Hard Science and Tough Choices: Transitions from RF to FF

A RESEARCH & RECOMMENDATIONS UPDATE

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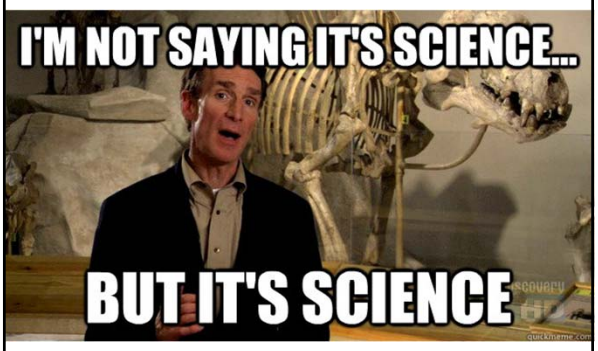
Disclosure Statement

Objectives

By the end of the session, attendees will be able to:

- Discuss the history of best practice recommendations for car safety seat usage
- Describe controversies in the research around car safety seat best-practice
- Discuss current AAP policy recommendations

Changing Knowledge & Products



1962 American Academy of Pediatrics Recommendations

SEAT BELTS IN THE PREVENTION OF AUTOMOBILE INJURIES
REPORT OF THE COMMITTEE ON ACCIDENT PREVENTION

- Many vehicles did not have belts as standard equipment
- Wear seat belts
- Have them installed in your vehicle if needed

1972 AAP Recommendations

COMMITTEE STATEMENT
CAR RESTRAINT DEVICES DESIGNED FOR CHILDREN
PROPER SAFETY DEVICE FOR SIZE AND WEIGHT OF CHILD WILL REDUCE DEATH RATE

- No hook-on car seats
- Under 50 pounds use CR with internal harnesses; over 50 pounds use lap belt (no shoulder belt)
- Over 50 pounds use lap belt No shoulder belt for children due to poor fit

1974 AAP Recommendations


statement

Auto Safety for the Infant and Young Child

- Specific well-designed RF and FF models for small children
- Over 4 and 40 lbs use a lap belt – a cushion may help the child to see out the window
- Over 4'6" and 55 lbs use both a lap and shoulder belt

1996 AAP Recommendations


Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents

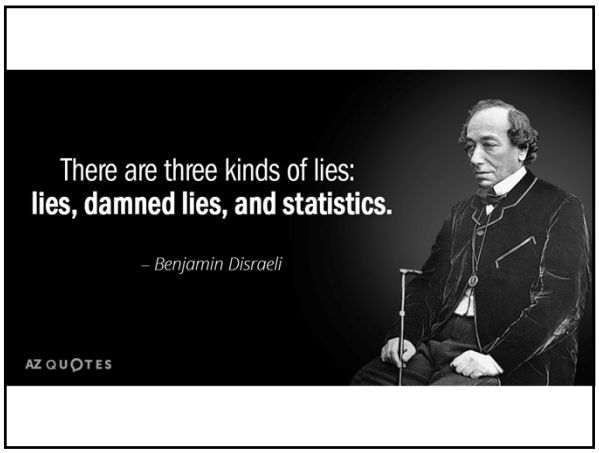
- RF to 1 and 20 lbs and never in front of an air bag
- No shield CR models for premature and small infants no shields
- FF conv or integrated over 1 and 20-40 lbs
- BPB or shield booster for over 40 lbs
- Proper use highlighted

2002 AAP Recommendations


AMERICAN ACADEMY OF PEDIATRICS

Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents

- RF at least to 1 and 20 lbs and better to maximum weight/height
- FF convertible or integrated seat over 1 & 20-40 lbs
- BPB until lap and shoulder belts fit
- Comprehensive proper use info
- Kids in back
- No aftermarket belt positioners
- Special needs recommendations



2007 Study

398

ORIGINAL ARTICLE

Car safety seats for children: rear facing for best protection

B Henary, C P Sherwood, J R Crandall, R W Kent, F E Vaca, K B Arbogast, M J Bull

Injury Prevention 2007;**13**:398–402. doi: 10.1136/ip.2006.015115

Objective: To compare the injury risk between rear-facing (RFCS) and forward-facing (FFCS) car seats for children less than 2 years of age in the USA.

