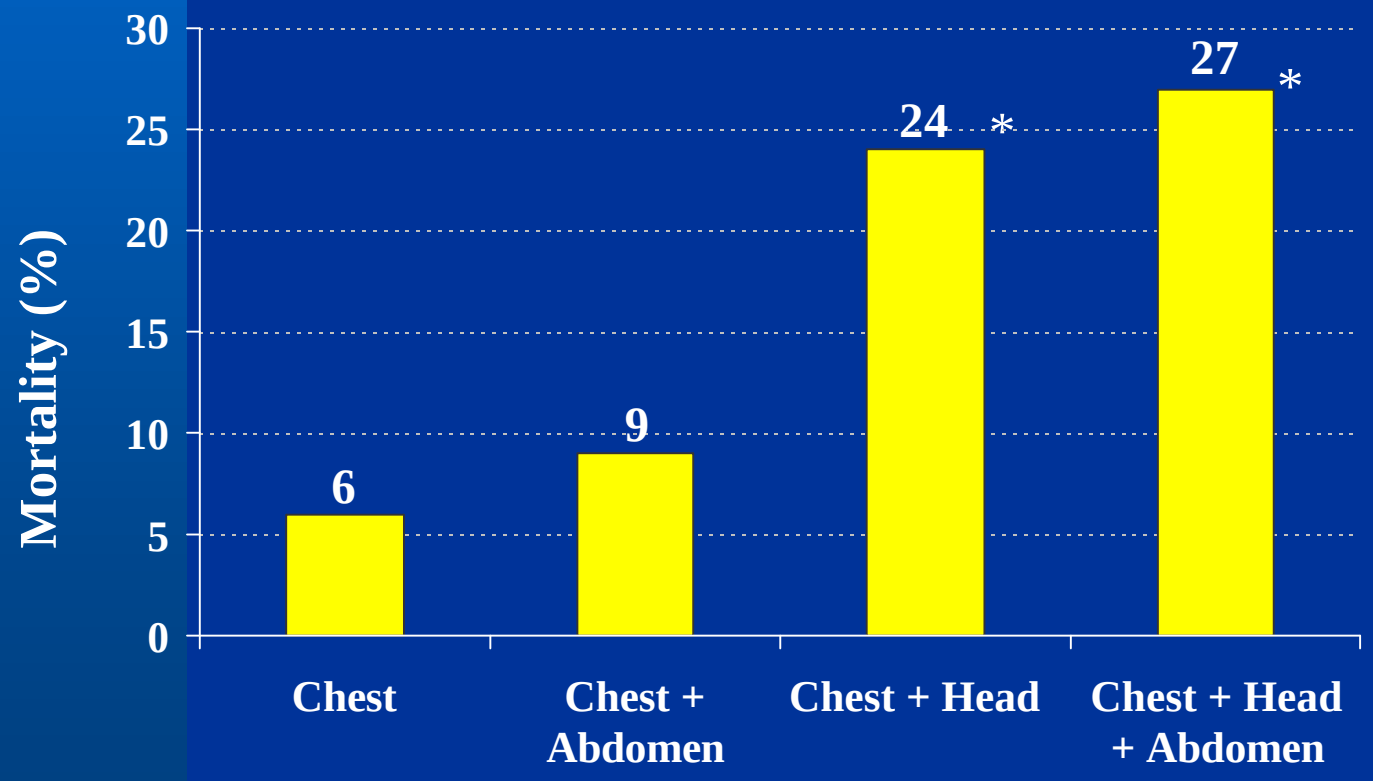


Mortality by Type of Thoracic Injury



* = $p < 0.05$

Effect of Body Region Injured on Mortality Rate



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