Pilot Trial of an Emergency Department–based Intervention to Promote Child Passenger Safety Best Practices

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ABSTRACT

Background: Despite demonstrated effectiveness of child restraint systems (CRSs), use remains suboptimal. In this randomized pilot trial, we sought to determine the feasibility, acceptability, and potential efficacy of "Tiny Cargo, Big Deal" an ED-based intervention to promote guideline-concordant size-appropriate CRS use.

Methods: Parents of children < 11 years old were recruited in two EDs and randomized in a 2 × 2 factorial design to four conditions: 1) generic information sheet, 2) tailored brochure mailed after the ED visit, 3) a single motivational interviewing-based counseling session in the ED, and 4) full intervention (counseling session plus tailored brochure). We assessed feasibility (recruitment, completion, follow-up rates) and acceptability (parent attitudes, uptake of information) in the ED, at 1 month and at 6 months. We obtained preliminary estimates of effect sizes of the intervention components on appropriate CRS use at 6-month follow-up.

Results: Of the 514 parents assessed for eligibility, 456 met inclusion criteria and 347 consented to participate. Enrolled parents were mostly mothers (88.1%); 48.7% were 18 to 29 years old; 52.5% were non-Hispanic, white; and 65.2% reported size-appropriate CRS use. Completion rates were 97.7% for baseline survey, 81.6% for counseling, 51.9% for 1-month follow-up, and 59.3% for 6-month follow-up. In the ED, 70.5% rated thinking about child passenger safety in the ED as very helpful. At 1 month, 70.0% expressed positive attitudes toward the study. Of 132 parents who reported receiving study mailings, 78.9% reviewed the information. Parents randomized to the full intervention demonstrated an increase (+6.12 percentage points) and other groups a decrease (−1.69 to −9.3 percentage points) in the proportion of children reported to use a size-appropriate CRS at 6-month follow-up.

Conclusions: Suboptimal CRS use can be identified and intervened upon during a child's ED visit. A combined approach with ED-based counseling and mailed tailored brochures shows promise to improve size-appropriate CRS use.

In 2011, the American Academy of Pediatrics (AAP)[1,2] and the National Highway Traffic Safety Administration (NHTSA)[3] updated their child passenger safety recommendations based on a growing body of evidence showing the effectiveness of age and size-appropriate child restraint systems (CRSs; i.e., car seats and booster seats).[4–6] Since then, little progress has been made in the use of recommended CRSs[7–10] and motor vehicle collisions remain a leading cause of unintentional injury-related deaths for children in the United States.[11,12] Many U.S. children travel completely unrestrained[13–15] and differences in CRS use between minority and white children[16,17] contribute to disparities in crash-related fatalities.[18] Additionally, nonfatal injuries place a substantial burden on children, their families, and society.[19–21]

Given these patterns, effective interventions to promote use of appropriate CRSs and address disparities are needed. The emergency department (ED) is a promising setting for injury prevention efforts.[22,23] Prior studies, focused on traditional age categories < 4 years for car seats and 4 to 7 years for booster seats,[24–29] have demonstrated that education can increase parental knowledge but results for behavior change have been mixed.[24,25,29–34]

In this randomized pilot study, we sought to determine the feasibility, acceptability, and the potential efficacy of a novel ED-based counseling session and tailored brochures to promote appropriate CRS use among parents of children < 11 years old. We addressed the following objectives to inform the design of a future fully powered randomized controlled trial (RCT): 1) to assess feasibility in terms of recruitment, completion of ED-based study interactions, counseling session fidelity, receipt of mailings, and follow-up; 2) to evaluate the acceptability to parents of intervention during their child's ED visit and their uptake of information; 3) to determine if remote data collection with digital photographs is possible; and 4) to obtain preliminary effect size estimates.

MATERIALS AND METHODS

Study Design

We conducted a pilot trial of the intervention described below. Subjects were recruited June 9, 2015, to September 29, 2015, in two Michigan EDs and randomized to one of four treatment conditions of increasing intensity in a 2×2 factorial design: 1) enhanced usual care (EUC)—generic information sheets, 2) generic information sheet plus tailored brochure(s), 3) single motivational interviewing (MI)-based counseling session plus generic information sheets, and 4) full intervention—single MI-based counseling session plus generic information sheets and tailored brochure(s). Counseling sessions were conducted in the ED after a baseline survey. Generic information sheets were distributed in the ED. Tailored brochures were mailed in the following week. Measures were assessed at ED discharge, 1 month, and 6 months. One- and 6-month follow-up assessments were completed by research assistants (RAs), blinded to randomization group, who entered responses to scripted questions into a survey on the Qualtrics platform (Qualtrics, LLC). The institutional review boards of the University of Michigan Medical School and Hurley Medical Center (HMC) approved this study. The study was registered on ClinicalTrials.gov (NCT02496481).

Setting

Parents were recruited during their child's ED visit at: 1) the Michigan Medicine (MM) C.S. Mott Children's Hospital or 2) the HMC. The MM pediatric ED is located in a suburban tertiary care, academic hospital with a predominantly white and privately insured patient population. The HMC general ED is located within an urban community hospital where higher proportions of patients are African American and covered by Medicaid compared with MM. The Hispanic populations at both sites are <5%.

Subjects

The potentially eligible study population included adult parents (parents, step-parents, grandparents, and guardians) of children < 11 years' old receiving ED care for any reason during shifts staffed by RAs. Parents were systematically approached based on order of arrival. Parents were not approached if their child was critically ill or injured (e.g., Triage Category 1, care in the resuscitation bay), was flagged as admitted or discharged when the RA screened the tracking board, or was being evaluated for suspected child abuse. Parents were excluded if they were < 18 years old or did not understand/speak English or if the caregiver did not regularly travel in a car with the child. RAs measured the child's height and excluded parents of children ≥57-inches tall, the height at which proper seat belt fit can be achieved without a CRS.[1,35,36]

Recruitment and Randomization

Research assistant shifts were scheduled between 10 AM and 11 PM. Recruitment days were varied to ensure weekday and weekend enrollment. RAs used a standard script to approach parents after the child was in their treatment room. We tracked patients who were not approached. Written informed consent was obtained after the RA reviewed study procedures. Parents who enrolled in the study self-administered an online survey on study tablets (iPad Air, Apple Inc.) using Qualtrics. Parents were randomized by the survey software to one of four treatment conditions. The survey prompted parents to hand the tablet back to the RA if they were randomized to receive counseling.

