Booster Seat Use and Reasons for Nonuse

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ABSTRACT. *Background.* **Many children 4 to 9 years old are inappropriately restrained in vehicles and are at risk for injury in crashes.**

Objectives. **This study was undertaken to determine the rate of booster seat use and the reasons for nonuse.**

Methods. **Observations were conducted at a random sample of day care centers, and drivers of unrestrained children 4 to 8 years old were interviewed to determine the reasons for lack of booster seat use.**

Results. **Observations were conducted on 149 children. Shoulder belt use significantly increased with the age of the child; 28.3% of 4-year-olds and 70.0% of 6- to 8-year-olds used lap–shoulder belts. Overall, 27.7% of children in the target age group used booster seats; only 10% of children 6 to 8 years old were restrained with booster seats. Booster seat use decreased when there were 3 or more passengers in the vehicle. The most common reason for lack of booster seat use was that parents thought the child was large enough to use the regular lap–shoulder belt system, or problems with attempting to use the seat in the vehicle. More than one half of parents who were not using booster seats at the time of the survey reported owning seats.**

Conclusion. **This study indicates that parental misconceptions about size and safety of regular restraint equipment are the most common reason that children are not appropriately restrained in vehicles. This information can be used to guide community intervention programs.** ***Pediatrics*** **2000;106(2). URL: http://www.pediatrics.org/cgi/content/full/106/2/e20;** ***motor vehicle crashes, booster seat, child occupant safety.***

Child passenger safety has long been a priority in national and state injury prevention programs. All 50 states now have laws mandating proper child passenger restraint; however, these laws generally only require safety seat use by children 4 years old or younger. Many states also have provisions allowing safety belt substitution for children as young as 3 years old. Although these laws reflect public awareness about the importance of child safety seat restraint for infants and young toddlers, they do not address the importance of proper restraint in children 3 to 8 years old.

Motor vehicle crashes are the major cause of death in children 5 to 9 years old. Of those killed as occupants in 1997, 46% used no restraint.[1] Additionally, 1 recent observational study showed a dramatic decrease in proper restraint use with increasing child age. Infant safety seat usage was observed 96.6% of the time; this decreased to 67.5% for toddlers who still require such seats for optimal safety. Furthermore, safety seat use in preschool children was observed at 6.1%, with 75.3% of these children prematurely using safety belts for restraint.[2] Despite federal recommendations that children <80 pounds, <58 inches tall, and with a sitting height <29 inches use booster seats after outgrowing their convertible child safety seats, such seat use seems to be uncommon according to currently available studies.

Car seats are 60% effective in reducing injury to infants and young toddlers, while lap–shoulder harnesses are only 34% effective in preventing injury to children too large for car seats but <9 years old.[3] Booster seats have been shown to be an effective means for increasing passenger safety for children in this age group. Booster seats are perhaps best labeled as belt-positioning devices, because they provide the child with a better belt fit than seat belts alone by allowing proper belt positioning across the neck and abdomen. Additionally, they increase comfort for the child by allowing their legs to bend properly over the seat. Although unrestrained children have a higher risk of injury than restrained children regardless of the method, children using improperly fitting seat belts have suffered from lumbar fractures and head, neck, and abdominal injuries.[4,5] Lumbar spine injuries were higher in seat belt-restrained children than their unrestrained counterparts.[6]

The benefits of booster seats are clear, yet their use remains marginal at best. In a telephone survey, where reported safety use tends to be inflated, only 29% of parents said they used booster seats for their children over 40 pounds.[7] Observed seat use as well as reasons for nonseat use have not been well-documented. This observational study set out to determine the rate of booster seat use in the greater Seattle area by observing drivers and children at day care centers. We were also interested in finding reasons for nonseat use, to determine how to best increase public awareness about, and use of, booster seats.

METHODS

Letters were sent to 50 child day care centers in King County chosen randomly by zip code to provide a geographical sample of the county. Letters requested permission for a research interviewer to observe motor vehicle restraint use and to conduct a brief oral survey of parents about child safety on 1 afternoon as they dropped off or picked up their children. All day care centers were called 3 weeks after sending the initial letters. Of the centers randomly chosen from the mailing lists, 8 did not have listed

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phone numbers, 6 were closed for the summer, 32 either had unreachable directors or refused the request, and 8 agreed to have a research interviewer come. Thirty-six additional letters were sent to other day care centers, with 5 agreeing to the request. Two pediatric clinics also granted permission for the research interviewer to conduct the survey and observations.

