

Counseling about Proper Use of Motor Vehicle Occupant Restraints and Avoidance of Alcohol Use while Driving: A Systematic Evidence Review for the U.S. Preventive Services Task Force

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Background: Motor vehicle–related injuries are the leading cause of death among children, adolescents, and young adults.

Purpose: To systematically review evidence of the effectiveness of counseling people of any age in primary care settings about occupant restraints or alcohol-related driving to prevent injuries.

Data Sources: MEDLINE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, CINAHL, and Traffic Research Information Service; published systematic evidence reviews; experts; and bibliographies of selected trials.

Study Selection: Randomized, controlled trials (RCTs); controlled clinical trials (CCTs); or comparative observational research studies that evaluated behavioral counseling interventions feasible to conduct in primary care or referral from primary care.

Data Extraction: Investigators abstracted data on study design, setting, patients, interventions, outcomes, and quality-related study details.

Data Synthesis: Trials report that counseling to increase the use of child safety seats leads to increased short-term restraint use (7

CCTs, 6 RCTs). Interventions that included a demonstration of correct use or distribution of a free or reduced-cost child safety seat reported larger effects. Few trials described the effect of counseling children 4 to 8 years of age to use booster seats (1 RCT); counseling older children, adolescents, or adults to use seat belts (1 CCT, 2 RCTs); or counseling unselected primary care patients to reduce alcohol-related driving behaviors (no trials).

Limitations: Most of the relevant trials were published before the widespread enactment of child safety seat legislation and had methodological flaws.

Conclusions: The incremental effect of primary care counseling to increase the correct use of child safety seats in the current regulatory environment is not established. The effectiveness of primary care counseling to reduce alcohol-related driving has not been tested. Studies are needed.

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Motor vehicle–related injuries are the leading cause of death among individuals between 3 and 33 years of age in the United States (1) and are a large source of morbidity for the nearly 3 million people who sustain nonfatal injuries annually (2). Increasing the correct use of occupant restraint devices and decreasing alcohol-related driving (that is, driving while under the influence of alcohol or riding with drivers who are under the influence of alcohol) are among the most important strategies to effectively reduce motor vehicle–related fatalities (3–8). Overall, occupant restraint use has been increasing and is considered a public health success (9). All 50 states currently have laws requiring child safety seats for infants and children, and 49 states and the District of Columbia have adult seat belt laws (10). Although belt-positioning booster seats reduce the risk for injury by nearly 60% for children 4 to 7 years of age (11) compared with seat belts, 22 states do not have any laws pertaining to booster seats. All 50 states, the District of Columbia, and Puerto Rico have laws that make it illegal to drive with a blood alcohol concentration of 0.08 g/dL or higher (9), and rates of alcohol involvement among fatal crashes have decreased during the past 2 decades (12).

Despite widespread regulation and overall increases in safer motor vehicle–related behaviors, recent crash data show that more than 50% of fatalities were among unre-

strained occupants and nearly 40% involved alcohol (2). Primary care providers and their staff have many opportunities to intervene with patients about these health behaviors already known to reduce the risk for motor vehicle occupant injuries (MVOIs). Children and adolescents younger than 15 years of age average more than 2 visits per year to office-based physicians, and older adolescents and adults average 2 to 8 visits per year (13). Additional public health strategies, such as closing gaps in current laws (14) and implementing evidence- and population-based approaches (8, 15, 16), will be important to make further improvements in motor vehicle safety behaviors.

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These strategies could include components delivered by primary health care providers or their staff.

Our objective was to systematically assess the evidence on the effectiveness of primary care counseling among people of all ages to increase the correct use of age- and weight-appropriate occupant restraint devices and reduce alcohol-related driving. The Oregon Evidence-based Practice Center (EPC) conducted the review to assist the U.S. Preventive Services Task Force (USPSTF) in updating its 1996 recommendation (17). The full evidence report is available at www.preventiveservices.ahrq.gov. This article summarizes the review's findings.

METHODS

Key Questions

In conjunction with members of USPSTF, we developed an analytic framework (**Appendix Figure 1**, available at www.annals.org) and 4 key questions to guide our evidence review.

Key question 1: Do primary care behavioral counseling interventions for children, adolescents, and adults to increase the correct use of age- and weight-appropriate restraints or reduce driving/riding with drivers under the influence of alcohol reduce morbidity and/or mortality from motor vehicle occupant injuries?

Key question 2: Do primary care behavioral counseling interventions for children, adolescents, and adults lead to increased correct use of age- and weight-appropriate restraints?

Key question 3: Do primary care behavioral counseling interventions for children, adolescents, and adults reduce driving/riding with drivers under the influence of alcohol?

Key question 4: What are the adverse effects of counseling children, adolescents, and adults to correctly use age- and weight-appropriate restraints and reduce driving/riding with drivers under the influence of alcohol?

Key question 1 addressed the direct effect of counseling interventions on actual health risk reductions, whereas key questions 2 and 3 addressed effects on intermediate behavioral outcomes known to lead to health risk reduction. This report did not examine the evidence for the efficacy of health risk reduction for the targeted MVOI-related safety behaviors, because the USPSTF found strong evidence for those relationships in 1996 (17). Correct use is defined by age, weight, and location as recommended by traffic safety organizations (18). **Appendix Table 1** (available at www.annals.org) describes recommended occupant restraint devices for children younger than 9 years of age. Children younger than 13 years of age should ride in the rear of the vehicle. Safety belts with straps across both the lap and shoulder are recommended for children who have outgrown booster seats, as well as for adolescents and adults.

Data Sources

We considered all studies that were included in the 1996 USPSTF recommendation, and we conducted 5 ad-

ditional literature searches that were limited to English-language studies. For the key questions pertaining to occupant restraint use (1 and 2), we searched for relevant studies in MEDLINE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, CINAHL, and Traffic Research Information Service (TRIS) published from 1992 to July 2005. We also searched the bibliographies of 4 systematic evidence reviews that addressed the effectiveness of counseling for occupant restraints in pediatric populations (16, 19–21). For the key questions addressing counseling about driving while under the influence of alcohol (1 and 3), we considered trials that were included in 3 recent systematic evidence reviews (22–24) and searched MEDLINE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, CINAHL, and TRIS for studies published from 2002 to September 2005 to update the searches conducted for those reports.

In 1996, the USPSTF recommendation did not specifically address the effectiveness of counseling patients about riding with someone who was under the influence of alcohol (key question 3) or the harms of counseling (key question 4). To cover these 2 areas, we searched MEDLINE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, CINAHL, and TRIS for studies published from 1966 to July 2005 and MEDLINE and TRIS for studies published from 1966 to September 2005, respectively. Although no key questions were related to cost, we searched the National Health Service Economic Evaluation Database for data published from the database's inception through July 2005. Literature searches are described in detail in **Appendix Table 2** (available at www.annals.org) and were supplemented with outside source material from experts in the field.

Study Selection

Two authors reviewed each abstract for potential inclusion by using the inclusion and exclusion criteria described in **Appendix Table 3** (available at www.annals.org). We conducted 5 searches to cover the separate focus of each key question, and we reviewed all abstracts for potential inclusion for any of the key questions. For all key questions, we included English-language reports of randomized, controlled trials (RCTs) or nonrandomized, controlled clinical trials (CCTs) and comparative observational studies that included patients of any age and were conducted in the United States or other similarly developed countries. Any intervention that included behavioral counseling as 1 of its components was considered. Studies were required to report 1 of the behavioral or health outcomes specified in our key questions and analytic framework or cost-effectiveness outcomes. We excluded studies rated as having poor quality on the basis of the criteria described in the following section.