Our recruitment target ($n = 175$ participants from each ED) was based on available resources. We set a goal of retaining 80% at 6-month follow-up (70 per condition). As this was a pilot trial, we did not conduct a priori power calculations.

Incentives

Parents received a $15 gift card for the ED portion of the study and a $30 gift card for in-person interview or a $10 gift card for telephone interview at 6 months.

ENHANCED USUAL CARE

After completing the ED portion of the study, every participant, regardless of randomization group, received a single-page generic information sheet that summarized Michigan's child passenger safety law and listed child passenger safety websites and telephone numbers for local resources. All counseling was provided before the information sheet was given and no counseling was provided when providing the information sheet. Parents who were randomized to receive generic information sheets were mailed a single page NHTSA flyer presenting 2011 child passenger safety recommendations by age group.

Tiny Cargo, Big Deal Intervention

Self-Determination Theory[37,38] provided the theoretical basis for the intervention components: 1) a single brief MI-based counseling session and 2) tailored brochure(s).

MI-based Counseling Session. Counseling occurred during the child's ED visit with the goal of motivating consistent use of an appropriate CRS while providing parents with knowledge and education on child passenger safety topics of interest. RAs had prior training in MI techniques including supporting autonomy, reflecting emotion, eliciting change talk, and rolling with resistance. RAs completed a half-day study-specific training on the counseling session and CRSs. RAs guided parents through the session using prompts on the tablet. The session began with an exercise to draw connections between parent-identified values and child safety. Importance and confidence rulers were utilized. The RA explored why and how the parent selected their child's usual restraint and challenges with CRS use. The RA presented age group-specific social norms for guideline-adherent CRS use and asked parents how this information relates to them. RAs elicited change talk when working to align behaviors with recommendations. Parents were provided an opportunity to set a learning agenda by selecting up to three CRS topics from a pick list. The session closed with a summary.

Tailored Brochures. Families were mailed demographically tailored brochure(s) relevant to their child's usual CRS and the appropriate CRS if different from the usual in the week following the ED visit. We developed four trifold brochures addressing appropriate CRS transitions and a "back seat pocket guide" with a weight-based overview of recommendations. Our messages were crafted to align with guidance for effective child passenger safety education.[39] Brochures were tailored on demographic characteristics including child name, age, and size during the ED visit. We used the child's weight/height growth percentiles from the ED visit to project the age at which the child would need to transition to the next CRS based on typical CRS size limits. The brochures contained information about proper fit and referred parents to their child's CRS instructions to ensure correct installation and use.

Measures

Child Passenger Safety Behaviors. Child passenger safety behaviors were assessed at baseline and 6 months with a series of questions adapted from our prior work.[17] Before randomization, parents were asked about the child's frequency of motor vehicle travel and use of restraints. If the parent reported using a restraint, they were asked to indicate which type was used on most trips in the past 6 months. Parents who indicated their child did not use any restraint were asked to confirm that response prior to continuing on

with the survey. Parents also were asked where their child usually sits in the car and how often the child sat in the front seat in the past 6 months. Our previous research demonstrated substantial agreement (82.6%, κ = 0.74) between parent-reported CRS and the observed CRS at ED discharge.[17]

Parent and Child Characteristics. Demographic characteristics including parent age, sex, relationship to child, race/ethnic background, highest education level attained, and annual household income in strata were obtained. Child age, sex, and weight were obtained from the ED record. Child height was measured by the study RA. For children present at 6-month follow-up, weight and height were remeasured.

Feasibility of Enrollment, Intervention, and Follow-up. To assess feasibility, we tracked rates of recruitment, completion of baseline assessments and counseling sessions, receipt of mailings, and 6-month follow-up.

Counseling Session Fidelity. Counseling sessions were audio-recorded with the permission of the parent. Trained RAs rated the counseling sessions utilizing the OnePass coding system.[40] Scores range from 1 to 7 with higher scores indicating greater competence. Counseling sessions with complete and audible recordings were scored. A 10% sample of the audio-recordings was double coded and checked for inter-rater reliability. There were significant differences in total points assigned to the first seven recordings (range = −9 to +8). The team met and discussed coding. Reliability was achieved with the next seven recordings (range of differences in total points = −3 to +5). The remaining audio-recordings were coded by two RAs independently.

Acceptability. In an immediate postintervention survey, all parents were asked to rate how helpful it was to think about child passenger safety while in the ED on a scale of 1 (not at all) to 10 (very). At 1-month follow-up, we gauged parental attitudes by asking, "How did you feel about being asked about car seats in the ED?" and probing for specific likes and dislikes. Responses were transcribed by the RA. At 6-month follow-up, we explored preferred modalities for receiving car safety information in relation to their child's ED visit using fixed choice options: 1) in the ED during the child's visit, 2) in person a few days after being in the ED, 3) by

phone a few days after being in the ED, 4) in the ED and again a few days later in person, and 5) in the ED and again a few days later by phone. Parents were also asked to indicate their level of interest on a 5-point scale (1 = not at all; 5 = a lot) in three other modalities to promote child passenger safety: 1) prompts to help them remember to buckle their child up, 2) text messages with information about keeping their child safer in the car, and 3) an online tool to help them know which seat is right for their child. We assessed acceptability immediately after the ED portion of the study, by telephone 1 month after the ED visit, and in person or by telephone approximately 6 months after the ED visit.

