Give Me A Boost: A Child Passenger Safety Educational Intervention

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ABSTRACT

BACKGROUND: Motor vehicle crashes (MVCs) are a leading cause of morbidity and mortality among children, yet belt-positioning booster seats remain underutilized. This study analyzed the impact of a provider-oriented child passenger safety (CPS) educational intervention on pediatric resident confidence, knowledge, and counseling behavior in the primary care setting.

METHODS: Pre- and post-educational intervention cross-sectional surveys were distributed to pediatric residents focusing on confidence, knowledge, barriers to, and frequency of CPS discussions.

RESULTS: Pre-intervention, only 16% (95% CI: 6.2–32%) of respondents reported confidence in their knowledge of the American Academy of Pediatrics' (AAP) booster seat recommendations. Post-intervention frequency of CPS discussion, confidence and knowledge in all measured aspects increased.

CONCLUSIONS: While pediatric residents are well positioned for CPS counseling, they lack adequate baseline knowledge of CPS recommendations, particularly for booster seats. Brief educational interventions can increase and maintain provider knowledge and confidence in counseling families on appropriate child car safety seats.

KEYWORDS: booster seats, child passenger safety, resident education, survey

BACKGROUND

Motor vehicle crashes (MVCs) are the leading cause of unintentional death and injury among children in the United States.[1] In 2017, there were 675 deaths and nearly 116,000 injuries due to MVCs in children ages 0–12.[1] Child safety seats (CSSs) aim to prevent serious injury and death while spreading the forces of the crash across the strongest parts of the child's body to help prevent serious injury.[2] Children should use a CSS with a harness until they exceed the maximum height or weight allowed for by the CSS manufacturer, both for rear-facing and then forward-facing seat positions.[2] When they outgrow their forward-facing CSS, children should then use a belt-positioning booster seat until the vehicle's lap-and-shoulder seat belt fits properly, which generally occurs when children are 4 feet 9 inches tall (approximately 145 centimeters) and are between 8 to 12 years old.[2] Belt-positioning booster seats have been shown to reduce the risk of injury to children by 45–59% when compared to seat belts alone.[3,4] Unfortunately, in children ages 4–7 years, booster seat use has been observed to be as low as <5%, even in states which require booster seats by law, and on average, 31.4% of children in this age range are not appropriately restrained.[5,6]

Parental education has been shown to significantly increase appropriate child safety seat usage.[7] Behavioral counseling interventions in the primary care setting are often effective at increasing short-term use of CSSs[8] and pediatricians are a primary source cited by parents for information on child passenger safety (CPS).[9] Pediatric primary care providers have variable knowledge and attitudes regarding CPS. A national survey of pediatricians practicing in the US found that only 81% were confident that they were counseling families on booster seats according to AAP guidelines.[10,11] Similarly, while pediatric residents are well positioned to provide CPS education and play a key role in providing healthcare (often to low-income, marginalized communities), their knowledge of and comfort with counseling on CPS recommendations varies.[10,12] Importantly, education provided during pediatric residency is associated with a greater likelihood that providers will continue to consistently counsel about CPS.[12] This is additionally supported by smoking cessation research that shows that brief educational interventions for providers are effective in increasing counseling behaviors in clinical practice, further emphasizing that residency is an optimal time for education on preventive topics.[13,14]

Besides focusing on education, some interventions utilize CSS distribution as a mechanism to increase parental usage of booster seats. For example, booster seat education by child care center staff paired with a free distribution program for booster seats has been shown to increase caregiver uptake of CPS information.[15] Indeed, research has shown that the largest effect on CSS usage occurs when interventions include a safety seat distribution program.[15,16] Brief educational interventions have been shown to be effective in increasing pediatric resident CPS knowledge and confidence, but have not examined the retention of this knowledge and changes

in attitude.[17,18] A single-point educational intervention on firearm injury prevention has been shown to increase medical student counseling self-efficacy significantly, with a reduction in retention at six months, indicating a need for continued education during residency on injury prevention topics.[19] So while it is apparent that educational interventions can be effective in increasing counseling behaviors in providers, and CSS distribution is an effective means of increasing CSS use, studies have not yet examined the effect of health care provider education paired with a booster seat distribution program.

