

# BRINGING UP A PEDIATRIC TRAUMA CENTER

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## 2017 TMAC Conference

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# Objectives

- To understand the process and components needed to set up a new pediatric trauma center
- To review the challenges of operating a new pediatric trauma program
- To analyze the impact of a new pediatric trauma center on the existing trauma system

# ACS Verified Pediatric Trauma Centers in Southern California

Level I            Children's Hospital Los Angeles  
                      Rady Children's Hospital

Level II            UCI Medical Center  
                      (CHOC at Mission)

# ACS Verified Adult Trauma Centers in Southern California

## Level I

Cedars Sinai Medical Center

Harbor UCLA

LAC/USC

Scripps Mercy

UCI

UCSD

UCLA Medical Center

# ACS Verified Adult Trauma Centers in Southern California

## Level II

Arrowhead Regional

Long Beach Memorial

California Hospital Medical Center

Huntington Memorial

Mission Hospital

Northridge Hospital

Providence Holy Cross

Riverside

Scripps Memorial

Sharp Memorial

St. Francis

St. Mary

# OSHPD Pediatric Trauma Centers in Southern California

## Level I

CHLA

Loma Linda

Ronald Reagan UCLA

## Level II

Cedars Sinai

LAC Harbor

LAC UCLA

Long Beach Memorial/ Miller Children's

Rady Children's

Santa Barbara Cottage Hospital

# OSHPD Level I Adult Trauma Centers In Southern California

LAC Harbor-UCLA Med Ctr

LAC USC Medical Center

Loma Linda Medical Center

Ronald Reagan UCLA

Scripps Mercy

UC Irvine Medical

UCSD Medical

# OSHPD Level II Adult Trauma Centers In Southern California

Antelope Valley Hospital

Arrowhead Rgnl Medical

CA Hospital Med Ctr

Desert Rgnl Med Ctr

Huntington Memorial

Long Beach Memorial Med Ctr

Mission Rgnl Med Ctr

Northridge Hospital

Palomar Health Downtown

Providence Holy Cross Med Ctr

Riverside Cmty Hosp

Riverside Cnty Rgnl Med Ctr, Moreno Vly

Santa Barbara Cottage Hosp

Scripps Memorial

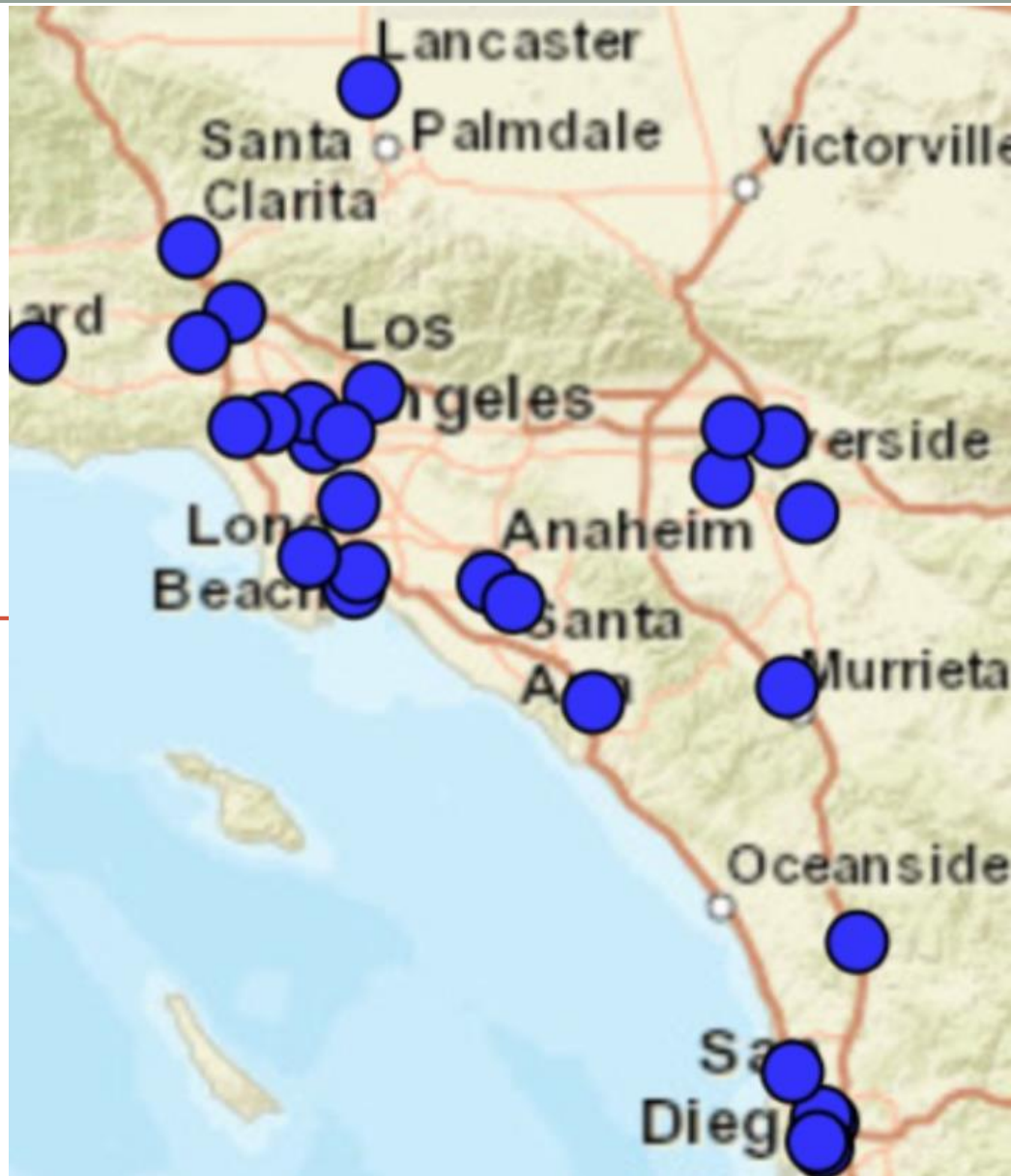
Sharp Memorial

St Francis Medical

St Mary Med Ctr

Western Medical (OC Global)





# Pediatric Trauma Care in Orange County Prior to 2015

- OC Global (former Western Medical Center Santa Ana)
- UCI Medical Center
- Mission Viejo Regional Medical Center
- Approximately 600 Traumas/year below the age of 15

