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**Belt-Positioning Booster Seats for Children:  
National Perspectives  
from Parents and Emergency Physicians**

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16. Abstract <p>Motor vehicle collisions (MVCs) remain a leading cause of death among children and result in more than 130,000 visits to US Emergency Departments (EDs) each year. Deaths and severe injuries sustained by child occupants in MVCs are overwhelmingly preventable through the correct and consistent use of child passenger restraints. However, child passenger restraint use remains below Healthy People 2020 Objective levels. Nearly one-fifth of 1- to 3-year-olds and one-third of 4- to 7-year-olds are prematurely placed in a booster seat or seat belt and 10% of children ride completely unrestrained. Overcoming the persistent problem of inadequate restraint use among child passengers requires better understanding of the practical barriers to recommended booster seat use faced by parents and exploration of novel clinical settings in which to promote child passenger safety such as the ED.</p> <p>In this two part study, we sought to examine the association between carpooling frequency and booster seat use among parents and to determine emergency physician perspectives related to child passenger safety within the field of emergency medicine.</p> <p>We conducted national surveys with 1) a sample of 693 parents of 4- to 8-year-old children regarding child passenger restraint use and experiences with booster seat use when carpooling and 2) a sample of 1200 emergency physicians regarding their attitudes and practices related to child passenger safety during MVC-related ED visits.</p> <p>In the parent survey, we found carpooling is a common practice during which booster seat use is lower than usual child passenger restraint use. In the physician survey, we found that respondents view a role for themselves in promoting child passenger safety; however their responses suggest substantial opportunities exist to increase the frequency with which parents receive child passenger safety messages during an ED visit following an MVC.</p>			
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## Statement of the Problem

Motor vehicle collisions (MVCs) are a leading cause of death in children older than 1 and the leading cause of death among 4- to 12-year-olds.<sup>1</sup> In addition to the mortality associated with MVCs, more than 130,000 children 1 to 12 years old are seen in US hospital emergency departments (EDs) each year for non-fatal injuries sustained as occupants in MVCs.<sup>1</sup> Deaths and severe injuries sustained by child occupants in MVCs are overwhelmingly preventable through the correct and consistent use of child passenger restraints.<sup>2-7</sup>

Laws have been effective in promoting passenger restraint use and preventing injuries in the United States.<sup>8-10</sup> Currently all states require that children younger than 4 years ride in car seats and 47 states require older children to use car seats or booster seats.<sup>11</sup> Unfortunately, child passenger restraint use remains consistently below Healthy People 2020 Objective levels.<sup>12-16</sup> Overcoming the persistent problem of inadequate restraint use among child passengers requires better understanding of the practical barriers to recommended booster seat use faced by parents and exploration of novel clinical settings in which to promote child passenger safety such as the ED.

Previously identified barriers to recommended restraint use include: parental lack of understanding of different child passenger restraint systems; beliefs that seat belts alone provide adequate protection; inconvenience associated with transferring bulky seats between vehicles; and child resistance to riding in a restraint.<sup>17-22</sup> In moving vehicles, children are more often observed riding in a seat belt when they would be recommended to use a booster seat when traveling with other children.<sup>23</sup> However, no prior study has explored the extent to which carpooling is a practical barrier to booster seat use.

It is known that education delivered during clinical encounters can increase safety practices among parents<sup>24-28</sup> but most injury prevention programs are developed for use in primary care settings. ED visits are frequent among children in the US<sup>29</sup> and children who utilize the ED often have less access to pediatric primary care.<sup>30</sup> Recently, there has been interest among emergency care providers and patients in an expanded role of the ED to promote public health with emphasis on the vital importance of injury prevention efforts.<sup>31-33</sup> While the American College of Emergency Physicians has created policy statements regarding the role of emergency physicians in injury prevention and control<sup>34</sup>, emergency physician attitudes and beliefs about providing parents with child safety seat information are unknown.

In this two part study, we conducted national surveys with 1) a sample of parents of 4- to 8-year-old children regarding booster seat use and carpooling and 2) a sample of emergency physicians regarding child passenger safety within the field of emergency medicine to accomplish the following aims:

**Aim 1:** To describe, among parents of 4- to 8-year-old children, the frequency with which parents drive multiple children and their experiences and opinions related to booster seat use when carpooling.

**Aim 2:** To examine emergency physicians' knowledge, attitudes, beliefs, and perceptions about their role in MVC-related injury prevention during the ED visit.

The approach, methods, results, and conclusions are presented separately for each component of this two part study.

## **Part 1: National Survey of Parents Regarding Booster Seats and Carpooling**

### **Approach**

Using the C.S. Mott Children's Hospital National Children's Health Poll, we conducted a cross-sectional Web-based survey of a nationally representative panel of US parents drawn from the KnowledgePanel of Knowledge Networks (Menlo Park, CA). This online panel was created through probability sampling of both online and offline members of the US population through random-digit dialing of listed and unlisted numbers, and through address-based sampling designed to target households that do not have landline telephones. Panel members who agree to participate in Web-based surveys are provided Internet access and hardware if they do not own it.

A random sample of adults from the KnowledgePanel was invited to participate in the survey during the month of January 2010. Up to four reminder emails were sent to non-respondents during the month to request their participation.