To be within the scope of the USPSTF, interventions

needed to be feasible for, or conducted in, a primary care setting or be available for primary care referral. Criteria for deciding whether the intervention was feasible for a primary care setting were developed previously by members of the Oregon EPC and the USPSTF. These criteria included 4 domains: 1) how the participant was identified, 2) who delivered the intervention, 3) how the intervention was delivered, and 4) where the intervention was delivered. **Appendix Table 4** (available at www.annals.org) contains a more detailed description of these domains. For an intervention to be feasible for primary care referral, we required that it be conducted in a health care setting or be widely available in the community at a national level (such as a car seat-fitting station within a hospital). We excluded studies that enrolled selected populations (for example, injured or intoxicated patients recruited from an emergency department) that were not representative of patients normally seen in primary care.

Our review did not include programs that counseled risky or harmful alcohol users to reduce alcohol consumption, which was reviewed previously for the USPSTF (22). Rather, we required that alcohol-related counseling interventions target *general* primary care patient populations of any age and specifically advise patients to reduce drinking and driving (not just reduce overall use of alcohol).

Data Extraction and Quality Assessment

Using the USPSTF's study design-specific criteria (25, 26), 2 authors rated the quality of all included studies and those excluded because of quality issues. For randomized, controlled trials, criteria included 1) the initial assembly of comparable groups (based on adequate randomization, including first concealment and whether potential confounders were distributed equally among groups); 2) maintenance of comparable groups (including attrition, crossover, adherence, and contamination); 3) important differential loss to follow-up or overall high loss to follow-up; 4) equal, reliable, and valid measurements (includes masking of outcome assessment); 5) clear definition of interventions; 6) all important outcomes considered; and 7) an intention-to-treat analysis. For nonrandomized, controlled trials or cohort studies, the initial assembly of comparable groups was judged on the basis of consideration of potential confounders, with either restriction or measurement for adjustment. In the analyses of results of nonrandomized studies, adjustment for confounders was a quality criterion. The USPSTF Methods Work Group has defined a 3-category rating of "good," "fair," and "poor" on the basis of these criteria. In general, a good-quality study meets all criteria well. A fair-quality study does not meet, or is not clear that it meets, at least 1 criterion but has no known important limitation that could invalidate its results. A poor-quality study has important limitations. The specifications are not meant to be rigid rules. Rather, they are intended to be general guidelines. Individual exceptions, when explicitly explained and justified, can be made. **Appendix Table 5**

(available at www.annals.org) describes the USPSTF quality criteria in detail.

For all included studies, 1 primary reviewer abstracted relevant information into standardized evidence tables and a second author checked the abstracted data. If the investigators disagreed on study content or quality, a third investigator reviewed the study and the final quality rating was based on agreement between 2 of the 3 reviewers. Studies receiving a final quality rating of "poor" ($n = 23$) were excluded. Major quality problems in studies rated as poor included noncomparable groups at baseline, attrition greater than 40%, and nonblinded outcome assessment by the interventionists or nonstandardized outcome assessment. Because many trials had several methodological problems but were not clearly biased, we rated some included studies as "fair to poor quality." In general, fair-quality studies reported or matched on some important baseline characteristics, measured outcomes by observation, specified correct use, and had lower attrition. Fair- to poor-quality studies often did not report baseline characteristics, used self-reported outcomes, did not specify correct use, and had higher attrition rates.

Data Synthesis and Analysis

We could not conduct quantitative synthesis for any key question because of heterogeneity of intervention methods, populations addressed, and settings. Instead, we qualitatively synthesized our results within categories, focusing first on the age of the population for which MVOI safety behaviors were addressed and second on the setting in which the population was identified and in which the intervention was delivered. Detailed qualitative summaries are reported in the full evidence report and are summarized in this review. For interventions targeting child safety seat use, results were also stratified by whether the program included a demonstration of correct child safety seat use or increased access through a free or discounted distribution program. We calculated absolute differences with 95% CIs for use of restraints between the intervention group and the control group, when sufficient data were reported, by using the RISKDIFF option of the FREQ procedure in SAS, version 8.2 (SAS Institute, Cary, North Carolina). This procedure uses a normal approximation to the binomial distribution to construct asymptotic CIs.

Role of the Funding Source

This research was funded by the Agency for Healthcare Research and Quality (AHRQ) under a contract to support the work of the USPSTF. Members of the USPSTF participated in the initial design and reviewed interim results and the final evidence review. The AHRQ had no role in study selection, quality assessment, or synthesis, although AHRQ staff reviewed interim and final evidence reports and distributed the initial evidence report for external review of content by outside experts, including representatives of professional societies and federal agencies. The final published systematic evidence review on

which this paper is based was revised on the basis of comments from these external reviewers.

RESULTS

We reviewed 1289 abstracts and 155 complete articles for all key questions (**Appendix Figure 2**, available at www.annals.org). Seventeen studies (9 RCTs [27–35] and 8 CCTs [36–43]) reported in 17 articles met our inclusion criteria (**Tables 1 and 2**): 7 from the 1996 USPSTF review, 6 from other systematic reviews or outside sources, and 4 from searches that were conducted for this review. No study that met our inclusion criteria was related to counseling about alcohol-related driving (key question 3) or the harms of counseling (key question 4). **Appendix Tables 6 to 13** (available at www.annals.org) contain detailed evidence on all included studies. Narrative descriptions of individual included studies and a list of excluded articles describing reasons for exclusion are available in the full evidence report (22). **Table 3** summarizes the overall quality of evidence according to USPSTF criteria (20) for each key question.

Key Question 1

Do primary care behavioral counseling interventions for children, adolescents, and adults to increase the correct use of age- and weight-appropriate restraints and reduce driving/riding with drivers under the influence of alcohol reduce morbidity and/or mortality from motor vehicle occupant injuries?

One large, fair-quality, group-level CCT ($n = 286\ 676$) reported the direct effects of behavioral counseling on the incidence of MVOIs among children from birth to 5 years of age (36) (**Table 1**). In the trial, interventions targeting child safety seat use included behavioral counseling components that were delivered in inpatient and primary care settings. These components were tested in the context of multiple, community-wide approaches to reducing MVOIs and other injuries. Investigators measured MVOIs through a hospital surveillance system during the year before the study and for the 2 years during which the injury prevention programs were conducted. During the 2 years of the programs, MVOI rates in the intervention communities decreased, whereas those in the control communities increased. The odds ratio of risk for MVOI during the preintervention period, compared with the intervention period, in the intervention communities was 2.78 times (95% CI, 1.66 to 4.66 times) as large as that for the control communities, after adjustment for socioeconomic status. Given the trial's nature, however, the effect of the clinical counseling components on MVOI reduction cannot be separately determined from community-based approaches. In addition, this trial was conducted in the early 1980s, when the Massachusetts state legislature was debating a child automobile restraint bill and the baseline use of child restraints was 49%, which is much lower than the current prevalence of use. The effects of clinical counseling

about child safety seat use on MVOI in the current, widely regulated environment remain untested. Similarly, we found no study that reported health outcomes of counseling interventions targeting the use of booster seats or safety belts for older children, adolescents, or adults or of interventions targeting alcohol-related driving for any age group.

Key Question 2

Do primary care behavioral counseling interventions for children, adolescents, and adults lead to increased correct use of age- and weight-appropriate restraints?

