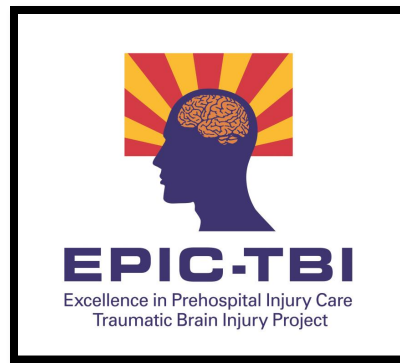


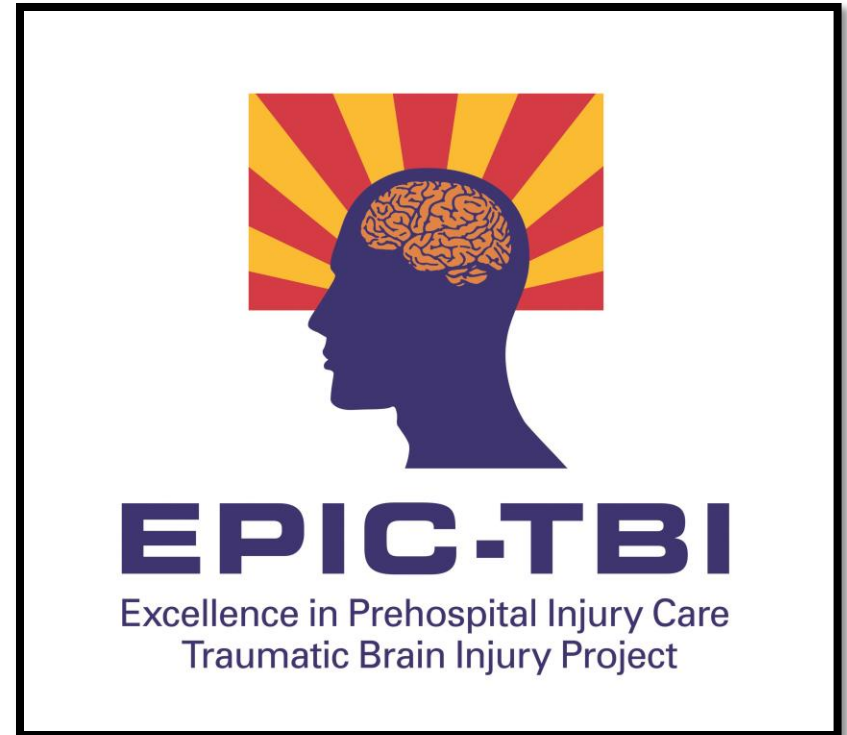
# Association Between Prehospital GCS and Trauma Center Outcomes in Moderate and Severe TBI

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Professor and Distinguished Chair  
of Emergency Medicine



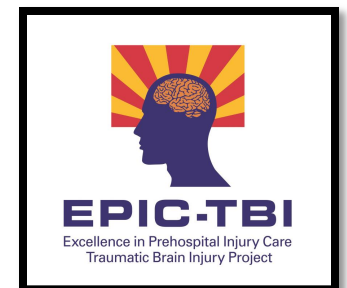
# EPIC Investigators

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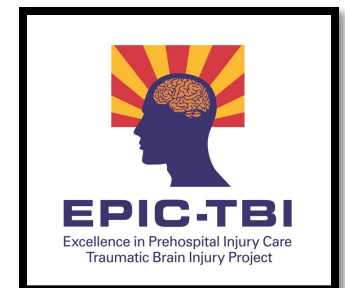
# Disclosure

- ▶ This study is funded by the NIH–NINDS
  - 1R01NS071049–01A1 (adults)
  - 3R01NS071049–S1 (children)



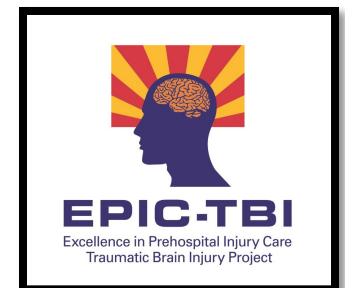
# Background

- ▶ Prehospital GCS utilized widely:
  - EMS assessment
  - Trauma triage
  - EMS Treatment decisions
    - Example: Tracheal intubation
  - Risk adjuster and short-term outcome measure
    - Quality Improvement
    - System evaluation
    - Research



