Objectives:

- Explain rates of appropriate restraint use among booster age children (typically 4-12)
- Explain car seat inspection usage rates in booster age children
- Identify real world consequences of improper belt fit
- Learn two ways to help parents make better choices (note, not BEST choices)
Background:

- Motor vehicle crashes are the leading cause of unintentional death and disability among children 4 years to 12 years of age in the United States.
- The occupant-related injury rate for 4 to 12 year olds was nearly TWICE that of children younger than 4 years old (317 per 100,000 children vs. 171 per 100,000 children younger than age 4).
- Booster seats have been shown to reduce the risk of serious injury by 45% in children aged 4-8 when compared with seat belt use alone.

How Are Kids Riding?

Restraint use for children 4-7
National Survey on the Use of Booster Seats 2011 vs. 2013

![Graph showing restraint use for children 4-7](image)

Why is This a Big Deal??

![Graph showing CTR (Crash and Trauma Research) data](image)

Nance ML, Lutz N, Arbogast KB, Correa PA, Kalan MJ, Winsten FK, Durbin CR. Department of Surgery, Children's Hospital of Philadelphia.
Aren’t Babies Fragile??

The RESEARCH – Belts and Bodies

The discrepancies in injury and death rates by age may be explained by lower observed rates of booster seat use in 4-7 year olds (41% to 47%) compared to the observed rates of car seat use for younger children (90% in children under age one and 83% in children 1 to 3).

As the child ages and becomes MORE FRAGILE (ie-high risk of injury) we observe a significant reduction in appropriate restraint use.

Seat Belt Geometry versus Anthropometry

- What is anthropometry??
  - The scientific study of the measurements and proportions of the human body.

Geometry of rear seats and child restraints compared to child anthropometry- Bilston & Sagar; Stapp Car Crash J. 2007;51:275-298

- Study Design:
  > Measured belt path (outboard/rear seat) in 50 vehicles
  > Compared to child body size
Vehicle Rear Seat Cushion Depth

- **Comparison of Child Body Dimensions with Rear Seat Geometry**
  
  - "Manufacturers have not systematically optimized rear seat cushions lengths, but rather have relied on stylists to determine their dimension."

Vehicle Seat Cushions

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Second Row</th>
<th>Third Row</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cars (≥27)</td>
<td>470.9</td>
<td></td>
</tr>
<tr>
<td>SUV’s (≥71)</td>
<td>465.4’</td>
<td>422.8’</td>
</tr>
<tr>
<td>Minivans (≥9)</td>
<td>400.1</td>
<td>452.5</td>
</tr>
</tbody>
</table>

Median 2nd row seat cushion = 455 mm

Median measurement is longer than average Buttock Popliteal Length of:

- 24% of adult rear-seat occupants
- 83% of children
The Beautiful Booster………

**IIHS Rating Zones for Belt Scores**

Red = BAD
Green = GOOD

Correct belt fit MUST start out FULLY below the ASIS = remain engaged with pelvis in crash

**Question:**

With the high risk of injury from motor vehicle crashes in this particular age group, was the field of occupant protection focusing efforts on booster age children?
How Are We Doing??

We conducted an analysis of child passenger safety seat checklist forms from two Safe Kids coalitions in Michigan (2013) to identify restraint type upon arrival to car seat check events.

<table>
<thead>
<tr>
<th>Child Age Category</th>
<th>Coalition 1 N=1,287</th>
<th>Coalition 2 N=3,148</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than 1 Year</td>
<td>1,308 (25.2%)</td>
<td>262 (20.4%)</td>
<td>0.0154</td>
</tr>
<tr>
<td>1 to 3 years</td>
<td>1,173 (26.4%)</td>
<td>243 (18.9%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>4 to 8 years</td>
<td>1,028 (23.2%)</td>
<td>387 (30.7%)</td>
<td>0.0004</td>
</tr>
<tr>
<td>8 years and older</td>
<td>613 (13.8%)</td>
<td>213 (16.5%)</td>
<td>0.184</td>
</tr>
</tbody>
</table>


Study Revealed:

- Child safety seats for infants and young children were more commonly inspected than booster seats
  - rear-facing carrier (40.3%)
  - rear-facing convertible (10.2%)
  - forward-facing (19.3%)
  - booster seat (10.8%)

- Children age 4 and above were found to be in a sub-optimal restraint at least 30% of the time (defined as seatbelt or no restraint)
- Booster age children were more likely to have an inspection done at a one time event rather than an inspection station.

Case Studies

Real world consequences of improper belt fit……………..
Parents Have A Lot on Their Minds………..

How Can We Motivate Parents?

YES

- Plain language
- Collaborative
- Parent focused
- Compassionate
- LESS is more

How Can We Motivate Parents?

NO

- Jargon (buttock-popliteal length, intercostal distance, clavicle, retractor, abdominal trauma, anterior superior iliac spine engagement, transition, projectile, after-market product)
- “This literally takes two minutes of your time. Isn’t it worth it?”
- “This is easy”, “This is important”, “You should do this”
- “I can’t talk to you about moving your child to a booster seat since it isn’t best practice and they still fit in their harness seat”
- “Do you even care what happens to your child?”
- “Just hold that coffee cup over your child’s face and drop it. That’s what will happen if it becomes a projectile in a crash”
- Fear appeal- does not work for long term health behavior changes
**Things to Consider……………**

- Asking IF a child wears a seat belt does not get at the problem of incorrect belt fit
- Bigger and older DOES NOT equal safer. It equals LESS SAFE until the child can fit a seatbelt.
- Four to eight year old children are at TWICE the risk of injury due to improper restraint, yet these seat checks make up only 10% of our effort………

**Take Home:**

- Child passenger safety efforts were not aligned with injury data and revealed an area for growth in child passenger safety programs.
- Low proportions of parents use car seat inspection stations for children in the booster seat age group. Parents of booster age children were more likely to visit an event almost as an afterthought.
- Evaluation of data from seat check forms exposed low rates of safety seat checks for booster age children.
- Technicians may benefit from evaluating their own programs to identify efforts in addressing this group of children that are sub-optimally restrained.

**Conclusions**

- Technician interactions with parents of older children may require more parental education and support of parental motivation for prolonged restraint use and less emphasis on the technical aspects of restraint installation.
- We have yet to understand how long behavior change lasts after an inspection. We do not know if the inspection continues to influence parental decisions surrounding premature transition to a booster seat or the vehicle seat.
- Technicians may benefit from skill development in areas of health behavior and health education in order to better understand parental choice surrounding booster seat use.
THANK YOU!!
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