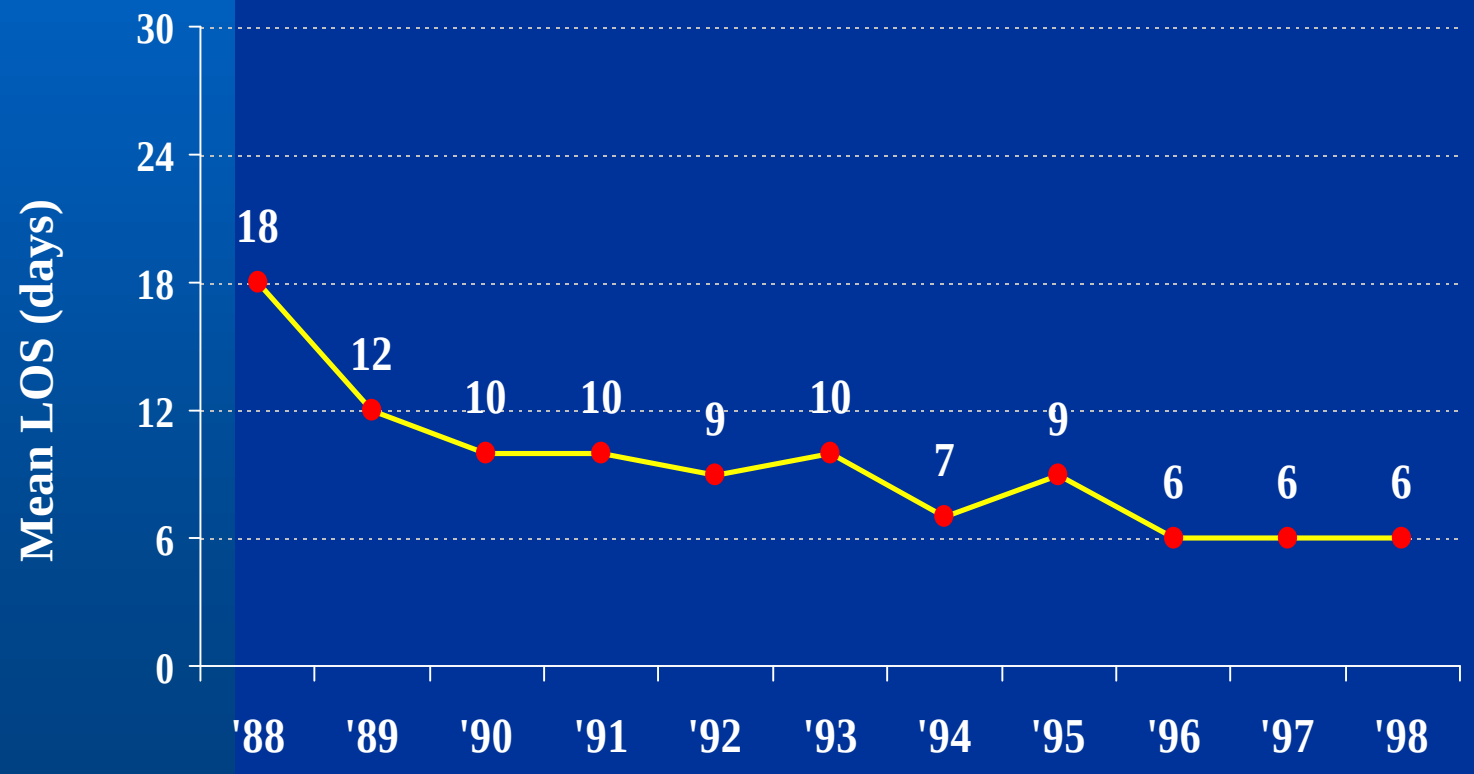
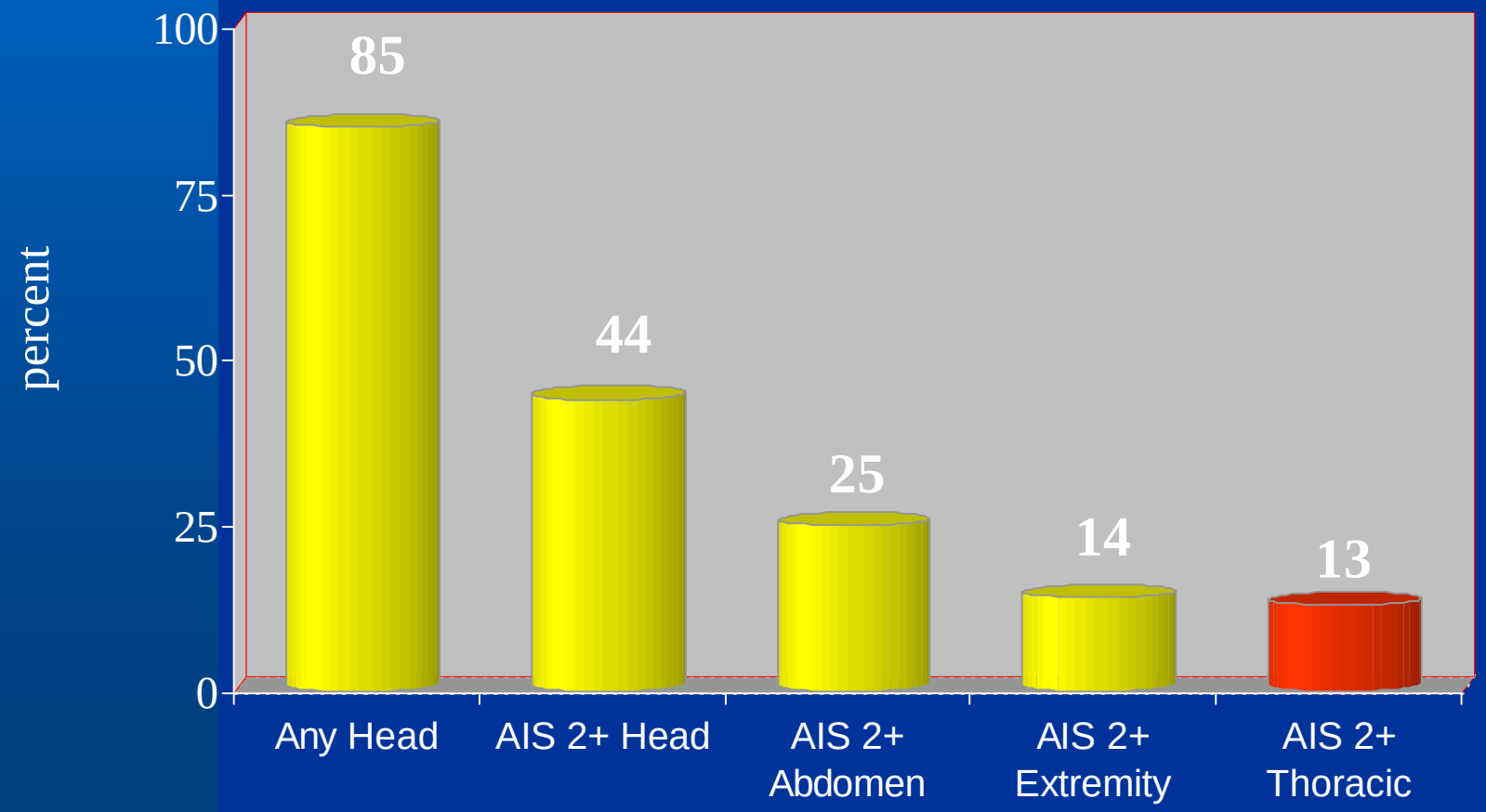
Hospital Length of Stay Over Time
Thoracic Injured Patients, 1988-98