All 17 included trials reported on the use or correct use of age- and weight-appropriate restraints. Most of these were published during the late 1970s or 1980s, before the widespread enactment of child safety seat or safety belt legislation. Overall, the trials addressed patient populations of all ages, with the most extensive literature involving infants and toddlers up to 4 years of age (6 RCTs [27–32] and 7 CCTs [36–42]) (**Table 1**). One RCT (33) focused on booster seat use among children 4 to 7 years of age, and 3 trials targeted safety belt use among older children, adolescents, or adults (1 CCT [43] and 2 RCTs [34, 35]) (**Table 2**). Across all trials, the tested behavioral counseling interventions comprised a wide range of educational approaches, including counseling by clinicians, written materials, films on automotive safety, live demonstrations of child safety seat use, and group-level informational sessions. Five trials included both educational components and the distribution of a free or reduced-cost child safety seat (29, 31, 39, 40) or booster seat (33). One trial included education plus behavioral reinforcement components (28). Interventions were conducted in primary care outpatient clinics and inpatient maternity wards (where clinicians encounter mothers of newborn infants) or met the criteria for being feasible for delivering in primary care or for referral for primary care. **Table 1** describes trials among infants and children up to 4 years of age and stratifies the studies by setting and time of delivery (antepartum period vs. during well-child care). Interventions also varied in other characteristics, such as who delivered the counseling or the intensity of the counseling. All trials had methodological flaws (7 fair-quality and 10 fair- to poor-quality trials), and none were of good quality according to the USPSTF criteria. Because trial characteristics were highly heterogeneous and study quality was limited, we did not quantitatively combine results across any of the trials.

Results varied widely among the trials targeting increased use of child safety seats among infants and toddlers up to 4 years of age. The largest absolute differences in use between intervention and control groups (47% to 72%) were reported in 3 of 4 trials that assessed interventions of combined education with distribution of a child safety seat (2 RCTs [29, 31] and 1 group-level CCT [39]). In these trials, the interventions were delivered either during the end of pregnancy or during the peripartum hospitalization

Table 1. Summary of Studies Evaluating Counseling to Increase the Use of Infant and Child Safety Seats during Pregnancy or after Birth to Age 4 Years*

Study, Year (Reference)	USPSTF Quality Rating†	Study Design	Sample Size, n	Timing and Setting	Groups and Intervention Components
Primary care setting during WCC visits					
Guyer et al., 1989 (36)	Fair	Group CCT	286 676 (14 communities in Massachusetts)	Immediate postpartum and WCC visits (1, 9, 12 mo); peripartum hospitalization, pediatric clinics, and community settings	IG: Concurrent implementation of 5 injury prevention projects conducted in health care settings and the community; components targeting infant and child safety seat use included tailored injury counseling by pediatricians during WCC visits for children up to age 5 years using Framingham Safety Surveys and promotion of infant safety seat restraints for infants leaving maternity hospitals and in preschool-age children CG: None of the 5 injury prevention projects were implemented; population had incidental participatory exposure to MVOI-related interventions: 14% at baseline, 34% at 2 y after intervention Exposure to the intervention was assessed through telephone survey
Kelly et al., 1987 (27)	Fair to poor	RCT	171	6-, 9-, 12-mo WCC visits; primary care clinic	IG: Tailored safety information targeting multiple injury prevention behaviors given by physician at 6-, 9-, and 12-mo WCC visits CG: Routine safety information as part of WCC visits
Liberato et al., 1989 (28)	Fair to poor	Group RCT	6 randomly assigned clinics; samples of 900 children at 3 time points	WCC visits for children age 0–4 y; county primary care clinics	IG: Parking lot warnings, brief advice, rewards for use; distribution of stickers and cups, information and presentation with distribution of sunshades in waiting rooms; bulletin boards displayed information; clinic staff (not physicians) provided verbal reinforcement and incentives when subject arose; monthly 1-h meetings with health educator; lottery drawing of car seat CG: Patients received usual care in maternity and WCC clinics on the importance of safety seats
Reisinger et al., 1981 (37)	Fair	CCT	269	Immediate postpartum and WCC visits (1 and 2 mo); peripartum hospitalization and pediatric clinics	IG: Counseling by pediatrician at postpartum hospital stay and WCC visits at 1 and 2 mo. Pamphlet, formal prescription at postpartum visit; tailored message at 1 and 2 mo; demonstration by pediatrician of seat use at 1 mo CG: Received educational messages that did not include car seat use
Scherz, 1976 (38)	Fair to poor	CCT	500	4-wk WCC visit; WCC in U.S. Army medical center	IG4: Display, pamphlet, 1–5 min with physician-pediatrician encouraging purchase of infant car seat IG3: Display, pamphlet, 1–2 min with registered nurse encouraging purchase of infant car seat CG: No stimulus

to newly postpartum women. These large differences in use or correct use were measured at the initial follow-up either immediately after hospital discharge (29, 31) or 9 months after the intervention (39). The effects were diminished at subsequent follow-up measurements (1% to 43%). Several methodological limitations may have led to an overestimate of effect size among these trials. The 2 RCTs included very small samples ($n = 14$ and 30), and the third trial measured outcomes by self-report, did not specify correct use, and excluded 13% of infants eligible for the intervention group because their caregivers did not accept the car seat loan. In contrast to these findings, a fourth trial that also assessed an intervention of education plus child safety seat distribution reported a small difference in correct use of child safety seats between the intervention and control groups (absolute difference, 5% to 7%) (40).

Of the remaining trials targeting children up to 4 years of age, 4 trials (3 fair-quality [36, 37] or fair- to poor-

quality [38] CCTs and 1 fair- to poor-quality RCT [27]) evaluated counseling by pediatricians during well-child care. Two trials measured follow-up at 2 months and reported an increase in restraint use, ranging from an absolute difference between the intervention and control group of 13% to 21% (37, 38). Trials that reported initial or repeated follow-up later than 2 months reported that use was similar between the intervention and control groups (absolute difference, 2% to 6%) (27, 36, 37). The remaining trials targeting child safety seat use varied in setting, when the intervention was delivered, and results, and each had multiple methodological flaws (all were rated fair to poor quality) (28, 30, 32, 42). Among the trials targeting increased use of infant or child safety seats, a demonstration of correct child safety seat use was an intervention component of trials reporting larger increases in use or correct child safety seat use. More specifically, among the 8 trials that included a demonstration of correct child safety

Table 1—Continued

Outcome Measured for Assessment	Observation Time Point	Results (IG vs. CG)	Absolute Difference (IG vs. CG) (95% CI), percentage points‡	Comments
Self-reported use of child safety restraints from random-digit dialing survey of approximately 5% of population	Before intervention 2 y after intervention	Restraint use: 49.1% vs. 49.6% Restraint use: 65.0% vs. 63.3% (<i>P</i> = NR)	1.7	Unable to calculate attrition or CIs
Motor vehicle–related injury or death assessed through injury surveillance at hospitals	Before intervention During 2-y intervention	Age-adjusted MVOI rates per 10 000 children: 46.54 vs. 44.53 Age-adjusted MVOI rates per 10 000 children: 21.54 vs. 60.77 OR, 2.78 (95% CI, 1.66 to 4.66)§	−39.23 MVOIs per 10 000 children	
Self-reported use of restraints (calculated from reported riding without restraints)	6 mo after first visit	33% vs. 30% (<i>P</i> = NS)	3 (−15 to 20)	Improvement in percentage usually sitting in front seat (33% vs. 53%; <i>P</i> ≤ 0.05); 36% attrition at 6 mo
Observed use (calculated from nonuse)	Baseline 6 mo 12 mo (after program began; follow-up among sampled individuals varied)	IG, 25.1%; CG, 12.2% IG, 37.7% ; CG, 10.9% IG, 35.3% ; CG, 30.0%¶	NA	Included incentives and rewards; medically indigent population, 66.9% minority; attrition NA because outcome was assessed among 3 samples, not entire study population
Observed correct use	1 mo 2 mo 4 mo 15 mo	38% vs. 31% 50% vs. 29% 47% vs. 43% 56% vs. 50% <i>P</i> = NR	7 (−4 to 19) 21 (10 to 33) 4 (−8 to 17) 6 (−8 to 19)	Mostly white, middle and upper middle class population; 0% attrition at 1 mo, 5% attrition at 2 mo, 11% attrition at 4 mo, and 23% attrition at 15 mo
Self-reported correct use	8 wk after intervention	IG4: 22% IG3: 22% CG: 9% <i>P</i> < 0.001 overall <i>P</i> < 0.001 for IG3 and IG4 vs. IG1, IG2, and CG	13 (3 to 23)	0% attrition at 8 wk (suspicious for reporting error); 43% attrition at 9–12 mo (results not included)

Continued on following page

seat use (28, 29, 31, 37, 39–42), 6 reported increases in child safety seat use (absolute differences, 17.8% to 72%) (28, 29, 31, 37, 39, 42). Five trials did not include a demonstration of correct use as part of the intervention (27, 30, 32, 36, 38), and only 1 of these (a fair- to poor-quality CCT [38]) reported an increase in use.