# The Rationale for a New Pediatric Trauma Center

- Potential for Improved Outcomes
- Community Expectation
- Community Benefit
- Improvement of Internal Processes and Care
- Provision of the Full Spectrum of Pediatric Care (It's What Children's Hospitals Do)
- Halo Effect

- [J Pediatr Surg.](#) 2016 Oct;51(10):1693-9. doi: 10.1016/j.jpedsurg.2016.04.005. Epub 2016 Apr 21.
- **Comparison of pediatric motor vehicle collision injury outcomes at Level I trauma centers.**
- [Dreyfus J](#)<sup>1</sup>, [Flood A](#)<sup>2</sup>, [Cutler G](#)<sup>3</sup>, [Ortega H](#)<sup>3</sup>, [Kreykes N](#)<sup>4</sup>, [Kharbanda A](#)<sup>3</sup>.
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- <sup>4</sup>Department of Pediatric Surgery, Children's Hospitals and Clinics of Minnesota, 2525 Chicago Avenue, Minneapolis, MN 55404.
- **Abstract**
- **OBJECTIVE:**
- Examine the association of American College of Surgeons Level I pediatric trauma center designation with outcomes of pediatric motor vehicle collision-related injuries.
- **METHODS:**
- Observational study of the 2009-2012 National Trauma Data Bank, including n=28,145 patients <18years directly transported to a Level I trauma center. Generalized estimating equations estimated odds ratios (ORs) for injury outcomes, comparing freestanding pediatric trauma centers (PTCs) with adult centers having added Level I pediatric qualifications (ATC+PTC) and general adult trauma centers (ATC). Models were stratified by age following PTC designation guidelines, and adjusted for demographic and clinical risk factors.
- **RESULTS:**
- Analyses included n=16,643 children <15 and n=11,502 adolescents 15-17years. Among children, odds of laparotomy (OR=1.88, 95% CI 1.28-2.74) and pneumonia (OR=2.13, 95% CI 1.32-3.46) were greater at ATCs vs. freestanding PTCs. Adolescents treated at ATC+PTCs or ATCs experienced greater odds of death (OR=2.18, 95% CI 1.30-3.67; OR=1.98, 95% CI 1.37-2.85, respectively) and laparotomy (OR=4.33, 95% CI 1.56-12.02; OR=5.11, 95% CI 1.92-13.61, respectively).
- **CONCLUSIONS:**
- Compared with freestanding PTCs, children treated at general ATCs experienced more complications; adolescents treated at ATC+PTCs or general ATCs had greater odds of death. Identification and sharing of best practices among Level I trauma centers may reduce variation in care and improve outcomes for children.

