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DATA REGARDING

REVISIONS TO

NRS 484.474

CHILD RESTRAINT LAW

- ◊ **Summation of CIREN Report, 2001**
- ◊ **Nevada Children**
- ◊ **Economic Cost Impact**
- ◊ **Recommended Upgrade to Nevada Law, National Safe Kids Campaign, 2000**
- ◊ **CIREN Report, 2001: Children's National Medical Center (Crash Injury Research & Engineering Network)**

G

Children's National Medical Center (CNMC)
CIREN (Crash Injury Research & Engineering Network)
Program Report, December 2001 (DOT HS 809 377)

SUMMATION

Motor vehicle crashes are the most significant cause of unintentional death and injury to children less than 15 years old in the United States. The use of a booster seat for the "forgotten child" of 4 – 8 years old places them in the right position for the seat belt to adequately protect them.

Children between the ages of 4 and 8 years old represent an important at-risk population for motor vehicle occupant protection. Having outgrown child safety seats designed for younger passengers, children in this age group frequently sit unrestrained or are placed prematurely in adult seat belt systems. In fact, children between the ages of 5 and 9 years represented one of only three age groups that did not demonstrate a significant decline in motor vehicle crash morbidity and mortality over the 20-year period of 1978-1998 (65-74 years and 75+ years being the other two groups). Yet we have an effective intervention for these injuries—booster seats.

Safety belts designed for adults do not protect children as well as safety seats designed with pediatric proportions in mind. Lap/shoulder belts result in hyperflexion-related injury to the abdominal viscera and lumbar spine of children. Adult three-point restraint systems are not adequate for children who have not attained most of their adult stature. Several unique anatomic features of infants and children are believed to contribute to the nature and severity of the injuries they sustain as motor vehicle occupants.

Seatbelt misuse puts children at additional risk for injury. The types of safety belt misuse (excluding non-use) commonly seen include restraining two occupants with a single belt, allowing a loose fit for the shoulder belt, re-routing the shoulder belt under the child's outboard arm, and routing the shoulder belt behind the child's back.

Seatbelt Injuries

Martin Eichelberger, MD became interested in further study of pediatric injuries associated with motor vehicle crashes after reviewing cases of injuries associated with lap belt use. All trauma admissions to CNMC during a three-year period were reviewed to determine the frequency of abdominal and spinal injury in children wearing safety belts. Ten of the 95 children (10.5%) wearing safety belts sustained a significant "seatbelt syndrome" or "lapbelt complex" injury to the lumbar spine or intestines; seven of these children also experienced head injuries.

The "lap belt syndrome" is caused by the transfer of deceleration forces to the spine. The typical complex of belt-related injuries includes a hallmark lap belt ecchymosis (Figure 7), and lumbar fracture or distraction (Figure 8), with or without spinal cord involvement. Damage to the spinal cord is most often is caused by blunt, non-penetrating trauma rather than by laceration or transection. These mid-lumbar spinal injuries may be associated with paraplegia and life-threatening visceral injury. Additionally, abdominal organs may be compressed between the belt and the spine resulting in perforations of the hollow viscera (Figure 9), and contusions or lacerations of the solid organs. These injuries result in considerable physical disability, emotional distress for the child and family, lost future productivity, and astronomical national health care expenditures.

Figure 7.
Lap Belt Ecchymosis

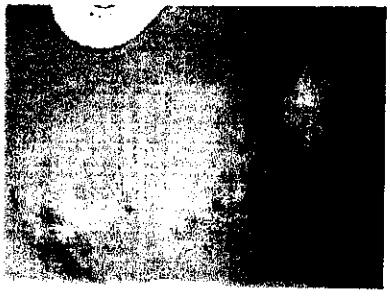


Figure 8.
Spinal Fracture

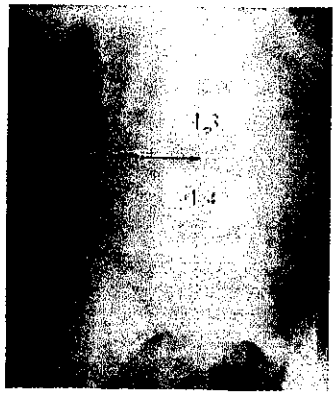
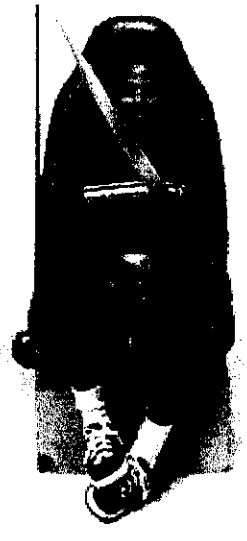


