A Survey of Transportation Services for Children With Disabilities

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Key Words: wheelchairs and accessories

Although many students with disabilities are transported daily in school vehicles, few state guidelines address special transportation needs. This study collected information from two states on the types of vehicles and safety restraints used, and the problems encountered by public schools, community agencies, and rehabilitation centers that transport people with disabilities from birth to 21 years of age. The information collected, together with a review of research on special needs transportation, contributed toward development of state regulations for school buses used to transport special education students.

Vehicular transportation safety is an important part of individualized education planning for the 18.6% of occupational therapists working in schools. Using this study's questionnaires, occupational therapists who are primary resources for selection of seating and transportation equipment may become informed advocates for implementing safer transportation on an individual and state level for clients with disabilities.

The proper use of child safety seats (also referred to as car seats or child restraint systems) reduces the risk of death by an estimated 71% and the risk of serious injury by 67% (Kahane, 1986). Current Federal Motor Vehicle Safety Standards (FMVSS) administered through the National Highway Traffic Safety Administration (NHTSA) have helped improve transportation safety for most children. Until recently, these standards excluded children with disabilities. For example, FMVSS 213 Child Restraint Systems, the federal standard for design and performance of child safety seats, pertains only to children weighing up to 50 lb; thus, children heavier than 50 lb with disabling conditions that prevent use of a conventional vehicle safety belt are not protected by the standard. Nevertheless, parents and professionals are expected to transport children with disabilities on a daily basis to schools and developmental facilities despite the limitations in the standards and the paucity of information and equipment options. FMVSS 222, School Bus Passenger Seating and Crash Protection, (1993) established requirements for school bus safety features, including seat height, seat spacing, and padding. Recent amendments to FMVSS 222, effective January 17, 1994, include the following requirements for wheelchair users on school buses:

1. Wheelchair securement devices and occupant restraint systems meeting federal performance requirements must be provided on new school buses with wheelchair securement locations.
2. When transporting wheelchairs on buses, the wheelchairs should be placed in the forward facing orientation. State and local school districts may establish a procedure for exceptions to this rule, but must still meet the federal mandates for safety equipment.
3. Wheelchairs are to be secured by 2 front and 2 rear securement devices, or in the case of 3-wheeled wheelchairs by 1 front and 2 rear securement devices.

4. Static testing is required for wheelchair securement devices and occupant restraint systems and their anchorages.

Despite these recent improvements in FMVSS 222, challenges remain. For example, anecdotal accounts report that child safety seats are being improperly secured on bus seats, resulting in sideways slippage or tipping during normal travel. Although many parents and care providers relate anecdotal stories concerning such problems encountered during the transportation of children with disabilities, this information has not been collected in a standard format. States do not have the policies, resources, or technology to quantify or report the number of accidents, injuries, or deaths that occur involving children with disabilities. Consequently, lawmakers, government officials, transportation professionals, and health care providers have little statistical data from which to support the need for ongoing legislative, regulatory, or policy change. To respond to this information deficit, data from two states were collected related to the transportation of children with disabilities to and from public schools, community agencies, and rehabilitation facilities.

Method

The questionnaire developed for this study expanded on work reported by the American Academy of Pediatrics (Richards, 1987). The questionnaire was reviewed by occupational therapists, members of the National Committee for School Bus Transportation of the Handicapped, and selected transportation directors in Indiana. Reviewers' suggestions regarding clarity and ease of completion were incorporated into the final questionnaire, which consisted of two sections. The first section contained nine items:

1. Agency classification
2. Transportation problems encountered
3. Needs not currently met by restraint system
4. Transportation recommendations
5. Wheelchair securement types
6. State versus contracted transportation
7. Number homebound due to inadequate transportation
8. Reason for homebound schooling
9. Vehicle types used.

The second section asked for students to be categorized according to handicapping condition, age, type of transportation, and type of restraint.

A letter asking for participation in the survey project was sent to members of a national child passenger safety organization's committee on special needs transporta-

Results

Returned data were analyzed with SAS. When asked their primary role, the majority of respondents were from public schools (Iowa 95%, Indiana 45%). Five percent of Iowa respondents reported "other" or gave no answer for their primary role. Indiana had 21% community agency respondents, 21% rehabilitation center respondents, 10% who selected "other" and 3% who did not respond to the question. As might be expected, ages of the children transported were distributed mostly among the 6- to 17-year-old students (see Figure 1). The two states reported
similar proportions of various handicapping conditions requiring special transportation. When asked to categorize students according to a primary handicap, respondents indicated that 72% of the students had poor head control, poor trunk control, or emotional-behavior problems. Approximately 10% of the students with disabilities had poor head control, 35% had poor trunk control, and 28% had emotional-behavior problems (see Figure 2).

