

Making Assistive Technology and Rehabilitation Engineering a Sure Bet

Transportation of Wheelchair Seated Students in School Buses: A Review of State Policy

Britta Moore¹, Susan Fuhrman, PhD², Patricia Karg, MS, BME³

¹ Department of Mechanical Engineering, Lafayette College

² Department of Otolaryngology, University of Pittsburgh School of Medicine

³ Department of Rehabilitation Science and Technology, University of Pittsburgh

ABSTRACT

This study quantitatively reviews publicly available state policies as they relate to the transportation of wheelchair-seated students in school buses. Inclusion of best practices in specially equipped school bus and driver training policies was assessed. Key points of interest within state policies were identified based on site visits, common policies among state documents, and frequently cited best practices. Study results indicated that most states have partially or completely incorporated the National Congress on School Transportation (NCST) guidelines, a comprehensive document that provides guidance on safe pupil transportation. State policies more frequently reflect NCST guidelines for bus specifications than for driver training directives, and infrequently address specific driver training for special needs transportation.

KEYWORDS

wheelchair transportation safety; special needs; state policy; pupil transportation; student transportation

BACKGROUND

Legislation exists pertaining to the transportation of wheelchair-seated students in school buses. The Individuals with Disabilities Education Act (IDEA) governs how states and public agencies provide for the educational needs of children with disabilities, including the necessary transportation (1). The Federal Motor Vehicle Safety Standards (FMVSS) are comprehensive mandatory motor vehicle standards that include regulations pertaining to school buses and fifteen passenger vans (2). FMVSS 222 contains specifications for wheelchair securement and occupant restraint devices, but does not include other information regarding equipment standards and procedures (3).

While state governments are not required to conform to guidance and best practice documents, such resources are available for states' consideration when establishing standards, specifications, and guidelines. The National Congress on School Transportation (NCST) has developed the *National School Transportation Specifications and Procedures*, a document containing detailed state-of-the-science guidelines related to bus specifications and driver training, including transportation of special needs students and those who use wheelchairs as seats in motor vehicles (4). Other available resources for best practices include the American Academy of Pediatrics (AAP) *School Bus Transportation of Children with Special Health Care Needs* policy statement (5), the "Ride Safe" Brochure (6), and the document, *Guidelines for Use of Secondary Postural Support Devices by Wheelchair Users during Travel in Motor*

Making Assistive Technology and Rehabilitation Engineering a Sure Bet

Vehicles (7). The Society of Automotive Engineers recommended practice *SAE J2249* (soon to be superseded by RESNA WC18) provides guidance for wheelchair tiedown and occupant restraint systems (8), and RESNA WC 19 – *Wheelchairs used as seats in motor vehicles* specifies voluntary wheelchair design and performance standards (9).

OBJECTIVES

1. Retrieve and review state policies for pupil transportation related to students who use wheelchairs as seats in motor vehicles
2. Identify relevant metrics to evaluate policy comprehensiveness
3. Evaluate and compare state policies across all 50 states
4. Assess inclusion of best practices in policies related to specially equipped school buses and driver training; including incorporation of the NCST *National School Transportation Specifications and Procedures* (4)

METHODS

Methods include four major components: retrieve and review state policy documents, conduct site visits to observe wheelchair-seated students loading onto school buses, assess inclusion of standards and best practices, and quantify results.

Initial research efforts included an extensive search of state websites to retrieve state policy documents related to the transportation of students who use wheelchairs as seats in motor vehicles. Web resources included state education and transportation departments, and state associations for pupil transportation. Key search terms included minimum standards/specification for school buses, pupil transportation safety, and specially equipped school buses. When information was not readily available online, state directors of pupil transportation were contacted directly by telephone and/or email.

Two site visits to a school for students with special needs were conducted during afternoon dismissal times. On-site observations were made of school bus loading procedures for students using wheelchairs. Multiple issues and potentially unsafe practices were noted and used in determining key points of interest within state policies.

All retrieved state policy documents were reviewed for specific information related to the transportation of students who remain seated in wheelchairs in school buses. Thirteen metrics were identified based on site visit observations, common policies found across state documents, and frequently incorporated portions of the NCST guidelines. The metrics identified were divided into two groups: specifications for specially equipped school buses (7 metrics), and specifications for ramps and lifts (6 metrics). These metrics are listed along the grouped data axes in Figures 1 and 2. The number of metrics identified in each state policy was tallied, and the comprehensiveness of state policies was compared using graphs. Incorporation of the NCST guidelines was evaluated and trends in policy content across all states were noted.