Figure 9
Intestinal Rupture

Several factors place children at special risk of seat belt syndrome. Due to a child's shorter torso length, shoulder straps frequently ride across the neck and face (Figure 10) increasing the likelihood that the child will place the strap behind his or her back. Three-point belts have been installed in cars produced since 1990, but there are still millions of cars on the road with only two-point restraints in the rear seats. Behavioral characteristics of children put them at further risk of lap belt syndrome. Restrained children usually sit in a more slouched posture than adults, increasing the likelihood that the lap belt will ride up across the abdomen. Even when the lap belt is properly placed across the iliac crests of the pelvis, children often move around altering the proper fit of the belt or they loosen the belts to allow greater freedom of movement.

Figure 10.
Incorrect Belt Fit



Children in forward-facing safety seats in the front seat also have a high risk of traumatic brain injury if the air bag deploys. In addition, they are at increased risk for cervical spine injury resulting from hyperextension. Thus, NHTSA child passenger safety guidelines require children less than 12 years of age to be seated in the back of a vehicle.

Figure 11.
Airbag Deaths to Children by Year

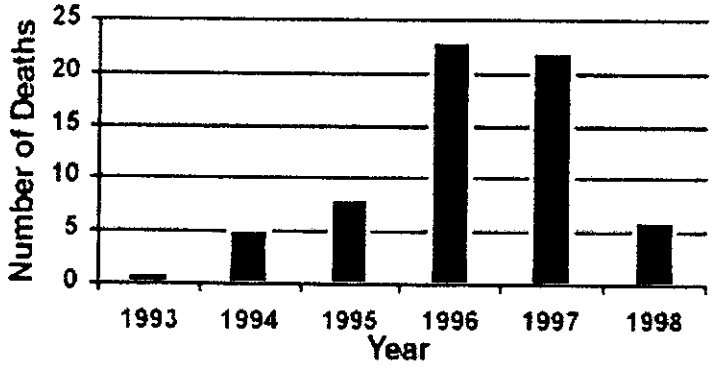
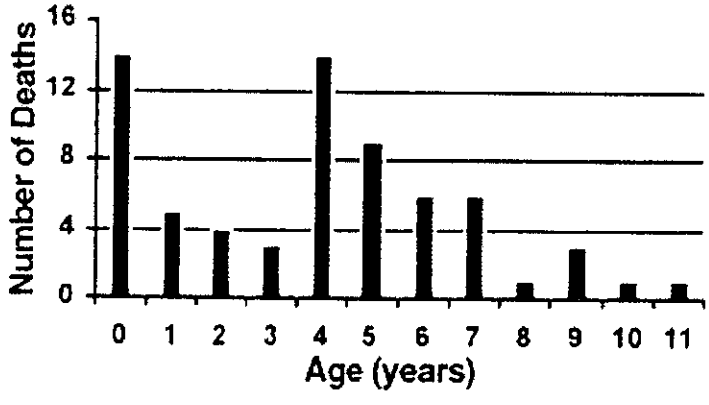


Figure 12.
Airbag Deaths to Children by Age



Our data indicates that except in cases of blatantly incorrect restraint use (failure to buckle safety straps), it is generally more dangerous to use inappropriate restraints than it is to use restraints somewhat incorrectly. The high injury rate among children who were correctly but inappropriately restrained suggests that we need to change our message to parents. It is not enough to emphasize using a restraint correctly; it is equally, if not more important, to enable parents to choose the correct restraint for their children based on the child's size and weight. NHTSA's current child safety guidelines are shown in Table 2.