Trauma Registry Conclusions

- **Incidence:** **4.3%**
- **Blunt Trauma**
- **Most Common:** **Pulmonary Contusion, Rib Fracture**
- **Rare:** **Aortic, Diaphragm Injuries**

CNMC CIREN Thoracic Injury Diagnoses (n=194)

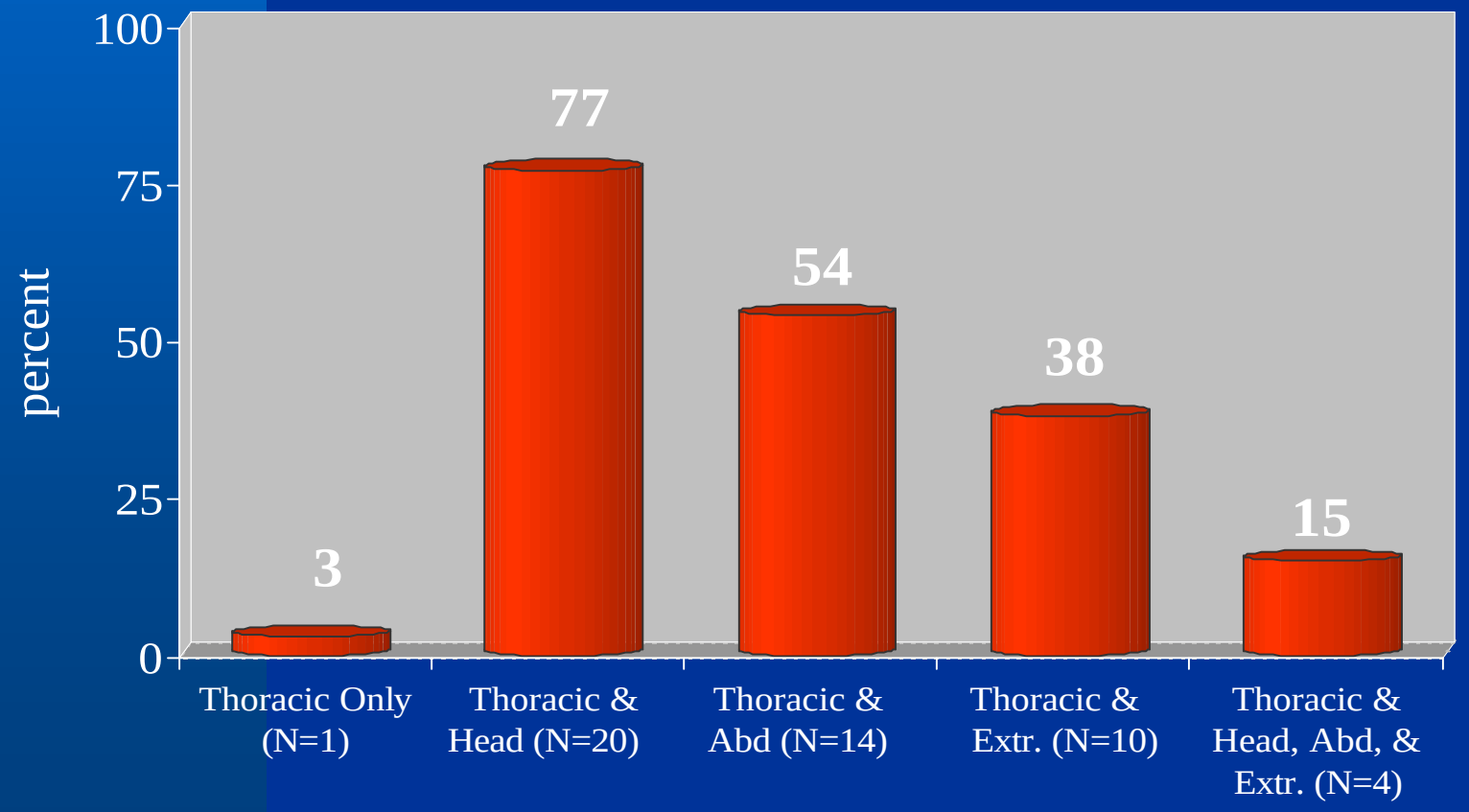


CNMC CIREN Thoracic Injuries

Injury	N	(%)
Pulmonary Contusion	15	(50)
Pneumothorax	5	(17)
Hemothorax	3	(10)
Heart/Great vessels	3	(10)
Rib Fracture	2	(7)
Clavicle Fracture	1	(3)
Thoracic Spine Fracture	1	(3)