Methods: Data were extracted from a US National Highway Traffic Safety Administration vehicle crash database for the years 1988–2003. Children 0–23 months of age restrained in an RFCS or FFCS when riding in passenger cars, sport utility vehicles, or light trucks were included in the study. Logistic regression models and restraint effectiveness calculations were used to compare the risk of injury between children restrained in RFCSs and FFCSs.

Results: Children in FFCSs were significantly more likely to be seriously injured than children restrained in RFCSs in all crash types (OR = 1.76, 95% CI 1.40 to 2.20). When considering frontal crashes alone, children in FFCSs were more likely to be seriously injured (OR = 1.23), although this finding was not statistically significant (95% CI 0.95 to 1.59). In side crashes, however, children in FFCSs were much more likely to be injured (OR = 5.53, 95% CI 3.74 to 8.18). When 1 year olds were analyzed separately, these children were also more likely to be seriously injured when restrained in FFCSs (OR = 5.32, 95% CI 3.43 to 8.24). Effectiveness estimates for RFCSs (93%) were found to be 15% higher than those for FFCSs (78%).

Conclusions: RFCSs are more effective than FFCSs in protecting restrained children aged 0–23 months. The same findings apply when 1 year olds are analyzed separately. Use of an RFCS, in accordance with restraint recommendations for child size and weight, is an excellent choice for optimum protection up to a child's second birthday.

2011 AAP Recommendations

Policy Statement—Child Passenger Safety

abstract

2011 NHTSA Recommendations

Implications of 2011 AAP Policy

Expression of concern: car safety seats for children: rear facing for best protection

Henary B, Sherwood CP, Crandall JR, *et al*. Car safety seats for children: rear facing for best protection. *Injury Prev* 2007;13:398–402.

The manuscript 'Car safety seats for children: rear facing for best protection' was published in *Injury Prevention* in 2007, after peer review. The paper used US data from the National Automotive Sampling System Crashworthiness Data System to conclude that children 0–23 months were less likely to be severely injured when using a rear-facing car seat than a front-facing car seat. This result, along with similar data from Swedish experience and biomechanical studies, has been used as the basis for public education and policy recommendations that favor a rear-facing position for children under age two in car seats.

In 2016, the journal was contacted by a biostatistician employed as an expert witness in a court case involving a car seat manufacturer. She indicated that she was unable to replicate the results of the analysis reported in the Henary *et al* paper. Despite requests from the editor, she did not provide details of her analysis nor did she submit a manuscript describing her analysis, her results, or their implications.

The same letter was also forwarded to authors of the Henary *et al* study. They, and colleagues, have communicated to the journal that their attempts to replicate the analysis also fell short. Specifically, they believe that survey weights were improperly handled in the initial analysis, which caused the apparent sample size to be larger than the actual sample size. This resulted in inflated statistical significance. It is important to stress-per the authors-there is no evidence that current recommendations are harmful. However, these field data are inadequate to statistically support the safety benefit of rear facing seats.

The journal has asked the authors to provide an erratum, correcting the analysis and results. We anticipate receiving this soon. We have also offered to publish updated analyses based on more recent data. In the meantime, we are releasing this statement of concern to alert readers and policymakers to uncertainty about the weight and significance of the findings reported herein.

Inj Prev 2017;**23**:tr1. doi:10.1136/ip.2006.015115eoc1

ORIGINAL ARTICLE

Car safety seats for children: rear facing for best protection

RETRACTED

Rear-facing versus forward-facing child restraints: an updated assessment

Timothy L McMurry,[1] Kristy B Arbogast,[2] Christopher P Sherwood,[3] Federico Vaca,[4] Marilyn Bull,[5] Jeff R Crandall,[6] Richard W Kent[6]

Results Years 1988–2015 of NASS-CDS contained 1107 children aged 0 or 1 year old meeting inclusion criteria, with 47 of these children sustaining injuries with Injury Severity Score of at least 9. Both 0-year-old and 1-year-old children in RFCRS had lower rates of injury than children in FFCRS, but the available sample size was too small for reasonable statistical power or to allow meaningful regression controlling for covariates.