Of a larger survey on a variety of health-related topics, 10 questions focused on parental experiences and opinions related to booster seats and carpooling. Questions were developed by the study team and revised based on pilot testing conducted with a sample of 120 respondents. Responses from pilot testing were used to refine survey questions that were confusing or that had limited variability in responses. Responses from pilot testing were not included in the presented results. The results presented relate to the subset of child passenger safety questions asked of parents of children 4- to 8-years-old (i.e., booster seat age-range). When parents indicated they had more than one 4- to 8-year-old child, the survey program randomly selected the age of one child in this range, about whom the parent was asked to respond.

Parents provided information including demographic characteristics and their own seat belt use. Parents were asked where their child typically sits in the family car (front seat, back seat, does not ride in a family car). Parents of children who ride in a family car were asked, "*Which of the following do you use for your [X-year-old] child,*" and selected one of the following options; 1) car seat, 2) booster seat, 3) seat belt, or 4) none of the above. Responses indicating the child used a car seat (N=113) or booster seat (N=402) were combined and termed "child passenger restraint systems" for analyses due to the availability of "combination" car seat/booster seats and the inability to verify the model of child passenger safety seat through a Web-based survey.

All parents surveyed indicated their degree of agreement with brief statements developed by the study team regarding the use of booster seats and inconveniences associated with booster seat use. Parents were also asked about their awareness and knowledge of their state booster seat law.

To determine the frequency of carpooling, parents were asked, “How often do you transport children other than your own?” and selected from the following responses: three or more times per week; one to two times per week; less than once per week, never. Responses were collapsed into 3 categories for analysis; (1) frequently defined as carpooling at least 1 time per week; (2) occasionally defined as carpooling at least sometimes but less than once per week; (3) never carpooling. Parents who indicated they carpool at least sometimes were asked to respond to 3 statements about their experiences using booster seats when carpooling. Parents who carpool were also asked how they would respond to a hypothetical scenario in which they needed to transport more children than they had available seatbelts in the back seat and asked to select from a list of responses. The study was approved by the University of Michigan Medical School Institutional Review Board.

## Methodology

We compared restraint use and carpooling frequency across demographic characteristics using chi-square statistics. In addition, we compared parental opinions and experiences with booster seats and carpooling across carpooling frequency. All analyses were conducted with Stata 11 (Stata Corp., College Station, TX), using Census-based sampling weights provided by KnowledgeNetworks to draw nationally representative inferences. P-values <0.05 were considered statistically significant.

## Findings

### Study Sample

The 1,612 parents who participated in the full survey represented a response rate of 71%. Of these 1,612 parents, 693 had a child aged 4 to 8-years, and 683 (98%) of these used one of the named restraint systems when their child rode in the family car. Responses from parents who answered “none of the above” to the question regarding the type of restraint used for their child were excluded (n=10), because we could not determine whether this meant another restraint type was used or that the child uses no restraint at all. All analyses were subsequently conducted using the responses from these 683 parents.

Overall 76% of parents reported that their 4- to 8-year-old child uses a child passenger restraint system (i.e., a car seat or booster seat) and 24% reported their child uses a seat belt. Child passenger restraint system use varied significantly by child age (92% 4-6yo, 52% 7-8yo,  $p<0.001$ ) (Figure 1). Parents who reported always using a seatbelt themselves were more likely to report their 4- to 8-year-old child uses a car seat or booster seat (78% vs. 59%,  $p=0.038$ ). Other parental demographic characteristics, child gender, number of children in the family, birth order, and carpooling frequency were not significantly associated with car

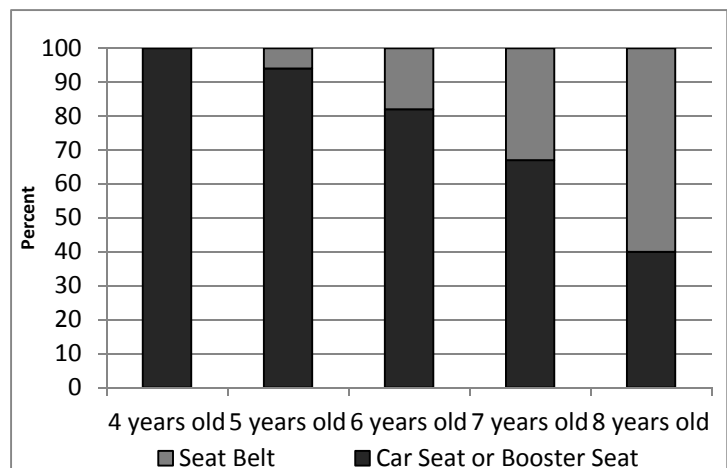


Figure 1. Child Passenger Restraint Type Used across Child Age

seat/booster seat use. Only 4 parents reported their 4- to 8-year old children ride in the front seat of their family vehicle.

Regarding state laws, 51% of parents report that they do not know their state booster seat law and 20% reported knowing the law but indicated the wrong age requirement. Use of booster seats did not differ with parents' awareness of state laws.

In our sample, 65% of parents carpool (16% frequently, 49% occasionally) and 35% do not. Parents of younger children were significantly less likely to carpool but other parent and child demographic characteristics were not significantly different across carpooling groups (Table 1).