Table 2.
Child Passenger Safety Guidelines
Buckle Everyone. Children Age 12 and Under in Back!

	Infants	Toddlers	Young Children
Weight	Birth to 1 year up to 20-22 lbs.	Over 1 year and over 20 up to 40 lbs	Over 40 pounds up to 80 lbs.
Type of Seat	Infant only or rear-facing convertible	Convertible / Forward-facing	Belt-positioning booster seat
Seat Position	Rear-facing only	Forward-facing	Forward-facing
Always Make Sure:	Infants up to one year and at least 20 lbs. must ride in rear-facing seats. Harness straps at or below shoulder lever.	Harness straps should be at or above shoulders. Most seats require top slot for forward facing	Belt positioning booster seat must be used with both lap and shoulder belt. Make sure the lap belt fits low and tight across the lap/upper thigh area and the shoulder belt fits snug crossing the chest and shoulder to avoid abdominal injuries.
Warning!	All children age 12 and under should ride in the back seat.	All children age 12 and under should ride in the back seat.	All children age 12 and under should ride in the back seat.

Restraint Misuse Research

In an analysis of CIREN data, misuse was found for 84% of restrained children (n=121). Improperly restrained children experienced a higher mean Injury Severity Score (ISS) than properly restrained children ($p < .05$) and **incurred medical charges more than 2 times higher** ($p<.05$). ***The most common type of misuse was failure to use a restraint that was appropriate for the child's size and age. More than 76% of children were restrained inappropriately. Children between 40-80 pounds were at greatest risk since they should have been restrained in a booster seat but were most commonly restrained by the vehicle's safety belt.*** Infants were also at considerable risk of being incorrectly restrained in forward facing safety seats before reaching 20 pounds and one year of age.

Predictors of Injury Severity

Two additional aspects of restraint use, appropriateness and correctness of use, were used to assess child passenger safety in a crash. The children were divided into 4 weight classifications (0-20 pounds, 21-40 pounds, 41-60 pounds, and greater than 60 pounds) based on the weights recommended by safety experts and seat manufacturers for rearward-facing infant safety seats, forward-facing child safety seats, booster seats, and lap/shoulder belts.

Children who were restrained in safety belts appear to be at greater risk of severe injury than are children restrained in safety seats, even though the misuse rate is higher among safety seats.

Belted children also appear to be at greater risk of injury to the abdomen and lumbar spine. Approximately 34% of the belted children sustained abdominal injury compared to 9% of the children in safety seats ($p<.05$); additionally, 13% of belted children versus none of the children in safety seats sustained fractures of the lumbar spine ($p<.05$). Lap/shoulder belts do not seem to provide adequate restraint of the upper torso for children aged 8 or younger, as 75% sustained "lap belt complex" injuries while only 1 of 5 older children were so injured.

NEVADA'S CHILDREN: 2001 and 2002

Source: Nevada FARS (Fatality Analysis Reporting System)
Nevada Office of Traffic Safety

Nevada lost ground in child safety seat usage between 2001 and 2002. Even with a primary child restraint law for under age 5 and 40 pounds, the State of Nevada had a 25 percent drop in observed usage from 49.8 percent to 37.2 percent for infants and toddlers. Four children ages zero to eight died in crashes in 2001; only one child was using some type of restraint (a seat belt or child safety seat). Thirty-four children from the same age group were injured survivors in fatal crashes for 2001; 61% of these survivors were using some type of restraint. This is consistent with national data that reveals safety restraint usage in cars increases the survival rate of occupants in crashes, for both children and adults.

For the thirteen month period of October 1, 2001 to October 31, 2002, Nevada lost eight children in the zero to eight age group, seven of which used no restraint at all. Forty children of this same age group were injured survivors in fatal crashes during that time period, with a 77% restraint usage rate for survivors, vs a 13% usage rate for the eight children that died.