Conclusions Non-US field data and laboratory tests support the recommendation that children be kept in RFCRS for as long as possible, but the US NASS-CDS field data are too limited to serve as a strong statistical basis for these recommendations.

NHTSA Affirms Position

From: Kuppa, Shashi (NHTSA) <Shashi.Kuppa@dot.gov>
Sent: September 19, 2017 11:09
To: jcolella@aama-ortg
Cc: Kuppa, Shashi (NHTSA)
Subject: RE: Introduction and Follow-Up

Dear Mr. Colella,

Thank you for your e-mail to NHTSA Acting Deputy Administrator, Jack Danielson, requesting NHTSA's guidance on recommendations for rear-facing and forward-facing child car seats. Your email was forwarded to me for response.

As you know, there have been communications and on-going technical reviews regarding the validity of the 2007 study comparing the injury risk between rear- and forward-facing car seats for children less than 2 years of age in the United States (Henary et al, 2007). Some of these communications may have caused uncertainty regarding child passenger safety and educational messages given to caregivers.

It is important to note that all the studies in question demonstrate the value and effectiveness that car seats play in keeping children safe while traveling.

In 2011, NHTSA revised its best practice child car seat recommendations to state that:

- Children under age 1 should always ride in rear-facing car seats; and
- Children 1 to 3 years of age ride in rear-facing car seats as long as possible and until they reach the upper height or weight limit according to the manufacturers' instructions.

The information and analyses available thus far supports NHTSA's position on car seats. Our best practice recommendations remain the same in 2017. Ensuring safety is an ongoing process at NHTSA, and we will review additional data as they become available.

We look forward to a continued partnership in child passenger safety.

Sincerely,
Shashi Kuppa

NHTSA
Shashi Kuppa, Ph.D.
Chief, Special Vehicles and Systems Division
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National Highway Traffic Safety Administration
1200 New Jersey Avenue SE., Washington, DC 20590
Office: 202-366-3617

POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN

Child Passenger Safety

Dennis R. Durbin, MD, MSCE, Benjamin Hoffman, MD, COUNCIL ON INJURY, VIOLENCE, AND POISON PREVENTION

abstract

Child passenger safety has dramatically evolved over the past decade; however, motor vehicle crashes continue to be the leading cause of death for children 4 years and older. This policy statement provides 4 evidence-based recommendations for best practices in the choice of a child restraint system to optimize safety in passenger vehicles for children from birth through adolescence: (1) rear-facing car safety seats as long as possible; (2) forward-facing car safety seats from the time they outgrow rear-facing seats for most children through at least 4 years of age; (3) belt-positioning booster seats from the time they outgrow forward-facing seats for most children through at least 8 years of age; and (4) lap and shoulder seat belts for all who have outgrown booster seats. In addition, a fifth evidence-based recommendation is for all children younger than 13 years to ride in the rear seats of vehicles. It is important to note that every transition is associated with some decrease in protection; therefore, parents should be encouraged to delay these transitions for as long as possible. These recommendations are presented in the form of an algorithm that is intended to facilitate implementation of the recommendations by pediatricians to their patients and families and should cover most situations that pediatricians will encounter in practice. The American Academy of Pediatrics urges all pediatricians to know and promote these recommendations as part of child passenger safety anticipatory guidance at every health supervision visit.

Published 8/30/18

2011

Best Practice Recommendation

1) Best Practice Recommendation
Infant-only or Convertible CSS Used Rear-facing

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 their car safety seat's manufacturer.