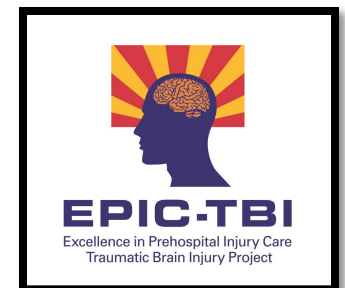
# Background

- ▶ EMSOP Literature Review (*AEM 2011;18:988-1000*)
  - ~5000 articles
  - 176 studies met inclusion
  - Evaluated 96 RAMs/OMs
  - GCS
    - Level 1 evidence
    - Category 1 recommendation for use in prehospital research



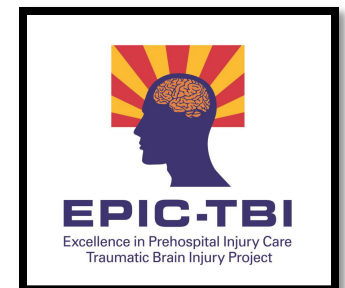
# Background

- ▶ Linkage of EMS and TC data is challenging
- ▶ Thus, few *large* studies assessing the association between *prehospital* GCS and *distal* outcomes



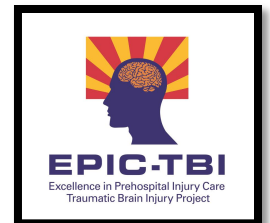
# Objective

- ▶ To evaluate the association between prehospital GCS and TC outcomes utilizing a *statewide* trauma registry for patients with *moderate or severe TBI*



# Methods

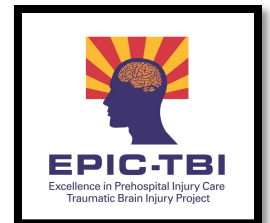
- ▶ System setting:
  - State of Arizona
  - Over 150 Fire Department and EMS agencies
  - Eight level 1 TCs
  
- ▶ Study setting:
  - The patients are part of the retrospective cohort of the EPIC Study
  - EPIC: Evaluation of the impact of the statewide implementation of the nationally and internationally-vetted EMS TBI Guidelines





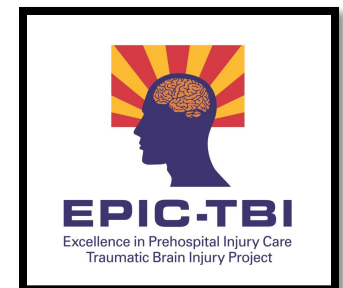
# Methods: Data Source

- ▶ The Arizona State Trauma Registry (ASTR):
  - EMS and TC data
  - Contains all patients who were taken to a Level 1 TC in the state
- ▶ Hospital and EMS data abstracted at each TC and entered into the ASTR



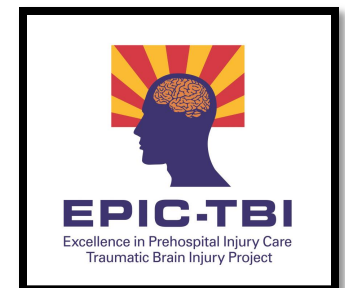
# Methods: Analysis

- ▶ Analyzed the associations between *initial* prehospital GCS and hospital outcomes:
  - All CDC Barell Matrix Type 1 TBI cases (mod/severe)
  - Two years: (Dec 09–Jan 10)
  
- ▶ GCS categorization:
  - Mild: 15–13
  - Moderate: 12–9
  - Severe: 8–4
  - Ominous: 3