Economic Cost Impact
Motor Vehicle Fatalities/Injuries
Relating to: Primary Seat Belt Law, and Child Restraint Law: Booster Seats
Prepared 12/13/2002, Nevada Office of Traffic Safety

◊ NHTSA (National Highway Traffic Safety Administration) estimates the U.S. economic costs of an average roadway fatality at $977,000 and the cost for a critical injury crash survivor at $1.1 million (as of calendar year 2000; *this estimate currently applies to both adults and children; logic would indicate an even higher cost for children due to life span)*

◊ If Nevada became a primary seat belt law state, it would increase its seat belt usage rate by a conservative 12% (from 74.5% in 2001 to 86.5%). With this increase in usage, Nevada would save 26 lives, 575 non-fatal injuries, resulting in $69.6 million in economic cost savings (annualized figures).

◊ Millions of unnecessary *additional* dollars are spent on health care every year for unrestrained occupants in motor vehicle crashes (MVC's). From the following tables, it is evident that unrestrained occupant costs are significantly and consistently higher than restrained occupants in MVC's.

The total difference in average amounts billed for Medicaid or County Pay insured, between unrestrained and restrained occupants from 1999-2001, is **$3,690,560.00***. This astounding sum displays the additional dollars needed for unrestrained vs restrained occupants in MVC's, and how unrestrained occupants place a significant and **direct fiscal burden** on all Nevadans.

Billed Amounts for MVC Trauma Patients, **Medicaid & County Pay ONLY**

Year	MVC Unrestrained occupants average cost	MVC Restrained occupants average cost	Difference in average cost of unrestrained vs. restrained	Number of MVC unrestrained occupants	Additional Cost to all Insurers, unrestrained occupants
1999	$30,086	$22,526	$ 7,560	60	$ 453,600
2000	$47,993	$31,071	$ 16,922	55	$ 930,710
2001	$84,060	$37,935	$ 46,125	50	$2,306,250

From 1999-2001, the average health care cost of **all insurers combined**, for an **unrestrained** occupant involved in a motor vehicle accident was $30,829.00. **The average health care cost** of a **restrained** occupant involved in a motor vehicle accident was $22,777.00.

* This data was obtained from the State of Nevada Health Division, Bureau of Health Planning and Statistics, and specifically, the Nevada Trauma Registry. Please note that this data ***only*** refers to those patients who met Trauma Criteria reporting requirements as outlined in NAC 450B.770

Billed Amounts for MVC Trauma Patients, **All Insurers**

Year	MVC Unrestrained occupants average cost	MVC Restrained occupants average cost	Difference in average cost of unrestrained vs. restrained	Number of MVC unrestrained occupants	Additional Cost to all Insurers, unrestrained occupants
1999	$28,460	$21,119	$ 7,341	1209	$ 8,875,269
2000	$37,436	$23,499	$13,937	1116	$15,553,692
2001	$36,775	$31,932	$ 4,843	1118	$ 5,414,474

Overall, nearly 75 percent of the costs of the nation's roadway crashes are paid by those not primarily involved in them, through insurance premiums, taxes and travel delay. In calendar year 2000 these costs, borne by society rather than individual crash victims, totaled $171 billion

◊ Clarification has been requested on whether the enactment of primary seat belt laws has had a direct relationship to the saving of a certain number of lives and/or statistics from other states that have enacted a primary law

Argument: NHTSA has already determined that almost half (45%) of those unrestrained fatalities in MVC's could have survived if they'd only been wearing their seat belt (or in a child safety seat, as applicable). New Mexico, which is similar to Nevada demographics, enacted a primary seat belt law in 1986 (front seat occupants), adding pick-up's in 1989, and extended to all seating positions in 2001. Their seat belt usage in 1985 was 20%, and has increased to 88% as of 2001. The effect on incapacitating and visible injuries is large. The rate of incapacitating injuries per 100 million vehicle miles fell from 19 in 1985 to 11.3 in 2001, and the rate of visible injuries fell from 34 in 1985 to 18 in 2001.