- [JAMA Pediatr.](#) 2016 Aug 1;170(8):780-6. doi: 10.1001/jamapediatrics.2016.0805.

- **Association Between Trauma Center Type and Mortality Among Injured Adolescent Patients.**

- [Webman RB](#)<sup>1</sup>, [Carter EA](#)<sup>1</sup>, [Mittal S](#)<sup>2</sup>, [Wang J](#)<sup>3</sup>, [Sathya C](#)<sup>4</sup>, [Nathens AB](#)<sup>4</sup>, [Nance ML](#)<sup>5</sup>, [Madigan D](#)<sup>6</sup>, [Burd RS](#)<sup>1</sup>.

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- <sup>3</sup>Center for Clinical and Community Research, Children's National Medical Center, Washington, DC.
- <sup>4</sup>Division of General Surgery, Department of Surgery, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada.
- <sup>5</sup>Department of Surgery, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania.
- <sup>6</sup>Department of Statistics, Columbia University, New York, New York.

- **Abstract**

- **IMPORTANCE:**

- Although data obtained from regional trauma systems demonstrate improved outcomes for children treated at pediatric trauma centers (PTCs) compared with those treated at adult trauma centers (ATCs), differences in mortality have not been consistently observed for adolescents. Because trauma is the leading cause of death and acquired disability among adolescents, it is important to better define differences in outcomes among injured adolescents by using national data.

- **OBJECTIVES:**

- To use a national data set to compare mortality of injured adolescents treated at ATCs, PTCs, or mixed trauma centers (MTCs) that treat both pediatric and adult trauma patients and to determine the final discharge disposition of survivors at different center types.

- **DESIGN, SETTING, AND PARTICIPANTS:**

- Data from level I and II trauma centers participating in the 2010 National Trauma Data Bank (January 1 to December 31, 2010) were used to create multilevel models accounting for center-specific effects to evaluate the association of center characteristics (PTC, ATC, or MTC) on mortality among patients aged 15 to 19 years who were treated for a blunt or penetrating injury. The models controlled for sex; mechanism of injury (blunt vs penetrating); injuries sustained, based on the Abbreviated Injury Scale scores (post-dot values <3 or ≥3 by body region); initial systolic blood pressure; and Glasgow Coma Scale scores. Missing data were managed using multiple imputation, accounting for multilevel data structure. Data analysis was conducted from January 15, 2013, to March 15, 2016.

- **EXPOSURES:**

- Type of trauma center.

- **MAIN OUTCOMES AND MEASURES:**

- Mortality at each center type.

- **RESULTS:**

- Among 29 613 injured adolescents (mean [SD] age, 17.3 [1.4] years; 72.7% male), most were treated at ATCs (20 402 [68.9%]), with the remainder at MTCs (7572 [25.6%]) or PTCs (1639 [5.5%]). Adolescents treated at PTCs were more likely to be injured by a blunt than penetrating injury mechanism (91.4%) compared with those treated at ATCs (80.4%) or MTCs (84.6%). Mortality was higher among adolescents treated at ATCs and MTCs than those treated at PTCs (3.2% and 3.5% vs 0.4%;  $P < .001$ ). The adjusted odds of mortality were higher at ATCs (odds ratio, 4.19; 95% CI, 1.30-13.51) and MTCs (odds ratio, 6.68; 95% CI, 2.03-21.99) compared with PTCs but was not different between level I and II centers (odds ratio, 0.76; 95% CI, 0.59-0.99).