2) Best Practice Recommendation
Convertible or Combination CSS Used Forward-facing

All children 2 years or older, or those younger than 2 years who have outgrown the rear-facing weight or height limit for their car safety seat should use a **Forward-Facing Car Safety Seat** with a harness for as long as possible, up to the highest weight or height allowed by their car safety seat's manufacturer.

3) Best Practice Recommendation
Belt-positioning Booster Seat

All children whose weight or height is above the forward-facing limit for their car safety seat should use a **Belt-Positioning Booster Seat** until the vehicle lap and shoulder seat belt fits properly, typically when they have reached 4 feet 9 inches in height and are between 8 and 12 years of age.

4) Best Practice Recommendation
Lap and shoulder Vehicle Seat Belt

When children are old enough and large enough to use the vehicle seat belt alone, they should always use **Lap and Shoulder Seat Belts** for optimal protection.

5) Best Practice Recommendation
All Children under 13 years of age should be restrained in the rear seats of vehicles for optimal protection.

All children younger than 13 years should be restrained in the **rear seats** of vehicles for optimal protection.

2018

Best Practice Recommendation

1) Best Practice Recommendation
Infant-only or Convertible CSS Used Rear-facing

All infants and toddlers should ride in a **Rear-Facing Car Safety Seat** (CSS) as long as possible, until they reach the highest weight or height allowed by their car safety seat's manufacturer.

2) Best Practice Recommendation
Convertible or Combination CSS Used Forward-facing

All children who have outgrown the rear-facing weight or height limit for their car safety seat should use a **Forward-Facing Car Safety Seat** with a harness for as long as possible, up to the highest weight or height allowed by their car safety seat's manufacturer.

3) Best Practice Recommendation
Belt-positioning Booster Seat

All children whose weight or height is above the forward-facing limit for their car safety seat should use a **Belt-Positioning Booster Seat** until the vehicle lap and shoulder seat belt fits properly, typically when they have reached 4 feet 9 inches in height and are between 8 and 12 years of age.

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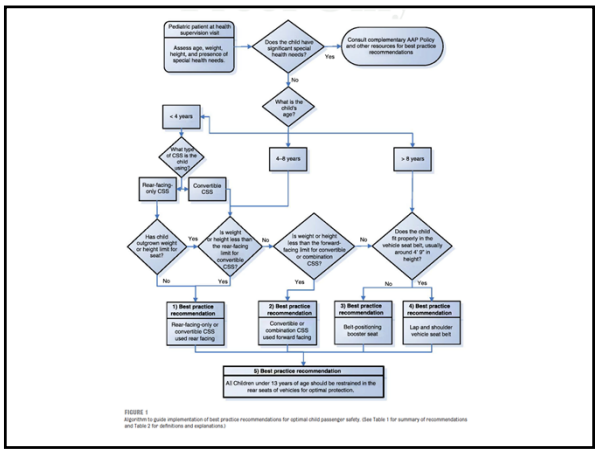


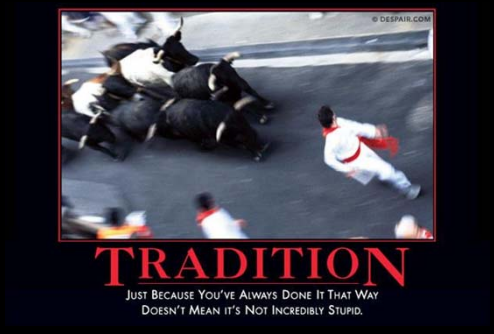
FIGURE 1
Algorithm to guide implementation of best practice recommendations for optimal child passenger safety. (See Table 1 for summary of recommendations and Table 2 for definitions and explanations.)

2019 Best Practices

No more 5X safer to age 2
No data specifying age 2

- **Under 1**
  - **Always RF**
- **1-4**
  - **RF to RF limits;**
  - **Then FF**
- **2-8**
  - **FF with harnesses to FF limits**
  - **Then BPB**
- **8-12**
  - **BPB until belts alone fit**
  - **Then lap and shoulder belt**

Questions & Discussion?



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