Investigators of 1 fair- to poor-quality RCT evaluated an intervention to increase the use of booster seats among primarily low-income, African-American children 4 to 7 years of age (33). The intervention consisted of brief (5-minute) educational counseling by a certified car seat technician in an emergency department setting, delivered either with or without a free booster seat, and was compared with a usual care control group. On the basis of self-reported data at 1 month after the intervention was delivered, 98% of families in the education plus distribution group reported using a booster seat, compared with 5.5% of fami-

lies in the other 2 groups (control or education only) combined (*P* < 0.001). The trial had several methodological problems that could have introduced bias, including high overall attrition (35%), differential attrition across treatment groups (40%, 39%, and 25%), self-reported outcomes, and analysis of only the completers. In addition, families who reported using a booster seat when presenting to the emergency department were not eligible for inclusion. Therefore, the magnitude of benefit from the education plus distribution programs in a general primary care population cannot be directly determined from these findings.

Investigators of 3 trials evaluated safety belt use among children, adolescents, or adults. Of these, 1 fair-quality CCT reported short-term improvement in observed seat belt use in the intervention group compared with the control group immediately after the intervention (38% vs. 5%;

Table 1—Continued

Study, Year (Reference)	USPSTF Quality Rating†	Study Design	Sample Size, n	Timing and Setting	Groups and Intervention Components
Primary care setting during antepartum period only					
Alvarez and Jason, 1993 (29); study 2	Fair	RCT	14	Antepartum period; outpatient prenatal clinic	IG1: Educational counseling about infant safety seats by unspecified prenatal provider in last month of pregnancy; list of available infant and toddler restraints; infant safety seat loan; demonstration of correct use IG2: Same as IG1, but infant safety seat loan was available at the 6-wk postpartum visit
Serwint et al., 1996 (30)	Fair to poor	RCT	156	Antepartum period; pediatric clinic	IG: Prenatal visit scheduled with a pediatrician between 32 and 36 wk of gestation; counseling by a pediatrician on multiple anticipatory guidance topics CG: Welcome letter and general brochure about pediatric practice; no visit scheduled
Peripartum inpatient setting only					
Christophersen and Sullivan, 1982 (31)	Fair	RCT	30	Immediate postpartum period; peripartum hospitalization	IG: Free loaner infant safety seat just before discharge, with demonstration of correct use CG: Usual care
Lindqvist, 1993 (39)	Fair to poor	Group CCT	3 community hospitals in Sweden; 1157 persons	Immediate postpartum period; peripartum hospitalization	IG: Free loaner infant safety seat, demonstration of correct use, videotape CG: Usual care
Reisinger and Williams, 1978 (40)	Fair	CCT	1103	Immediate postpartum period; peripartum hospitalization	IG3: Pamphlets, free car seat, demonstration of correct use (<i>n</i> = 265) CG: Usual care (<i>n</i> = 272)
Tietge et al., 1987 (41)	Fair to poor	CCT	93	Immediate postpartum period; peripartum hospitalization	IG2: 14-min video from Physicians for Automotive Safety (including demonstration of proper use of infant safety seat) and 5-min, face-to-face instruction session, which included practice by participant IG1: Viewed video CG: Given no safety seat information
Referable to primary care; education courses					
Barone, 1988 (32)	Fair to poor	RCT	79 couples or individuals	Unspecified; hospital-affiliated course for parents of toddlers	IG: Viewed home safety slides; slides addressing water temperature, smoke detectors, and child restraints; 6-min film on crash tests of restrained and unrestrained children; received education packet and digital thermometer CG: Viewed home safety slides only
Goodson et al., 1985 (42)	Fair to poor	Group-level CCT	163	Antepartum period; hospital-based prenatal class	IG: 30-min lecture by social worker with discussion and demonstration of correct use of infant safety seat; 10-min film by the Insurance Institute for Highway Safety; question-and-answer session; brochures CG: Usual cursory mention of child passenger safety

* ANOVA = analysis of variance; CCT = controlled clinical trial; CG = control group; CI = confidence interval; IG = intervention group; MVOI = motor vehicle occupant injury; NA = not applicable; NR = not reported; NS = not significant; OR = odds ratio; RCT = randomized, controlled trial; SES = socioeconomic status; USPSTF = U.S. Preventive Services Task Force; WCC = well-child care.

† The USPSTF quality criteria are described in Appendix Table 5, available at www.annals.org.

‡ Absolute differences are reported in percentage points, unless otherwise noted.

§ Adjusted for SES.

|| *P* < 0.005 from baseline.

¶ *P* not significant from baseline.

P < 0.001), but investigators analyzed only children and adolescents who were not wearing seat belts when arriving to the visit (43). Investigators of the remaining 2 trials measured seat belt use at 6 to 36 months of follow-up and reported that use was similar between intervention and control groups at these times (34, 35). Among these trials, the most intensive seat belt intervention was tested in the Dartmouth Prevention Project (34), a large, fair-quality, cluster-randomized RCT evaluating an office-based struc-

tured prevention intervention delivered to 3145 fifth- and sixth-grade children. Counseling by a pediatrician or nurse practitioner during well-child care visits was supplemented by a contract for a family policy, reinforcement of the message at subsequent office visits over 36 months, written materials mailed to the home, and telephone calls alternately targeting the parent and child. No statistically significant differences were found in the proportion of children who reported always wearing seat belts during the

Table 1—Continued

Outcome Measured for Assessment	Observation Time Point	Results (IG vs. CG)	Absolute Difference (IG vs. CG (95% CI), percentage points‡	Comments
Observed correct use	Discharge	86% vs. 14% ($P \leq 0.01$)	72 (35 to 100)	Included infant safety seat distribution through loan program; low-income, Hispanic population; 0% attrition at discharge, 0% attrition at 6 wk after discharge
	6 wk after discharge	57% vs. 14% ($P = NS$)	43 (–2 to 88)	
Self-reported use during last ride	2 mo after birth	77% vs. 86% ($P = NS$)	–9 (–23 to 6)	Intervention addressed multiple other anticipatory guidance topics; low-income, primarily African-American population; 32%–33% attrition at 2 mo
Observed correct use	Discharge	67% vs. 0% ($P \leq 0.05$)	67 (43 to 91)	0% attrition at discharge; 10% attrition at 4–6 wk after discharge
	4–6 wk after discharge	29% vs. 23% ($P = NS$)	6 (–27 to 38)	
Self-reported use	9 mo	96.2% vs. 49.4% ($P = NR$)	46.8 (42 to 52)	Excluded 13% of infants in intervention group who did not accept car seat loan; 14% attrition at 9 mo, 15% attrition at 15 mo
	15 mo	98.7% vs. 97.6% ($P = NR$)	1.1 (–1 to –3)	
Observed correct use	Discharge	11% vs. 6% ($P = NR$)	5 (–0.4 to 10)	15% attrition at discharge, 34% attrition at 2–4 mo after discharge
	2–4 mo after discharge	28% vs. 21% ($P = NR$)	7 (–1 to 17)	
Observed correct use	Discharge	IG2 vs. CG: 74.2% vs. 63.3% IG1 vs. CG: 68.8% vs. 63.3% (1 × 3 ANOVA NS)	IG2 – CG: 10.9 IG1 – CG: 5.5	16% minority; 73% had at least some college education; 27% attrition at discharge; unable to calculate 95% CIs for absolute difference because raw data NR
Observed correct use	Unclear	100% vs. 100%	0	100% use in population may be due to high SES, educated study population; 0% attrition, but timing of outcome assessment is unclear; unable to calculate CIs for 0% difference
Self-reported use during last ride	4–6 mo after birth	96.1% vs. 78.3% ($P \leq 0.001$)	17.8 (6 to 29)	Results were not different at 1 of the 2 hospitals where both IG and CG reported high use (97.5%–100%); 17% attrition at 4–6 mo after birth

previous month at the 12-, 24-, or 36-month follow-up (odds ratios, 0.87, 0.96, and 0.89, respectively [all 95% CIs include 1.0]).