- **CONCLUSION AND RELEVANCE:**

- Mortality among injured adolescents was lower among those treated at PTCs, compared with those treated at ATCs and MTCs. Defining resource and patient features that account for these observed differences is needed to optimize adolescent outcomes after injury.

- [See comment in PubMed Commons below JAMA Surg.](#) 2015 Sep;150(9):874-81. doi: 10.1001/jamasurg.2015.1121.

- **Mortality Among Injured Children Treated at Different Trauma Center Types.**

- [Sathya C](#)<sup>1</sup>, [Alali AS](#)<sup>2</sup>, [Wales PW](#)<sup>3</sup>, [Scales DC](#)<sup>4</sup>, [Karanicolas PJ](#)<sup>5</sup>, [Burd RS](#)<sup>6</sup>, [Nance ML](#)<sup>7</sup>, [Xiong W](#)<sup>8</sup>, [Nathens AB](#)<sup>5</sup>.

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- <sup>8</sup>Sunnybrook Research Institute, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada.

- **Abstract**

- **IMPORTANCE:**

- Trauma is the leading cause of death among US children. Whether pediatric trauma centers (PTCs), mixed trauma centers (MTCs), or adult trauma centers (ATCs) offer a survival benefit compared with one another when treating injured children is controversial. Ascertaining the optimal care environment will better inform quality improvement initiatives and accreditation standards.

- **OBJECTIVE:**

- To evaluate the association between type of trauma center (PTC, MTC, or ATC) and in-hospital mortality among young children (5 years and younger), older children (aged 6-11 years), and adolescents (aged 12-18 years).

- **DESIGN, SETTING, AND PARTICIPANTS:**

- In this retrospective cohort study, injured children aged 18 years or younger who were hospitalized in the United States from January 1, 2010, to December 31, 2013, were observed for the duration of their admission until discharge or death. We included patients with an Abbreviated Injury Score of 2 or greater in at least 1 body region. Random-intercept multilevel regression was used to evaluate the association between center type and in-hospital mortality after adjusting for confounders. Stratified analyses in young children, older children, and adolescents were performed. We conducted secondary analyses limited to patients with severe injuries (Injury Severity Score  $\geq 25$ ). Both analyses were performed between January 1 and August 31, 2014. Data were derived from 252 US level I and II trauma centers voluntarily participating in the American College of Surgeons adult or pediatric Trauma Quality Improvement Program.

- **MAIN OUTCOME AND MEASURE:**

- In-hospital mortality.

- **RESULTS:**

- We identified 175 585 injured children. Crude mortality rates were 2.3% for children treated at ATCs, 1.8% for children treated at MTCs, and 0.6% for children treated at PTCs. After adjustment, children had higher odds of dying when treated at ATCs (odds ratio [OR], 1.57; 95% CI, 1.15-2.14) and MTCs (OR, 1.45; 95% CI, 1.05-2.01) compared with those treated at PTCs. In stratified analyses, young children had higher odds of death when treated at ATCs vs PTCs (OR, 1.78; 95% CI, 1.05-3.40), but there was no association between center type and mortality among older children (OR, 1.17; 95% CI, 0.65-2.11) and adolescents (OR, 1.23; 95% CI, 0.82-1.85). Results were similar in analyses of severely injured children: those treated at ATCs (OR, 1.75; 95% CI, 1.25-2.44) and MTCs (OR, 1.62; 95% CI, 1.15-2.29) had higher odds of death when compared with those treated at PTCs.

- **CONCLUSIONS AND RELEVANCE:**

- Injured children treated at ATCs and MTCs had higher in-hospital mortality compared with those treated at PTCs. This association was most evident in younger children and remained significant in severely injured children. Quality improvement initiatives geared toward ATCs and MTCs are required to provide optimal care to injured children.