Making Assistive Technology and Rehabilitation Engineering a Sure Bet

RESULTS

Site visits suggested several issues related to improper wheelchair securement and occupant restraint in school transportation vehicles. In some cases lap belts were improperly placed across soft abdominal tissue rather than low on the pelvis, potentially putting the child at increased risk of abdominal injuries (10). Incorrect routing of a shoulder belt, not crossing the shoulder midline, was also observed. Occupant restraints were often not compatible with wheelchair construction, increasing the incidence of lap belts fastened around the armrests, far away from the body. Some wheelchair tiedowns were improperly installed with non-symmetric anchor points, or with anchor points insufficiently spaced to allow proper tightening of wheelchair tiedowns. Due to a lack of knowledge, drivers attached tiedown straps to wheelchair components designed to fold or be removed (seatback canes, armrests, footrests), rather than robust parts of the wheelchair frame. Several drivers stated that they did not know how to use the equipment properly or did not know how to handle non-compatible pieces of equipment.

Information was retrieved for 43 of 50 states regarding state school bus standards, while information from only 34 states was readily available on driver training. In Hawaii and Rhode Island, school bus services are provided by private contractors who maintain the school bus standards and procedures for their own buses and employees (11, 12). Wyoming has no statewide standards for pupil transportation; individual school districts each have their own policies and regulations (13). California, Massachusetts, Michigan, and New Jersey provided little to no information regarding school bus specifications in online sources.

Twenty-seven of the forty-three states with available policies have incorporated the NCST guidelines, either in full or in part. Twelve states explicitly stated that minimum requirements for design and construction of school buses shall meet or exceed the National School Transportation Specifications and Procedures, 2005 revised edition (4), and another fifteen states explicitly incorporated sections from the document. Sixteen states provided alternative information. No state policies were retrieved from seven states (RI, HI, WY, CA, MA, MI, NJ).

Of the forty-three states for which bus specifications were found online, most provide specifications for 30-inch aisles (86%), wheelchair tiedown and occupant restraint systems (91%), and special service entrances (93%), as displayed in Figure 1. Only 42% of states with publicly available documentation specify standards for special equipment or supplies used

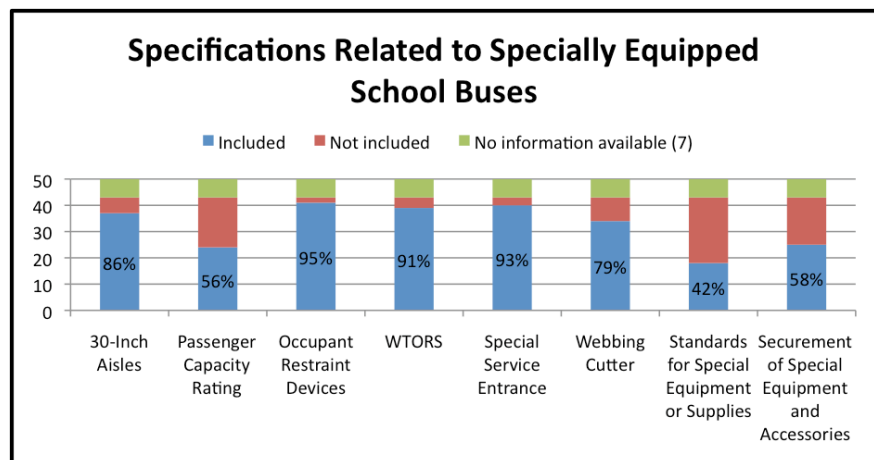


Figure 1: Number of states with specifications related to specially equipped school buses.

Making Assistive Technology and Rehabilitation Engineering a Sure Bet

in the bus for mobility assistance, health support, or safety purposes. Figure 2 indicates that a majority of state policies include information on power lift and ramp installation (93%), yet fewer than half (49%) require instructions and training materials be provided by lift manufacturers and only 54% specify lift use procedures.

