



# Rear-Facing Car Safety Seat Use for Children 18 Months of Age: Prevalence and Determinants

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**Objective** To examine the prevalence and potential determinants of rear-facing car safety seat use among children approximately 18 months of age born at a university hospital.

**Study design** We administered a telephone survey to caregivers of children 17-19 months of age who were born between November 2013 and May 2014. The survey was designed to assess the prevalence of rear-facing car safety seat use and estimate the likelihood of rear-facing car safety seat use, compared with forward-facing car seat use, in reference to hypothesized determinants. aORs and 95% CIs were calculated using multivariable logistic regression.

**Results** In total, 56% of potentially eligible caregivers (491/877) completed the survey; 62% of these reported rear-facing car safety seat use. Race, education, rurality, and household income were associated with rear-facing car safety seat use after controlling for potential confounders. Additionally, caregivers who reported having discussed car seats with their child's provider (aOR 1.7; 95% CI 1.1-2.6); receiving their child's primary care in pediatrics compared with family practice clinics (aOR 2.4; 95% CI 1.1-2.6); and being aware of the American Academy of Pediatrics rear-facing recommendation (aOR 2.8; 95% CI 1.8-4.1) were significantly more likely to report rear-facing car safety seat use. Conversely, caregivers who previously used a car seat with another child were less likely to have their child rear facing at 18 months of age (aOR 0.6; 95% CI 0.4-0.9).

**Conclusions** A large proportion of children were forward facing at 18 months of age. Future efforts focused on encouraging providers to discuss car seats during patient visits, increasing awareness of the American Academy of Pediatrics' rear-facing recommendation, and targeting high-risk populations may improve the prevalence of children who remain rear facing until 2 years of age. (*J Pediatr* 2017;189:189-95).

In 2014, an estimated 167 000 children were injured in motor vehicle crashes (MVCs) in the US.<sup>1</sup> Of the 135 fatalities in children ages 1-3 years, 18% were unrestrained and 7% were restrained only by a seat belt.<sup>1</sup> MVCs are the second leading cause of injury death for US children 1-2 years of age.<sup>2</sup> It has been estimated that car safety seats reduce the risk of death by 54% for children 1-4 years of age in passenger cars<sup>3</sup> and also prevent substantial nonfatal traumatic injuries.<sup>4</sup>

Child fatality from MVCs has decreased over the past decade as child passenger restraint use has increased.<sup>1,5</sup> However, a large percentage of children still ride in car seats that are misused,<sup>6-9</sup> placing them at increased risk of injury or death in the event of a crash.<sup>4</sup> Children 12-23 months of age involved in MVCs have a 5 times greater risk of serious injury in forward-facing car safety seats when compared with rear-facing car safety seats.<sup>10</sup> Consequently, in 2011, the American Academy of Pediatrics (AAP) issued a policy statement recommending that "all infants and toddlers should ride in a rear-facing car safety seat (CSS) until they are 2 years of age or until they reach the highest weight or height allowed by the manufacturer of their CSS."<sup>5</sup> Despite this recommendation, subsequent research has found that only 13%-27% of children remained rear facing at 2 years of age.<sup>11-13</sup>

To date, little information exists on caregiver or health system factors—or interventions—that may help to increase the prevalence of rear-facing car safety seat use among children <2 years of age. The purpose of this study was to examine the prevalence and identify potential determinants of rear-facing car safety seat use among children 17-19 months of age born at a university hospital. Results of this work could help to inform clinical or public health approaches to improve rear-facing car safety seat use.

## Methods

We conducted a cross-sectional, telephone survey of a sample of caregivers of children between 17 and 19 months of age who had been discharged from the Oregon Health and Science University (OHSU) Mother Baby Unit (MBU). OHSU Hospital

AAP American Academy of Pediatrics  
MBU Mother Baby Unit  
MVC Motor vehicle crash  
OHSU Oregon Health and Science University

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is a tertiary care academic health center in Portland, Oregon, and the MBU cares for well infants  $\geq 35$  weeks' gestational age. The study was approved by the OHSU Institutional Review Board.