# The Rationale for a New Pediatric Trauma Center

- Potential for Improved Outcomes
- Community Expectation
- Community Benefit
- Improvement of Internal Processes and Care
- Provision of the Full Spectrum of Pediatric Care (It's What Children's Hospitals Do)
- Halo Effect

# Setting up a Pediatric Trauma Program

- Free-Standing Physical Facility (Available 2013)
  - ED
  - OR's
  - Lab
  - Imaging



# Setting up a Pediatric Trauma Program

- Strategic Plan
  - Formally Began in 2013, but considered for years
  - Multiple Stakeholders Consulted
  - Financial Modeling
  - Buy-in from the Hospital Board

# Setting up a Pediatric Trauma Program

- Setting Up the Team
  - Trauma Medical Director
  - Trauma Coordinator
  - Registrar
  - Executive Management Support (COO, CNO, CMO)
  - Trauma Committee
  - Other Regional Stakeholders (UCI, OCEMS)

# Setting up a Pediatric Trauma Program

- Policies
  - Orange Book
  - OCEMS Policies
  - PI Setup – M & M and IOP
  - MEC Commitment of Support
  - Board Commitment of Support
  - MTP, Video Recording, Guidelines
  - Beg, Borrow, and Steal

# Setting up a Pediatric Trauma Program

- Physical Facility
  - Trauma Bays (Supplies, Video Recording)
  - Office Space (Small)

# Setting up a Pediatric Trauma Program

- Call Panels (this was the hardest part)
  - In house trauma surgery
  - In house anesthesia
  - Neurosurg, Ortho, Ophtho, Plastics, OMFS
  - ED, Radiology, Critical Care, Rehab

# Setting up a Pediatric Trauma Program

- Education
  - TMD – Optimal, TOPIC, UCI, PTS, APSA
  - TPM – Optimal, TOPIC, TNCC
  - MD's – ATLS
  - RN's, Techs

# The Pediatric Difference

- Pediatric Expertise – all specialists are board certified and Peds experienced
- Pediatric Concussion Expertise
- Pediatric PTSD/Secondary Medical Stress
- Staff are solely pediatric oriented
- Child Life
- Family Support
- Nursing expertise

# Anticipated Areas of Concern

- Low penetrating trauma volume
- Massive Liver Injury
- Ruptured Globe
- Reimplantation
- IR
- Response from other trauma centers in the area
- VERIFICATION and the unknown unknowns



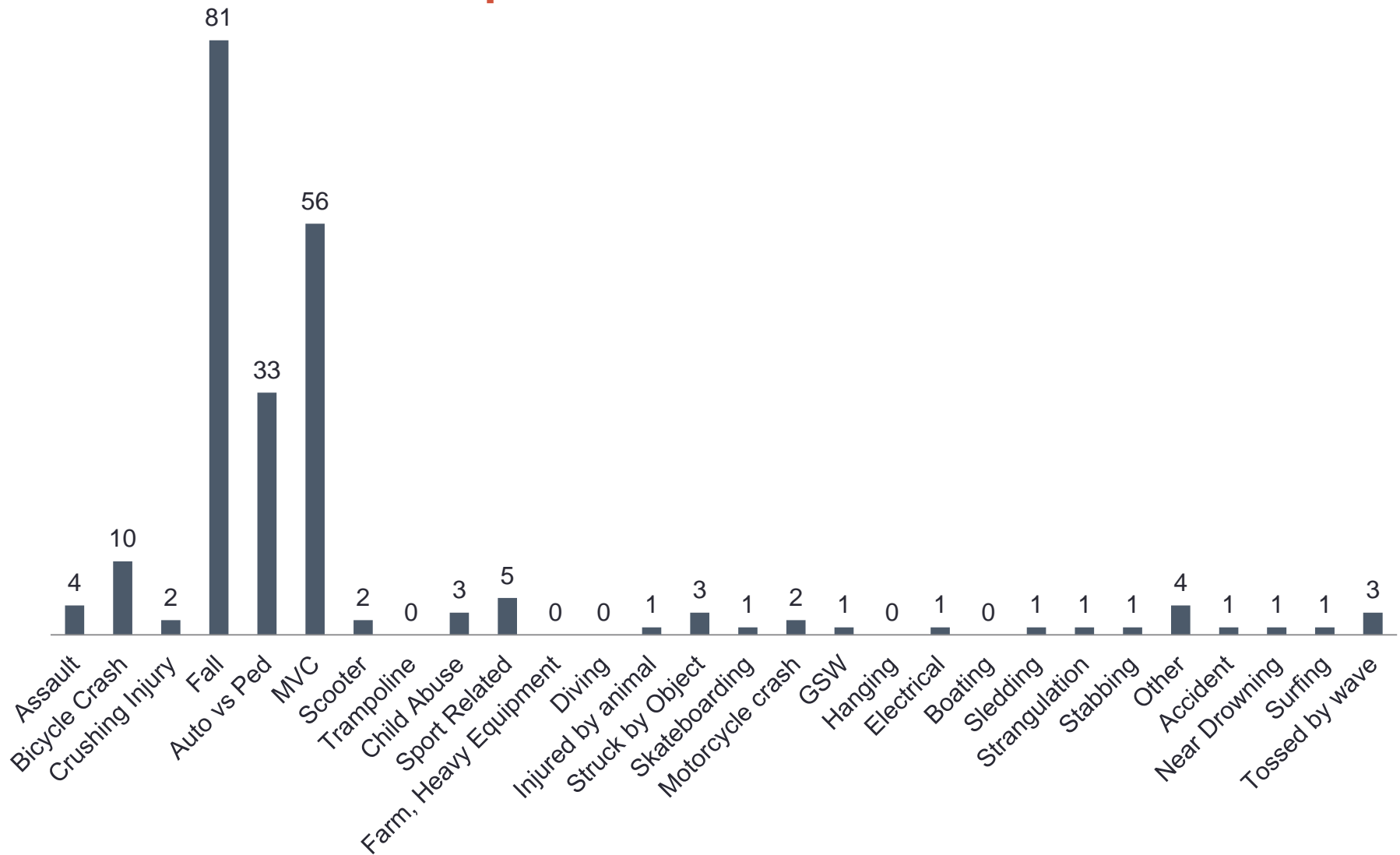
# Operating a New Pediatric Trauma Center