CNMC CIREN Thoracic Injuries

AIS 2+ Injuries



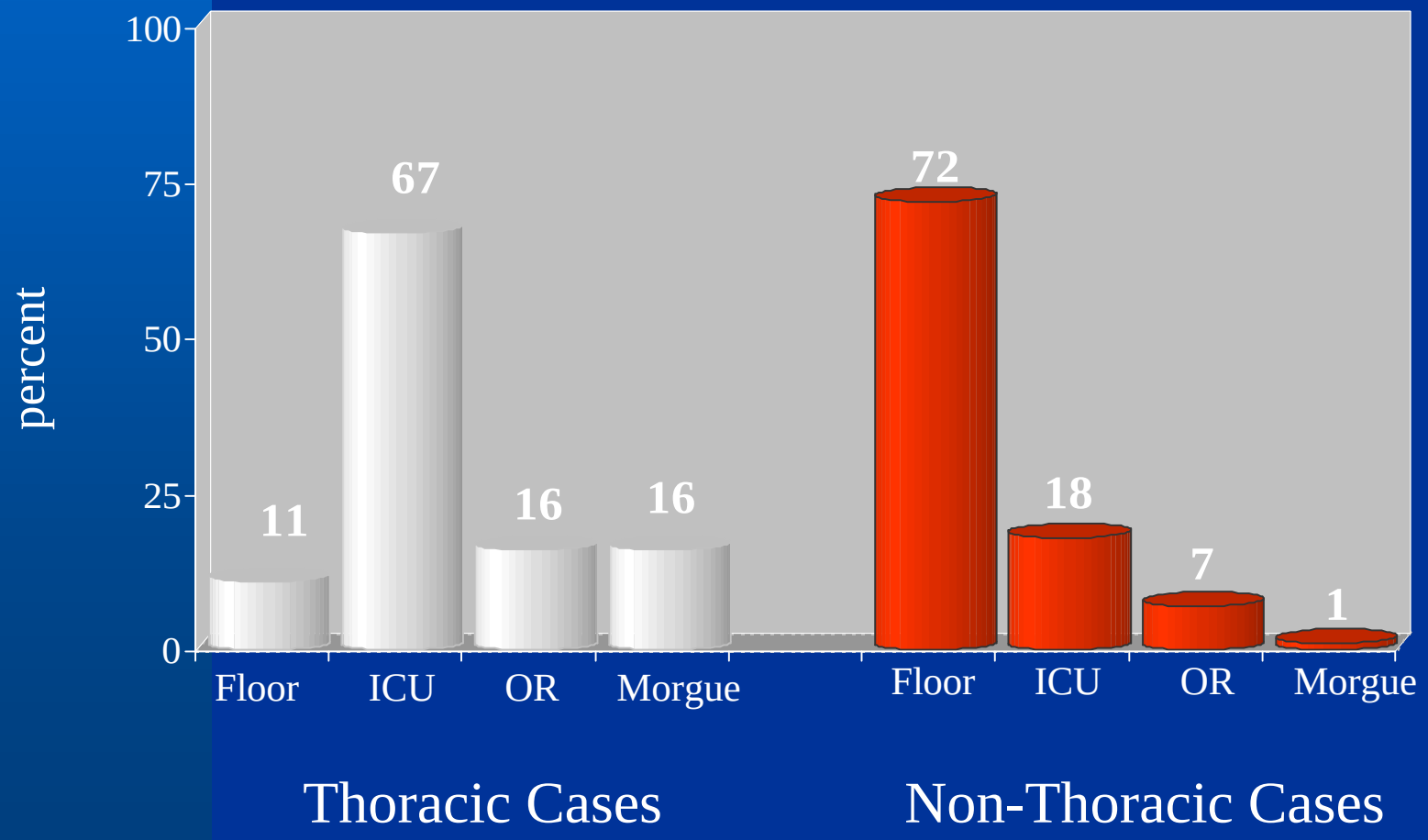
CNMC CIREN Thoracic Injuries

Injury Severity

	Thoracic	Non-Thoracic
Cases	26 (13%)	168 (87%)
Mean age	7 yrs	6 yrs.
> 8 yrs old	42%	22%
Median ISS	26	5
Median LOS	7 days	2 days
Median Costs	$27,535	$5,779