There were interesting differences between the types of vehicles used in the two surveyed states. Iowa used 91 station wagons; Indiana used 5 station wagons. Iowa reported use of 193 66-passenger school buses; Indiana reported use of 143. Iowa indicated use of only 2 taxicabs, whereas Indiana used 70. Iowa used 28 vans with seats and 5 special vans, whereas Indiana used 45 vans with seats and 36 special vans (see Figure 3). Indiana law (Indiana Code 20-9.1-5-2.6, 1981) allowed for transportation of special education students in special purpose vans or buses. Indiana and Iowa had similar distribution in the amount of state and contractual transportation used (see Figure 4).

Safety belt (seat belt) use was the primary occupant restraint used in both states (53% in Indiana, 26% in Iowa) but Iowa reported nearly twice the incidence of side-facing wheelchairs that Indiana reported (21% versus 12%) (see Figure 5).

Respondents' recommendations for improvement of the methods of safe transportation directly corresponded to the problems they had encountered (see Figures 6 and 7). Wheelchairs were secured, in many cases, by four-point strap-type tie-downs. Of those specifying tie-down use, the dynamically crash tested Q-Straint®, a wheelchair-occupant restraint, was used by 22% and Aeroquip, now called Kinedyne®, was used by 15% of respondents. Respondents used other tie-downs in 63% of the cases.

Fourteen children received homebound education because of transportation problems. Five were homebound due to orthopedic casting, two because of respiratory problems, and seven for other reasons.

Discussion
At a time when most available information was drawn from laboratory crash tests, this two-state survey of child safety seat use was conducted to document experiences of transporting children with disabilities. The transportation needs of children with disabilities identified in our survey were a reference for advocates and policy makers in both states and across the country working to improve school bus regulations ("Survey Profiled," 1990). Survey data were shared with State Departments of Education in Indiana and Iowa as one means of improving transportation of people with disabilities. Indiana and Iowa responded to this and other data by adopting requirements for forward-facing wheelchairs on school buses (575 Indi-
ana Administrative Code, 1990; Iowa Department of Education, 1988). Additional requirements for ancillary medical equipment and use of federally approved child restraints have also been incorporated into the Indiana specifications for special education school buses.

Despite advances, problems still exist. Survey results show the frequently encountered problems when schools, rehabilitation facilities, and community agencies attempt transportation for their clients with disabilities aged from birth to 21 years. We found that student size, disability differences, and vehicle differences affect safe transportation needs. For example, children weighing more than 50 lb may no longer fit in a child safety seat, but they cannot ride unsupported on a bus seat. Survey respondents recognized this as a special need because there is no FMVSS for equipment for children weighing more than 50 lb. Equipment manufacturers therefore have no specific federal standards for crash test durability and head and knee excursion limits for equipment for these larger children.

Results from this and similar surveys can be used by occupational therapists to anticipate the frequency and extent of certain problems faced by transporters to plan intervention for safe transportation and to advocate for changes in current policies. For example, our survey data showed that many students were transported in devices other than wheelchairs (the only focus of FMVSS 222 amendments). Use of these other devices, such as car seats, seat belts, and vests, in the school bus is not addressed by current federal safety standards. This lack of regulation could jeopardize the safety of infants and toddlers with disabilities who ride in such devices.

Only by knowing the client, the equipment needs, and the existing safety guidelines can the occupational therapist offer assistance to ensure a safe ride. For example, a choice between two wheelchairs or seating devices may be influenced by the combined needs of a good positioning–mobility device and a safe ride in the car or on the school bus. The occupational therapist's knowledge of wheelchairs and positioning equipment, combined with knowledge of safety guidelines, can make them uniquely qualified to make this type of recommendation. As shown in the survey, vehicle types differ widely from state to state, based in part on state laws. Therapists may circumvent vehicle-child safety seat incompatibility or child-child safety seat incompatibility by being familiar with equipment advantages, disadvantages, and alternatives.

Education of parents and transportation personnel could prevent some transportation problems, such as the use of inexpensive strollers or the use of three-wheeled carts, equipment that cannot be safely used as vehicular seats. Care providers should have the opportunity to be informed about research, state and federal standards, and equipment availability as it relates to their children (Stout, Bull, & Stroup, 1989). Resources available to meet the transportation needs of this population are listed in Tables 1 and 2.

Figure 5. Type of restraint used by respondents.

Figure 6. Problems encountered by respondents.

Figure 7. Recommendations of respondents.

