THIRTY YEARS OF TRAUMA: THE EVOLUTION OF THE TRAUMA PATIENT IN THE SAN DIEGO COUNTY TRAUMA SYSTEM

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The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose
### BRIEF HISTORY OF THE SAN DIEGO COUNTY TRAUMA SYSTEM

<table>
<thead>
<tr>
<th>Date</th>
<th>Trauma System Related Activity</th>
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<tbody>
<tr>
<td>1983</td>
<td>Trauma Advisory Task Force – San Diego County Board of Supervisors</td>
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<tr>
<td>August 1, 1984</td>
<td>Major trauma victims in San Diego County began bypassing community hospitals in favor of designated trauma centers.</td>
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<tr>
<td>1993</td>
<td>Trauma System treated its 50,000&lt;sup&gt;th&lt;/sup&gt; patient</td>
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<tr>
<td>1999</td>
<td>Trauma System treated its 100,000&lt;sup&gt;th&lt;/sup&gt; patient</td>
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<tr>
<td>2002</td>
<td>Comprehensive review of the trauma system: Single Registry</td>
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<td>2006</td>
<td>First Hospital makes the switch to the current registry</td>
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<tr>
<td>2009</td>
<td>Trauma System treated its 200,000&lt;sup&gt;th&lt;/sup&gt; patient</td>
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<tr>
<td>2010</td>
<td>Last Hospital makes the switch to the current registry</td>
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<tr>
<td>2014</td>
<td>Trauma System turns 30 years old, treating its 250,000&lt;sup&gt;th&lt;/sup&gt; patient</td>
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Five Adult Trauma Centers

1. University of California, San Diego Medical Center (Level 1)
2. Scripps Mercy Hospital (Level 1)
3. Scripps Memorial Hospital (Level 2)
4. Palomar Medical Center (Level 2)
5. Sharp Memorial Hospital (Level 2)

One Pediatric Trauma Center (ages 14 and younger)

1. Rady Children’s Hospital (Level 1)
With five adult trauma centers and one pediatric trauma center, how are trauma patients delivered to the most appropriate hospital?

- All pediatric trauma patients 14 and younger: Rady Children’s Hospital
  - May involve helicopter transport or inter-facility transport from another hospital

- Adult trauma patients: Trauma Catchment System
  - Based on population distribution and transport times
  - Trauma patients may not request destination as other EMS patients are allowed
  - Trauma patients are not necessarily taken to nearest Trauma Center
  - Healthcare Insurance does not play an role in trauma transport
What changes have we seen in...

- Trauma Volume?
- Cause of Injury?
- Trauma Outcome?
What are the potential external factors affecting Trauma Volume?

1. Increasing population

2. Higher percent of injuries diverted to trauma centers
   - Injured patients do better when they are sent to a trauma center
     (This may be considered an internal factor).
TOTAL PATIENTS TREATED OVER THE YEARS

162% Increase

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012
TRAUMA PATIENTS VS. GENERAL POPULATION

Trauma – 168% Increase

Population – 45% Increase

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012
INCREASE IN TRAUMA VOLUME

How can an increase in trauma volume (potentially) affect the system?

1. Increased burden on the system
2. Increased need for staffing
3. Increased need for ambulance/EMS
4. Increased bypass

5. *Poorer outcomes?*
What are the potential external factors affecting *cause of injury*?

- Trauma-related legislation
  - Laws
  - Safety improvements
  - Technology
- Aging population
TRAUMA-RELATED LEGISLATION

January 1986: Secondary seat belt law
July 1987: California Motorcyclist Safety Program implemented
1987: Bicycle helmets required for riders under 5 years
1989: Roberti-Roos Assault Weapons Control Act of 1989 (Semi-automatic assault weapons control)
January 1990: 0.08% blood alcohol concentration limit and administrative license suspension laws implemented
January 1992: motorcycle helmet law
January 1993: primary seat belt law
January 1994: Bicycle Helmet Law (riders under 18 years)
January 1994: Illegal for anyone to ride in back of a pickup on a public highway
January 1994: “Zero tolerance” alcohol law: illegal for anyone under 21 years to drive with BAC of 0.01% or greater
1994: Brady Handgun Violence Prevention Act (5-day waiting period, background check)
July 1998: Brady Jared Teen Driver Act: Graduated licensing system for under age 18
January 2002: Child safety restraints required until children reach 6 years or 60 lbs. (previously 4 years and 40 lbs.)
January 2002: Bicycle helmet law expanded to include non-motorized scooters, skateboards, roller skates, and in-line skates
January 2003: All handgun buyers required to obtain safety license
2004: Assault weapons registration requirements
2005: Ban on certain semiautomatic weapons
2005: Child safety booster seats recommended for children up to 80 lbs
October 2013: Restrictions on those with mental illnesses owning firearms
MOTOR VEHICLE SAFETY

- Seatbelts
- Airbags
- Laminated windshields
- Crumple zones
- Anti-lock braking systems
- Tire pressure monitoring
- Traction control systems
- Driving under influence of alcohol laws
- Child car seats and safety restraints
PERCENT OF TOTAL TRAUMA – MOTOR VEHICLE ACCIDENTS

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2013
TOTAL FALL-RELATED TRAUMA ADMISSIONS

1986: 162
1992: 251
2002: 485
2012: 1440

789%

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012
Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2013
PERCENT OF TOTAL TRAUMA - ASSAULTS

1986: 14.7%
1992: 24.5%
2002: 13.2%
2012: 11.6%

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012

1994: Brady Handgun Act. 5-Day waiting period and background check on handguns
PERCENT OF TOTAL TRAUMA – SELF-INFRINGEMENTED INJURIES

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012
Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012
TRAUMA VOLUME BY CAUSE OF INJURY (ISS > 14)
CAUSES OF INJURY, PERCENT OF TOTAL (ISS > 14)

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012
MAJOR CHANGES IN CAUSE OF INJURY

- **Motor Vehicle Crashes**
  - 1986: 30.6%
  - 2012: 37.1%

- **Falls**
  - 1986: 7.2%
  - 2012: 14.7%

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2013
What are the potential factors affecting trauma patient outcome?

- Improved trauma care
- Improved Emergency Medical Services
- Trauma-related regulations and laws?
- Changing causes of injury?
  - Limitation to this study: Too many databases!
MORTALITY RATE – INJURY SEVERITY SCORE 15 OR GREATER

1986: 20.8%
1992: 22.4%
2002: 17.4%
2012: 10.4%

Source: County of San Diego, Health and Human Services Agency, Emergency Medical Services, Trauma Registry, 1984 - 2012
• Trauma volume has continually increased and we can expect this to continue

• Motor vehicle safety laws and an aging population have shifted the majority of trauma victims from car crashes to falls

• Penetrating injuries and assaults peaked in the early 90’s but have steadily decreased since then

Most importantly…

• The mortality rate for the most severely injured trauma patients has been cut in half over the life of the San Diego County Trauma System
THANK YOU