Information Uptake. At the conclusion of study interaction in the ED, all parents were asked to rate how likely they will be to talk about car safety with family and friends on a scale of 1 (not at all) to 10 (very). At 1-month follow-up, we assessed parent-reported receipt of mailings. Parents who received the mailing were asked if they reviewed the information and, if so, how much of the information they read (none to all on a 10-point scale). We also asked if they examined the information a second time. Information uptake was assessed in the ED and at 1 month.

Outcome Measure: Appropriate CRS Use. We determined age- and size-appropriateness of the parent-reported CRS in use at 6-month follow-up based on a combination of the 2011 recommendations from AAP and NHTSA, Michigan law, and typical weight limits for CRS (Table 1).[2,41] When possible, parent-reported CRS type at 6 months was verified by direct in-vehicle observation of the restraint (n = 93) or assessment of the restraint pictured in a digital photograph (n = 16) taken by the parent and submitted via the study e-mail/Web link. RAs used a standard checklist for these observations and recorded information about the type of restraint. For children who were not present at 6-month follow-up, we estimated growth based on the assumption that a typical 2- to 10-year-old child gains 3 pounds over 6 months.[42] Although infants experience more rapid growth, there were only seven children < 2 years with missing follow-up weights and only one child's restraint was changed from recruitment to follow-up. That child was moved prematurely to a booster seat (baseline weight 27.5 pounds, minimum booster seat weight 40 pounds). We assessed the outcome of appropriate CRS use at 6 months.

We initially planned for all 6-month follow-up assessments to occur in person. In preparing to schedule 6-month follow-up appointments, we found that 67 of 172 families recruited at MM and 14 of 176 families recruited at HMC lived > 15 miles from a follow-up location. To reduce the burden of travel for follow-up on families, we offered a telephone follow-up option to those families living > 15 miles from a follow-up location. Parents were contacted by telephone, text, mail, and e-mail to schedule their 6-month follow-up. We invited 32 parents, without additional incentives, to submit digital photographs to pilot test this approach to supplement self-reported CRS use.

Data Analyses

Descriptive statistics were calculated. We set feasibility targets of 80% for recruitment, survey and counseling session completion, receipt of mailings, and 6-month follow-up. MI-session fidelity was assessed by calculating the average score on the OnePass for each counseling session with an audible recording. A counselor who scores an average 5 of 7 points is considered competent in MI.[40] Chi-square tests were used to compare acceptability of the intervention and uptake across treatment groups and for minority compared with non-Hispanic, white parents. For analyses, we set a threshold of 8 or more on the 10-point scale as indicative of a high level of helpfulness or likelihood to share information. We considered selection of anything other than "not at all" as having at least some interest in the alternative modalities to promote child passenger safety. We examined the amount of mailed information that the parent reviewed in three categories: 1) half or less, 2) more than half but not all, or 3) all. We did not have a priori targets for

acceptability or uptake. We present results in terms of proportions with 95% confidence intervals (CIs). The kappa statistic was used to assess the agreement between reported and observed CRS at 6-month follow-up when observations were available, with a goal of at least substantial agreement (kappa of greater than 0.61).[43]

Responses to the 1-month follow-up question "How did you feel about being asked about car seats in the ED?" were coded as positive, negative, or neutral by a study investigator (MLM) blinded to randomization group using the text analysis tool within Qualtrics. Comments that used terms such as good, happy, pleasant, nice, and helpful were considered positive; fine and ok were considered neutral; and stressful, inconvenient, and hard were considered negative. Coding was then reviewed by a study RA and discrepancies were resolved with discussion.

Intention-to-treat analyses were used for the preliminary outcome assessment. We calculated differences in proportions with 95% CI for changes in appropriate CRS from baseline to 6-month follow-up for the four intervention groups. We conducted a multiple variable analysis of the intervention components in a logistic regression model of appropriate restraint use at 6 months. We explored socioeconomic covariates that influence child passenger safety behaviors based on prior literature. We retained variables with $p \leq 0.20$ in bivariate analyses. We completed planned stratified analyses by child age category (<2, 2–4, and 5–10 years) and use of an appropriate CRS at baseline. We hypothesized that the type of restraint recommended for each age group and the use of the appropriate CRS at baseline may influence the response to the intervention; however, there was insufficient sample size to

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Table 1
Age- and Size-appropriate Child Passenger Restraints

Age Group (Years)	Weight (Pounds)								
	10	20	30	40	50	60	70	80	90
<2	Rear-facing to 35 pounds*								
2–4	Rear-facing to 35 pounds								
			Harness 30 to 50 pounds						
					Booster 50 to 80 pounds				
5–10			Harness 30 to 50 pounds						
			Booster 40 to 100 pounds						

*The weight ranges for children in the sample by age category were as follows: <2-year-olds, 5 to 32 pounds; 2- to 4-year-olds, 21.5 to 78.5 pounds; 5- to 10-year-olds 38 to 163 pounds. Child weight at follow-up was estimated (using baseline weight + 3.3 pounds) for 18 of 111 in person follow-up visits and 90 telephone follow-ups. Analysis assuming children did not grow over the 6-month period, 56.2% of CRS would be considered appropriate at follow-up. When we assumed growth, 62.7% of CRS were considered appropriate at follow-up.

formally test for these possible interaction effects. Analyses were conducted using Stata 13.1 (StataCorp).

RESULTS

Subject flow is presented in Figure 1. There were 514 parents assessed for eligibility. Of the 456 who met inclusion criteria, 76.0% consented. Parents who consented were similar to those who declined in terms of study site, child age, triage level, and ED length of stay prior to being approached (results not shown). Recruitment was evenly divided between sites. Baseline assessments were completed by 339 parents who enrolled (97.7%). Most parents were mothers (88.1%), 48.7% of parents were 18 to 29 years old, and 52.5% of parents were non-Hispanic, white. At baseline, for the full sample, independent of treatment arm, 65.2% (95% CI = 59.9%–70.1%) of parents reported in the past 6 months their child usually used a CRS that was considered to be appropriate by our study definition, 86.8% (95% CI = 82.7%–90.1%) reported that their child never traveled unrestrained, and 89.6% (95% CI = 85.9%–92.5%) reported that their child always sat in the back seat. Baseline parent and child characteristics were similar across intervention arms with the exception of annual family income, which was lower among parents randomized to the full intervention (Table 2).