Conclusion

All children deserve safe transportation to and from schools and developmental programs. Laws and standards are changing to improve safety for children with
### Table 1
**Product Guide for Special Needs Transportation**

<table>
<thead>
<tr>
<th>Disability</th>
<th>Potential Solution</th>
<th>Supplier (not all-inclusive)</th>
<th>1993 Approximate Retail Cost ($)</th>
<th>Child Weights Limits (lb)</th>
<th>Child Heights Limits (in.)</th>
<th>Comments/References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-weight infants</td>
<td>Infant-only car seats without shields</td>
<td>Wherever car seats are sold</td>
<td>30-50</td>
<td>Infant-only seat ≤20</td>
<td>≤26</td>
<td>Blanket rolls at sides and between legs provide positioning support. Height and weight limits vary</td>
</tr>
<tr>
<td></td>
<td>Evenflo Dyn-O-Mite Infant Car Seat</td>
<td>Evenflo 1801 Commerce Drive Piqua, OH 45356 (800) 543-8954 or wherever car seats are sold</td>
<td>30</td>
<td>≤20</td>
<td>≤26</td>
<td>American Academy of Pediatrics recommends testing low-weight infants' oxygen desaturation while infant is in the car seat</td>
</tr>
<tr>
<td>Must lie prone or supine</td>
<td>Swinger Car Bed</td>
<td>Not currently available, future marketability projected</td>
<td>60</td>
<td>≤17</td>
<td>≤26</td>
<td>Has a 30° position</td>
</tr>
<tr>
<td></td>
<td>Dream-Ride</td>
<td>Cosco 2525 State Street Columbus, IN 47201 (800) 544-1108 or wherever car seats are sold</td>
<td>60</td>
<td>≤20</td>
<td>≤26</td>
<td>Infant car bed</td>
</tr>
<tr>
<td></td>
<td>Evenflo Dyn-O-Mite Infant Car Seat</td>
<td>See above information</td>
<td>30</td>
<td>≤20</td>
<td>≤26</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E-Z-On Vest 101M</td>
<td>E-Z-On Products, Inc. 500 Commerce Way West, Suite 3 Jupiter, FL 33458 (800) 323-6598</td>
<td>70</td>
<td>≤105</td>
<td>–</td>
<td>22 to 43-in. waist. Modified vest has additional loops to allow child to lie down</td>
</tr>
<tr>
<td>Behavior problems</td>
<td>E-Z-On Vest</td>
<td>E-Z-On Products, Inc. (See address above)</td>
<td>70</td>
<td>≤164</td>
<td>–</td>
<td>22 to 43-in. waist, tether required</td>
</tr>
<tr>
<td>Poor trunk control</td>
<td>E-Z-On Vest</td>
<td>E-Z-On Products, Inc. (See address above)</td>
<td>70</td>
<td>≤164</td>
<td>–</td>
<td>22 to 43-in. waist, tether required</td>
</tr>
<tr>
<td>Little Cargo Vest</td>
<td>Little Cargo Vest</td>
<td>Little Cargo Vest 100 N. Broadway, Suite 2000 St. Louis, MO 63102 (800) 933-8580</td>
<td>45</td>
<td>25-49</td>
<td>–</td>
<td>Child must be able sit independently. No tether required</td>
</tr>
<tr>
<td>Safe Rider Vest</td>
<td>Kidd Enterprises</td>
<td>Kidd Enterprises 711 Tumamber Rd. Madison, WI 53719 (608) 274-7436</td>
<td>60</td>
<td>#1: 30-50 #2: 50-70</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Poor head and trunk control</td>
<td>Regular car seat</td>
<td>Wherever car seats are sold</td>
<td>60-90</td>
<td>≤40</td>
<td>≤40</td>
<td>Tether is free and used for children weighing more than 50 lb</td>
</tr>
<tr>
<td></td>
<td>Orthopedic Positioning Seat</td>
<td>Columbia Medical Manufacturing PO Box 635 Pacific Palisades, CA 90272 (310) 454-6612</td>
<td>549</td>
<td>20-102</td>
<td>≤60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STC 900 Series</td>
<td>Quickie Designs 2842 Business Park Ave. Fresno, CA 93727 (800) 456-8165</td>
<td>varies</td>
<td>–</td>
<td>–</td>
<td>#15073 Harness required. Wheel base has not passed dynamic crash testing</td>
</tr>
<tr>
<td>Disability</td>
<td>Potential Solution</td>
<td>Supplier</td>
<td>1993 Approximate Retail Cost ($)</td>
<td>Child Weights Limits (lb)</td>
<td>Child Heights Limits (in.)</td>
<td>Comments/References</td>
</tr>
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</tr>
<tr>
<td>Ortho-Kinetic Travel Chair</td>
<td>Ortho-Kinetics, Inc.</td>
<td>varies</td>
<td>15–90</td>
<td>30–54</td>
<td></td>
<td>Extra DOT seat belt must be mounted to vehicle floor or can be transported in bus with Q-Straint tie down</td>
</tr>
<tr>
<td>Sit 'n' Stroll</td>
<td>SafeLine Children's</td>
<td>159</td>
<td>≤ 40</td>
<td></td>
<td></td>
<td>Unlike most child safety seats, Sit 'n' Stroll can be used rear-facing for children weighing up to 32 lbs</td>
</tr>
<tr>
<td>Poor head and trunk control</td>
<td>Carrie Car Seat</td>
<td>J.A. Preston Corp.</td>
<td>775–995</td>
<td>#1: 20–40</td>
<td>30–68</td>
<td>Not Tumble Forms; several sizes; approved for buses and airplanes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>#2: 30–60</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>#3: 50–100</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>#4: 80–130</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carrie Bus Seat</td>
<td>J.A. Preston Corp.</td>
<td>359–435</td>
<td>#1: 20–60</td>
<td>30–58</td>
<td>For use on school bus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>#2: 50–100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidster</td>
<td>Gunnel</td>
<td>varies</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>For 2- to 12-year-old children. Wheel base has not passed dynamic crash testing</td>
</tr>
<tr>
<td>Snug Seat</td>
<td>Snug Seat, Inc.</td>
<td>*50–825</td>
<td>#1: 18–40</td>
<td>20–40</td>
<td></td>
<td>Frame and stroller base cost extra, not used when in vehicle</td>
</tr>
<tr>
<td>Mulholland</td>
<td>Mobility Plus</td>
<td>2,600–3,000</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Wheel base has not passed dynamic crash testing</td>
</tr>
<tr>
<td>Shuttle SE</td>
<td>Life Enhancement</td>
<td>1,135</td>
<td>≤ 60</td>
<td>20–40</td>
<td></td>
<td>Rear facing for infants, forward for toddlers, converts to a stroller; tray must be removed for transport in vehicle</td>
</tr>
<tr>
<td></td>
<td>Products, Ltd.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip spica cast or brace</td>
<td>E-Z-On Vest</td>
<td>70</td>
<td>≤ 164</td>
<td>–</td>
<td>22 to 43-in. waist</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spelcast (modified Kantwe 410)</td>
<td>Snug Seat, Inc.</td>
<td>200</td>
<td>≤ 40 (including cast)</td>
<td>40</td>
<td>Tether</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilator dependent; tracheostomy; wears eye glasses</td>
<td>Standard car seats with no shield</td>
<td>Wherever car seats are sold</td>
<td>30–90</td>
<td>≤ 40</td>
<td>≤ 40</td>
<td>Secure auxiliary ventilator equipment</td>
</tr>
</tbody>
</table>