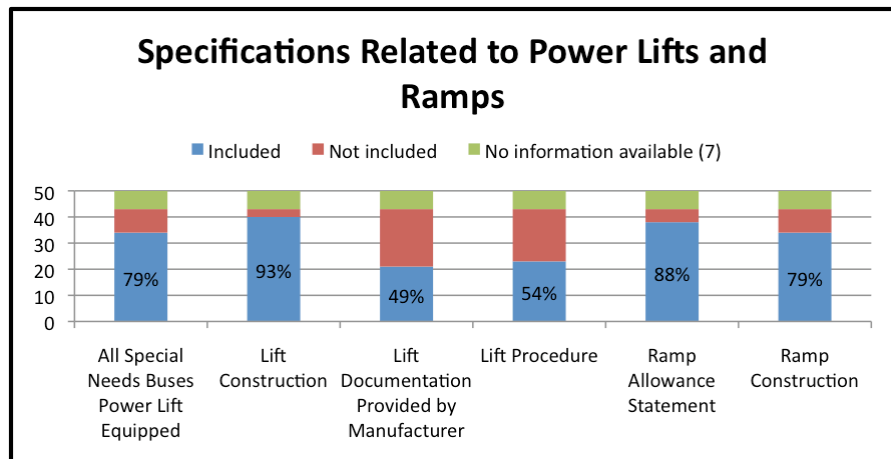


Figure 2: Number of states with specifications related to power lifts and ramps.

The number of key metrics identified within each state policy was tallied and compared using a radar chart (Figure 3). States with peripherally located points provide more comprehensive policies, while those with centrally located points provide less information. The variability of these data demonstrates the wide range in comprehensiveness of state policies with respect to special needs, including wheelchair, transportation.

Driver training policies were successfully retrieved for thirty-four of fifty states. Of the thirty-four states with publicly available driver training policies, a slight majority includes specifications on special needs training (59%), wheelchair securement (53%), and bus evacuation procedures (59%). While it is more common for states to provide bus specifications than driver training policies, extensive information is available for both Michigan and California on driver training, while bus specifications policies are not available in these states.

Multiple states make training recommendations, but have no requirements. School bus driver manuals are provided, however drivers are not required to be familiar with its contents or training in those areas. Some states specify very little in terms of school bus driver training, while others (Michigan, Idaho, Montana and Nebraska) have significant training and procedure requirements including training on wheelchair transportation. Both Michigan

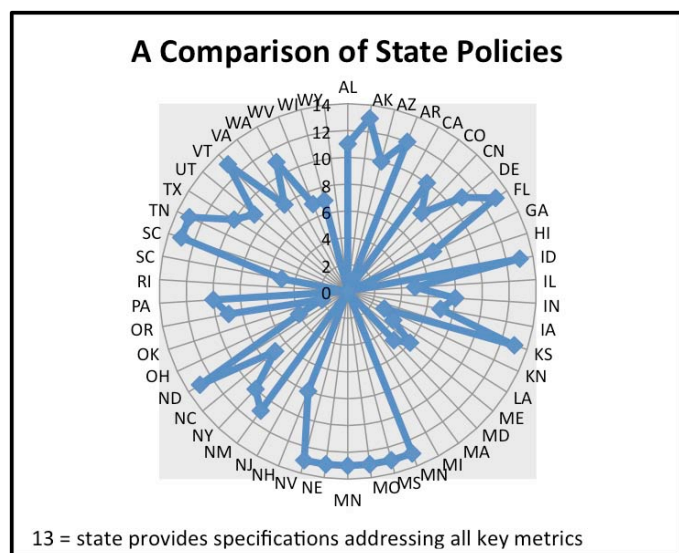


Figure 3: Comparison of state policies. States are listed alphabetically on the graph periphery. Numeric levels indicate the tally of key metrics

Making Assistive Technology and Rehabilitation Engineering a Sure Bet

and Idaho require that lap trays be removed during transportation. Michigan specifies that lap belts be placed over the pelvic bone, not across soft tissue, and recommends that parents buy wheelchairs that comply with RESNA WC19. Michigan is the only state policy that references WC19 wheelchairs. Both Montana and Nebraska require wheelchair securement and wheelchair inspection training.

DISCUSSION

Site visits indicated that current practices are failing to ensure that children who use wheelchairs fully benefit from currently available occupant protection technology and best practices for safe transportation. Issues include poor installation and improper use of WTORS, and drivers unaware of the problems and safety risks. Correct usage and placement of occupant restraints is identified in the “Ride Safe” Brochure (6). The importance of proper wheelchair securement and occupant restraint systems is demonstrated by the videos available at the RERC WTS website (14).