**Table 1: Demographic Characteristics by Carpooling Frequency**

Parent Characteristics		Carpooling Frequency		
		Frequently N=108 Weighted %	Occasionally N=341 Weighted %	Never N=236 Weighted %
Parent Gender	Female	36	49	15
	Male	35	47	18
Parent Age	< 35 years old	19	47	34
	≥35 years old	14	50	36
Parent Race	White	16	48	36
	Hispanic	14	56	30
	Black	29	34	37
	Other	12	46	42
Parent Education	High school or less	21	49	30
	Some college	11	43	46
	College graduate	15	54	31
Family Income	< \$30,000	18	49	33
	\$30,000 to \$60,000	11	52	37
	\$60,000 to \$100,000	17	46	37
	> \$100,000	21	46	33
<b>Child Characteristics</b>				
Child Age*	4 years old	7	50	43
	5 years old	14	45	41
	6 years old	19	52	29
	7 years old	20	44	36
	8 years old	20	49	31
Child Birth Order	Only child	16	41	43
	Youngest child	18	56	26
	Middle child	16	58	26
	Oldest child	9	42	49

\*p=0.03

***Parental Opinions about Booster Seats***

Roughly 70% of parents agreed or strongly agreed with the statement, “Even if there were no laws, I would use a booster seat for my child,” and more than one-quarter of parents agreed that “It is okay for their child to use only a seat belt when going on short trips.” Parents who reported never carpooling were more likely to agree with the statement, “It is difficult to make arrangements to have booster seats available for other people’s children,” (49%)

compared with parents who occasionally carpool (33%) or frequently carpool (38%) ( $p=0.02$ ) (Table 2). Parents who reported never carpooling also more strongly agreed with the statement, “Having my child sit in a booster gets in the way of being able to use all the seats in the car,” compared with parents who carpool, but this did not reach statistical significance.

**Table 2. Parental Opinions of Child Passenger Restraint Use by Carpooling Frequency**

	Carpooling Frequency			p-value
	Frequently N=108	Occasionally N=341	Never N=236	
It is difficult to make arrangements to have booster seats available for other people’s children	38	33	48	0.02
It is okay for my child to use only a seat belt when they are going on short trips	30	28	27	0.75
Even if there were no laws, I would use a booster seat for my child	79	69	69	0.08
Having my child sit in a booster gets in the way of being able to use all the seats in the car	17	15	22	0.07

***Parental Experiences with Carpooling and Booster Seats***

Among parents who carpool and report their children use a child passenger restraint system, just half report they always have all 4- to 8-year-olds ride in booster seats when carpooling and only 60% indicated they would always ask another driver to use a booster seat for their child. Parents who occasionally carpool were more likely than parents who frequently carpool to report their children always use boosters when riding with their friends who do not use boosters (45% vs. 31%,  $p=0.03$ ) (Table 3).

**Table 3. Parental Experiences with Booster Seats and Carpooling**

	Carpooling Frequency		p-value
	Frequently N=108	Occasionally N=336	
My child uses their booster seat when I drive their friends who do not have booster seats	32	45	0.03
I ask other people to have my child use a booster seat when they are driving	51	64	0.08
I have all 4- to 8-year-olds I drive ride in booster seats	47	52	0.31

In response to the hypothetical scenario of needing to transport more children than they had available seat belts in the back seat(s), most parents indicated that they would not transport the additional children (73%). However, 18% would have the biggest child sit in front and 9% indicated they would buckle two children in one belt or have children sit in a cargo area or on the lap of another passenger. There were no significant differences in responses to this hypothetical scenario when comparing parents who carpool frequently with those who carpool occasionally.

**Conclusions**

Carpooling is a common practice among parents of 4- to 8-year-old children. Lower booster seat use among school age children may relate to factors associated with carpooling such as inconvenience and social norms. The importance of using the correct restraint for each



passenger on every trip may not be adequately conveyed in existing community, school, and office-based public health efforts. Parents should be encouraged to plan for booster seat use when scheduling carpooling trips. Child passenger safety programs should increase clinician and parental awareness of the improved seat belt fit that older children experience when using booster seat, a benefit that extends beyond the current age limits for booster seat use in most state laws.

## **Part 2: National Survey of Emergency Physicians Regarding Child Passenger Safety during a Motor Vehicle Collision-Related ED Visit**

### **Approach**

We drew a national random sample of 600 emergency physicians and 600 pediatric emergency physicians from the American Medical Association (AMA) Physician Masterfile through a contracted vendor. The AMA Physicians Masterfile is the most comprehensive database of physicians licensed to practice in the United States and includes both AMA members and non-members. Our sampling frame included all physicians self-described as emergency physicians or pediatric emergency physicians who provide direct patient care in the United States. We excluded resident physicians and physicians 70 years and older. After review of the 1200 records in the sample, we excluded 2 physicians who were found not to meet inclusion criteria.

We designed a 4-page, 17-item survey instrument comprised of questions with a mixture of fixed-choice and Likert-scale response options. Questions were developed by the study team to assess respondent awareness of various child passenger safety resources, the local availability of the resources, and the likelihood with which a parent of a 2-year-old child being discharged from the respondent's ED following an MCV would receive discharge instructions containing child passenger safety information and referral to local resources.

