Passenger Safety for Children with Special Health Care Needs

Melissa Bryan, OTR/L, OTD, ATP, CPST
Sarah Haverstick, CPSTI
Heidi Kessler, PT, ATP, CPST

Objectives
• List best practice recommendations for child passenger safety
• Identify technology options for positioning and safety for children with special needs during transportation
• Locate online resources for conventional and special needs transportation safety
• Describe requirements for Child Passenger Safety Technician certification
• Discuss model for Special Needs Transportation Clinic

Why Transportation?

Motor vehicle crashes are the leading cause of injury death for children and young adults in the United States.

(National Center for Injury Prevention and Control, 2010)
Motor Vehicle/Traffic Prevention

• Deaths of children younger than 13 years of age has decreased in response to:
  o Using age- and size-appropriate child restraints
  o Seating children in rear seat of vehicle
  o Enforcement of stricter child restraint laws

Child Passenger Safety Technicians (CPST)

• National certification program- National Highway Traffic Safety Administration (NHTSA)
• Certification program began in 1997
• 3-4 day training course, written test, competency check-offs, and community car seat-check event
• Continuing education requirement for biannual recertification
• www.cert.safekids.org
Role of CPSTs

- Assist families with proper installation and use of child restraints and seat belts
- Provide resources and current information to families
- Participate in community car seat checks
- Provide educational presentations
- Provide in-hospital consultations or fitting station appointments

Common Misuses

- >70% of child restraints misused in a way that could lead to injury in a crash
- Common critical misuses
  - Loose installation
  - Loose harness straps
  - Improper positioning of harness straps
  - Chest clip not used or not positioned correctly
  - Seat belt placement incorrect

Best Practice

- Recommendations made by American Academy of Pediatrics
- Meet or exceed all state laws
- Based on child’s:
  - Height
  - Weight
  - Age
  - Readiness

(Decina & Lococo, 2005; Ohled, Yantim, Talty, & Bii, 2009)

(Durbin, 2011)
Rear-Facing

- Children and infants up to 2 years old
- Until highest height or weight limits for the child restraint are reached

---

Rear-Facing

- Infant-only
- Convertible

---

Forward-Facing with Harness

- Children over 2 years old, or
- Have outgrown the rear-facing height or weight limit of their child restraint
- Use until child outgrows the highest height or weight limit

---

www.evenflo.com  www.coscojuveniledgusa.com
Forward-Facing with Harness

- Convertible
- Combination

www.britaxusa.com
www.toysrus.com

Belt-Positioning Booster

- Children whose height or weight is above the limits of a forward-facing seat with harness
- Use until the vehicle lap and shoulder seat belt fits correctly (usually around 4 feet, 9 inches tall [145 cm] and 8-12 years old)
- Child must have maturity and trunk control to sit upright for duration of travel

Belt-Positioning Booster

- High back
- Low back

www.toysrus.com
www.walmart.com
Vehicle Seat

- Children who are:
  - Old enough
  - Large enough
  - Mature enough
- Use lap and shoulder seat belt
- Rear seat under 13 years old

Vehicle Seat Belt Readiness

- Sits upright with back/bottom against the vehicle seat
- Knees bend over the edge of the vehicle seat
- Feet rest flat on the floor
- Seat belt fits appropriately (lap belt across pelvis, shoulder belt across torso and shoulder)
- Maturity to sit in this manner for duration of travel

Transporting Children with Special Needs

- May require additional problem solving due to:
  - Limited postural control
  - Limited physiologic stability
  - Limited behavioral regulation
- Can often use a traditional child restraint
- Sometimes require a specialized child restraint
- Training through NHTSA is available (16 hour course)
- Therapists and suppliers are well-positioned to assist families, because of existing relationships
Rehab Therapist Knowledge

- Online survey of over 1,000 occupational and physical therapists
- Therapists reported knowledge and behavior regarding transportation
  - 53%: little or no knowledge
  - 79%: no formal training
  - 54%: no experience
  - 61%: little or no counseling with families on the subject

(Blake, Sherman, Horns, & Lapidus, 2006)

Use Trained Providers

- Child passenger safety is complex
- Providers should not exceed the limit of their expertise
- Do not modify child restraints or use after market products (NHTSA, 2007)
- Therapists/suppliers not trained in child passenger safety can make referrals to community resources and organizations who can assist them (Yonkman, Lawler, Talty, O’Neill, & Bull, 2013)
- Therapists/suppliers can pursue CPST training

Special Needs Training for CPSTs

- Created by the Automotive Safety Program at Riley Hospital for Children, with funding from the National Safety Council
- Designed to expand the knowledge base of CPSTs in situations involving transporting children with medical conditions and procedures
- 16 hour training, available to CPSTs
- www.preventinjury.org
Restraint Use by Families

- Comparison study of recommendations and practice
- 275 drivers transporting 294 children with special health care needs were observed.
- 82% of drivers had chosen the appropriate type of restraint.
- Only 27% of restraints were being used properly.
- 24% of the seats observed were inappropriately modified.
- 19% of the children could have used additional positioning support during transportation.
- Only 8% of medical equipment was properly secured.

