Unsafe from the Start: Serious Misuse of Car Safety Seats at Newborn Discharge

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Objective To estimate prevalence of car safety seat (CSS) misuse for newborns on hospital discharge; and to identify potential risk and protective factors for CSS misuse.

Study design We randomly sampled 291 mother–baby dyads from the newborn unit of an academic health center. Participants completed a survey and designated someone (themselves or another caregiver) to position their newborn in the CSS and install the CSS in their vehicle. Certified child passenger safety technicians assessed positioning and installation using nationally standardized criteria. To examine factors associated with CSS misuse, we used logistic regression to compute ORs and 95% CIs.

Results A total of 291 families (81% of those eligible) participated. Nearly all (95%) CSSs were misused, with 1 or more errors in positioning (86%) and/or installation (77%). Serious CSS misuse occurred for 91% of all infants. Frequent misuses included harness and chest clip errors, incorrect recline angle, and seat belt/lower anchor use errors. Families with mothers of color (OR, 6.3; 95% CI, 1.8-21.6), non-English language (OR, 4.9; 95% CI, 1.1-21.2), Medicaid (OR, 10.3; 95% CI, 2.4-44.4), or lower educational level (OR, 4.5; 95% CI, 1.7-12.4) were more likely to misuse CSSs. However, families that worked with a child passenger safety technician before delivery were significantly less likely to misuse their CSSs (OR, 0.1; 95% CI, 0.0-0.4).

Conclusion Nearly all parents of newborn infants misused CSSs. Resources should be devoted to ensuring families with newborns leave the hospital correctly using their CSS. *(J Pediatr 2016;171:48-54)*.

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More than 3.9 million children were born in the US in 2014.[1] Considering that only approximately 36 000 of those births were home deliveries,[2] the overwhelming majority of infants born in the US traveled home from a hospital or birthing center. Given that all 50 states have laws mandating car safety seat (CSS) use for young children,[3] it follows that virtually all children born in the US travel home in a CSS.

The American Academy of Pediatrics (AAP) policy statement on Safe Transportation of Newborns at Hospital Discharge states that "every newborn should be properly restrained in a car safety seat,"[4] a policy echoed by the Children's Hospital Association.[5] Although many hospitals have child passenger safety programs, and many prenatal classes include information about safe transportation of newborns, there is tremendous variability in the content and degree of integration of these programs into hospital perinatal services.[6] Constraints on time, staffing needs, financial resources, and risk management concerns are all barriers to the development and implementation of robust child passenger safety programs.[7] Research is essential to define the need and identify the essential components of effective child passenger safety programs for newborns and parents.

In 2013, 134 infants aged <1 year died in motor vehicle crashes, and approximately 500 more were hospitalized and >8000 more were treated in emergency departments for injuries sustained in crashes.[8] CSSs are very effective at protecting children in crash events, reducing the risk of death by 71% in infants aged <1 year.[9] However, research has found that some 73% of all CSS uses involve at least 1 critical misuse.[10] Misuse may be even more prevalent for newborns; 2 previous studies examining CSS use at hospital discharge reported misuse rates of 85% and 78%.[11,12] The purpose of the present study was to apply standardized criteria to examine the prevalence and types of CSS misuse, and to identify potential risk factors and protective factors, among a random sample of families of well newborns at an academic medical center.

AAP	American Academy of Pediatrics
CPST	Child passenger safety technician
CSS	Car safety seat
MBU	Mother-Baby Unit
NHTSA	National Highway Traffic Safety Administration
OHSU	Oregon Health and Science University

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Methods

This study was conducted at the Oregon Health and Science University (OHSU) Hospital, a 498-bed tertiary care academic health center in Portland, Oregon, and was approved by the OHSU Institutional Review Board. OHSU's Mother-Baby Unit (MBU) provides care for mother–infant dyads with well infants of ≥35 weeks gestational age, approximately 2500 infants per year.

The Doernbecher Children's Hospital, Tom Sargent Children's Safety Center at OHSU employs child passenger safety technicians (CPSTs) certified by Safe Kids Worldwide, and provides child passenger safety services to much of the community served by the hospital. Currently, CSS services are not routinely provided to patients in the MBU, except for children with special health care needs. For this study, certified CPSTs from the Safety Center assessed a random sample of families with newborns when positioning infants within their CSS and when installing CSSs in their vehicle. This study was conducted between November 2013 and May 2014.