For all age groups, the volume and quality of research were inadequate to quantitatively address questions about essential elements of efficacious interventions, other positive outcomes from behavioral counseling interventions addressing seat belt use, or maintenance of MVOI safety behaviors after behavioral counseling interventions. The complexity of the type of restraint device needed (for example, child safety seat, booster seat, or safety belt) and receptivity of the patient because of differences in age influence the type of intervention that may be needed. These issues were not specifically addressed in the studies.

Key Question 3

Do primary care behavioral counseling interventions for children, adolescents, and adults reduce driving/riding with drivers under the influence of alcohol?

Our searches found no studies of primary care interventions evaluating behavioral counseling in general populations to reduce driving while under the influence of alcohol or riding with drivers who are under the influence of alcohol.

Key Question 4

What are the adverse effects of counseling children, adolescents, and adults to correctly use age- and weight-appropri-

Table 2. Summary of Studies Evaluating Counseling to Increase the Use of Occupant Restraints among Children Age 4 Years or Older, Adolescents, and Adults*

Study, Year (Reference)	USPSTF Quality†	Study Design	Sample Size, n	Timing and Setting	Groups and Intervention Components
Age 4–8 y					
Gittleman et al., 2006 (33)	Fair to poor	RCT	225	During ED visit; ED	IG1: Certified car seat technician delivered a 5-min instruction on importance of booster seats, correct use, how to obtain a booster seat, and where to go for a fitting station IG2: Same as IG1, plus received free booster seat with proper installation and instructions CG: Standard discharge instructions from the ED
Age 9–19 y					
Stevens et al., 2002 (34)	Fair	Group RCT (cluster randomization)	12 clinics (3145 children)	34 contacts over 36 mo; WCC visits to pediatrician office	IG: Received counseling from pediatrician, contract for family policy, letter, reminders at follow-up visits, biannual telephone calls alternating parent and child, brochure, newsletters for parents (12) and children (12) on gun safety, seat belt use, bicycle helmet use CG: Received all the same contacts as the IG with the information targeting alcohol and tobacco use
Macknin et al., 1987 (43)	Fair	CCT	385	Single contact; WCC visits	IG: Physician-pediatrician asked a screening question about seat belt use; if yes—positive reinforcement; if no—give facts about seat belt use, and a contract promising use was signed by patient and physician CG: No mention of seat belt
Adults					
Hempel, 1992 (35)	Fair to poor	RCT	360	Single contact, Primary care center	IG: Viewed a 6-min film explaining why one should wear seat belts; nurse practitioner gave an appeal to wear seat belts based on her personal conviction CG: Viewed a 6-min film on general preventive health care guidelines with no mention of seat belts

* CCT = controlled clinical trial; CG = control group; ED = emergency department; IG = intervention group; NR = not reported; NS = not significant; OR = odds ratio; RCT = randomized, controlled trial; SES = socioeconomic status; USPSTF = U.S. Preventive Services Task Force; WCC = well-child care.

† The USPSTF quality criteria are described in Appendix Table 5, available at www.annals.org.

ate restraints and reduce driving/riding with drivers under the influence of alcohol?

Our searches found no studies of adverse effects of counseling to use age- and weight-appropriate restraints or reduced driving while under the influence of alcohol or riding with drivers who are under the influence of alcohol.

DISCUSSION

The evidence for reducing the risk for injury and death when using recommended motor vehicle occupant restraints has been previously demonstrated to be strong. The current prevalence of restraint use is near the Healthy People 2010 goal of 100% use for infants and is more than 90% for children age 1 to 3 years (44). Incorrect use, however, remains common in these age groups and diminishes the level of protection provided. Restraint use is less prevalent among children 4 to 7 years of age, among whom premature advancement to seat belts increases the risk for injuries and among adolescents and adults (20% to 25% nonuse in these age groups) (45).

The available scientific literature provides fair evidence that, among infants and children up to 4 years of age, behavioral counseling interventions have been effective in increasing short-term correct use of infant and child safety seats at the time of hospital discharge or within 2 months after initially delivering the intervention. Effects have subsequently diminished, in many cases because use increases over time in groups without intervention. Many of the successful interventions included a demonstration of correct safety seat use. The largest effect sizes were seen among the trials that included a safety seat distribution program through a reduced-cost loan or giveaway program. Several interventions that did not include distribution programs, however, were also effective, at least in the short term.

Most of the studies included in this review had multiple methodological flaws, and no study was of good quality according to the USPSTF criteria. Some of the better-quality trials that were most relevant to the primary care setting were nonrandomized, controlled trials conducted during the late 1970s to 1980s, when many states first

Table 2—Continued

Outcome Measured for Assessment	Observation Time Point	Results (IG vs. CG)	Absolute Difference (IG vs. CG) (95% CI), percentage points	Comments
Self-reported booster seat use	1-mo post-ED visit	IG1 vs. CG: 8.7% vs. 1.3% ($P = \text{NS}$) IG2 vs. CG: 98.2% vs. 1.3% ($P = \text{NR}$) IG2 vs. IG1 and CG: 98.2% vs. 5.5% ($P \leq 0.001$)	7.4 (–3 to 16) 96.9 (90 to 100) 92.7	Families who used booster seats at baseline were excluded from trial; study families all resided in low SES ZIP codes; 71%–77% African American; 35% attrition at 1 mo; differential attrition across groups
Self reported use	12 mo 24 mo 36 mo	OR (CG vs. IG), 0.87 (CI, 0.73 to 1.04) ($P = 0.12$) OR (CG vs. IG), 0.96 (CI, 0.79 to 1.15) ($P = 0.65$) OR (CG vs. IG), 0.89 (CI, 0.73 to 1.09) ($P = 0.27$)	Unable to calculate because use was NR for either CG or IG at any follow-up time point	Children were in 5th or 6th grade when enrolling in study; baseline use 72%–74% in both groups; 31% attrition reported at all 3 time points; cannot calculate attrition at individual follow-up time points
Observed use	Postvisit	Those not wearing previsit vs. wearing postvisit: IG, 38%; CG, 5% ($P < 0.001$)	Unable to calculate	Enrolled children age 5–19 y; baseline use was 61%–63% in both groups; predominantly white, middle class; 0% attrition at postvisit, 35% attrition at 1 y
Self-reported seat belt use	1 y	IG, 62%; CG, 67% ($P = \text{NS}$)	–5 (–20 to 10)	
Seat belt use assessed through questionnaire using a linear scale	Baseline 6 mo	22% vs. 20% 37.3 vs. 33.6% ($P = \text{NS}$)	3.7 (–8 to 16)	Rural, primarily indigent population; 25% attrition at 6 mo

began passing child seat restraint laws. Some studies reported observed prevalence of correct use of child safety seats in fewer than 10% of the study population. Awareness and attitudes about restraint use differed greatly from current awareness and attitudes. Experts in the field, including authors of previous evidence reviews, have expressed concern about the limited quality and lack of recent studies in this body of evidence (19, 20, 46), especially given the magnitude of public health burden.