The research interviewer (A.R.) spent 1 afternoon only at each site to avoid duplicate observations of the same child. The type of restraint used both by driver and child, as well as child position in the car was observed. Type of restraint used by the child was placed in 1 of 7 categories: lap belt with shoulder strap in front, lap belt with shoulder strap behind, lap belt only, no restraint, toddler car seat, booster seat, or unknown restraint. The observer recorded the child position in the car as front seat, back seat, or far rear seat (in vans and minivans). The observer then approached the parents to conduct a brief oral survey. Drivers, who were usually the parents, were asked the age of the children in the vehicle. Those who were using booster seats for their children were asked the reasons for doing so. Those without booster seats were asked whether they owned a booster seat and why they had chosen not to use one. Subjects were assured that the survey would be anonymous, voluntary, and brief. Only drivers with children between 2 and 8 years old were interviewed.

Data were key entered into Microsoft Excel (Microsoft, Redmond, WA) and analyzed using SPSS (SPSS, Chicago, IL) for the personal computer. χ^2 and Student's t tests were used to test differences for statistical significance.

The study was approved by the University of Washington Institutional Review Board.

RESULTS

Observations of Booster Seat Use

One hundred fifty-nine children were observed at 13 different sites in the greater Seattle area. The children observed were grouped into 4 age groups: 2 to 3, 4, 5, and 6 to 8 years old. The percentage of children observed in each were 21.4%, 28.9%, 30.8%, and 18.9%, respectively.

Ninety-five percent of drivers were observed using lap–shoulder belt restraints, while 5% were observed using no restraint. Information about the type of restraint used for children in the 4 age groups is shown in Table 1. Very few children were unrestrained. Lap–shoulder belts were the most frequently used child restraint (33.3%). Only 3% of 2- to 3-year-olds used shoulder belts, compared with 28.3% of 4-year-olds, 36.7% of 5-year-olds, and 70.0% of 6- to 8-year-olds. Lap–shoulder belt use increased significantly with age ($P < .01$, χ^2 for trend). Three children were restrained using lap–shoulder belt systems in which the shoulder harness was placed behind the child; these were grouped with children restrained by lap belts only. Although booster seat use was 27.7% overall, only 10% of children 6 years of age and older were observed in booster seats. At best, only one third of children who graduated from car seats but were still too young to use lap–shoulder belts alone were restrained using booster seats. There was a significant decrease ($P < .05$) in use of car seats or booster seats with age (60.9% at 4 years old to 36.7% at 5 years old; $P < .05$).

The observer also recorded the child's location, as well as the total number of passengers (including drivers) in the vehicle (Table 2). Overall, 27 children (17%) were observed in the front seat. However, riding in the front seat was related to the age of the child: only 5.9% of 2- to 3-year-olds were observed in the front seat, compared with 15.2% of 4-year-olds, 20.4% of 5-year-olds, and 26.7% of 6- to 8-year-olds. All other children were observed riding in the rear seat. Twenty-eight percent of children in the no seat use category (neither car seats nor booster seats) were riding in the front seat, whereas 95% of booster seat users rode in the rear seat. The majority of children restrained with a lap–shoulder belt were riding in the rear seat.

Sixty-two percent of the children observed rode alone with the driver, 30% rode with the driver and 1 other passenger, 7% with 2 other passengers, and 1% with 3 other passengers. Table 3 shows the variation in type of restraint use with the number of passengers in the vehicle (including driver). The frequencies of booster seat use in cars with 2 and 3 passengers are not significantly different ($P > .9$). However, no seat use (neither car seat nor booster seat use) is significantly higher in vehicles with 3 or 4 passengers, compared with vehicles with 2 passengers ($P < .05$).

Parent Survey

Observers interviewed 69 drivers with children 3 to 8 years old in the restraint category no seat use to determine whether they owned a booster seat and their reasons for nonuse. The response rate for the interview was 98%. Twenty-one different reasons for nonuse were given, which were assigned to 6 categories. The frequencies and percentages of responses in these 6 categories are summarized in Table 4. Forty-six percent of respondents considered their child large enough to no longer need a booster seat. Approximately one half of these parents cited specific weight guidelines of between 40 and 60 pounds as justification for moving their child into a standard lap–shoulder belt system. More general responses indicating the child was too large or too tall were also given. Some parents indicated that the child had outgrown the booster seat, while others said they