OBJECTIVE

We aimed to assess the effect of an educational module paired with a clinic-based booster seat and car seat distribution program on pediatric residents' knowledge, attitudes, and self-efficacy around CPS recommendations.

METHODS

Study Design

This study was a pre- and post-educational intervention survey of pediatric residents at a large urban academic primary care practice in the northeastern United States from February 2020 to August 2020. A total of 48 pediatric residents train at this site and spend one half-day per week seeing primary care patients. An educational module on child passenger safety was delivered within the pre-existing educational conference structure as one of the weekly teaching conferences focused on a primary care topic. This module was delivered just before the initiation of a free booster seat distribution and car seat referral program in the primary care clinic, which continued throughout the six-month study period. The distribution program was funded by a local health maintenance organization, Neighborhood Health Plan, which supported booster seats and car seat vouchers for patients regardless of their insurance plan. The educational intervention was administered in person and via videoconferencing, and residents were surveyed pre-intervention, immediately post-intervention, and six-months post-intervention. Participants were excluded if they were not categorical pediatric residents or if they were study investigators. If participants did not complete the educational intervention, they were excluded from the immediate post-intervention survey.

Educational Intervention

The educational module was a 40-minute conference with participants either in person or via a live videoconference. The educational intervention utilized interactive components, including digital polling, multimedia content, and a short movement dance and sing-a-long to discuss CPS. Information covered included MVC injury prevention data and AAP recommendations for the use of and timing of transition for each type of CPS restraint, focusing on booster seats.

Survey Development

The surveys included items with multiple choice and Likert scale responses to gather participant confidence in and knowledge of CPS (including various restraint use and transitions), barriers to counseling patients on these topics, and self-report of counseling behaviors in the clinical setting. These items were rooted in the current AAP recommendations and integrated social-cognitive theories of behavior change which suggest self-efficacy and confidence are strong determinants of actual practices.[17-21] We also collected demographic data about the participants, including training level (post-graduate year), self-identified race/ethnicity, and number of children, and age of children.

Confidence & Knowledge & Barriers

A Likert scale from 1 "not confident at all" to 5 "very confident" was utilized to assess participant confidence in providing recommendations about each type of CPS restraint, including rear-facing CSS, forward-facing CSS, booster seats, and seat belts. We assessed resident knowledge of AAP booster seat recommendations using five multiple-choice items, which asked for the correct identification of: AAP recommendations on the transition out of a forward-facing car seat (to a booster seat) and out of a booster seat (to a seat belt), the average age based on height/weight recommendations to transition to these restraints, and the correct components of the seat belt fit test.[2] We assessed perceived barriers to booster seat counseling using a list of six barriers adapted from those identified previously in the literature.[10] Participants were asked to select the degree of each barrier using a Likert scale from 1 "not a barrier" to 5 "significant barrier." These three topics (confidence, knowledge, and barriers) were assessed at baseline, immediately post-educational module, and six-months post-intervention.

Counseling Behaviors

A Likert scale from 1 "never" to 5 "always" was used to assess the self-reported frequency of child passenger safety discussions with parents/guardians during primary care visits for the following patient age ranges: birth–2 years, 3–5 years, 6–10 years, and 11–18 years. These items were included in the baseline survey and the six-month post-educational module survey.

Data Collection

The electronic survey was generated and distributed using our institution's Research Electronic Data Capture (REDCap) system.[27] Pediatric residents were sent an email describing the survey, waiver of written consent, and a survey link. The surveys were distributed electronically before and after the educational module as well as at six months

post-intervention. Residents received a reminder email to complete the survey after the initial distribution of the surveys if they had not yet responded. All responses were anonymous, thus pre- and post-surveys were not linked. There was no incentive for participation. The study was approved by our Institutional Review Board.