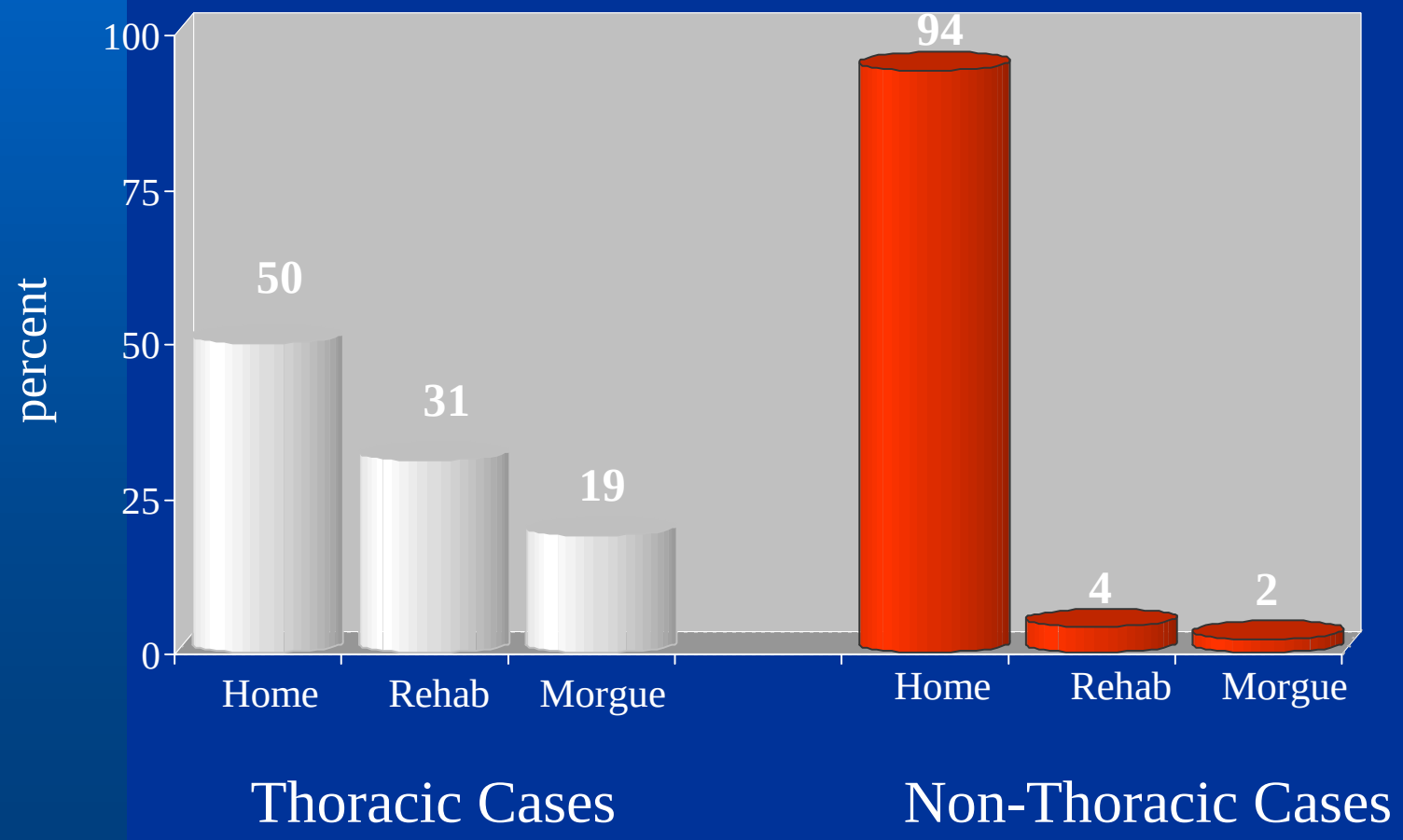
CNMC CIREN Thoracic Injuries

ED Disposition



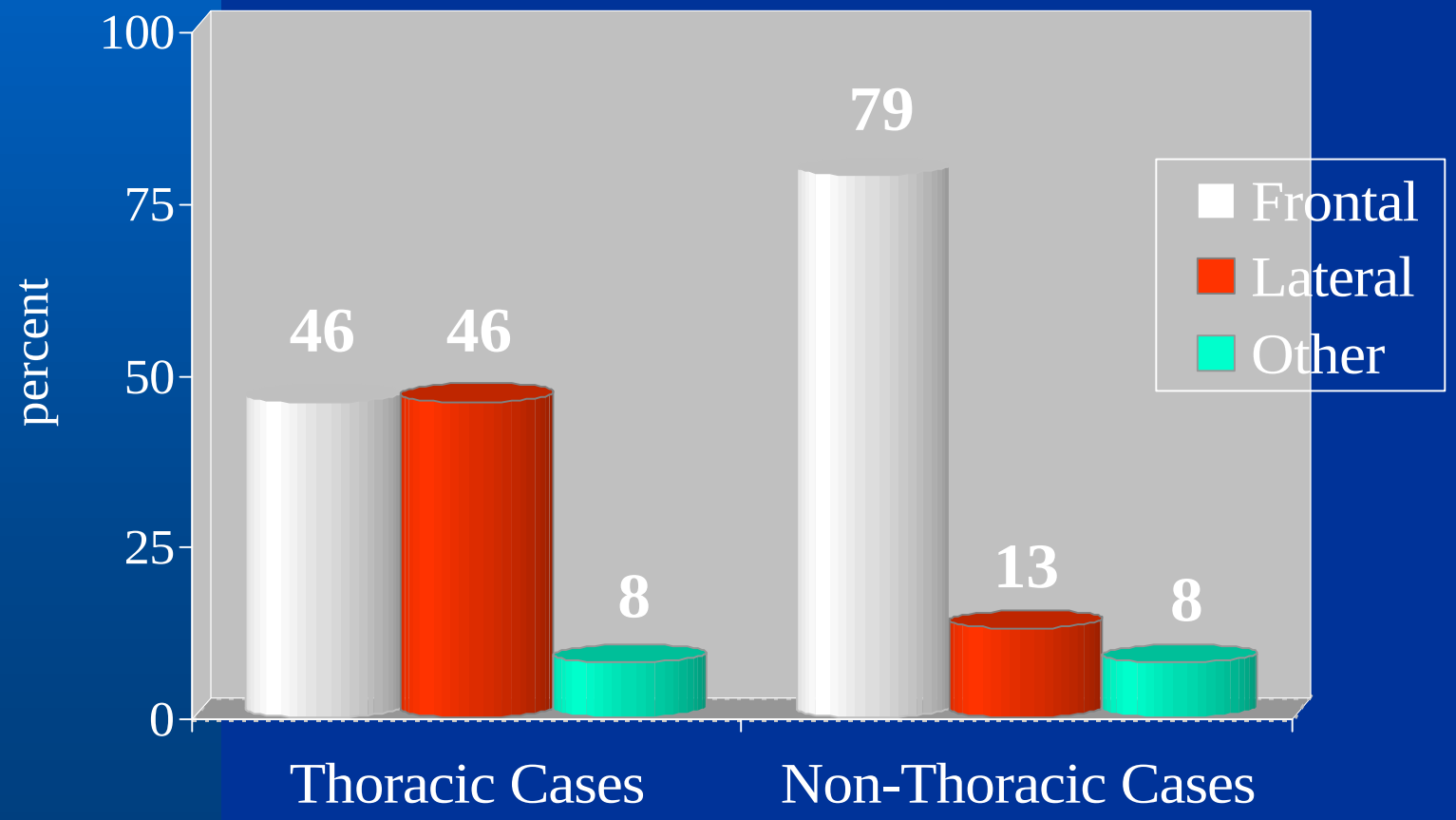
CNMC CIREN Thoracic Injuries