(Fitch et al., 2009)

Concerns of Families

- Questionnaire completed by more than 1,000 families in Sweden
- Findings:
  - Transfers in/out of vehicle are perceived as “risky.”
  - Concerns regarding poor postural sitting positions
  - Concerns regarding lack of information/education.

(Falkmer & Gregersen, 2002)

Transportation Interventions

- Must meet Federal Motor Vehicle Safety Standards 213 (FMVSS, 2014)
- Instructions of child restraint manufacturer and vehicle manufacturer must be followed
- Child restraints crash tested in specific configuration. Variance from this can compromise safety.
Considerations

- Child’s age
- Child’s height
- Child’s weight
- Child’s behavioral regulation
- Vehicle (make, model, year, seat belt type, lower anchors, tether anchor, other occupants, other child restraints in use)
- Child’s medical condition
- Medical equipment

Large Medical Seats

- Children with poor postural control (neuromuscular disorders, scoliosis, etc.)
- Height and weight are above limits of commercially available child restraint
- Children with behavioral challenges that compromise safety of child or vehicle occupants
- Children with temporary orthopedic conditions (casts)
- 5-point harness
- Up to 130 lbs. (59 kg) and 66 inches (167 cm)
- Consider large size of car seat, growth of child, ease of transfers, and availability of tether anchor in vehicle

Roosevelt by Merritt Manufacturing

- Low sides
- EZ Tether
- Scoliosis kit
- EZ-Up Head Rest
- Chest clip guard
- Buckle guard
- Seat depth extender
- Narrow shoulder width

www.eztether.com
Spirit by Columbia Medical

- Swing-away adjustable positioning supports (lateral chest supports, lateral hip supports, medial thigh guide)
- Individually adjustable harness straps (for trunk asymmetry)
- Low sides for easier transfers
- Requires tether anchor or long seat belt path

www.columbiamedical.com

Traveller Plus by Snug Seat

- Recline bar allows a semi-reclined position when forward-facing
- Crotch pad incorporates buckle guard to discourage children with behavioral disorders from unbuckling the seat
- Seat depth extension available

www.snugseat.com

Hippo by Snug Seat

- Designed for children with spica or hip casts
- Optional pillow allows seat fit to be adjusted
- Allows semi-reclined position forward-facing

www.snugseat.com
Jefferson by Merritt Manufacturing
• Designed for omphalocele
• Support cushion for smaller children
• Rebound control bar
• Optional tether
• E-Z Leveling feature
• Rear-facing only

Medical Belt-Positioning Boosters
• Designed for children who need more support than what the seat belt alone can provide
• Children must have some head/trunk control
• Offers a more age-appropriate option than a large medical seat for some children (achondroplasia, neuromuscular disorders, etc.)
• Consider behavioral regulation of child
• Consider availability of tether anchor

Carrot 3 by Convaid
• Offers free-angle recline
• Adjustable seat depth and back height
• Tray and footrest available
• Requires use of lower anchors, top tether, and seat belt
Churchill by Merritt Manufacturing

- Guides to position seat belt properly on child
- Trunk, head, and lower extremity supports available
- Very low sides for transfers
- Compact and lightweight
- Age-appropriate option for older children
- Requires lower anchors and tether anchors

Vests

- Children who require more support than the seat belt alone
- Children with behavioral regulation difficulties that have mastered unbuckling the seat belt or child restraint harness
- Some offer installation without using seat belt
- Can be an age-appropriate option
- Require tether anchor

E-Z-On Upright Vest by E-Z-On Products

- Zipper on back of vest prevents escape from the child restraint
- Requires top tether and seat belt or top tether and floor mounted lower anchors

www.eztether.com

www.ezonpro.com
E-Z-On Modified Vest by E-Z-On Products

- Allows child to lay supine in the vehicle seat
- Designed for children in spica or long-leg casts
- Lightweight and easy to transport
- Requires available bench seat in vehicle