The National Congress on School Transportation has created a comprehensive document that provides guidance for states on safe pupil transportation. The National School Transportation Specifications and Procedures document provides guidance regarding both bus specifications and driver training, with specific recommendations for the transportation of special needs students in wheelchairs. A majority of states have incorporated the NCST guidelines in their policies, either in full or in part. However, there exists a large degree of variability across states in the extent of incorporation and the comprehensiveness of policies with respect to wheelchair transportation. States have more readily incorporated the bus specifications portions than the driver training directives. Few states specifically address special needs transportation in their driver training policies, with only Michigan recommending the use of RESNA WC19 wheelchairs.

Limitations of this study include the difficulty in obtaining policies from all states. It is assumed that all states have some policy, so conclusions cannot be drawn where no information was found. In the future, policies should be reviewed from states where no data was collected. Additional planned research will investigate the implementation of these policies on state, local, and bus-specific levels.

ACKNOWLEDGEMENTS

Funding for this research was provided by the National Science Foundation, Project EEC 0552351 and by the National Institute on Disability and Rehabilitation Research (NIDRR), Rehabilitation Engineering Research Center (RERC) on Wheelchair Transportation Safety, Grant # H133E060064. The opinions expressed are those of the authors and do not necessarily reflect those of the NSF or NIDRR.

REFERENCES

1. Individuals with Disabilities Education Act of 1997, Pub. L. No. 91–230, 101 & 111 Stat. 37 (2004).
2. Federal Motor Vehicle Safety Standards and Regulations, 49 U.S.C. §301 (2009).
3. Federal Motor Vehicle Safety Standard No. 222 - School Bus Passenger Seating and Crash Protection, 49 U.S.C. §571.222 (2008).

Making Assistive Technology and Rehabilitation Engineering a Sure Bet

4. National School Transportation Specifications and Procedures. Warrensburg, MO: Missouri Safety Center (2005).
5. Bull M, Argan P, Laraque D, et al. Pediatrics: Transporting Children with Special Health Care Needs. (Vol. 104 No. 4 - 988-92). Elk Grove Village, IL: American Academy of Pediatrics (1999).
6. Ride Safe Brochure. Rehabilitation Engineering Research Center on Wheelchair Transportation Safety (RERC WTS), University of Michigan Transportation Research Institute (UMTRI), University of Michigan Health System (2008).
7. RERC on Wheelchair Transportation Safety: Guidelines for Use of Secondary Postural Support Devices by Wheelchair Users during Travel in Motor Vehicles. Pittsburgh, PA: Rehabilitation Engineering Research Center on Wheelchair Transportation Safety (2006).
8. Society of Automotive Engineers. SAE J2249: Wheelchair Tiedown and Occupant Restraint Systems for Use in Motor Vehicles (1999).
9. RESNA WC 19: Wheelchairs Used as Seats in Motor Vehicles. Arlington, VA: Rehabilitation Engineering and Assistive Technology Society of North America (2000).
10. Bulger M, Kaufman R, Mock C. Childhood Crash Injury Patterns Associated with Restraint Misuse: Implications for Field Triage (2008). University of Wisconsin-Madison. Retrieved from <http://pdm.medicine.wisc.edu/23-1%20PDFs/bulger.pdf>.
11. Transportation Specifications Document provided by Hawaii Director of Pupil Transportation (personal communication, June, 2009).
12. Title 16 - Education, §21.1-7 Statewide Transportation of Students with Special Needs (2009). Rhode Island State Code. Retrieved from <http://www.rilin.state.ri.us/Statutes/TITLE16/16-21.1/16-21.1-7.HTM>.
13. Education: General Provisions and Definitions, 21 Wyoming State. Ch. 1. (2009). Retrieved from <http://legisweb.state.wy.us/statutes/dlstatutes.htm>.
14. RERC on Wheelchair Transportation Safety: A Look at Wheelchair Crash Testing (2009). Retrieved from http://www.nercwts.org/RERC_WTS2_KT/RERC_WTS2_KT_Edu/RERC_WTS2_crashtest.html.

Author Contact Information

Britta Moore, Department of Mechanical Engineering, Lafayette College, PO Box 7381, Easton, PA 18042, moorebc@lafayette.edu.