♦ *The primary seat belt bill draft* ***should contain language specifying the wearing of seat belts dependent on size of occupant*** *(i.e., younger children are not adequately protected by a seat belt alone, "seat belt syndrome;").*

NEVADA

General Statement/Composite

Nevada's child occupant protection law has some important characteristics, including requiring all children to be restrained in all seating positions in some manner. However, the law allows some of its young children to ride in an inappropriate restraint when traveling in a motor vehicle. Furthermore, Nevada does not place a legislative priority on educating its citizens about the law or about the importance of protecting children when they travel. SAFE KIDS applauds Nevada for its strong enforcement measure that assesses a potentially high monetary penalty. Overall, though, Nevada's poor showing clearly demonstrates the immediate need for the Nevada Legislature to improve its child occupant protection law.

Grade Breakdown

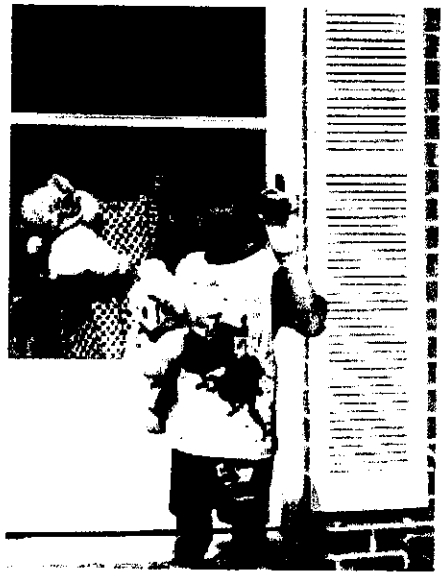
Criteria	How Nevada Fared
Restraint Use Required Through Age 15 **35 points out of a possible 35 points**	Nevada's law requires children ages 15 and under to be restrained in some manner regardless of seating position.
Appropriate Child Restraint Requirement by Age **16 points out of a possible 24 points**	Only children ages 4 and under and weighing less than 40 pounds must be properly restrained in an appropriate child safety seat in all seating positions. Children ages 5 – 8 can be restrained like adults in a safety belt alone – putting them in a potentially dangerous situation.
Proper Child Safety Seat Adjustment Clause **0 points out of a possible 9 points**	Although it may have been intended by the Nevada Legislature, the law fails to expressly recognize the importance of *properly* securing both the child and the child safety child safety seat.
Public Education/Public Fund Component **0 points out of a possible 5 points**	Unfortunately, Nevada does not recognize the importance of legislatively mandating a public education campaign, nor does it provide public funds to offset the costs of programs that would help protect children while traveling.
Penalty Provisions **4 points out of a possible 9 points**	Nevada was awarded 4 points for its high maximum fine of $100 and received no points for its failure to assess license points for violations.
No Exemptions for Certain Drivers or Vehicles **9 points out of a possible 9 points**	Based on SAFE KIDS' criteria, Nevada's law received the full 9 points for allowing no relevant exemptions.
Other Provisions **0 points out of a possible 9 points**	Nevada's law does not contain any additional provisions worthy of recognition.

Nevada's Call to Action

The National SAFE KIDS Campaign is troubled by Nevada's grade. The Nevada Legislature should, among other things:

- Expressly require children ages 4 – 8 and weighing 40 – 80 pounds to use booster seats.
- Add language that requires not only use, but *proper* use according to child safety seat manufacturer's instructions.
- Establish a child occupant protection public education program and supply sufficient funds to implement it.
- Consider creating a child safety seat loaner/giveaway program for families in need and establishing a child occupant protection class for violators.
- Eliminate its "proof of child safety seat purchase waiver."
- Consider adding a well-crafted back seat mandate for its child passengers.

Figure 18.
CIREN Case After Discharge



Appendix A. Research Publications & Presentations

Publications

Gotschall CS and Eichelberger MR. "Injuries to restrained children in motor vehicle crashes." *Recovery 2001,* in press.

Gotschall CS, Marchant M, Dougherty DJ, Eichelberger MR. "Accuracy of police crash reports in determining child restraint usage and injury severity in the United States." *43rd Annual Proceedings, Association for the Advancement of Automotive Medicine*, 1999.