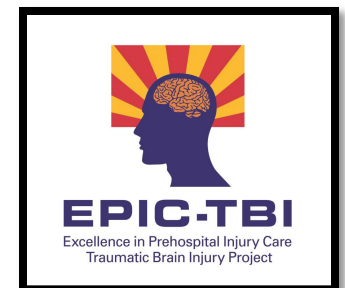
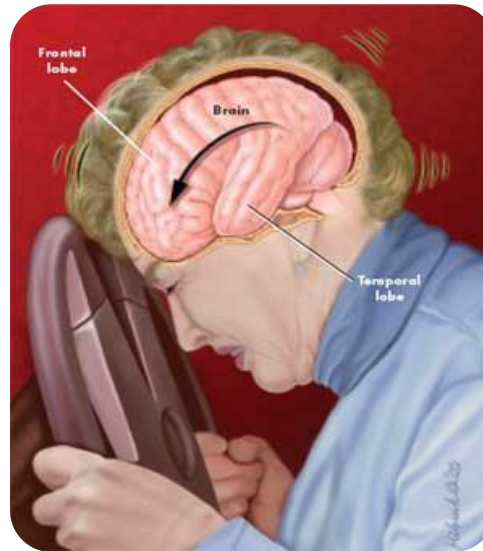
# Analysis

- ▶ Evaluated associations between GCS and:
  - Survival
  - TC length of stay
  - TC disposition
  - Hospital cost (charges)
- ▶ Statistics:
  - Fisher's Exact Test or Kruskal–Wallis as appropriate