Counseling Session Feasibility and Fidelity
Of the 163 parents randomized to receive counseling, 133 (82.6%, 95% CI = 75.9%–87.75%) completed the session. The main reason for noncompletion was because the child was discharged during the study interaction. The survey was not programmed with a hard stop after the baseline assessment and four parents did not hand the tablet back to the RA when the survey prompted them to do so. These parents went through the counseling session screens without interacting with the RA. Counseling sessions were on average 13 minutes in duration (standard deviation [SD] ± 4.9). For the 135 counseling sessions with audible recordings, the mean (±SD) OnePass Score was 5.0 (±0.69) on the 7-point scale, indicating that the counselors were skilled.

Follow-up Feasibility
We reached 180 parents by telephone at 1 month (51.9%, 95% CI = 46.6%–57.2%). The ability to reach families was similar across treatment groups and between study sites. Of the families who could not be reached, there were 17 wrong numbers, 26 numbers were no longer in service, and 12 numbers were not accepting calls. Seventy-five percent of parents reported receiving the study mailings, without differences between those randomized to tailored (76.5%, 95% CI = 66.2%–84.3%) versus generic information (75.8%, 95% CI = 65.9%–83.6%). Only six mailings were returned by the postal service (three tailored and three generic information).

Six-month follow-up was completed by 201 parents (59.3%, 95% CI = 54.0%–64.4%) and 55.2% (95% CI = 48.3%–62.0%) of follow-up appointments were conducted in person. Parents who completed 6-month follow-up were similar to those who did not in terms of randomization group and baseline behaviors (appropriate restraint use, 65.7%, 95% CI = 58.8%–71.9% vs. 64.5%, 95% CI = 56.1%–72.0%; never traveled unrestrained, 88.5%, 95% CI = 83.3%–92.2% vs. 84.3%, 95% CI = 77.1%–89.6%) but were more likely to have been recruited at MM and to have attained higher education levels (Table 2). We attained higher rates of in-person follow-up at HMC (59.6%, 95% CI = 49.0%–69.3%) than MM (51.8%, 95% CI = 42.5%–60.9%).

Acceptability
Measures of acceptability are presented in Table 3. In the immediate postintervention survey, overall 70.5% (95% CI = 65.3%–75.2%) of parents rated thinking about child passenger safety in the ED as very helpful (8 or more on a 10-point scale), with slightly higher proportions of parents who received an MI session giving a rating of 8 or higher. At 1-month follow-up, 70.0% (95% CI = 62.9%–76.5%) of parents provided open-ended comments indicating positive attitudes toward the study interaction in the ED, 27.0% (95% CI = 20.9%–34.1%) were neutral, and 2.9% (95% CI = 1.2%–6.8%) were negative. Responses were similar for those who were randomized to receive an ED-MI session and those who were not. When asked specifically about dislikes, 11 parents shared an example, most commonly that the interaction took too long or the timing was bad. Higher proportions of minority parents rated the information as very helpful (81.0%, 95% CI = 74.0%–86.5%) versus non-Hispanic, white (61.0%, 95% CI = 53.5%–68.1%) and expressed neutral feelings about the ED intervention (35.6%, 95% CI = 25.4%–47.3%) vs. non-Hispanic, white (20.8%, 95% CI = 13.9%–29.9%). At 6-month follow-up, parents had varied preferences for receiving information about child passenger safety but more than half of parents selected an option that included the ED visit.

Screened

Children less than 11 years old
who presented to ED (n=1560)

Not screened (n=923)
♦ RA occupied with another subject

Screened prior to eligibility
assessment (n=637)

Excluded (n= 123)
♦ Child was admitted or discharged (n=29)
♦ Child being evaluated for abuse (n=23)
♦ Technical difficulties (n=23)
♦ Family not available (n=13)
♦ Triaged with severe illness/injury (n=11)
♦ Other (n=24)

Enrollment

Assessed for eligibility (n=514)

Excluded (n=175)
♦ Declined to participate (n=109)
♦ Not meeting inclusion criteria (n=58)
♦ Other reasons (n=8)

Randomized (n=339)

Allocation

Allocated to enhanced standard care (n=97)	Allocated to tailored brochure (n=81)	Allocated to motivational interviewing (MI) (n=81)	Allocated to MI & tailored brochure (n=80)
♦ Received allocated intervention (n=86)	♦ Received allocated intervention (n=69)	♦ Received allocated intervention (n=54)	♦ Received allocated intervention (n=60)
♦ Did not receive mailing (n=11)	♦ Did not receive mailing (n=12)	♦ Incomplete MI session (n=16)	♦ Incomplete MI session (n=12)
		♦ Did not receive mailing (n=11)	♦ Did not receive mailing (n=8)

Follow-Up

Lost to Follow-up (n=38)	Lost to Follow-up (n=38)	Lost to Follow-up (n=31)	Lost to Follow-up (n=31)
♦ Unable to reach (n=34)	♦ Unable to reach (n=34)	♦ Unable to reach (n=27)	♦ Unable to reach (n=26)
♦ Declined follow-up (n=4)	♦ Declined follow-up (n=4)	♦ Declined follow-up (n=4)	♦ Declined follow-up (n=5)

Assessment

Assessed for acceptability (No MI session) at conclusion of study interaction in ED (n=173) at 1 month (n=77)	Assessed for acceptability (MI session in ED) at conclusion of study interaction in ED (n=152) at 1 month (n=97)