TABLE 1. Type of Restraint Used Compared With Child Age

Type of Restraint	No. (%) of Children Using Restraint Type				Total No. (%) of Children Using Restraint Type
	2 to 3 Years Old	4 Years Old	5 Years Old	6–8 Years Old	
Lap–shoulder belt	1 (3.0)	13 (28.3)	18 (36.7)	21 (70.0)	53 (33.3)
Lap belt	0	4 (8.7)	7 (14.3)	4 (13.3)	15 (9.4)
No restraint	0	1 (2.2)	6 (12.2)	1 (3.3)	8 (5.0)
Car seat	23 (67.6)	13 (28.3)	2 (4.1)	1 (3.3)	39 (24.5)
Booster seat	10 (29.4)	15 (32.6)	16 (32.6)	3 (10.0)	44 (27.7)
Total no. (%) of children in each age category	34 (21.4)	46 (28.9)	49 (30.8)	30 (18.9)	159 (100)

TABLE 2. Type of Restraint Use by Seating Position in the Vehicle

Restraint Type	Front Seat	Rear Seat	Total
Lap–shoulder belt	17 (33%)	35 (67%)	52*
Lap belt	1 (7%)	14 (93%)	15
No restraint	3 (38%)	5 (62%)	8
Car seat	4 (10%)	35 (90%)	39
Booster seat	2 (5%)	42 (95%)	44
Total	27 (17.0%)	131 (83.0%)	158

* Data missing on seat position for 1 subject.

had moved their child directly from a car seat to a lap–shoulder belt or no restraint when the child exceeded the car seat weight limit.

Twenty-one percent of parents indicated that they understood the benefits of booster seats and usually used ($n = 4$) or intended to use them ($n = 11$) for their children. Many parents who usually used seats for their children said that they had left these seats in other cars. Eleven percent of parents attributed their nonuse to problems with the seat itself. Some problems cited dealt with the general hassle of having the seat in the car, as well as the specific difficulty of fitting multiple child safety seats in 1 car. Other reasons focused on problems with the actual seats, eg, shield boosters would not close over the child and the child did not fit in the seat correctly. Some parents indicated that it was difficult to find, or too expensive to purchase, a booster seat suitable for a 60-pound child.

Ten percent of parents said they used other safety devices in place of booster seats. The most common other safety device cited by parents and observed by the interviewer was a shoulder strap adjuster. This adjuster consisted of a Velcro strap that connected the shoulder and lap belts and, thus, changed the positioning of the shoulder strap across the child's chest instead of the neck or face. Seat cushions were also used as a booster seat alternative. Only 7% of parents indicated that they had not considered purchasing booster seats, and 4% attributed nonuse to the child's dislike of the booster seat.

Parents of children not using booster seats were also asked whether they owned any booster seats. Fifty-seven percent of parents ($n = 39$) whose children were not using booster seats claimed ownership of 1 or more seats. One half of these parents did not use the seats because they said their children were large enough to no longer need seats. Another third of these parents said they usually used booster seats for their children.

TABLE 4. Frequencies and Percentages of Responses for No Booster Seat Use

Response Given	Frequency Response Given	Percent of Total Responses
Child large enough to not need seat	32	45.7
Use other safety device	7	10.0
Intend to or usually use seat	15	21.4
Hassle or problem with seat	8	11.4
Child does not like seat	3	4.3
Had not considered buying seat	5	7.1
Total	70	100.0

The primary reason for nonownership given by the 30 parents who did not own booster seats was that their children were large enough to no longer require such seats. Other reasons for nonownership were similar to those given above for nonuse.

Reasons for nonuse were also examined by the child's age (Table 5). This showed that nearly all of the parents (94%) who reported that the child was large enough to not need a seat were parents of children 5 years of age and older (50% of the responses were given by parents of 5-year-olds). This result is consistent with the 34% increase in no seat use between 4 and 5 years old (Table 1). Other nonuse responses, however, were given with equal frequency by parents of children in the 4, 5, and 6 to 8 years old categories.

Forty-four parents with children using booster seats were asked what had compelled them to use booster seats for their children. One half cited general safety, and 21% said their children required seats. Sixteen percent did not know why they had chosen to use the seat. Seven percent had used 1 for an older child, while another 7% had obtained the information through literature on child transportation safety. Responses were evenly distributed across the different age categories.

DISCUSSION

This study indicates that booster seat use is uncommon among children <9 years old, and that the majority of children who graduate from car seats are inadequately restrained in motor vehicles. It also indicates that the most common reason for lack of use of these devices is an incorrect perception by parents that children 3 to 8 years old are large enough not to need booster seats.