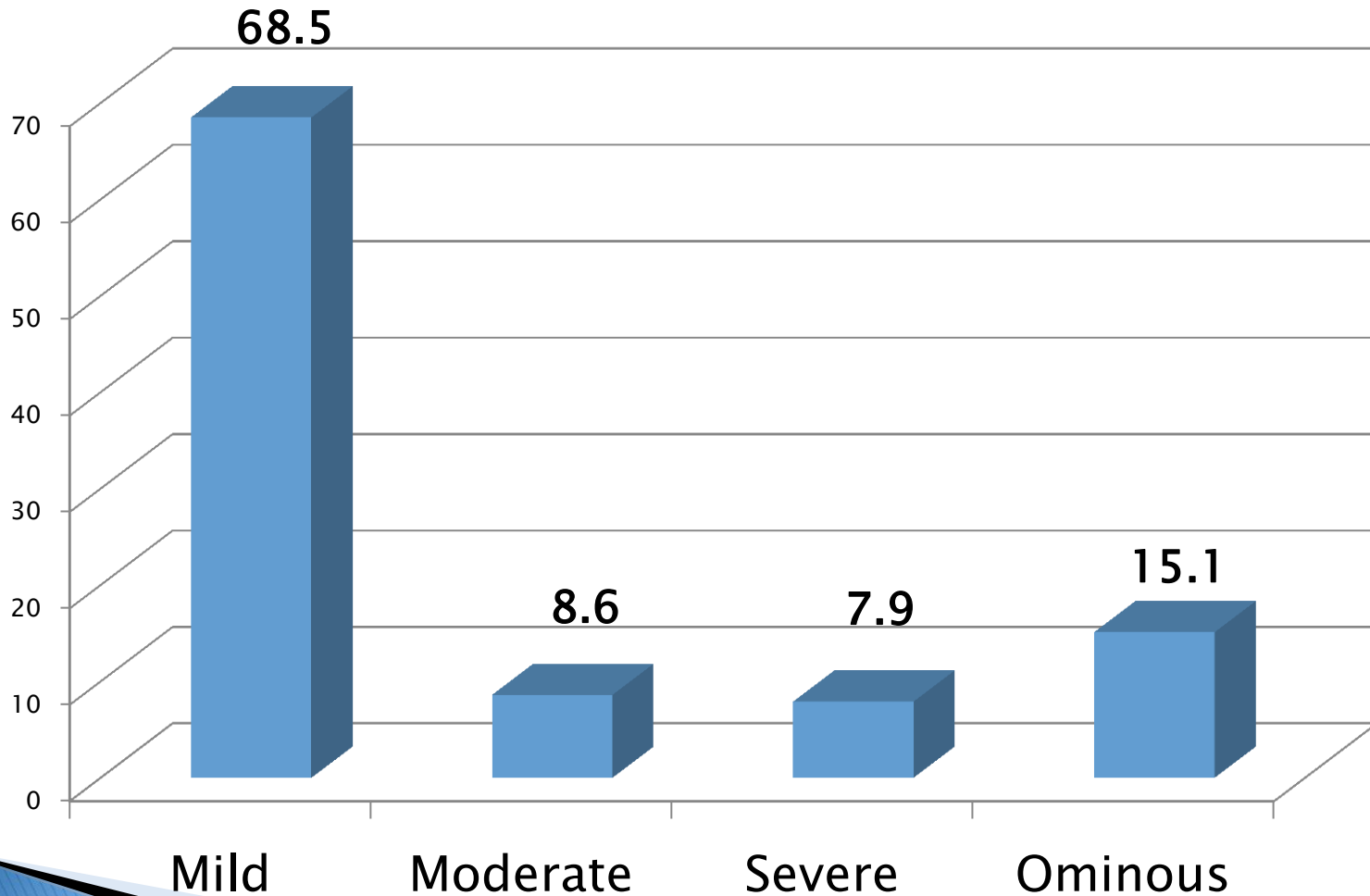
# Results

- ▶ A total of 6,985 moderate/severe TBI cases
- ▶ 5,375 (77%) had documented prehospital GCS
  - Study group