Car Beds

- Designed for premature or low birth weight infants or infants who are unable to pass child restraint tolerance testing
- Common diagnoses: osteogenesis imperfecta, apnea, Pierre Robin sequence, myelomeningocele, omphalocele, hydrocephalus, casts, etc.
- Offers supine, prone, or sidelying positioning options
- Consider position relative to air bags and other vehicle occupants (some take up 2 seating positions)

Car Beds

Angel Ride by Angel Guard

Hope Car Bed by Merritt Manufacturing
Special Needs Transportation Clinic

- Developed in 2009
- Goal: Provide safe transportation options through family-centered care to improve quality of life
- Seeks to promote safety and prevent injury during community mobility
- Strong focus on education
- Over 250 families served

Client Population

- Any child with a medical diagnosis and transportation concerns
- Typically over age 3 and weigh more than 35 lbs.
- Common diagnoses:
  - Cerebral palsy
  - Spina bifida
  - Autism
  - Osteogenesis imperfecta
  - Achondroplasia
  - Down syndrome
  - Respiratory conditions
  - Gastro-esophageal reflux
  - Hydrocephalus

Clinic Structure

- Physician referral
- Usually 2 clinic visits (evaluation and fitting/training)
- Evaluation by occupational or physical therapist
  - Family concerns
  - Travel habits and routines
  - Position of family members in the vehicle
  - Current child restraints in use
  - Vehicle details
  - Physical assessment (pain, behavior, posture, strength, range of motion, functional mobility)
  - Positioning in and installation of current restraint
  - Needs identification
Evaluation Visit
- Demonstration and trial of options
  - Allows family to gain hands-on understanding of positioning, installation, and ease of use
- Family and therapist work together to determine best option
- Family can practice transfers under guidance of skilled practitioner and receive education on safe techniques
- Recommendation

Funding
- Traditional child restraint recommended when possible – funded by family
- Large medical seats and medical boosters – often funded by medical insurance
- Vests – funded by family or grant funding
- Denials after appeals – funded by family or grant funding

Fitting/Training Visit
- Strong focus on education
- Therapist provides instruction/assistance in positioning child, adjusting components, and installing in vehicle
- Therapist provides education on future steps, such as changing harness position, seat orientation, or seat style
- Caregivers install the seat with coaching by therapist as needed
- Therapist completes checklist to ensure proper use and installation
Promote Transportation Safety

- Become a CPST – [www.cert.safekids.org](http://www.cert.safekids.org)
- Develop a special needs transportation clinic
- Become familiar with child passenger safety resources nationally and locally
- Refer families to local CPSTs – list available at [www.cert.safekids.org](http://www.cert.safekids.org)
- Ask about transportation during every evaluation

References


References

References

Americans with Disabilities Act, 1990

• All persons with disabilities will have availability, and access to transportation.
• Transportation will have a lift or ramp, area for wheelchair space in width/depth and height, accessible doorways, handrails, seats, lap/shoulder belt and a securement for the wheelchair.
• There are no specifics on how the wheelchair should be secured to the vehicle.

Organizations for Wheelchair Safety

• ISO - International Organization for Standardization
  prepares standards and other documents concerning methodology and principles for terminology and language resources.
• ANSI - American National Standards Institute
  the U.S. representative of the International Organization for Standardization (ISO), and as a founding member of the ISO, ANSI plays an active role in its governance.
• RESNA - Institute/Rehabilitation Engineering and Assistive Technology Society of North America

Wheelchair Standards of Practice

• (ANSI/RESNA) American National Standards Institute/Rehabilitation Engineering and Assistive Technology Society of North America

• Wheelchair safety standards
  • Best Practice
  • Crash tested
  • Voluntary
Wheelchair Standards

- Standards are usually listed as WC – section #
- WC-18: Wheelchair tie-downs and occupant restraint systems for use in motor vehicles
- WC-19: Wheelchairs used as seats in motor vehicles
- WC-20: Wheelchair seating systems for use in motor vehicles

University of Michigan Transportation Research Institute

- The University of Michigan Transportation Research Institute (UMTRI) is dedicated to achieving safe and sustainable transportation for all. UMTRI is committed to interdisciplinary research that will ultimately increase driving safety and further transportation systems knowledge.
- Crashworthiness performance and seatbelt-accommodation testing of wheelchair seating systems are evaluated according to RESNA Wheelchair Standards and with ISO Seating systems for use in motor vehicles.
- http://www.umtri.umich.edu/content/UMTRIWheelchairTestingBrochure

Preferred Transportation Option

- It is generally safest to transport children in age-appropriate CSRS – child safety restraint system – that complies with the federal safety standards.
- Wheelchair users that should be out of their wheelchair for transportation include:
  - sport style wheelchairs that have low back heights
  - three wheeled scooters – these can not be anchored safely.
The standard requires that wheelchair tie-down/securement systems must be dynamically strength tested on an impact sled using a 30-mph/20-g crash pulse, a 187-pound (85 kg) surrogate wheelchair, and a 170-lb (76-kg) midsize adult male crash-test dummy.