Note: This listing is provided for information purposes only. It does not imply product endorsement. Contact manufacturers or Auto Safety Hotline at 1-800-424-9393 with model number and date of manufacture for current recall information.

DOT = Department of Transportation.

disabilities at the state and national level. Occupational therapists can collect and report data to be child advocates and to improve transportation safety in their state, in the schools in which they are employed or for an individual child. Occupational therapists may use this information or replicate the survey to advocate transportation safety equality for their pediatric clients. Using knowledge of disabilities and transportation-positioning...
equipment, therapists can assume a proactive stance to promote understanding, to improve legislation, and to decrease the likelihood of injury or death due to motor vehicle crashes.

Acknowledgments

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Appendix

Wheelchair-Occupant Restraints

Following is a list of manufacturers of wheelchair tie-down occupant restraint systems that have been tested at 30 miles per hour, 20 Gs. This list may not be all-inclusive.

This listing is provided for information purposes only and is not intended as a product endorsement. Consumers should purchase only systems that meet applicable standards and should beware of restraints that have performed satisfactorily in dynamic crash tests only when unoccupied.

Manufacturers              Tie-Down
Ahnafleld Corp.            Latchlock Automatic
3219 W. Washington         Tie-down System
Indianapolis, Indiana 46222
(317) 636-8061

Creative Controls, Inc.    Power tie-downs that can be used by a driver in a wheelchair
32450 Dequindre
Warren, Michigan 48092
(313) 979-3500

Gresham Driving Aids       Secure – Lok Tie-Downs
PO Box 405
Ixom, Michigan 48096
1-800-521-8930

Kinedyne Corp.             FE 500 Tie-down and occupant restraint system (retractable or nonretractable shoulder harness)
3701 Greenway Circle
Lawrence, Kansas 66946
(913) 841-4000

Ortho Safe Systems, Inc.  Protector
PO Box 9435
Trenton, New Jersey 08659

Q-Straint                  Q-Straint
4248 Ridge Lea Road
Buffalo, New York 14226
(716) 831-9959

Tie Tech, Inc.             Tie Tech 700 Series with optional stanchion and headrest
PO Box 5226
Lynnwood, Washington
90146-5223
(206) 743-5863

References


Indiana Code 20-9.1-5-2.6 (Public Law 198) as added by Acts 1981.

Iowa Department of Education. (1988). Iowa Administrative Code, Chapter 281-44.