Data Analysis

Likert scale data for confidence were dichotomized, grouping responses of 1–3 to indicate "not confident" and 4–5 to indicate "confident." Similarly, Likert scale data for frequency of counseling behaviors were dichotomized, categorizing responses of 4–5 as "frequent" counseling and 1–3 as "infrequent" counseling. Standard descriptive summaries were used for demographic variables. Categorical variables were compared using chi-square and Fisher exact tests, depending on the sample size.

RESULTS

Demographics

Thirty-seven pre-, 20 post-, and 25 six-months post-intervention responses were collected from respondents, giving a response rate of 77% pre-, 42% post-, and 46% six-months post-intervention. There was no significant difference in training year, age, or race of respondents across the survey time points. Less than 10% of all respondents across all time points had children. (**See Table 1**.)

Table 1. Demographics

	Pre-intervention	Immediate post-intervention	6-month post-intervention
	N = 37 (%)	N= 20 (%)	N = 25 (%)
Training Level			
PGY-1	12 (32)	6 (30)	1 (4)
PGY-2	12 (32)	9 (45)	9 (36)
PGY 3-6	13 (35)	5 (25)	15 (60)
Race/Ethnicity			
White	18 (49)	10 (50)	12 (48)
Black/African American	4 (11)	2 (10)	5 (20)
Other	10 (27)	4 (20)	4 (16)
No response	5 (14)	4 (20)	4 (16)
# of Children			
0	36 (97)	20 (100)	23 (92)
>1	1 (3)	0 (0)	2 (8)
Age of Children			
	N= 2 (%)	N = 0 (%)	N=2 (%)
Birth to 1 year	0 (0)	0 (0)	0 (0)
>1 year of age	2 (100)	0 (0)	2 (100)

*PGY: Post-graduate year

Confidence

At baseline, participants' confidence in providing counseling on car safety restraint types was lowest for booster seats. Only 27% (95% CI 14%–44%) of respondents felt confident in discussing booster seat use, with the most confidence reported for rear-facing car seat discussions (78%, 95% CI 60–91%). Immediately post-intervention and six-months post-intervention, the percentage of confident respondents about booster seat counseling increased significantly (p-value <0.0001), with 95% (95% CI 75-100%) feeling confident immediately post-intervention and 80% (95% CI 59%–93%) six-months post-intervention. Additionally, at baseline only 16% (95% CI 6%-32%) of respondents felt confident in their knowledge of AAP booster seat recommendations, whereas 75% (95% CI 51%-91%) felt confident immediately post-intervention, and confidence at the six-month post-intervention time period remained well above the initial confidence level at 68% (95% CI 47%-85%). In addition, participants' confidence in counseling about CSS and seat belts increased immediately post-intervention and remained higher than baseline at the six-month post-intervention survey as well. (**See Table 2**.)

Table 2. Resident Confidence in Providing Counseling About Child Passenger Safety (Pre/Immediate Post and Six-Months Post-Intervention)

	Pre-intervention	Immediate post-Intervention	6-months post-intervention	
	N= 37	N= 20	N=25	
Topics	% Confident (95% CI)	% Confident (95% CI)	% Confident (95% CI)	P value
Rear Facing Car Seats	78 (60–90)	95 (75–100)	100 (86–100)	**0.014**
Forward Facing	35 (20–53)	95 (75–99.9)	80 (59–93)	**<0.001**
Booster Seat	27 (14–44)	95 (75–99.9)	80 (59–93)	**<0.001**
Seat Belt Transition	41 (25–58)	95 (75–99.9)	84 (64–96)	**<0.001**
AAP Booster Seat Recommendations	16 (6–32)	75 (51–91)	68 (47–85)	**<0.001**