Owing to resource limitations, we were unable to approach all mother–baby dyads admitted to the MBU during the study period; therefore, we randomly sampled potential participants from among the entire population of eligible mother–baby dyads. Families were excluded if the mother's medical condition precluded participation, or if the baby required angle tolerance testing according to hospital protocol, had been in the neonatal intensive care unit for longer than 4 hours, or would be traveling home by public transportation not requiring CSS use. Families with multiple-gestation deliveries were eligible, but data were collected for only 1 of the infants. Telephone interpreter services were used for any family who preferred to participate in any language other than English.

Study team members attended daily MBU rounds to identify eligible mother–baby dyads. Using a computer algorithm, we randomly sampled and approached eligible dyads, inviting their participation, until we had reached our maximum daily capacity for participants (up to 4 dyads/day). Potential participants were approached and recruited within 24-48 hours after birth. Study data were managed using REDCap electronic data capture tools hosted at OHSU.[13]

All families who agreed to participate completed the informed consent process with study staff and signed an informed consent form approved by the Institutional Review Board. They then completed a survey regarding family sociodemographic data and CSS experience and preparation. The mother (or her designee) then positioned the newborn infant in the CSS as she would at discharge, taking as much time and privacy as needed to complete the task to her satisfaction. Evaluation of infant positioning included use of harness webbing, buckles, and retainer clip, as well as use of other positioning devices in accordance with Safe Kids Worldwide[14] and National Highway Traffic Safety Administration (NHTSA)[15]-defined best practice and CSS manufacturers' recommendations. Finally, if the CSS was not already installed, then the mother (or her designee) was asked to install it in the vehicle in which the baby would be leaving the hospital. Once installation was completed, the CPST reviewed the installation, including location in the vehicle, angle of installation, and lower anchor or seatbelt use. The survey, infant positioning, and installation did not necessarily occur consecutively; each portion could occur at different times depending on the family's and healthcare team's schedules. Details on administration of the evaluation process were documented, including time to perform positioning and installation checks to the nearest 5-minute increment.

The research team worked with each family to ensure that infants left the hospital in an appropriate CSS, correctly positioned and installed by the designated caregiver, in accordance with vehicle and CSS manufacturer recommendations, and guidelines established by Safe Kids Worldwide and the NHTSA. During the study period, all families who agreed to participate had a CSS that they intended to use to take their infant home. Families with a CSS that had been recalled, had visible damage, was expired, or was of unknown history were provided with a replacement at minimal or no cost.

Dependent Variables

We categorized participants' CSS misuse at 3 levels: critical misuse, serious misuse, and any misuse. We defined critical misuse according to NHTSA guidelines published in 2004.[15] Given that this definition does not include lower anchor misuse, we defined serious misuse to include all critical misuses plus those involving lower anchors. In addition, NHTSA criteria for critical misuse does not include harness retainer misuse, although they did assess for this.[15] Our experience, as well as data that demonstrate an increased risk for infants with improper positioning of harness straps,[16] led us to include malpositioning of the harness retainer clip (too high or too low) as a serious misuse in this study. Similarly, the NHTSA criteria do not include errors in the recline angle of the CSS. Among newborns, a too-upright angle can lead to airway compromise. Again, both our experience and published data[16] led us to include incorrect recline angle as a serious misuse. Finally, the any misuse category included all serious misuses plus any additional as identified on a standardized child passenger safety checklist from Safe Kids Worldwide and in consultation with both CSS manufacturers' and vehicle owners' manuals (to ensure that both infant positioning and vehicle installation conformed to stated recommendations).[14] All categories of misuse are shown in **Table I**.

We chose serious misuse of a CSS as the primary outcome of interest for regression analyses because a large proportion of families used lower anchors for installation, and both recline angle and harness retainer clip misuses put infants at risk for injury related to airway compromise during CSS use.[15,16]

Independent Variables

Mother's age, race/ethnicity, primary language, educational attainment, marital status, parity, and preparation (ie,