Additional questions explored emergency physician perceptions and attitudes related to their personal role and the role of the ED in child passenger safety. Two clinical scenarios were used to determine the self-reported frequency with which the respondent would perform specific child passenger safety promotion behaviors during their evaluation of 1) a 6-year-old front-seat restrained passenger following a minor MVC and 2) a 3-year-old restrained in a car seat during a roll-over MVC. The 6-year-old and 3-year-old ages were selected as point when parents and clinicians may consider transitioning a child from a booster seat to seat belt and a car seat to booster seat respectively. The child passenger safety promotion behaviors were selected to reflect NHTSA recommendations for the following: (1) children under 13 years of age should sit in the rear seat of a vehicle; (2) children should use a booster seat from the time they outgrow their car seat (usually around age 4) until the seat belt fits properly (usually at a height of 57 inches and 8 years old); and (3) car seats should be replaced following a moderate or severe MVC even if there are no visible signs of damage to the seat.

We also inquired of demographic, clinical training background, and ED practice setting characteristics. Demographic information included year of residency graduation and gender. Respondents were asked to indicate the age(s) of their child(ren) by selecting from the

following categories: <1 year, 1-3 years, 4-8 years, 9-12 years, 13-15 years, 16 years or older. Responses were used to categorize the type of child passenger restraint systems the respondents children would be recommended to use: car seats for 0- to 3-year-olds, booster seats for 4- to 8-year-olds, and seat belts for children older than 8 years of age. There were no questions related to the type of passenger restraint used by the respondent or their children.

Respondents provided self-report of the type of residency training program, year of residency graduation, and completion of formal Pediatric Emergency Medicine fellowship training. Respondents were defined as pediatric emergency medicine (PEM) trained if they completed formal pediatric emergency medicine fellowship training or a pediatric residency; all other respondents were defined as general emergency medicine (GEM) trained. Respondents were asked to select the option that best describes the ED setting in which they work the majority of their shifts: 1) a general ED caring for both children and adults in the same treatment area; 2) a pediatric treatment area within a general or community ED; or 3) a pediatric ED that treats only children. They also estimated the proportion of patients they treat who are children less than 15 years of age. Respondent's also indicated if their hospital is verified as an Adult and/or Pediatric Trauma Center by the American College of Surgeons and the level of the verification.

We pilot tested the survey instrument to ensure clarity and ease of administration with 12 general and pediatric emergency physicians from across the United States working in community, academic, and Children's hospital EDs. Responses to the pilot surveys were not included in the analyses. The institutional review board of the University of Michigan Medical School approved this study.

The initial survey mailing was sent in August 2010 to 1198 physicians (599 emergency physicians and 599 pediatric emergency physicians) and included a personalized cover letter, the survey instrument, and a \$5 cash incentive. A self-addressed postage paid envelope was included to facilitate return of the completed surveys. Two additional mailings to non-respondents occurred at 6-week intervals.

## **Methodology**

After verification of data entry, univariate frequencies were calculated for each variable. We performed chi-square analyses to examine associations between variables. To test the hypothesis that training background would be associated with different practices and beliefs, bivariate analyses focused on physician self-report of child passenger safety promotion behaviors and attitudes by training background (PEM vs. GEM).

Self-reported frequency of performing child passenger safety promotion behaviors in response to the 2 clinical scenarios was then dichotomized (always/often vs. sometimes/rarely/never) in order to conduct multivariate logistic regression analyses. The main predictor variable was training background (PEM vs. GEM). Control variables included gender, parent status, having a child in car seat, booster seat or seat belt age range, trauma center verification, and year of graduation from residency. All analyses were

conducted using Stata 10.1 (Stata Corp., College Station, TX). P-values <0.05 were considered statistically significant.

## **Findings**

### ***Survey Response and Demographic Characteristics***

Of the 1198 physicians in the mailing sample, 116 were excluded because mailing materials were returned as undeliverable (57 emergency physicians, 59 pediatric emergency physicians). Survey materials were returned by 720 (332 emergency physicians and 388 pediatric emergency physicians) of the remaining 1082 for an overall response rate of 66% (61% emergency physicians, 72% pediatric emergency physicians).

In response to the initial screener question, 84 respondents (63 emergency physicians and 21 pediatric emergency physicians) indicated that they do not provide ED care to children under 15 years of age with traumatic injuries leaving 638 eligible respondents (271 emergency physicians and 367 pediatric emergency physicians) and an eligible response rate of 64%. There were no significant differences between respondents and non-respondents based on available demographics within the AMA masterfile with the exception of a medical school graduation year among the pediatric emergency physicians. Pediatric emergency physicians respondents had more recently graduated from medical school compared with non-respondents [median graduation year 1997 (IQR 1989, 2001) vs. 1996 (IQR 1987, 2000),  $p=0.05$ ].

Overall, 60% of respondents were male and 80% were parents. Of the parents, 60% had at least one child who would be recommended to use a car seat (younger than 4 years old) and 56% had at least one child who would be recommended to use a seat belt (older than 8 years old) (Table 4). Half of parents had children in more than one of the provided age groups and 31% were parents of children whose ages spanned multiple child passenger restraint types (i.e., one child in the booster seat age-range and one child old enough to be using a seat belt). The majority of respondents indicated their residency training was in pediatrics or emergency medicine. More than half of respondents reported completing formal pediatric emergency medicine fellowship training, and 94% of respondents who reported completing formal PEM fellowship training were residency trained in pediatrics.