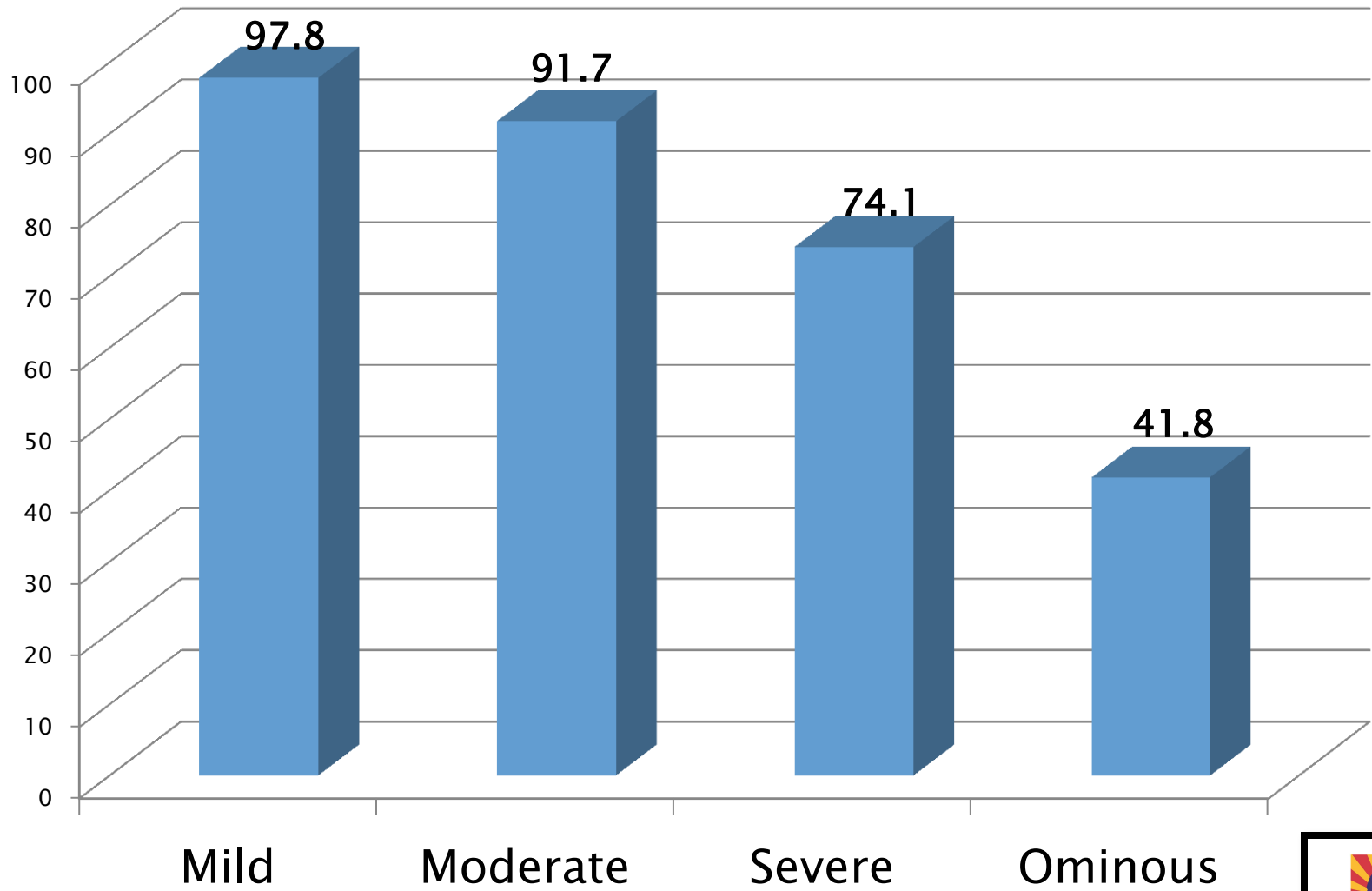


# Results By GCS Category

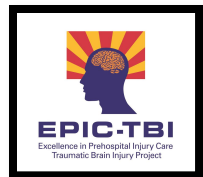