Discharge Disposition



CNMC CIREN Thoracic Injuries

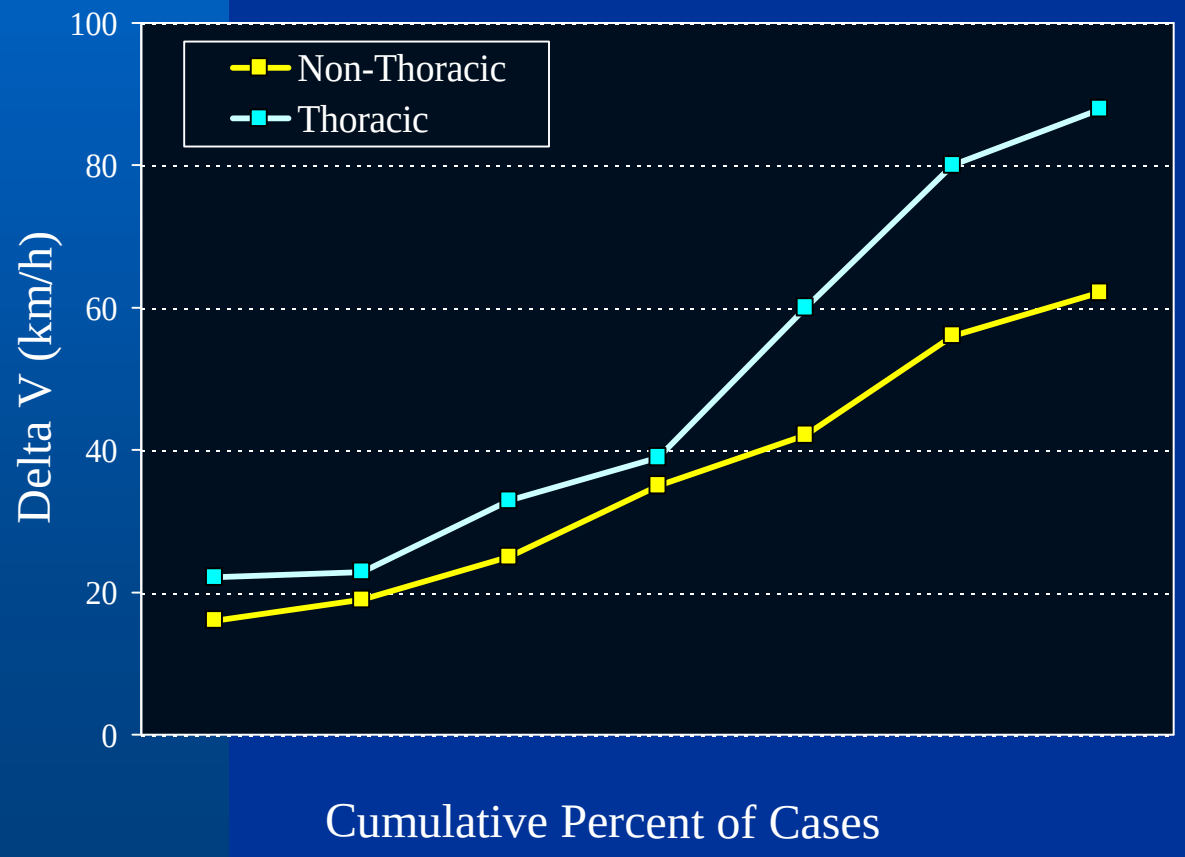
Crash Type



Source of Contact: Thoracic Injuries

Contact Source	Frontal	Lateral
Seat Belt	6 (50)	3 (15)
Door Panel	2 (17)	6 (30)
A-B Pillar	0 (0)	5 (25)
Seat Back	1 (8)	1 (5)
CSS	2 (17)	1 (5)
Other	1 (8)	4 (20)