Three-hundred seventy three (58%) respondents were classified as PEM physicians based on having completed pediatric emergency medicine fellowship training ( $n=333$ ) or pediatric residency training alone ( $n=40$ ). PEM physicians were more likely to be female, parents of children under the age of 9, and to have more recently graduated from residency compared with GEM physicians (Table 4). Expected differences in practice settings and patient populations were noted between the two physician groups. More than 80% of PEM physicians reported working the majority of their shifts in a pediatric ED while 95% of GEM physicians reported working the majority of their shifts in a general ED. In addition, 65% of PEM physicians indicated their hospital is a Level 1 trauma center compared with 21% of GEM physicians. Seven respondents reported they did not know their hospital's adult trauma center designation and 21 did not know their hospital's pediatric trauma center designation. Among PEM physicians, 90% reported more than half of their patient population is younger

than 15 years of age whereas 1% of GEM physicians reported more than half of their patient population is younger than 15.

**Table 4. Demographic Characteristics of Survey Respondents**

	Overall % (N=638)	PEM % (N=373)	General EM % (N=265)	p-value
<b>Male</b>	60	46	79	<0.001
<b>Parent*</b>				
Parent of a 0-3yo child	61	71	48	<0.001
Parent of a 4-8yo child	44	49	37	0.01
Parent of a 9yo+ child	56	47	69	<0.001
<b>Residency Training</b>				
Pediatrics	55	94	0	<0.001
Emergency Medicine	38	5	84	
Other	7	1	16	
<b>Residency Graduation Year Median (IQR)</b>	1999 (1992, 2003)	2000 (1993, 2003)	1997 (1990, 2002)	<0.001
<b>PEM Fellowship Training</b>	52	89	0	<0.001
<b>Clinical Setting</b>				
General ED	42	4	96	<0.001
Pediatric treatment area	8	11	3	
Pediatric ED	50	85	1	
<b>Trauma Center</b>				
Level 1 Adult or Pediatric	47	65	21	<0.001
Level 2-4	28	20	40	
Not/I don't know	25	15	39	
<b>Estimated % of patients &lt;15yo</b>				
1-49%	46	8	99	<0.001
50-100%	54	92	1	

\*247 (49%) of respondents who indicated they were parents had children in more than one age categories and 161 (31%) of parents had children of more than one child passenger restraint type age group.

***Child passenger safety resources – Awareness and Availability***

In response to questions related to common child passenger safety resources, PEM physicians indicated greater awareness compared with GEM physicians across all listed resources (Table 5).

**Table 5: Local Availability of Child Passenger Safety Resources**

	Available in my ED/hospital	Available in my area	Not available	Unsure of availability	p-value
	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	
<b>Free or reduced-price car seat distribution program</b>	33 vs. 10	24 vs. 17	12 vs. 26	31 vs. 47	<0.001
<b>Free or reduced-price booster seat distribution program</b>	25 vs. 6	22 vs. 16	15 vs. 28	38 vs. 50	<0.001
<b>Certified Child Passenger Safety Technician</b>	27 vs. 4	33 vs. 20	8 vs. 26	32 vs. 50	<0.001
<b>Police or fire department car seat installation program</b>	8 vs. 1	59 vs. 42	4 vs. 13	28 vs. 44	<0.001

Of all listed resources, awareness about police or fire department car seat installation programs was greatest among both PEM and GEM physicians. One-third of PEM physicians

reported free or reduced-price car seat distribution programs were available in their ED or hospital and one-quarter reported availability of such a program for booster seats in their ED or hospital. More than one-quarter of GEM physicians reported that similar programs were *not available* in their ED, hospital, or community and half of GEM physicians were unsure of the availability. PEM physicians indicated a Certified Child Passenger Safety Technician was available in their ED, hospital, or community twice as commonly as GEM physicians.

Nearly half of PEM and an equal proportion of GEM respondents indicated the parent of a 2-year-old child who was being discharged following an MVC would be *unlikely* to receive written information about car seats as a part of their discharge instructions (Table 6). Regarding the provision of other information related to community child passenger safety resources, respondents indicated parents would be least likely to receive contact information for certified child passenger safety technicians to complete a car seat inspection, followed by instructions to contact their local police department for assistance with proper car seat installation and a recommendation to talk with their child’s primary care physician for questions about car seats. Across each item, PEM physicians indicated a significantly greater likelihood of parents receiving child passenger safety information than GEM physicians.

**Table 6: Likelihood Child Passenger Safety Information is Distributed at ED Discharge**

Please indicate the likelihood with which the parent of a 2-year-old child who was being discharged home from your ED following an MVC would receive the following:					
	Very likely	Somewhat	Unlikely	Unsure	p-value
	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	
<b>Written information about car seats as part of their discharge instructions</b>	20 vs. 22	26 vs. 16	45 vs. 45	9 vs. 17	0.002
<b>Contact information for a certified child passenger safety technician to complete a car seat inspection</b>	4 vs. 4	11 vs. 3	70 vs. 72	15 vs. 21	<0.001
<b>Instructions to contact their local police or fire department for assistance with proper car seat installation</b>	9 vs. 8	28 vs. 13	52 vs. 64	11 vs. 15	<0.001
<b>Recommend the parent talk with their child’s PCP for questions about car seats</b>	13 vs. 11	34 vs. 24	47 vs. 53	6 vs. 11	0.007

There were no differences between PEM and GEM physicians in the age at which they would recommend children begin using a booster seat (median, 4 years, IQR: 4-5) and a seat belt alone (median, 8 years, IQR: 8-9). These responses were consistent with the ages referenced as transition points from car seat to booster seat and booster seat to seat belt in the NHTSA guidelines for child passenger safety.