Gotschall CS, Luchter S, Wing J-S. "Head injuries to motor vehicle occupants aged 0-5 years." *43rd Annual Proceedings, Association for the Advancement of Automotive Medicine*, 1999.

Gotschall CS, Better SI, Bulas D, Eichelberger MR, Bents F, Warner M. "Injuries to children restrained in 2- and 3-point belts." *42nd Annual Proceedings, Association for the Advancement of Automotive Medicine*, 42:29-44, 1998.

Gotschall CS, Dougherty DJ, Eichelberger MR, Bents FD. "Traffic-related injuries to children: Lessons from real world crashes." *42nd Annual Proceedings, Association for the Advancement of Automotive Medicine*, 42:165-178, 1998.

Paparo PH, Snyder HM, Gotschall CS, Johnson DL, Eichelberger MR. "The relationship of two measures of injury severity to children's psychological outcome 3 years after acute head injury." *J Head Trauma Rehab* 1997; 12(3):51-67.

Gotschall CS, Eichelberger MR, Morrissey JR, Better AL, Reardon J, Bents F. "Nonfatal air bag deployments involving child passengers." *2nd Child Occupant Protection Symposium Proceedings, Society of Automotive Engineers*, Warrendale, PA, 1997; 17-24.

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Newman K, Bowman LM, Eichelberger MR, Taylor GA, Johnson D, Loe W, Gotschall CS. "The lap belt complex: intestinal and lumbar spine injury in children." *J The Institute for Injury Reduction*, 1991;1:54-61.

Bond SJ, Gotschall CS, Eichelberger MR. "Predictors of Abdominal Injury in children with pelvic fracture." *J Trauma*, 1991;31:1169-1173.

Sivit CJ, Taylor GA, Newman KD, Bulas DI, Gotschall CS, Wright CJ, Eichelberger MR. "Safety belt injuries in children with lap-belt ecchymosis: CT findings of 61 patients." *Amer J Radiology*, 1991;57:111-114.

Newman K, Eichelberger MR, Bowman LM, Taylor GA, Loe W, Gotschall CS. "The lap belt complex: Intestinal and lumbar spine injury in children." *J Trauma*, 1990; 30:1133-1140.

Published Abstracts:

Gotschall CS, Better M, Bents F, Eichelberger MR. "Biomechanics of air bag injuries to children." *J Trauma* (abstract) 1998; 45:192.

Gotschall CS, Better AI, Eichelberger MR. "Differences in injury severity and costs associated with child restraint misuse." *Book of Abstracts*, Volume I, and p. 363. 4th World Conference on Injury Prevention and Control, World Health Organization, May 1998.

Luchter S, Gotschall CS, Walz MC. "Injury patterns experienced by infants and children surviving motor vehicle crashes." *Book of Abstracts*, Volume 1, p. 427. 4th World Conference on Injury Prevention and Control, World Health Organization, May 1998.

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Gotschall CS, Eichelberger MR, Sivit CJ, Sturm PF. "Child booster seats: What works, what doesn't." In: *Abstracts: Workshops, Oral Presentations, Poster Sessions, The Second World Conference on Injury Control.* Atlanta, Georgia: Centers for Disease Control and Prevention 1993; 265-266

Garcia VF, Gotschall CS, Eichelberger MR, Bowman LM. "Rib fractures in children: A marker of severe trauma." *J Trauma*, 1989; 29:1726.

Invited Presentations:

"Pediatric Injuries Associated with Specific Types of Restraint Misuse." International Child Passenger Safety Conference, Annual Meeting, Indianapolis, IN, April 2001.

"The Crash Injury Research & Engineering Network (CIREN)." Emergency Medical Services Care Conference, Greenbelt, MD, April 2001.

"Head injuries to motor vehicle occupants aged 0-5 years" Child Occupant Protection in Motor Vehicle Crashes, Association for the Advancement of Automotive Medicine, Sitges, Spain, 1999.

"Accuracy of police crash reports in determining child restraint usage and injury severity in the United States" Child Occupant Protection in Motor Vehicle Crashes Association for the Advancement of Automotive Medicine, Sitges, Spain, 1999.