Because of recently revised safety recommendations, only 28 states currently have laws that apply to children in booster seats, and most of these do not cover all children up to age 8 years (10). We found few relevant data describing the effectiveness of primary care clinician counseling of children or parents on the use of booster seats. One recent trial conducted in an emergency department setting demonstrated a large increase in self-reported use among low-income families that received both education and a free booster seat (33). The intervention, however, was delivered by certified car seat technicians who had undergone intensive training, and it required the distribution of a free booster seat to be effective. Translating these findings to

the primary care setting is not yet tested. Few adequate-quality trials have evaluated counseling to increase seat belt use among older children, adolescents, and adults.

We found no research addressing the effect of behavioral counseling interventions delivered to unselected patients in primary care to reduce alcohol-related driving or riding with an impaired driver. The USPSTF, however, has previously recommended screening and brief interventions for alcohol misuse in primary care (47), and these interventions may also improve alcohol-related MVOIs. Among the trials included in the systematic review on primary care screening and interventions for risky and harmful alcohol use that were prepared to support the USPSTF recommendation (22), 1 RCT found a reduction in the self-reported rate of driving after drinking among risky or harmful alcohol users who received an intervention to reduce alcohol use (48). Another RCT of a similar intervention reported a reduction in motor vehicle crashes with nonfatal injuries in a subanalysis of adults 18 to 30 years of age (49). More than 80% of alcohol-impaired driving episodes are reported by people who also reported binge drinking (50). Thus, screening all patients for alco-

Table 3. Summary of Evidence Quality, by Key Question*

Key Question	Age Group	Overall USPSTF Quality†	Summary of Results
KQ1			
Occupant restraint use	Infants and children (age 0–4 y)	Fair	1 fair-quality, group-level CCT (36) reported a lower incidence of MVOI among children age 0–5 y in intervention communities compared with control communities during the 2-y study period.
	Children (age 4–8 y), older children, adolescents, and adults	Poor	No trials
Alcohol-related driving	All ages	Poor	No trials
KQ2			
	Children (age 0–4 y)	Fair	13 trials (6 RCTs [27–32] and 7 CCTs [36–42]), all fair or fair to poor quality, demonstrate evidence of short-term, increased correct use of child safety seats at discharge or at 2 mo and diminished effects at later initial or follow-up time points. Several trials reporting successful interventions included a demonstration of correct child safety seat use, and the trials demonstrating the largest effects included education plus a child safety seat distribution program (29, 31, 39). Most trials were conducted before the widespread enactment of child safety seat legislation.
	Children (age 4–8 y)	Fair to poor	1 fair to poor-quality RCT of an education plus booster seat distribution program reported a large increase in booster seat use at 1 mo after an intervention (33).
	Older children or adolescents (age 9–19 y)	Fair	2 fair-quality trials (1 CCT [43] and 1 RCT [34]): The CCT reported increased observed use of seat belts immediately after the visit among those not using them when arriving to clinic. The RCT reported no difference in self-reported use at 12-, 24-, and 36-mo of follow-up in an intensive, office-based behavioral counseling intervention targeting 5th and 6th graders.
	Adults	Fair to poor	1 fair to poor-quality RCT (35) reported no difference between the intervention and control groups.
KQ3	All ages	Poor	No trials
KQ4	All ages	Poor	No trials

* CCT = controlled clinical trial; KQ = key question; MVOI = motor vehicle occupant injury; RCT = randomized controlled trial; USPSTF = U.S. Preventive Services Task Force.

† The USPSTF quality criteria are described in Appendix Table 5, available at www.annals.org.

hol misuse and then intervening with risky and harmful users (instead of counseling all primary care patients about reducing alcohol-related driving) may be the best evidence-based approach that is currently available for primary care clinicians.

Interventions to reduce MVOIs are complex, involving both regulatory approaches and behavioral counseling through community-based and clinical settings. Furthermore, the complexity of behavioral counseling approaches changes as the individual ages (complex restraint systems for infants and children, inherent risk-taking behavior for adolescents, and established behaviors for adults). Although primary care behavioral counseling interventions to increase correct age- and weight-appropriate restraint use among infants and toddlers may increase short-term use of restraints, these effects may diminish over time. Effective interventions included education, demonstration of correct use, and child safety seat distribution programs and were tested during a time of growing cultural support and increasing regulatory requirements for child safety restraint use. Data from primary care studies were lacking for interventions to increase the use of belt-positioning booster seats for children 4 to 8 years of age, an area where interventions are needed because of lower use and gaps in cur-

rent child safety seat legislation. Similarly, no interventions targeting drivers 16 to 24 years of age, a known high-risk group, were available. Data describing the effects of behavioral counseling interventions among adults were also limited. Across age groups addressed, recent or good-quality trials for any MVOI-related safety behaviors were lacking. Many of the available studies were conducted when restraint use was less common, and the studies in populations with higher baseline use did not show improvements in restraint use, suggesting a possible ceiling effect. Misuse of child safety restraints remains common and diminishes their effectiveness.

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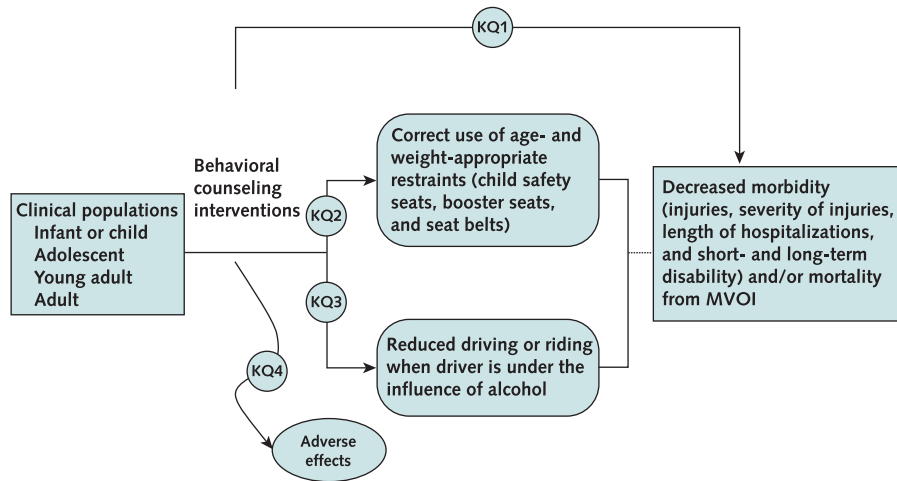
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51. National Highway Safety Transportation Administration Dictionary of Child Safety Seat Terms. Accessed at www.nhtsa.gov on 16 March 2006.

Appendix Figure 1. Analytic framework.



KQ = key question.

Appendix Table 1. Recommendations for Child Safety Seats Based on Age and Weight*

Population	Age; Weight	Seat Type; Position†
Infants	Birth to at least 1 y; ≤20 lb <1 y; 20–35 lb	Infant-only seats or convertible seats; rear-facing seat‡, positioned in the back seat§
Toddlers or preschoolers	1–4 y; ≥20 lbs to ≈40 lb	Convertible seats; rear-facing seat‡, positioned in the back seat§ Convertible seat ; forward-facing or forward facing–only seat or high-back booster seat with harness, positioned in the back seat§
Young children	4 to at least 8 y, unless height is 4'9" (57")	Belt-positioning booster seat or high-back, belt-positioning booster seat; positioned in the back seat

* Data from reference 18.

† Types of child safety seats are defined in Appendix Table 2. Consult the National Highway Traffic Safety Administration General Child Seat Use Information for other essential use specifications (18).

‡ Rear-facing child safety seat must not be placed in the front passenger seat of any vehicle equipped with an airbag on the front passenger side. Death or serious injury can occur from the impact of the airbag against the child safety seat.