***Attitudes about Child Passenger Safety and the Emergency Department***

Regardless of training background, emergency physicians overwhelmingly agreed that they have a role in the education of parents about child passenger safety and that they can say things during an ED visit that make a difference in how a parent restrains their child (Table 7). More than 75% of PEM physicians and 61% of GEM physicians agreed or strongly agreed that parents view them as an expert in child passenger safety. Physicians in both groups were less supportive of the statement “Parents should receive information about child passenger safety at ED discharge regardless of the reason for visit”, 54% of PEM physicians compared with 38% of GEM physicians. However, neither physician group felt parents are too overwhelmed to learn about passenger safety prior to discharge following an MVC.

**Table 7: Emergency Physician Attitudes regarding Child Passenger Safety and the ED**

	Strongly agree	Agree	Disagree	Strongly disagree	p-value
	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	
<b>It is my role as an emergency physician to educate parents about child passenger safety and child safety seats</b>	48 vs. 23	47 vs. 59	4 vs. 16	1 vs. 2	<0.001
<b>I can say things during an ED visit that make a difference in how a parent restrains their child in their car</b>	38 vs. 30	54 vs. 63	7 vs. 6	1 vs. 1	0.124
<b>While in the ED, parents should be made aware of state laws about child passenger restraints</b>	35 vs. 19	54 vs. 61	10 vs. 19	1 vs. 1	<0.001
<b>Parents view me as an expert in child passenger safety</b>	23 vs. 15	56 vs. 46	19 vs. 36	2 vs. 3	<0.001
<b>I feel comfortable answering questions from parents about child safety seats including both car seats and booster seats</b>	29 vs. 11	55 vs. 43	15 vs. 42	1 vs. 4	<0.001
<b>Parents should receive information about child passenger safety at ED discharge regardless of the reason for visit</b>	14 vs. 8	40 vs. 30	40 vs. 51	5 vs. 11	<0.001
<b>Parents are too overwhelmed to learn about passenger safety prior to discharge from the ED after a minor MVC</b>	2 vs. 2	12 vs. 12	56 vs. 64	30 vs. 22	0.132

***Child Passenger Safety Promotion Behaviors considering Two Clinical Scenarios***

In response to Scenario 1, a 6-year-old front seat passenger involved in a minor MVC, PEM physicians were more likely than GEM physicians to report they would always or often perform all of the listed child passenger safety promotion behaviors (Table 8).

**Table 8: Responses to Child Passenger Safety Promotion Behaviors in Scenario 1**

<b>Scenario: A 6-year-old is brought into the ED by their parent after a minor MVC.</b>					
<b>The child was restrained in the front seat with a lap-shoulder belt and has no apparent injuries.</b>					
<b>How often would you:</b>					
	Always	Often	Sometimes	Rarely/never	P
	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	
<b>Inform the parent that the child is too young to sit in the front seat</b>	74 vs. 51	16 vs. 23	6 vs. 15	4 vs. 12	<0.001
<b>Recommend this child use a booster seat</b>	64 vs. 41	22 vs. 27	8 vs. 16	6 vs. 16	<0.001
<b>Discuss the risks of injury to children in MVCs who are restrained in seat belts that do not fit properly</b>	56 vs. 39	24 vs. 25	13 vs. 21	7 vs. 15	<0.001
<b>Help the family determine if the child is big enough to recommend using a lap-shoulder belt alone</b>	24 vs. 13	19 vs. 18	23 vs. 18	33 vs. 50	<0.001

While 90% of PEM physicians reported they would always or often inform the parent their 6-year-old child is too young to sit in the front seat and 86% would recommend the child use a booster seat, only 80% would discuss the risks of injury to children who are restrained a seat belts that do not fit properly and just 53% would help the family determine if their child is big enough to recommend using a lap-shoulder belt alone. A similar pattern of responses was noted among the GEM physicians.

In response to Scenario 2, a 3-year-old involved in a roll-over MVC, PEM physicians were more likely than GEM physicians to report always or often recommending the family replace the car seat even if there were no signs of damage (76% vs. 41%) and PEM physicians were less than GEM physicians to assess for signs of visible damage (56% vs. 71%) (Table 9).

**Table 9: Responses to Child Passenger Safety Promotion Behaviors in Scenario 2**

<b>Scenario: A 3-year-old was restrained in a forward-facing car seat during a roll-over MVC. The child is brought to the ED via EMS still in their car seat. The child is alert with no sign of injury. How often would you:</b>					
	Always	Often	Sometimes	Rarely/never	P
	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	PEM vs. GEM	
<b>Recommend that this family replace the car seat even if there are no signs of damage</b>	60 vs. 23	16 vs. 18	12 vs. 13	12 vs. 46	<0.001
<b>Assess the car seat for visible signs of damage</b>	40 vs. 52	16 vs. 19	20 vs. 13	24 vs. 16	0.001
<b>Recommend the family purchase a belt-positioning booster seat for this child</b>	7 vs. 5	13 vs. 10	21 vs. 20	59 vs. 65	0.475
<b>Provide the family with a replacement seat before ED discharge</b>	14 vs. 2	12 vs. 1	24 vs. 3	50 vs. 94	<0.001

Few responding physicians in either group would recommend a family purchase a booster seat for this 3-year-old child. Twenty-six percent of PEM physicians indicated a replacement seat would be always or often provided to the family before discharge from their ED compared with 3% of GEM physicians.