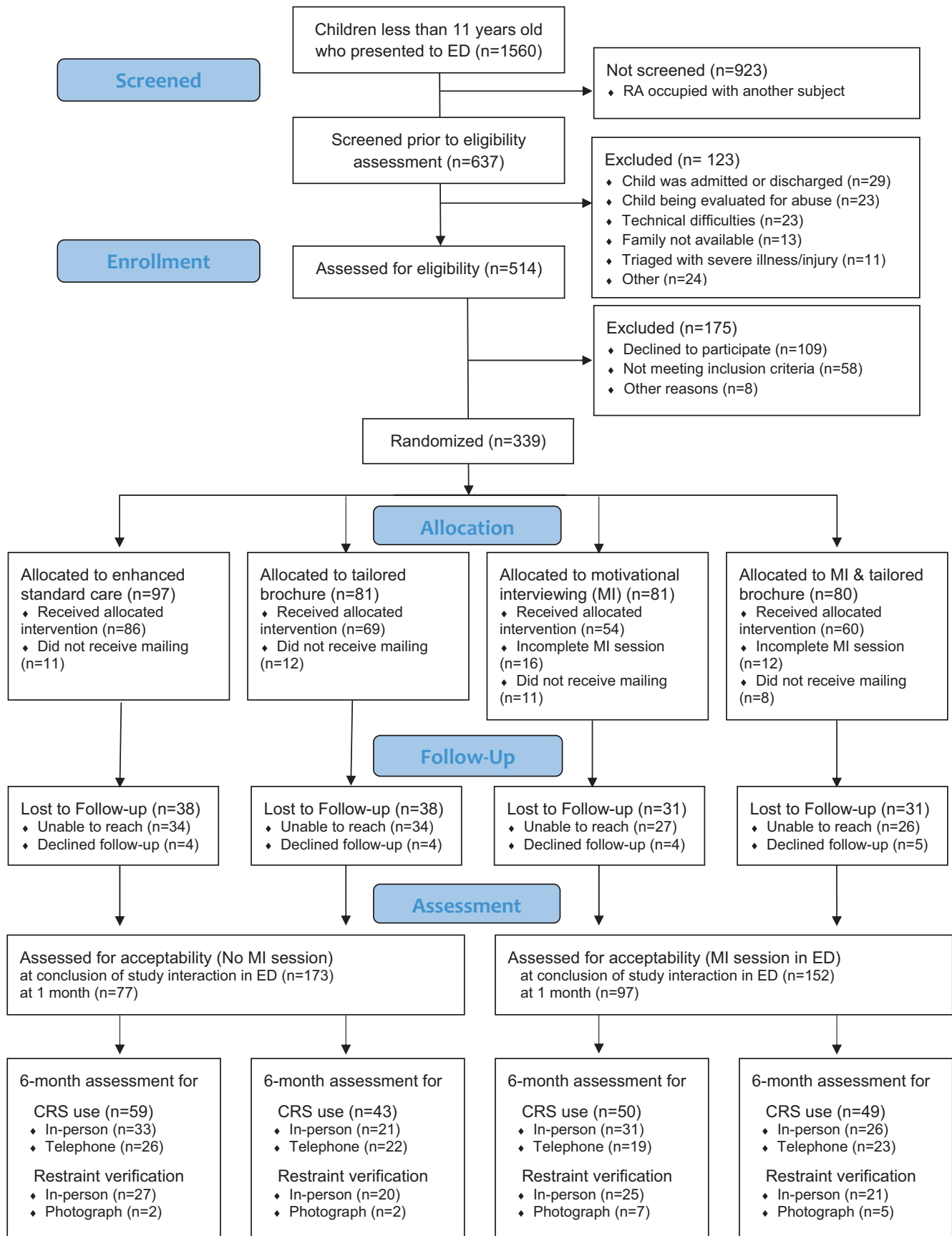| 6-month assessment for	6-month assessment for	6-month assessment for	6-month assessment for
CRS use (n=59)	CRS use (n=43)	CRS use (n=50)	CRS use (n=49)
♦ In-person (n=33)	♦ In-person (n=21)	♦ In-person (n=31)	♦ In-person (n=26)
♦ Telephone (n=26)	♦ Telephone (n=22)	♦ Telephone (n=19)	♦ Telephone (n=23)
Restraint verification	Restraint verification	Restraint verification	Restraint verification
♦ In-person (n=27)	♦ In-person (n=20)	♦ In-person (n=25)	♦ In-person (n=21)
♦ Photograph (n=2)	♦ Photograph (n=2)	♦ Photograph (n=7)	♦ Photograph (n=5)

Figure 1. Consort flow diagram of study recruitment and participation. CRS = child restraint system; MI = motivational interviewing; RA = research assistant.

Table 2
Baseline Sample Characteristics and Randomization

	EUC (n = 97)	Tailored Brochure (n = 81)	ED MI (n = 81)	ED MI + Tailored Brochure (n = 80)	Overall Sample (N = 339)	Completed 6-month Follow-up (n = 201)
Site						
HMC	50.5	48.2	50.6	50.0	49.9	44.3
MM	49.5	51.8	49.4	50.0	50.1	55.7
Parent race/ethnicity						
Minority	50.5	53.1	55.6	52.5	52.8	44.8
Non-Hispanic, white	49.5	46.9	44.4	47.5	47.2	55.2
Parent Age (Years)						
18–24	26.8	27.2	22.2	21.3	24.5	20.9
25–29	20.6	24.7	24.7	26.3	23.9	21.4
30–39	37.1	34.6	37.0	40.0	37.2	42.3
40–62	14.4	11.1	11.1	7.5	11.2	12.9
Missing	1.0	2.5	4.9	5.0	3.2	2.5
Relationship to child						
Mother	87.6	87.7	87.7	88.8	87.9	88.1
Father	9.3	9.9	11.1	10.0	10.0	9.9
Grandparent/other	3.1	2.5	1.2	1.2	2.1	2.0
Highest education level						
High school or less	49.5	48.2	51.9	52.5	50.4	41.8
Associates or higher	50.5	51.8	48.1	47.5	49.6	58.2
Annual household income						
≤$25,000	46.4	48.2	55.6	66.2	53.7	43.8
>$25,000	53.6	51.8	44.4	33.8	46.3	56.2
Child sex						
Male	57.7	48.2	45.0	62.5	53.6	51.7
Female	42.3	51.8	55.0	37.5	46.4	48.3
Child Age (Years)						
<2	38.1	34.6	37.0	28.7	34.8	35.8
2–4	29.9	35.8	38.3	42.5	36.3	34.8
5–10	32.0	29.6	24.7	28.7	28.9	29.3
Usual child passenger restraint system at enrollment						
Rear-facing	28.9	30.9	32.1	20.0	28.0	28.9
Forward-facing	32.0	32.1	34.6	40.0	34.5	34.8
Booster seat	26.8	28.4	24.7	33.8	28.3	27.4
Seat belt	12.4	8.6	8.6	6.2	9.1	9.0
Age- and size-appropriate restraint at enrollment						
Yes	67.0	65.4	65.4	62.5	65.2	65.7
No	33.0	34.6	34.6	37.5	34.8	34.3