Wheelchair Tie-down and Occupant Restraint Systems for Use in Motor Vehicles (WTORS)

Used with:
- forward-facing wheelchair-seated children and adults
- passengers and drivers of personally licensed motor vehicles
- passengers of public and school transportation
- Consists of:
  - Tie-down system for wheelchair
  - Lap/shoulder belt for passenger

Proper Installation – Securing the wheelchair

Proper installation includes the following:
- Face forward
- 4-point tie down
- Lap/shoulder belt or 5 point harness – separate of straps on the wheelchair.
- Combined occupant and wheelchair weight should not exceed tie-down recommendations
- Remove lap trays
Securing / Protecting the Rider

• Should use a crash-tested lap and shoulder belt, or a child restraint harness.
• Lap and Shoulder Belt’s should attach to the vehicle.
• Child Restraint Harness’ are usually apart of a wheelchair and have been crash tested with the wheelchair—currently only on medical strollers.
• Remember that the positioning belt and chest strap on wheelchairs for positioning the client, are not safety restraints.

Continue – Securing the Rider

• The lap belt should be angled between 45 and 75 degrees to the horizontal when viewed from the side.
• A diagonal shoulder belt should cross the middle of the shoulder and the center of the chest, and should connect to the lap belt near the hip of the wheelchair rider.

Incorrect Belt Placement
Wheelchairs for Use as Seats in Motor Vehicles.

Instituted in May 2000

WC-19 wheelchair

Transit Option (4 points of securement / hooks)

WC-19 is a wheelchair frame that is compliant with crash testing.
For a list of wheelchairs that meet W-19 standards go to the following website:

http://www.rercwts.org/WC19.html
Securing the wheelchair that is WC19 compliant

- **Always** position the wheelchair and rider facing forward in the vehicle.
- Attach the four tie down straps to the transit hooks provided on the wheelchair. Tighten the straps to remove all slack.

Securing a wheelchair that is not WC19 compliant

- Attach the tie down straps to welded junctions of the wheelchair frame or to other structural areas where the frame is fastened together.
- Secure either the top frame or the bottom frame with all four straps.

Wheelchairs – Non-WC19

- Recommended that the point be marked clearly when you find a good attachment location on the wheelchair:
  - Plastic ties
  - Colored tape
  - Or similar markings so that the operator will be able to identify the selected location.
Adjustable, moving or removable parts of the wheelchair, such as armrests, footrests & wheels.

Wheelchair Seating Systems for Use in Motor Vehicles

WC-20 states that a second-party seating system and the hardware have been crash tested on a surrogate base and have passed.

Seating systems that comply with this standard are intended to be used with WC-19 bases and WC-18 wheelchair tie-downs and occupant restraint systems.
Other Important Points to Remember

• During transportation the wheelchair backrests should be upright or not greater than 30 degrees recline or tilt.
• A properly positioned headrest can help protect the neck in a crash.
• If it is necessary to use a head and neck support during travel, choose a soft, flexible neck collar.

• Remove hard trays to reduce the chance of rider injury from contact with the tray.
• Secure medical and other equipment elsewhere in the vehicle/bus to prevent it from breaking loose and causing injuries in a crash.
• Check WTORS equipment regularly and replace worn or broken components. Keep anchorage track free of dirt and debris

• Read and follow all manufacturers’ instructions for both the wheelchair and the tie-down system.
• If the WTORS and wheelchair have been involved in a vehicle crash, check with the manufacturers to determine if the equipment needs to be repaired or replaced.
Ride Safe

• Brochure - developed and available through the University of Michigan Transportation Research Institute at:
  [link]

• “Information to help you travel more safely in motor vehicles while seated in your wheelchair”

Resources

• University of Michigan Transportation Research Institute – [link]
• Rehabilitation Engineering and Research Center on Wheelchair Transportation Safety – [link]
• Ride Safe brochure – [link]; umtridocs@umich.edu, 734-764-2171
• List of Crash Tested Wheelchairs - [link]