(%)



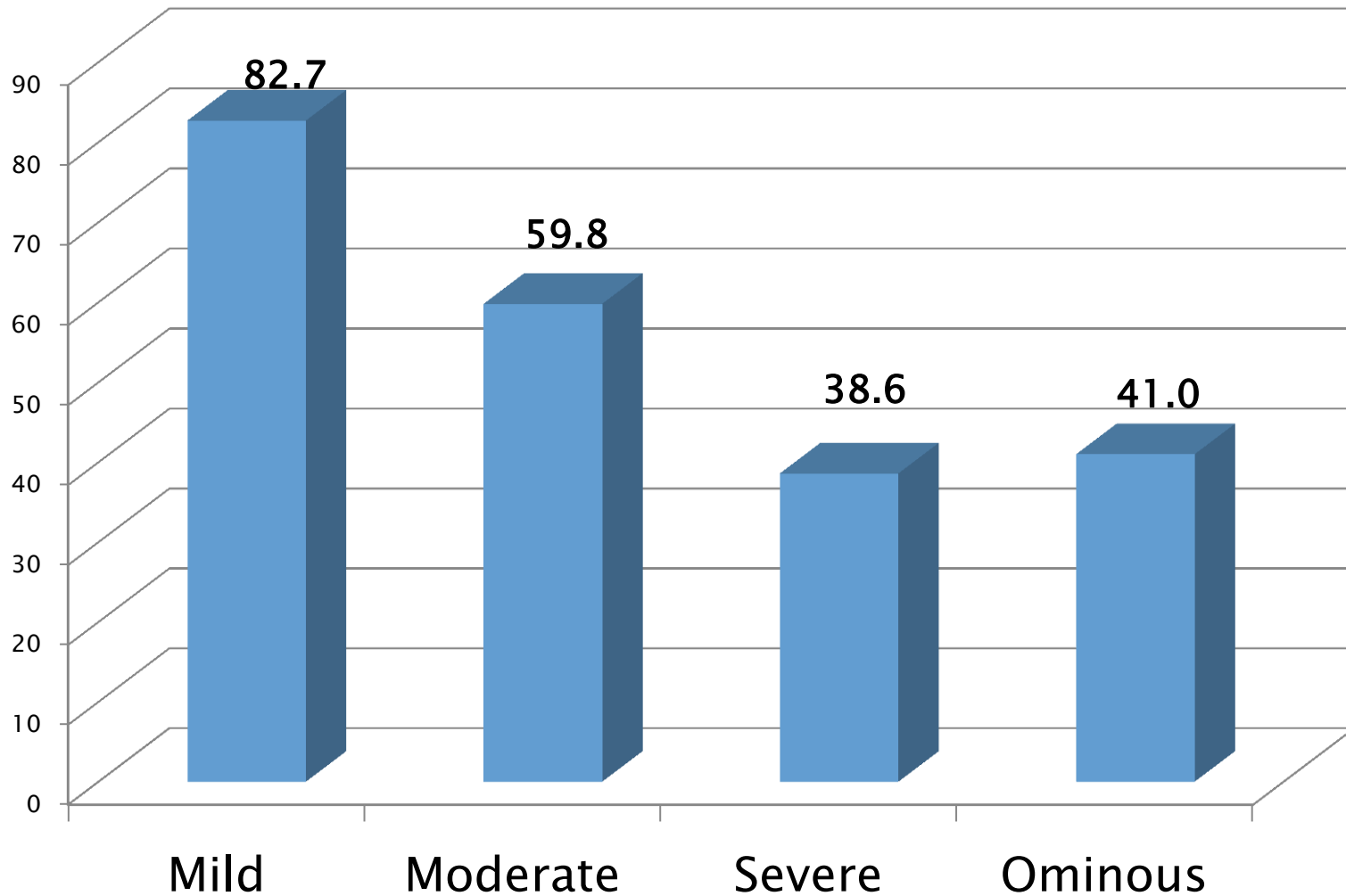
# Survival by GCS Category (%)