EUC = enhanced usual care; HMC = Hurley Medical Center; MI = motivational interviewing; MM = Michigan Medicine.

Preferences did not differ significantly by treatment group. Few parents completing 6-month follow-up had at least some interest in prompts to remind them to buckle their child up (12.1%, 95% CI = 8.2%–17.6%). More parents indicated at least some interest in receiving informational texts about child passenger safety (40.8%, 95% CI = 34.1%–48.0%). Most parents indicated some interest in an online tool that would help them know what safety seat is right for their child (74.9%, 95% CI = 68.2–80.5). Comparisons by intervention group are shown in Table 3. Minority parents were more interested in prompts but equally interested in texts and online tools as non-Hispanic, white parents (results not shown).

Information Uptake

In the immediate postintervention survey, higher proportions of parents randomized to counseling reported they were very likely to share the information with family (71.1%, 95% CI = 63.3%–77.7%) and friends (68.8%,

Table 3
Acceptability of the Intervention

	No ED MI			ED MI	
At the conclusion of study interaction in ED	*n* = 173			*n* = 152	
	% (95% CI)			% (95% CI)	
Information was very helpful*	67 (60–74)			74 (67–81)	
At 1-month follow-up	*n* = 77			*n* = 97	
Response to "How did you feel about being asked about					
Positive	71 (61–79)			69 (58–78)	
Neutral	27 (19–37)			27 (19–38)	
Negative	2 (0.5–8)			4 (1–12)	
	EUC	Tailored Brochure	ED MI	ED MI + Tailored Brochure	
At 6-month follow-up	*n* = 58	*n* = 42	*n* = 48	*n* = 44	
Preference for setting to receive child passenger safety education	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
ED visit only	17 (9–29)	21 (11–36)	42 (29–56)	23 (13–37)	
ED visit and then by phone	40 (28–53)	29 (17–44)	27 (16–41)	32 (20–47)	
ED visit and then in person	10 (5–21)	17 (8–31)	0	11 (5–25)	
By phone a few days after ED visit	22 (13–35)	26 (15–41)	19 (10–32)	23 (13–37)	
In person a few days after ED visit	10 (5–21)	7 (2–20)	12 (6–25)	11 (5–25)	
Interest in other methods to improve child passenger safety					
Prompts to help me remember to buckle my child up	19 (11–32)	10 (4–23)	13 (6–26)	5 (1–17)	
Text messages with information about keep my child safer in the car	47 (34–59)	38 (25–54)	38 (26–53)	39 (25–54)	
An online tool to help me know which seat is right for my child	78 (65–87)	76 (61–87)	70 (56–82)	75 (60–86)	

EUC = enhanced usual care; MI = motivational interviewing.
*Rating of ≥8 on a 10 point scale.

95% CI = 61.0%–75.8%) compared with parents who were not (60.3%, 95% CI = 52.9%–67.4% for family and 56.3%, 95% CI = 48.8%–63.5% for friends). Most of the 132 parents who received the study mailing reported reviewing the information (78.0%, 95% CI = 70.1%–84.3%). A slightly higher proportion of parents who received tailored brochures reported reviewing the information (82.5%, 95% CI = 71.0%–90.1%) compared with those who received generic information (73.9%, 95% CI = 62.2%– 83.0%). Of parents who reviewed the mailings, 29.1% (95% CI = 21.1%–38.7%) indicated they read half of the information or less, 28.2% (95% CI = 20.2%– 37.7%) read more than half but not all of the information, 42.7% (95% CI = 33.4%–52.5%) read all of the information, and 35.3% (95% CI = 26.6%–45.1%) referred back to the information a second time. Results were similar for parents who received tailored brochures and generic information sheets. Higher proportions of minority parents indicated they would be very likely to share information with family (72.9% [95% CI = 65.3%–79.3%] vs. 58.5% [95% CI = 50.9%–65.7%] non-Hispanic, white) and friends (68.8% [95% CI = 61.1%–75.7%] vs. 56.1% [95% CI = 48.6%–63.4%] non-Hispanic, white). Although fewer minority parents reviewed the mailed information (71.2% [95% CI = 57.4%–81.9%] vs. 82.5% [95% CI = 72.5%–89.4%] non-Hispanic, white), more minority parents referred back to the information if they had read it (51.3% [95% CI = 35.5%–67.0%] vs. 26.1% [95% CI = 16.9%–38.3%] non-Hispanic, white).