§ Seats should be secured to the vehicle by the safety belts or a “lower anchor and tether for children” (LATCH), which is available in some cars.

|| Select a convertible seat that is designed for heavier infants.

Appendix Table 2. Search Strategy

Search Strategy

Key questions 1 and 2: Restraints, 1992–July 2005*

1. Seat Belts/
2. Automobile restraint\$.ti,ab.
3. Back seat.ti,ab.
4. Booster seat\$.ti,ab.
5. Car restraint\$.ti,ab.
6. Car safety.ti,ab.
7. Car seat\$.ti,ab.
8. Carseat\$.ti,ab.
9. Child restraint\$.ti,ab.
10. Child seat\$.ti,ab.
11. Front seat.ti,ab.
12. Infant restraint\$.ti,ab.
13. Lap belt\$.ti,ab.
14. Rear seat.ti,ab.
15. Safety belt\$.ti,ab.
16. Safety restraint\$.ti,ab.
17. Safety seat\$.ti,ab.
18. Seat belt\$.ti,ab.
19. Seatbelt\$.ti,ab.
20. Shoulder belt\$.ti,ab.
21. Vehicle restraint\$.ti,ab.
22. belt position\$.ti,ab.
23. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
24. health education/
25. Health promotion/
26. Mothers/ed [Education]
27. Behavior therapy/
28. Counseling/
29. Directive counseling/
30. Parents/ed [Education]
31. Patient education/
32. Physician's Role/
33. Student health services/
34. Teaching Materials/
35. "Wounds and Injuries"/pc [Prevention & Control]
36. advice.ti,ab.
37. advise.ti,ab.
38. counsel\$.ti,ab.
39. intervention\$.ti,ab.
40. motivational interview\$.ti,ab.
41. 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 (379 486)
42. 23 and 41
43. limit 42 to english language
44. limit 43 to (comment or news)
45. 43 not 44
46. limit 45 to yr="1992 - 2005"

Key questions 1 and 3: Riding with alcohol-impaired drivers, 1966–July 2005*

1. passenger\$.ti,ab.
2. riding.ti,ab.
3. rider.ti,ab.
4. riders.ti,ab.
5. 1 or 2 or 3 or 4
6. alcohol.mp.
7. alcoholic.mp.
8. drinking.mp.
9. drinker\$.ti,ab.
10. intoxicate\$.ti,ab.
11. drunk.ti,ab.
12. impaired.ti,ab. and (driver\$ or driving).mp.
13. 6 or 7 or 8 or 9 or 10 or 11 or 12
14. 5 and 13
15. health education/
16. Health promotion/

Appendix Table 2—Continued

17. Mothers/ed [Education]
18. Behavior therapy/
19. Counseling/
20. Directive counseling/
21. Parents/ed [Education]
22. Patient education/
23. Physician's Role/
24. Student health services/
25. Teaching Materials/
26. "Wounds and Injuries"/pc [Prevention & Control]
27. advice.ti,ab.
28. advise.ti,ab.
29. counsel\$.ti,ab.
30. intervention\$.ti,ab.
31. motivational interview\$.ti,ab.
32. 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 (379 486)
33. 14 and 32
34. limit 33 to english language
35. limit 34 to (comment or editorial or letter or news)
36. 34 not 35
37. from 36 keep 1-71

Key questions 1 and 3: Alcohol and driving, 1999–September 2005*

1. Alcohol Drinking/
2. Alcoholic Intoxication/
3. Alcoholism/
4. Drinking Behavior/
5. alcohol.ti,ab.
6. alcoholic.ti,ab.
7. drink.ti,ab.
8. drinking.ti,ab.
9. drinker\$.ti,ab.
10. drunk.ti,ab.
11. intoxicate\$.ti,ab.
12. under the influence.ti,ab.
13. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 (167 771)
14. Accidents, traffic/
15. Automobile driving/
16. automobile\$.ti,ab.
17. drive.ti,ab.
18. driver.ti,ab.
19. drivers.ti,ab.
20. driving.ti,ab.
21. vehicle\$.ti,ab.
22. vehicular\$.ti,ab.
23. 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
24. Health education/
25. Health promotion/
26. Behavior therapy/
27. Counseling/
28. Directive counseling/
29. Patient education/
30. Physician's Role/
31. Student health services/ (
32. Teaching Materials/
33. advice.ti,ab.
34. advise.ti,ab.
35. counsel\$.ti,ab.
36. intervention\$.ti,ab.
37. motivational interview\$.ti,ab.
38. 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37
39. 13 and 23 and 38
40. Accident Prevention/
41. "Wounds and Injuries"/pc [Prevention & Control]
42. 40 or 41
43. 13 and 42

Continued

Continued

Appendix Table 2—Continued

44. 39 or 43
45. limit 44 to english language
46. limit 45 to animals
47. limit 46 to humans
48. 46 not 47
49. 45 not 48
50. (news or comment).pt.
51. 49 not 50
52. limit 51 to yr="2002 - 2005"
53. from 52 keep 1-235

Key question 4: Harms, 1966–September 2005†

1. risk compensation.ti,ab.
2. risks compensation.ti,ab.
3. risk homeostasis.ti,ab.
4. offsetting behavio\$.ti,ab.
5. risk\$ driv\$.ti,ab.
6. reckless driv\$.ti,ab.
7. driv\$ recklessly.ti,ab.
8. compensating behavio\$.ti,ab.
9. behavio?r\$ compensation.ti,ab.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. health education/
12. health promotion/
13. mothers/ed
14. behavior therapy/
15. counseling/
16. directive counseling/
17. parents/ed
18. patient education/
19. physician's role/
20. student health services/
21. teaching materials/
22. "wounds and injuries"/pc
23. advice.ti,ab.
24. advise.ti,ab.
25. counsel\$.ti,ab.
26. intervention\$.ti,ab.
27. motivational interview\$.ti,ab.
28. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 (391 108)
29. 10 and 28
30. limit 29 to english language
31. from 30 keep 1-61

Cost, through September 2005‡

1. Automobile restraint
2. Back seat
3. Booster seat
4. Car restraint
5. Car safety
6. Car seat
7. Carseat
8. Child restraint
9. Child seat
10. Front seat
11. Infant restraint
12. Lap belt
13. Rear seat
14. Safety belt
15. Safety restraint
16. Safety seat
17. Seat belt
18. Seatbelt
19. Shoulder belt
20. Vehicle restraint
21. Belt position
22. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21

Appendix Table 2—Continued

23. alcohol
24. drinking
25. drinker
26. intoxicate
27. drunk
28. impaired
29. under the influence
30. 23 or 24 or 25 or 26 or 27 or 28 or 29
31. driver
32. driving
33. vehicle
34. automobile
35. 31 or 32 or 33 or 34
36. 30 and 35
37. 22 or 36
38. health education
39. Health promotion
40. Patient education
41. Physician's Role
42. advice
43. advise
44. counsel
45. intervention
46. 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45
47. 37 and 46

* MEDLINE, Cochrane Central Registry of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, CINAHL, and Traffic Research Information Service.

† MEDLINE and Traffic Research Information Service.

‡ National Health Service Economic Evaluation Database.