In multivariate logistic regression analysis, differences in child passenger safety promotion behaviors between physicians with PEM and GEM training backgrounds remained significant controlling for gender, being the parent of a child in the car seat, booster seat, or seat belt age ranges, working in a trauma center, and year of graduation from residency (Table 10).

**Table 10: Odds of Reporting Always or Often Performing Child Passenger Safety Behaviors Pediatric Emergency Medicine vs. General Emergency Medicine Physicians**

	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
<b>Inform the parent a 6yo is too young to sit in the front seat</b>	2.72 (1.95-3.80)	1.87 (1.25-2.82)
<b>Recommend the 6yo child use a booster seat</b>	2.49 (1.80-3.44)	1.77 (1.20-2.61)
<b>Discuss the risks of injury to children in MVCs who are restrained in seat belts that do not fit properly</b>	1.94 (1.41-2.68)	1.50 (1.02-2.20)

**Table 10 Continued**

	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
<b>Help the family determine if the 6yo child is big enough to recommend using a lap-shoulder belt alone</b>	2.07 (1.35-3.17)	1.86 (1.13-3.05)
<b>Assess the 3yo's car seat for visible signs of damage</b>	0.60 (0.43-0.82)	0.57 (0.39-0.83)
<b>Recommend that this family replace the car seat even if there are no signs of damage</b>	5.04 (3.53-7.19)	4.12 (2.73-6.23)
<b>Recommend the family purchase a belt-positioning booster seat for this 3yo child</b>	1.27 (0.91-1.76)	1.42 (0.96-2.10)
<b>Provide the family with a replacement seat before ED discharge</b>	16.62 (9.50-29.10)	10.48 (5.70-19.25)

\*Adjusting for gender, having children in car seat, booster seat, or seat belt age ranges, working in a level 1 trauma center, and year of graduation.

### **Conclusion**

Emergency physicians responding to our survey indicated they see a role for themselves in promoting child passenger safety; however their responses suggest substantial opportunities exist to increase simple passenger safety promotion messages that physicians convey to parents of children following an MVC. Increasing physician awareness of and parent referrals to local resources related to child passenger safety may be one way to promote child passenger safety during an ED visit.

### **Implications**

The findings from these two national surveys provide important information to increase our understanding of parental experiences with booster seats and carpooling and emergency physician attitudes and practices regarding child passenger safety. Parents face practical barriers to following child passenger safety recommendations and efforts should be increased to identify ways to motivate parents to use the recommended restraint for their child on each and every trip. The ED visit likely represents an opportunity to promote child passenger safety in ways that complement existing community and primary care injury prevention programs. ED-specific programs must be developed for the most effective delivery of child passenger safety information to parents who present for emergency care. Our results suggest there are important differences between PEM and GEM physicians' knowledge, attitudes, and their practice environments. A single, one-size-fits-all program may not be adequate to address child passenger safety in the diverse settings in which children receive emergency care.



## REFERENCES:

1. Injury Prevention and Control: Data & Statistics. *Web-based Injury Statistics Query and Reporting System (WISQARS)* 2008; <http://www.cdc.gov/injury/wisqars/index.html>. Accessed January 25, 2011.
2. Arbogast KB, Jermakian JS, Kallan MJ, Durbin DR. Effectiveness of Belt Positioning Booster Seats: An Updated Assessment. *Pediatrics*. Nov 2009;124(5):1281-1286.
3. Durbin DR, Elliott MR, Winston FK. Belt-positioning booster seats and reduction in risk of injury among children in vehicle crashes. *JAMA*. Jun 4 2003;289(21):2835-2840.
4. Elliott MR, Kallan MJ, Durbin DR, Winston FK. Effectiveness of child safety seats vs seat belts in reducing risk for death in children in passenger vehicle crashes. *Archives of pediatrics & adolescent medicine*. Jun 2006;160(6):617-621.
5. Johnston C, Rivara FP, Soderberg R. Children in car crashes: analysis of data for injury and use of restraints. *Pediatrics*. Jun 1994;93(6 Pt 1):960-965.
6. Wagenaar AC, Webster DW. Preventing injuries to children through compulsory automobile safety seat use. *Pediatrics*. Oct 1986;78(4):662-672.
7. Winston FK, Durbin DR, Kallan MJ, Moll EK. The danger of premature graduation to seat belts for young children. *Pediatrics*. Jun 2000;105(6):1179-1183.
8. Beck LF, West BA. *Vital Signs: Nonfatal, Motor Vehicle-Occupant Injuries (2009) and Seat Belt Use (2008) Among Adults - United States*: Centers for Disease Control and Prevention; January 4, 2011.
9. Sun K, Bauer MJ, Hardman S. Effects of upgraded child restraint law designed to increase booster seat use in New York. *Pediatrics*. Sep 2010;126(3):484-489.
10. Winston FK, Kallan MJ, Elliott MR, Xie D, Durbin DR. Effect of booster seat laws on appropriate restraint use by children 4 to 7 years old involved in crashes. *Archives of pediatrics & adolescent medicine*. Mar 2007;161(3):270-275.
11. Insurance Institute for Highway Safety - Child Restraint Laws. <http://www.iihs.org/laws/ChildRestraint.aspx>. Accessed July 1, 2010.
12. Healthy People 2020 Topics & Objectives: Injury and Violence Prevention: IVP-16: Increase age-appropriate vehicle restraint system use in children aged 1 to 3 years, 4 to 7 years, and 8 to 12 years. <http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=24>. Accessed 12/22/2010.
13. Macy ML, Freed GL. Persistent Racial Disparities in Age-Appropriate Child Passenger Restraint Use in the United States; 2006-2008. Under Review.
14. *Traffic Safety Facts Research Note: Booster Seat Use in 2008*: National Highway Traffic Safety Administration; May 2009.
15. *Traffic Safety Facts Research Note: Child Restraint Use in 2008 - Use of Correct Restraint Types*: National Highway Traffic Safety Administration; May 2009.
16. Pickrell TM, Ye T. *The 2009 National Survey of the Use of Booster Seats*: National Center for Statistics and Analysis, National Highway Traffic Safety Administration; September 2010.
17. Johnston BD, Bennett E, Quan L, Gonzalez-Walker D, Crispin B, Ebel B. Factors influencing booster seat use in a multiethnic community: lessons for program implementation. *Health Promot Pract*. Jul 2009;10(3):411-418.