The target participant population was all caregivers of living children 17 to 19 months of age with birth dates between November 2013 and May 2014 who were discharged from the OHSU MBU; those potentially eligible for the study were identified using the OHSU Research Data Warehouse Cohort Discovery system. All families admitted to the MBU receive in-person anticipatory guidance, as well as standardized written guidance, regarding newborn care from a child health provider, whether pediatric or family medicine. This guidance rigorously follows AAP policy and Bright Futures guidelines. During the study period, usual care relevant to car safety seat education in the MBU included a 1-page informational flyer as part of each family's discharge materials; this flyer included a statement about the AAP recommendation for rear-facing car safety seat use.

The telephone survey was administered as a structured interview by 1 member of the study team, to maintain consistency, in 2015 through early 2016. The interviewer attempted to contact all caregivers after their child had turned 17 months old up until the day before they turned 20 months old. Potential participants were called  $\geq 6$  times, and up to 10 times, at different times of the day and different days of the week, or until a caregiver (1) completed the survey, (2) declined participation, or (3) was deemed ineligible and excluded. When contact was made at a time that was not convenient for the caregiver, an alternate time for survey completion was arranged at the caregiver's convenience. Caregivers were considered eligible if the survey team was able to make contact via a phone number listed in the electronic health record and if the caregiver reported he or she was comfortable conversing and completing the survey in English (owing to limited resources, translators were not available for this study). Caregivers of twins were only surveyed once. All participants gave verbal consent for participation after being read an institutional review board–approved telephone consent statement and offered the opportunity to have their questions answered. No financial incentive was provided for completing the survey.

Some of the children whose caregivers were contacted had the opportunity to participate in a past car safety seat-focused research study<sup>6</sup> at the time of their newborn hospital admission. This past study was independent of the current study. The past study involved evaluating the infant's positioning in their car safety seat and the car safety seat installation in the vehicle before discharge. After the evaluation, the caregiver received hands-on education by a certified Child Passenger Safety Technician regarding proper car safety seat installation and use, including recommendations about rear-facing car safety seat use, and all errors in installation and/or positioning of the newborns were corrected. Owing to the time frame of each study, some of the participants of the past study had the opportunity to participate in the current study. Therefore, the current study included a survey measure

asking caregivers if they had participated in the past study at the time of their child's newborn hospital stay. This question allowed us to assess the potential effects of this past car safety seat "educational intervention" on rear-facing car safety seat use at 18 months.

We developed a telephone survey that included questions regarding sociodemographic characteristics, pediatric health services use, past and present car safety seat use, training in car safety seat use (including interactions with Child Passenger Safety Technicians), and awareness of the AAP's recommendation for rear-facing car safety seat use. The survey was pilot tested for clarity, face validity, and duration of administration time with caregivers of children outside the target study population. The survey instrument was refined based on results of pilot testing. The final survey (Figure; available at [www.jpeds.com](http://www.jpeds.com)) was  $\leq 42$  questions in length (depending on skip patterns) and took most participants  $< 15$  minutes to complete.

Caregivers were asked to report whether their child's car safety seat was rear or forward facing at the time of the survey; this served as the dependent variable for analyses described. Depending on participants' responses, they were then asked in an open-ended question the reasons for having their child either rear or forward facing. The reasons indicated were categorized by the study team and reported here based on the frequency of caregivers' responses. Further details on caregivers' knowledge of and methods for learning about car safety seat use were assessed in additional open- and closed-ended survey items.

Independent variables of interest included caregivers' sociodemographic characteristics (age, gender, race or ethnicity, preferred language, education level, marital status, annual household income, and urban vs rural region of residence), their child's primary care provider characteristics (provider specialty, remember discussing car safety seat use with provider), their car safety seat experience and knowledge (prior car safety seat use, know AAP recommendation), and their receipt of training (eg, received training from certified Child Passenger Safety Technician, participation in the past car safety seat research study at time of birth). Variables were categorized dichotomously or in categories based on theory and/or distributions of responses. Caregivers' zip codes were matched against published rural–urban commuting area codes to determine caregivers' rural or urban region of residence.<sup>14</sup>

### Statistical Analyses

We conducted descriptive analyses on the prevalence of rear-facing car safety seat use by caregiver demographics, knowledge, and behavior, and estimated the odds of rear-facing car safety seat use in reference to hypothesized determinants. ORs and 95% CIs were calculated using logistic regression; aORs were computed using multivariable regression models controlling for potential confounders that included caregivers' age, race or ethnicity, education level, and marital status. Observations with missing values were excluded from respective analyses.

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