$P < 0.001$



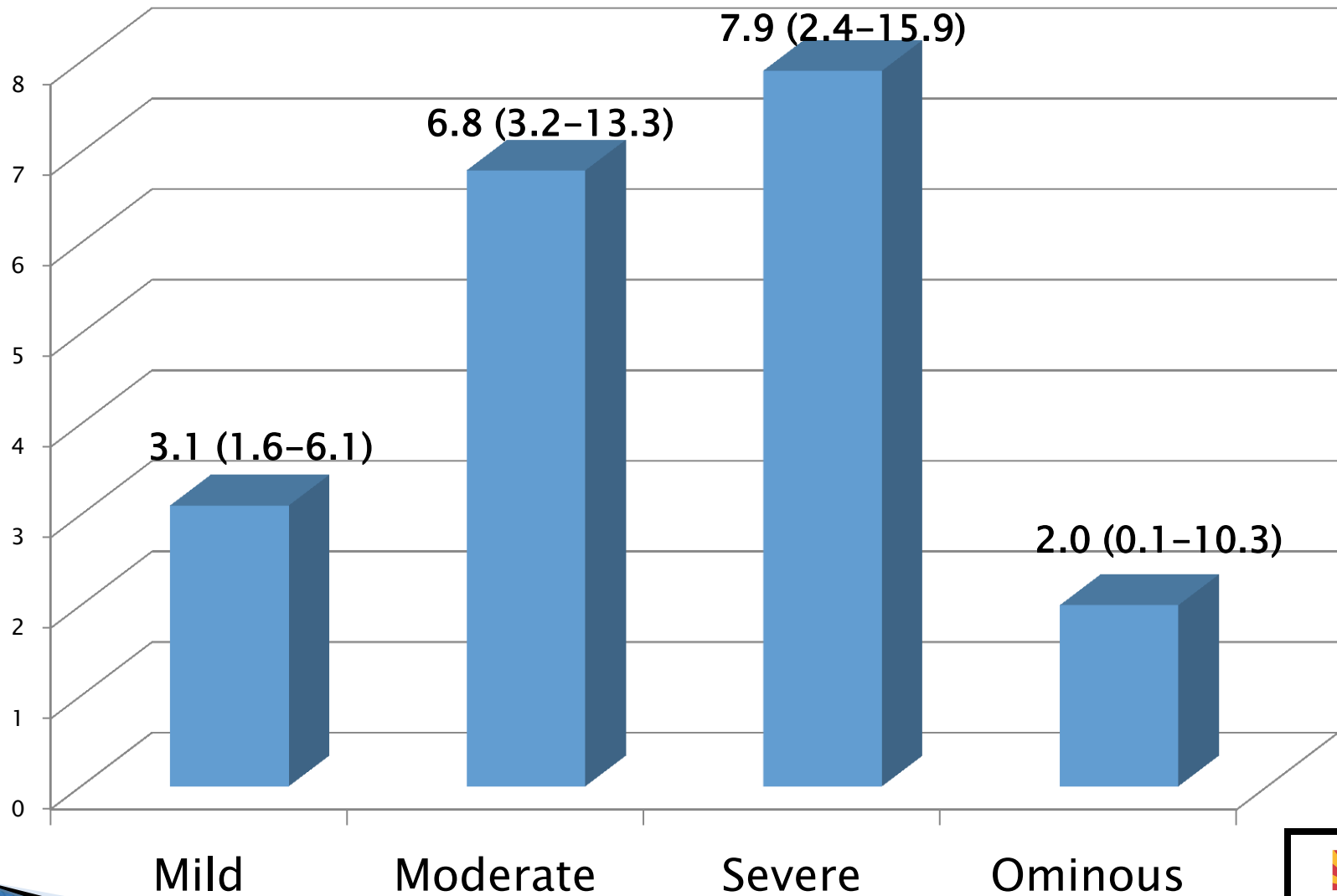
# Discharged Home Vs. SNF



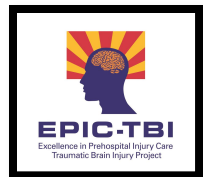
$P < 0.001$



# Trauma Center LOS (days/IQ range)

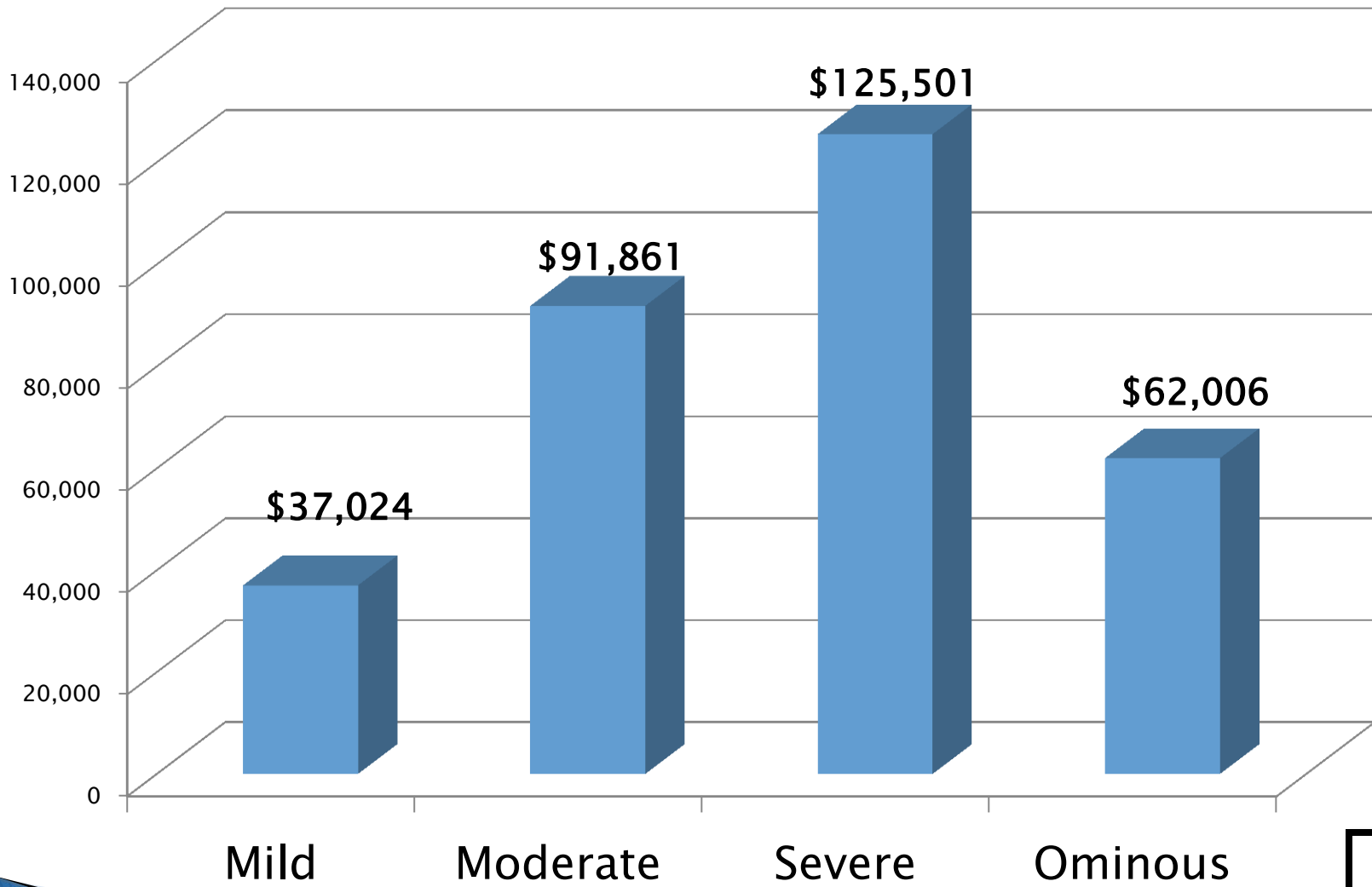


$P < 0.001$

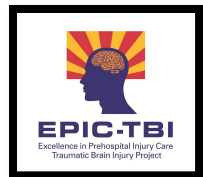




# Trauma Center Charges (USD)



$P < 0.001$



# Limitations

- ▶ GCS “categorizations”:
  - Commonly-used
  - Not validated for research purposes
- ▶ Evaluated only initial GCS
  - Evaluating GCS trends in a 4-year cohort (>13,000)
- ▶ Missing *prehospital* GCS in 23% of cases
  - Selection bias



# Limitations

- ▶ Known limitations as a risk-adjuster:
  - Intra- and inter-rater reliability
  - Non-normal distribution
  - Not a continuous variable (often treated as one)
    - E.g., the difference between 3/4 vs. 14/15
- ▶ “Cost”:
  - Charges are only a surrogate for true cost



# Conclusions

- ▶ *Lower* initial prehospital GCS was strongly associated with:
  - *Lower* survival
  - *Greater* hospital/ICU LOS and hospital charges
    - Exception–GCS 3: Many early deaths
  - *Greater* proportion of survivors going to skilled care facilities upon discharge



# Conclusions

- ▶ Despite the strong associations:
  - Two-thirds of all patients with major TBI had an initial GCS of 15–13 in the field
  - 17.3% in the “mild” GCS category were discharged to a SNF
- ▶ While GCS is useful for risk stratification, it cannot be used alone as an identifier of significant TBI



Special thanks to  
the EPIC Partners

*Arizona Fire Departments and EMS Agencies*



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## Upcoming Events

- Traumatic Brain Injury (EPIC) Rollout Session  
Mon, 01/30/2012

◀ **December** ▶

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

## Excellence in Prehospital Injury Care (EPIC)

### Why is the EPIC Project important?

Each year, an estimated 1.7 million people sustain a TBI annually. Of them:

- 52,000 die,
- 275,000 are hospitalized, and
- 1.365 million, nearly 80%, are treated and released from an emergency department.

TBI is a contributing factor to a third (30.5%) of all injury-related deaths in the United States.<sup>1</sup>

There is growing evidence that the management of TBI in the early minutes after injury profoundly impacts outcome. EMS operates in the ultra-acute setting, usually providing the first care for TBI victims when treatment matters the most. Reports on implementation of evidence-based TBI treatment guidelines inside the hospital are very promising. However, no studies to date have evaluated their impact in the prehospital setting.

The EMS agencies of Arizona have already proven their ability to dramatically improve cardiac arrest survival and, thus, Arizona was selected by the National Institutes of Health to do the same with TBI.