18. Ebel BE, Koepsell TD, Bennett EE, Rivara FP. Too small for a seatbelt: predictors of booster seat use by child passengers. *Pediatrics*. Apr 2003;111(4 Pt 1):e323-327.
19. Simpson EM, Moll EK, Kassam-Adams N, Miller GJ, Winston FK. Barriers to booster seat use and strategies to increase their use. *Pediatrics*. Oct 2002;110(4):729-736.
20. Winston FK, Erkoboni D, Xie D. Identifying interventions that promote belt-positioning booster seat use for parents with low educational attainment. *J Trauma*. Sep 2007;63(3 Suppl):S29-38.
21. Agran PF, Anderson C, Winn DG. Development of a child safety seat Hassles Scale in a largely low-income Latino population. *Pediatrics*. Jul 2006;118(1):e85-91.
22. Agran PF, Anderson CL, Winn DG. Violators of a child passenger safety law. *Pediatrics*. Jul 2004;114(1):109-115.
23. Koppel S, Charlton JL, Fitzharris M, Congiu M, Fildes B. Factors associated with the premature graduation of children into seatbelts. *Accid Anal Prev*. Mar 2008;40(2):657-666.
24. Gielen AC, McKenzie LB, McDonald EM, et al. Using a computer kiosk to promote child safety: results of a randomized, controlled trial in an urban pediatric emergency department. *Pediatrics*. Aug 2007;120(2):330-339.
25. Nansel TR, Weaver N, Donlin M, Jacobsen H, Kreuter MW, Simons-Morton B. Baby, Be Safe: the effect of tailored communications for pediatric injury prevention provided in a primary care setting. *Patient Educ Couns*. Mar 2002;46(3):175-190.
26. Nansel TR, Weaver NL, Jacobsen HA, Glasheen C, Kreuter MW. Preventing unintentional pediatric injuries: a tailored intervention for parents and providers. *Health Educ Res*. Aug 2008;23(4):656-669.
27. Christakis DA, Zimmerman FJ, Rivara FP, Ebel B. Improving pediatric prevention via the internet: a randomized, controlled trial. *Pediatrics*. Sep 2006;118(3):1157-1166.
28. McDonald EM, Solomon B, Shields W, et al. Evaluation of kiosk-based tailoring to promote household safety behaviors in an urban pediatric primary care practice. *Patient Educ Couns*. Aug 2005;58(2):168-181.
29. Merrill CT, Owens PL, Stocks C. *HCUP Statistical Brief #52: Pediatric Emergency Department Visits in Community Hospitals from Selected States, 2005*. 2008.
30. Johnson WG, Rimsza ME. The effects of access to pediatric care and insurance coverage on emergency department utilization. *Pediatrics*. Mar 2004;113(3 Pt 1):483-487.
31. McKay MP, Vaca FE, Field C, Rhodes K. Public health in the emergency department: overcoming barriers to implementation and dissemination. *Acad Emerg Med*. Nov 2009;16(11):1132-1137.
32. Miller SZ, Rincon H, Kuppermann N. Revisiting the emergency medicine services for children research agenda: priorities for multicenter research in pediatric emergency care. *Acad Emerg Med*. Apr 2008;15(4):377-383.
33. Bernstein E, Goldfrank LR, Kellerman AL, et al. A public health approach to emergency medicine: preparing for the twenty-first century. *Acad Emerg Med*. May-Jun 1994;1(3):277-286.
34. Role of the emergency physician in injury prevention and control for adult and pediatric patients. *Ann Emerg Med*. Nov 2008;52(5):594-595.