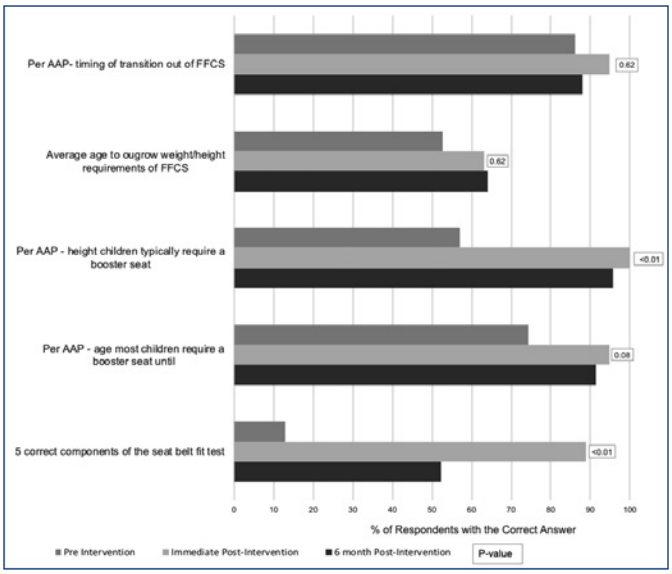
*AAP: American Academy of Pediatrics
Bolded values indicate p<0.05

Knowledge

At baseline, participants displayed the highest level of knowledge regarding rear-to-forward facing car seat transition (86% correct, 95% CI 71%-93%), and the least knowledge regarding key elements of booster seat use including: expected age for transitioning from a forward-facing car seat to a booster seat with 53% correct (95% CI 37%–68%), AAP recommended height for transitioning from a booster

seat to a seat belt (57% correct, 95% CI 41%–72%), and the five components of the seat belt fit test (13% correct, 95% CI 5%–29%). Statistically significant increases (p <0.01) in knowledge pre- and post-intervention were found only in the questions regarding the AAP recommended height for transitioning from a booster seat to a seat belt and correctly identifying the five components of the seat belt fit test, and was sustained at six-months post-intervention. (**See Figure 1**.)

Figure 1. Resident Knowledge of Car Seat Restraints Pre- and Post-Intervention



Self-reported Counseling Behaviors

Percent of "frequent" child passenger safety discussion increased after the educational intervention across all age ranges, though the only statistically significant increase was found for discussions with 11–18-year-olds. Fifty-seven percent (95% CI 40%–73%) of participants reported frequent child passenger safety discussions with 6–10-year-old patients at baseline, and 80% (95% CI 59%–93%) reported frequent discussions on the six-month survey. (**See Table 3**.)

Table 3. Resident Behaviors Regarding Child Passenger Safety (Pre/6-months Post-Intervention)

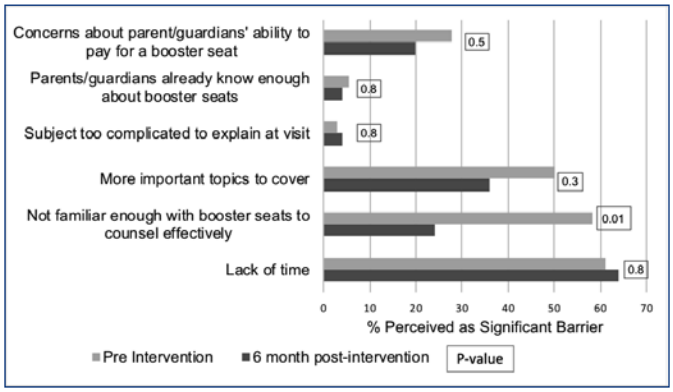
	Pre-Intervention	6-months Post-Intervention	
	N= 37	N=25	
Patient Age Group	**% Frequent (95% CI)**	**% Frequent (95% CI)**	**P value**
Birth–2 years	92 (78–98)	100 (86–100)	0.263
3–5 years	79 (62–90)	96 (71–99.9)	0.053
6–10 years	57 (40–73)	80 (59–93)	0.058
11–18 years	35 (20 –53)	76 (55–91)	**0.002**

* CPS: Child Passenger safety.
***Bolded values indicate p<0.01**

Barriers

Participants identified lack of time and lack of familiarity with booster seats as the most commonly identified barriers to counseling pre-intervention (**Figure 2**). The most common post-intervention barriers were lack of time and the large number of important topics to cover in a well-child visit. The only statistically significant change found in reported barriers from pre- to post-intervention was familiarity with booster seats. Lack of familiarity with booster seats dropped from 58% to 24% (p <0.01) of respondents as an identified barrier to counseling on this topic. Concern about parental ability to pay for a booster seat decreased slightly (from 28% to 20%, p = 0.5), despite the initiation of the free distribution program for booster seats.