# Opening Our Doors

- On January 15, 2015 we started receiving trauma patients
- Age range 0-14 yrs 364 days
- Over 35 Tier 1, 400 Tier 2 Activations, 130 Consults
- 3 mortalities
- No major missed injuries

# Mechanism of Injury

Jan 2016 – Sept 2016



# Successes

- Excellent patient outcomes
- Transition from PICU to floor admits
- ED satisfaction
- Provider acceptance
- Call panel reinforcement
- Facilitation of transfers
- Process improvement
- Administrative/Community Support

# Challenges

- Registry
- PI Process
- Clarifying patient flow issues
- The pursuit of ACS Verification

# ACS Verification

- Doors Open January 2015
- Consultative visit requested Spring, 2016
- Consultative visit November, 2016
- ACS Verification visit scheduled January, 2018

# Findings of the Consultative Visit

- CME Deficiencies
- Attendance and documentation of attendance
- The PI Process
- Making the Registry a Useful Tool
- Organ donation, drug/alcohol screening

# Lessons Learned So Far

- Read the Orange Book
- At least one of the three major people in the program (Registry, TPM, TMD) should have significant Trauma experience
- At least one of the founders should be well established in the hospital
- Make Friends. (Peds vs adult resources)
- GET A CONSULTATIVE VISIT
- Pay attention to CME's
- Read the Orange Book



# Effect on the County Trauma System

# Negative Impact on the Other Trauma Centers

- Loss of Pediatric Volume
- Potential Loss of Expertise
- Loss of Trauma Fellow training
- Hospital Administrator Concerns
- Loss of Halo Effect (diminution of full service)

# Positive Impact on the Other Trauma Centers

- Transfer resource for difficult patients
- Additional source of expertise for pediatric-specific best practices
- Many staff may not want to do trauma patients
- Financial impact likely limited on balance

# Impact on the Regional Trauma System

- Increase in Trauma Capacity
- Potential to improve level of care through exchange of best practices
- Additional resource for EMS system
- Increased readiness for a mass casualty event involving children
- Potential for adult overflow in a mass casualty event
- Possible downstream negative impact

# Overall Impact

- Good for current patients
- Good for the trauma system
- Good for the standard of care
- Neutral to negative for existing programs

# Conclusions

- A collaborative approach is the ideal way to integrate a pediatric trauma program into the existing system
- At least one of the principals should have significant trauma experience
- Setting up a new program is very different than adding a pediatric program to an existing adult program
- Read the Orange Book
- Get a Consultative Visit
- Well run Pediatric Trauma Programs benefit the entire system and the community

# Questions ?