"Crash injury findings from merging medical and engineering data." American Public Health Association, Washington, DC, November, 1998.

"Collecting Forensic Data on Children in Crashes," Society of Automotive Engineers TOPTEC, Philadelphia, PA, October, 1998.

"Skull Fractures to Restrained Infants in Motor Vehicle Crashes" 2nd Annual CIREN Research Conference, Ann Arbor, MI, September 1998.

"Differences in injury severity and costs associated with child restraint misuse" 4th World Conference on Injury Prevention and Control, Amsterdam, the Netherlands, May 1998.

"The future of Child Passenger Safety: Restraint-related injuries in children", SAE Government-Industry Meeting, Washington, DC, April, 1998.

"Injuries associated with child safety seat misuse" Lifesavers 16, Cleveland, Ohio, March, 1998.

"Injuries to children resulting from misuse of child restraints" Moving Kids Safely, Tysons Corner, Virginia, 1997.

"Nonfatal air bag deployments involving child passengers" Association for the Advancement of Automotive Medicine, Annual Meeting, Orlando, FL, October 1997.

"Injury patterns associated with child restraint misuse" Association for the Advancement of Automotive Medicine, Annual Meeting, Orlando, FL, October 1997.

"Restraint Related Injuries in Children" Moving Kids Safely 1996, National Highway Traffic Safety Administration, Tyson's Corner, Virginia.

"Children — Vulnerable Road Users" Third International Conference on Injury Prevention and Control, February 1996, Melbourne, Australia.

"Childhood Injury Prevention — Restrained Children in Motor Vehicle Crashes" Lifesavers 12 Symposium, Washington, DC, March 1994.

"Overview of In-depth Accident Investigation — Trauma Team Findings in Late Model Vehicle Collisions" Session Chairperson. Society of Automotive Engineers. Detroit, Michigan, February 1994.

"Biomechanics of Injury to Children Restrained by Safety Belts" Society of Automotive Engineers. Detroit, Michigan, February 1994.

"Crash-related Injuries to Restrained Children Aged 3 to 6 Years" American Public Health Association, San Francisco, California, 1993.

"Are Medicaid-eligible children at greater risk for motor vehicle crash injuries?" Annual Meeting of the American Public Health Association, Washington, DC 1992.

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"Sport Utility Vehicles and the Pediatric Occupant." CIREN Quarterly Meeting, Detroit, MI. September 6, 2001.

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"Characteristics of Thoracic Injury in Children." CIREN Quarterly Meeting, Washington, DC. November 30, 2000.

"Predictors of Severe Childhood Injuries in Lateral Impact Crashes." CIREN Quarterly Meeting, Washington, DC. July 21, 2000.

"Lower Extremity Injury Patterns to Restrained Children in Motor Vehicle Crashes." CIREN Quarterly Meeting, Washington, DC. May 5, 2000.

Poster Sessions:

Orzechowski KM, Edgerton EA, Eichelberger MR. "Injury Trends Among Improperly Restrained Booster Seat Age Children Involved in Motor Crashes." American Academy of Pediatrics, Annual Meeting, San Francisco, CA, October 2001.

Gotschall CS, Dougherty DJ, Marchant M, Eichelberger MR. "Accuracy of police crash reports in determining child restraint usage." Partnerships for Health in the New Millennium, Launching Healthy People 2010, Washington, DC, January, 2000.

Luchter S, Gotschall CS, Walz MC. "Injury patterns experienced by infants and children surviving motor vehicle crashes." 4th World Conference on Injury Prevention and Control, Amsterdam, the Netherlands, May 1998.

Gotschall CS, Eichelberger MR, Sivit CJ, Sturm PF. "Child booster seats: What works, what doesn't." Second World Conference on Injury Control. Atlanta, Georgia, 1993.

Gotschall CS, Bents FD, Khaewpong N, Sturm PF, Sivit CJ, Eichelberger MR. "The performance of lap/shoulder belts in restraining children in motor vehicle crashes." Association for the Advancement of Automotive Medicine, Annual meeting. San Antonio, Texas, October 1993.

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