This study found that one third of children in whom it was appropriate were restrained in booster

TABLE 3. Type of Restraint Used by Children Compared With Number of Passengers in Vehicle

Type of Restraint	No. (%) of Children in Restraint Category Compared With No. of Passengers in Vehicle				Total No. (%) of Children in Restraint Category
	2 Passengers	3 Passengers	4 Passengers	5 Passengers	
No seat used	38 (38.8)	28 (58.3)	9 (75.0)	1 (100)	76 (47.8)
Booster seat used	28 (28.6)	14 (29.2)	2 (16.7)	0	44 (27.7)
Car seat used	32 (32.6)	6 (12.5)	1 (8.3)	0	39 (24.5)
Total no. (%) of children with given no. of passengers in vehicle	98 (61.6)	48 (30.2)	12 (7.5)	1 (0.7)	159 (100)

TABLE 5. Reason for No Booster Seat Use Compared With Child Age

Response Given	No. (%) of Children by Age				Total No. (%) of Responses Given
	2–3 Years Old	4 Years Old	5 Years Old	6–8 Years Old	
Child large enough to not need seat	0	2 (12.5)	16 (55.2)	14 (58.3)	32 (45.7)
Use other safety device	1 (100)	2 (12.5)	2 (6.9)	2 (8.3)	7 (10.0)
Intend to or usually use seat	0	6 (37.5)	5 (17.2)	4 (16.7)	15 (21.4)
Hassle or problem with seat	0	2 (12.5)	3 (10.3)	3 (12.5)	8 (11.4)
Child does not like seat	0	1 (6.3)	2 (6.9)	0	3 (4.3)
Had not considered buying seat	0	3 (18.7)	1 (3.4)	1 (4.2)	5 (7.1)
Total no. (%) of responses given per age group	1 (1.4)	16 (22.9)	29 (41.4)	24 (34.3)	70 (100)

seats. This is considerably higher than the rate of 5% use found in a recent survey conducted by the National SafeKids Program.[2] This may be a reflection of the generally higher rate in Seattle of use of occupant restraints[8] and of safety devices for children, such as bicycle helmets,[9] compared with the rest of the country.[8,10] Nevertheless, nearly three fourths of children in this age group were not using booster seats.

The study provided important information on reasons for the lack of booster seat use and can help guide interventions to increase use. The most common reason was misinformation with parents believing that their children did not need to use a booster seat. Most such parents thought that their child was large enough to safely use the regular adult restraint systems, and were not aware of the need for booster seats in children 4 to 8 years old. Parents seem to be relying on information that they received at earlier visits to physicians, when their child was an infant or young toddler and have not updated themselves with information relevant for a 4- to 8-year-old child. This lack of knowledge on the part of parents is very similar to what we found when we first began to promote bicycle helmet use.[11] Most parents were unaware of the risk of head injuries and the need for helmet protection. Public education programs can change this knowledge gap.

The study also found that booster seats are cumbersome to use, discouraging both parents and children. More parents owned booster seats than used them, and this was especially true when there were more occupants in the vehicle. The federal government has recently taken a large step to increase car seat use by mandating a uniform system of attachment of the seats in the vehicles. Similar regulations may be required to make booster seats easier to use. In addition, as use (and sales) of booster seats increases, manufacturers are likely to respond by producing a better product.

Surveyed parents were concerned that their children would not like using a booster seat. Public education messages will need to be tailored to both parents and children, emphasizing the better behavior of restrained children[12] and the better visibility offered to children by using the booster seat. Much was learned about how best to promote child car seats[13]; the same techniques should be explored for the promotion of booster seats.

Although fear must be used cautiously as an incentive to change behavior, the risks of injury to children inadequately restrained should not be ignored. Children using only lap belts have been shown to be at increased risk of both lumbar spine injuries and hollow viscus injuries.[6] The risk of these injuries is decreased through the use of upper torso restraints as offered by the shoulder harness. Children 5 to 12 years old restrained with lap belts in the rear seat seem to be at lower risk of dying in a crash than children restrained with lap shoulder belts in the front seat.[14] Nevertheless, booster seats are a more appropriate restraint method than either of these 2 approaches.

CONCLUSION

Many children are inadequately restrained in motor vehicles. Pediatricians more than 1 decade ago were instrumental in promoting use of car seats for infants and toddlers. These same efforts should now be expended on promoting booster seat use by young school-aged children, and educating parents about the hazards of using lap–shoulder belts alone in young children. Pediatricians should recommend that children generally be in booster seats until they reach 8 years old or 80 pounds. Resources for counseling families include the American Academy of Pediatrics Family Shopping Guide to Car Seats (available at: www.aap.org/family/famsjop.htm), the American Academy of Pediatrics One-Minute Car Seat Checkup (available at: www.aap.org/family/carseat3.htm), and the National Highway Traffic Safety Administration (www.nhtsa.dot.gov).

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