Preliminary Effect-Size Estimates

At 6-month follow-up, 62.7% (95% CI = 55.8%–69.1%) of parents reported that in the past 6 months their child usually used a CRS considered appropriate, 86.1% (95% CI = 80.5%–90.2%) reported that their child never traveled unrestrained, and 88.1% (95% CI = 82.8%–91.9%) reported that their child always sat in the back seat. Parent-reported CRS was verified with in-vehicle observation for 109 families (93 in person and 16 photographs). CRS appropriateness did not differ by method (64.0% [95% CI = 54.6%–72.4%] in person vs. 61.1% [95% CI = 50.6%–70.6%] photograph). Agreement between reported and observed CRS was 92.6% (κ = 0.90, p < 0.001) overall, 91.4% for in person (κ = 0.88, p < 0.001), and 100% for photograph (κ = 1, p < 0.001).
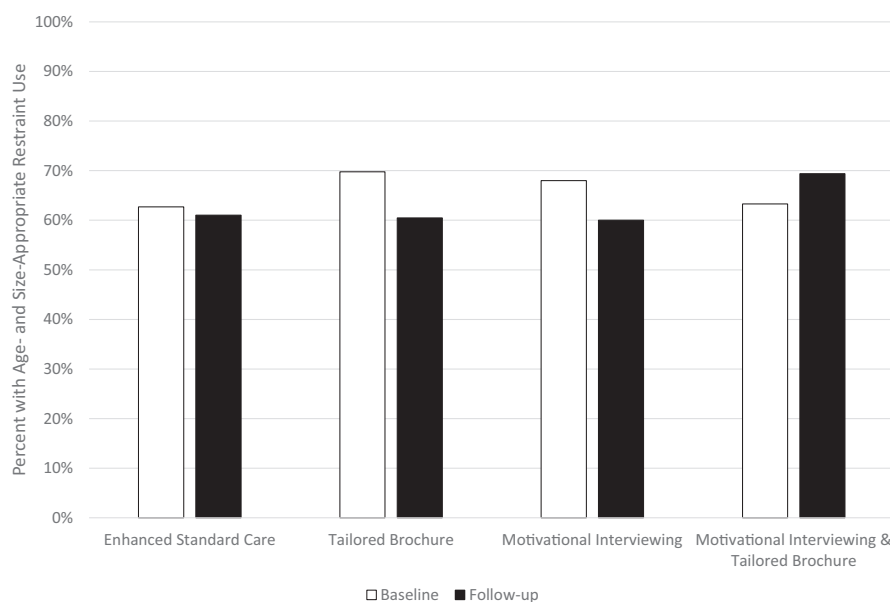
Figure 2. Percentage of children reported to be using a restraint that was considered to be age and size-appropriate at baseline (*white bars*) and 6-month follow-up (*black bars*) by intervention group.

Parents randomized to receive the full intervention demonstrated an increase (+6.1 percentage points) and other groups a decrease (–1.7 to –9.3 percentage points) in the proportion of children reported to use a CRS considered appropriate at 6-month follow-up, although differences were not statistically significant (Figure 2). Table 4 shows results stratified by child age group and restraint appropriateness at baseline. Overall, parents of children < 2 years showed decreased appropriate restraint use at 6 months, with smaller decreases among those randomized to the full intervention or EUC. Parents of 2 to 4 and 5 to 10 year olds randomized to the full intervention had greater increases in appropriate CRS use than other groups. Among parents of children who were using an appropriate CRS at baseline, the smallest decrease in appropriate CRS use was observed for those randomized to the full intervention. Among children who were not using an appropriate CRS at baseline, the greatest increase in appropriate restraint use was observed for those randomized to receive tailored brochure(s).

The unadjusted odds ratio of appropriate CRS use at 6 months was 1.45 (95% CI = 0.65–3.23) for the full intervention versus EUC (0.98 [95% CI = 0.44–2.18]) for the tailored brochure(s) versus EUC and 0.96 (95% CI = 0.44–2.07) for counseling versus EUC. Among parents who reported using an appropriate CRS at baseline, unadjusted odds of appropriate restraint use at 6 months was 3.38 (95% CI = 0.65–17.66) for the full intervention versus EUC, 0.54 (95% CI, 0.18–1.69) for

the tailored brochure versus EUC, and 0.76 (95% CI = 0.24–2.38) for counseling versus EUC. Among children reported to not be using an appropriate CRS at baseline, the unadjusted odds of appropriate restraint use at 6 months was 1.02 (95% CI = 0.25–4.14) for the full intervention versus EUC, 1.67 (0.39, 7.17) for the tailored brochure versus EUC, and 0.89 (95% CI = 0.20–3.67) for counseling versus EUC. Similar patterns were observed in the adjusted analyses (Table 5).

DISCUSSION

In this two-site, randomized pilot trial we demonstrated that the ED-based "Tiny Cargo, Big Deal" child passenger safety intervention was feasible and acceptable across our diverse sample of parents. Almost half of study parents reported using a CRS that was not considered appropriate and about 10% had allowed their child to travel unrestrained or sit in the front seat. Minority parents found talking about child passenger safety in the ED to be more helpful and they were more likely to plan to share information learned with family and friends than non-Hispanic, white parents. These findings support our assertion that suboptimal child passenger safety behaviors can be identified in the ED and the ED may be an opportune setting to address disparities. We also demonstrated that digital photographs can be used to remotely assess CRS use and verify parent self-report without the burden of in-person follow-up.

Table 4
Change in Parent-reported Usual Restraint Considered Age- and Size-appropriate by Intervention Group