Figure 2. Perceived Barriers to Booster Seat Counseling Pre- and 6-months Post- Intervention



* FFCS: forward-facing car seat, AAP: American Academy of Pediatrics

DISCUSSION

This study demonstrated the effect of a brief provider-focused CPS educational intervention paired with a booster seat distribution program on increasing provider knowledge and confidence in counseling families on appropriate child car restraint use, with retention of that knowledge and confidence six months later.

As shown in other studies, our results emphasize pediatric residents' limited knowledge and confidence regarding child passenger safety, especially for booster seats.[10,12] Because residents come from different institutional backgrounds, there is no standardized pre-residency curriculum regarding child passenger safety that trainees undergo before starting their training and role as primary care providers. Despite this limitation, pediatric residents are well positioned as practicing primary care providers and learners in the field, and education during training is especially important in building their practice patterns in family counseling.[26] If early comfort with and uptake of CPS counseling occurs in residency, a broader, more uniform practice among primary care providers will be lasting and impactful, leading to safer-riding children in the community. Indeed, literature has shown, counseling by pediatricians positively influences families' use of CSS.[8,9]

While lack of time is a barrier in nearly every patient interaction,[25] lack of familiarity with a topic can be readily addressed by increased exposure and education, as demonstrated in this study. By including child passenger safety education as part of a graduate medical education or residency-specific curriculum, providers can not only enhance their knowledge of evidence-based and practical child passenger safety recommendations but can pass that information along to patients and families. Notably, the largest knowledge gains were made regarding booster seat use and readiness for transition to a seat belt, directly related to the topics infrequently discussed at baseline and in need of improvement in real-world CPS practice by parents and caregivers.

The intervention did not show a significant reduction in residents' view of cost as a barrier to booster seat use for families, despite the inclusion of a free booster seat distribution program in the resident clinic. This may be due to the low cost of booster seats at baseline. Nevertheless, the availability of booster seats within the clinic removes one barrier for families' CSS use, and perhaps provided increased visibility of CPS as a key topic among residents, leading to some of the behavior changes. Though we could not discern the specific impact of the booster seat distribution in comparison to the education module, the sustained knowledge and confidence six- months post-intervention without additional educational sessions suggests this programming in the clinic may have been supportive.

Our booster seat and car seat voucher distribution program was supported by a local insurance agency that provides coverage for a large proportion of Medicaid patients. While this study does not examine changes in booster seat use by families, the evidence has shown repeatedly that education paired with incentive or distribution programs shows more consistent increases in booster seat usage than education programs alone.[28,29] Therefore, in addition to ensuring early education for pediatric trainees regarding booster seats and CPS, a new frontier for training programs may also be engaging with insurance companies to work with health care providers to improve child passenger safety.

Our study did have several limitations that must be considered. Firstly, the sample size was small, and while the response rate was fairly high, there may have been response and selection biases. However, the results clearly show a deficit in knowledge and confidence in pediatric residents regarding child passenger safety. Additionally, there were not any fully validated surveys to draw from about confidence and barriers regarding CSS, so the validity of the results may be unclear. This study was also conducted within a single residency program, which may limit the generalizability of the results. Finally, this study was conducted during the Coronavirus pandemic, which may have impacted the priorities during well-child visits of providers as well as patients and families.

CONCLUSIONS

While pediatric residents are well positioned for child car restraint counseling, they do not have adequate knowledge of or confidence in counseling about child passenger safety recommendations, especially in regards to booster seats. A brief, one-time educational intervention paired with a free booster seat distribution program can sustainably increase provider knowledge and confidence in counseling families on appropriate child car restraint use. Further investigation is warranted into the effect of increased provider education and ease of access to CPS products on the use of appropriate CSS use in the community.

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