Cumulative Probability of Thoracic Injury Delta-V (Frontal Cases only)



Means:
Thoracic= 46.1
No Thoracic= 36.1
p=.031

Child Restraint Used

Restraint Type	Thoracic N (%)	No Thoracic N (%)
Child Safety Seat	5 (19)	40 (24)
Booster Seat	0 (0)	12 (7)
Lap/Shoulder Belt	12 (46)	62 (37)
Lap Belt Only	7 (27)	48 (29)
Shoulder Belt Only	2 (8)	6 (4)

Evaluating Restraint Use

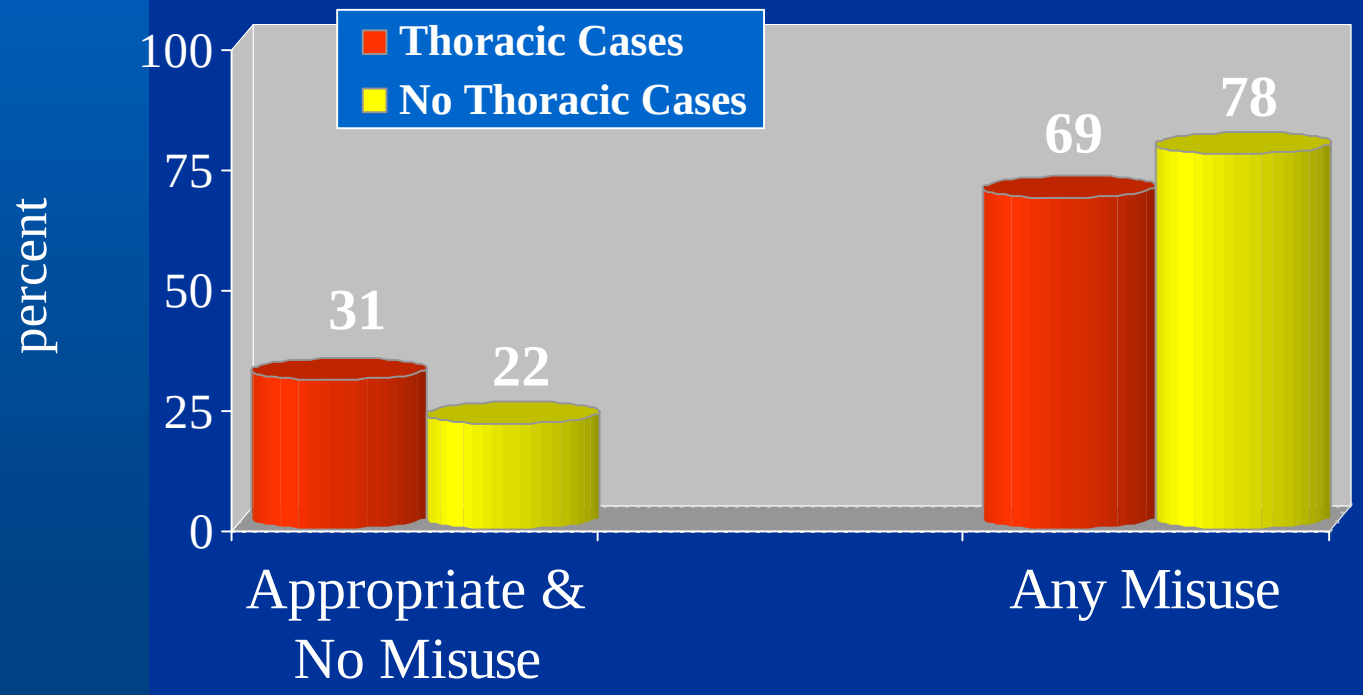
- INAPPROPRIATE (Who)
- INCORRECT (How)

Child Restraint Misuse

Misuse	Thoracic	No-Thoracic
None	57%	44%
CSS Improperly Installed	4/5 (80%)	22/50 (40%)
Shoulder Belt Not Worn, Under Arm	2/14 (14%)	35/68 (51%)
Lap Belt Not Worn, Slack	3/19 (16%)	9/110 (8%)

Child Restraint Use:

% Appropriately Restraint & Not Misused



Conclusions

- Rare (4.3%)
- Associated With:
  - Lateral Impact
  - Higher Delta V
  - Greater Morbidity & Mortality
- Relatively same injury severity over past 10 yrs