	Usual Restraint Is Considered Appropriate		
	Baseline	Follow-up	Δ (95% CI)
Overall (n = 201)			
EUC	62.7	61.0	−1.7 (−19.2 to 15.8)
Tailored brochure(s)	69.8	60.5	−9.3 (−29.3 to 10.7)
ED MI + generic information sheet	68.0	60.0	−8.0 (−26.7 to 10.7)
ED MI + tailored brochure(s)	63.3	69.4	+6.1 (−12.6 to 24.8)
<2 years (n = 72)			
EUC	72.7	68.2	−4.5 (−37.1 to 28.1)
Tailored brochure(s)	86.7	60.0	−26.7 (−52.8 to −0.57)
ED MI + generic information sheet	85.0	65.0	−20.0 (−50.1 to 10.1)
ED MI + tailored brochure(s)	66.7	53.3	−13.4 (−42.0 to 15.3)
2 to 4 years (n = 70)			
EUC	53.3	46.7	−6.6 (−36.8 to 74.6)
Tailored brochure(s)	50.0	62.5	+12.5 (−19.6 to 73.1)
ED MI + generic information sheet	55.6	55.5	−0.1 (−34.5 to 34.3)
ED MI + tailored brochure(s)	57.1	71.4	+14.3 (−19.6 to 48.2)
5 to 10 years (n = 59)			
EUC	59.1	63.6	+4.5 (−32.9 to 41.9)
Tailored brochure(s)	75.0	58.3	−16.7 (−53.8 to 20.4)
ED MI + generic information sheet	58.3	58.3	0 (−39.4 to 39.4)
ED MI + tailored brochure(s)	69.2	84.6	+15.4 (−9.1 to 39.9)
Using an appropriate CRS at baseline (n = 132)			
EUC	100	81.1	−18.9 (−30.1 to −0.06)
Tailored brochure(s)	100	70.0	−30.0 (−46.4 to −13.6)
ED MI + generic information sheet	100	76.5	−23.5 (−37.8 to −9.25)
ED MI + tailored brochure(s)	100	93.6	−6.4 (−15.0 to −2.22)
Not using an appropriate CRS at baseline (n = 69)			
EUC	0	27.3	+27.3 (8.7 to 45.9)
Tailored brochure(s)	0	38.5	+38.5 (12.0 to 64.9)
ED MI + generic information sheet	0	25.0	+25.0 (3.8 to 46.2)
ED MI + tailored brochure(s)	0	27.8	+27.9 (7.1 to 48.5)

CRS = child restraint system; EUC = enhanced usual care; MI = motivational interviewing.

This study allowed us to learn several important lessons for improvement prior to a full-scale RCT. Our MI-based counseling session was acceptable to and completed by the majority of parents. We anticipate that completion rates can be increased by engaging with parents earlier in their child's ED visit. Parents who received tailored brochures were more likely to review information. This signals that even minimal demographic tailoring increases uptake. In addition, participants were interested in online tools for child passenger safety. Prior to a planned RCT, we will convert the print materials into an online resource with deeper tailoring on psychosocial variables and knowledge. Many parents who completed 6-month follow-up indicated interest in receiving additional information after discharge. A telephone counseling session in the days after ED discharge may be a useful addition. These modifications may strengthen the impact of the intervention on appropriate CRS use.

We found evidence for the potential additive benefit of the intervention components on appropriate CRS use at 6 months, particularly among parents who were using an appropriate restraint at baseline. The full intervention may encourage parents to delay the transition out of an appropriate restraint. This hypothesis could be tested by studying parents who plan to make a premature transition in the months following enrollment. The tailored brochure was associated with increased appropriate restraint use among children who were not using an appropriate restraint at baseline. Future research targeting parents who are not guideline adherent at baseline may be higher yield

Table 5
Adjusted Odds of Parent Reported Child Passenger Safety Behaviors Considered Guideline Adherent at 6-month Follow-Up Stratified by CRS Use at Enrollment and Child Age

| | Full Sample (n = 201) | | | | Age- and Size-appropriate CRS Use at Enrollment | | | |
| | Unadjusted | | Adjusted | | Yes (n = 132) | | No (n = 69) | |
Study Condition	OR	95% CI	AOR*	95% CI	AOR†	95% CI	AOR†	95% CI
EUC	Ref	—	Ref	—	Ref	—	Ref	—
Tailored brochure	0.98	0.44–2.18	0.61	0.23–1.64	0.65	0.18–2.31	1.14	0.20–6.60
ED MI	0.96	0.44–2.07	0.64	0.23–1.76	0.81	0.22–3.05	0.55	0.10–2.88
ED MI + tailored brochure	1.45	0.65–3.23	1.13	0.39–3.24	3.3	0.55–19.91	0.86	0.18–4.08

AOR = adjusted odds ratio; EUC = enhanced usual care; MI = motivational interviewing.
*Adjusted for study site, parent race/ethnicity, family income, size-appropriate restraint use at enrollment, never traveled unrestrained in the 6 months prior to enrollment, always sit in back seat in the 6 months prior to enrollment.
†Stratified by size-appropriate restraint use at enrollment and adjusted for study site, parent race/ethnicity, family income, never traveled unrestrained in the 6 months prior to enrollment, and always sit in back seat in the 6 months prior to enrollment.

than intervening with parents who plan to continue appropriate CRS use.

The lack of intervention effect among parents of children < 2 may be due to limited acceptance of newer guidance to keep U.S. children rear-facing until at least 2 years of age. The AAP has recently reaffirmed their position on rear-facing car seat use[44,45] and several states have passed legislation mandating rear-facing until age 2.[46] Policy changes specific to rear-facing car seat use for toddlers can be incorporated to make the intervention more influential on parent decision making about when to turn their child from a rear- to forward-facing car seat.

LIMITATIONS

This pilot study has several limitations. First, there are several factors that decreased our chances of detecting an intervention effect. The lack of a true control condition (all parents received some educational materials) decreases the potential for differences in the outcome between conditions. It is also possible that the intervention dose was too low to show an effect or that the individual intervention components led parents to different conclusions about the appropriate CRS. Second, we were able to retain just over half of enrolled parents. Our results may be biased toward parents who were more willing and able to complete follow-up and possibly parents who were more interested in child passenger safety. The EUC group had the highest 6-month follow-up rates. Third, our results may not be generalizable to settings with robust public transportation systems or to non–English-speaking populations. Fourth, there is potential for social desirability bias. We estimate these effects are minimal as many parents reported socially undesirable behaviors

including allowing their child to travel unrestrained. We also found high agreement between the parent-reported and observed CRS. Finally, recruitment of parents from June through September and during daytime and evening hours may introduce sampling bias but we cannot estimate the direction of this effect.

CONCLUSION

In conclusion, suboptimal child passenger safety behaviors can be identified and intervened upon during a child's ED visit. An motivational interviewing–based counseling session in the ED combined with mailed tailored brochures resulted in raw improvements in appropriate child restraint system use among parents of children < 11 years old compared with enhanced usual care.

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