Continued

Appendix Table 3. Inclusion and Exclusion Criteria for Motor Vehicle Occupant Injury Prevention

Inclusion criteria

Intervention: Study evaluates a behavioral counseling intervention targeting restraint use (including safety seats, booster seats, seat belts, correct use, and seat location) or alcohol-impaired driving or riding
 Age groups: All age groups
 Outcomes: Use and correct use of age- and weight-appropriate restraints; decreased alcohol-impaired driving or riding with alcohol-impaired drivers; decreased morbidity or mortality of occupants in motor vehicle accidents; harms from counseling

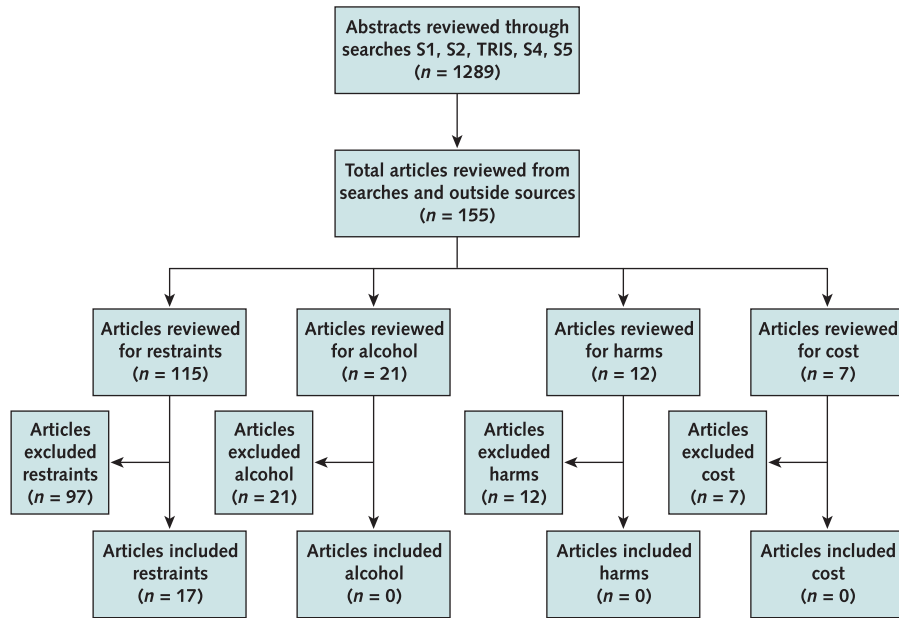
Exclusion criteria

Nonhumans
 Non-English-language abstract
 Study does not evaluate a behavioral counseling intervention targeting restraint use or alcohol-impaired driving or riding with alcohol-impaired drivers
 Setting: Intervention not done in primary care, not feasible for primary care, or not widely available for primary care referral, as described in Appendix Table 4
 Population: Selective population not normally seen in primary care (e.g., patients recruited from emergency department or other specialty setting who are injured or intoxicated and do not represent a general patient population)
 Country: Study not conducted in a country with United Nations human development index similar to U.S. population
 Outcomes: Does not report designated outcomes (see above)
 Study quality: Does not meet U.S. Preventive Services Task Force criteria for quality
 Study designs: Editorials, letters, non-systematic reviews, non-comparative studies, case-control studies

Appendix Table 4. Criteria for Interventions Judged to Be Relevant or Feasible to Primary Care

Variable	Criteria
Whom targeted?	Involve individual-level identification of being a patient or being in need of intervention
Who delivered?	Usually involve primary care clinicians (physicians in family practice, internal medicine, obstetrics-gynecology, pediatrics, general practitioner); other physicians, nurses, nurse practitioners, physician assistants, or related clinical staff (dietitians, health educators, other counselors) in a direct or indirect way; or, at least, the participant would see the intervention as connected to the health care system
How delivered?	To individuals or in small groups (≤15 persons); does not involve only or primarily group-level interventions outside the primary care setting to achieve behavioral changes; generally involves no more than 8 group sessions, and an intervention period no longer than 12 months
Where delivered?	Could be delivered anywhere (including via the Web, interactive technologies, and in the home) if linked to primary care as above

Appendix Figure 2. Search results and article flow by behavior.



S = search; TRIS = Traffic Research Information Service.

Appendix Table 5. U.S. Preventive Services Task Force Study and Quality Rating Criteria*

Systematic reviews

Quality rating criteria

Comprehensiveness of sources considered or search strategy used

Standard appraisal of included studies

Validity of conclusions

Timeliness and relevance are especially important

Definition of ratings from above criteria

Good: Recent, relevant review with comprehensive sources and search strategies; explicit and relevant selection criteria; standard appraisal of included studies; and valid conclusions

Fair: Recent, relevant review that is not clearly biased but lacks comprehensive sources and search strategies

Poor: Outdated, irrelevant, or biased review without systematic search for studies, explicit selection criteria, or standard appraisal of studies

RCTs and cohort studies

Quality rating criteria

Initial assembly of comparable groups

RCTs: Adequate randomization, including first concealment and whether potential confounders were distributed equally among groups

Cohort studies: Consideration of potential confounders with either restriction or measurement for adjustment in the analysis; consideration of inception cohorts

Maintenance of comparable groups (includes attrition, crossover, adherence, contamination)

Important differential loss to follow-up or overall high loss to follow-up

Measurements: equal, reliable, and valid (includes masking of outcome assessment)

Clear definition of the interventions

All important outcomes considered

Analysis: Adjustment for potential confounders for cohort studies or intention-to-treat analysis for RCTs

Definition of ratings from above criteria

Good: Meets all criteria: comparable groups are assembled initially and maintained throughout the study (follow-up $\geq 80\%$); reliable and valid measurement instruments are used and are applied equally to the groups; interventions are defined clearly; all important outcomes are considered; and appropriate attention to confounders in analysis. In addition, for RCTs, intention-to-treat analysis is used.

Fair: Any or all of the following problems have occurred, without the fatal flaws noted in the "poor" category below: Generally comparable groups are assembled initially, but some question remains whether some (although not major) differences occurred with follow-up; measurement instruments are acceptable (although not the best) and are generally applied equally; some but not all important outcomes are considered; and some but not all potential confounders are accounted for. Intention-to-treat analysis is done for RCTs.

Poor: Any of the following fatal flaws are present: Groups assembled initially are not close to being comparable or maintained throughout the study, unreliable or invalid measurement instruments are used or are not applied at all equally among groups (including not masking outcome assessment), and key confounders are given little or no attention. For RCTs, intention-to-treat analysis is lacking.

* Data are from references 25 and 26. RCT = randomized, controlled trial.

Appendix Table 6. Included Studies: Children Age 0 to 4 Years*

Study, Year (Reference)	Target Behavior	Setting	Study Design; Location; Target Population	Study Population	Baseline Data on Use	Inclusion and Exclusion Criteria	Description of Intervention
PC setting during WCC visits							
Guyer et al., 1989 (36)	Child restraints; age 0–5 y Burns, poisonings, suffocations, falls	PC component and peripartum hospitalization	CCT; 14 communities in Massachusetts; families with children age 0–5 y	n = 286 676 Age: NR % male: NR % minority: NR SES: NR	49% using child restraints	Inclusion: ≥1 child in household age <19 y Exclusion: NR	IG: Concurrent implementation of 5 injury prevention projects conducted in health care settings and the community. Components targeting infant and child safety seat use included injury counseling by pediatricians during WCC visits for children up to age 5 y by using Framingham Safety Surveys and promotion of infant safety seat restraints for infants leaving maternity hospitals and in preschool-age children. CG: None of the 5 injury prevention projects were implemented. (Population had incidental participatory exposure to MVOI-related interventions: 14% at baseline and 34% at 2 y after intervention.) Exposure to the intervention was assessed through telephone survey respondents grouped into 3 groups.
Kelly et al., 1987 (27)	Infant car seat Other behaviors: home safety, such as fires and burns, falls, poisoning; drowning, suffocation, and choking; injuries due to sharp and heavy objects; electrical hazards	PC pediatrics	RCT; New Haven, CT; community hospital PC clinic	Overall: n = 171 Age: NR % male: NR % minority: NR SES: NR IG: n = 85 Maternal age: 23.4 y % male in household: 18 % minority: 96 SES: 91 receiving welfare CG: n = 86 Maternal age: 23.6 y % male in household: 20 % minority: 93 SES: 94 receiving welfare	NR	Inclusion: Attendance at primary care clinic for infant WCC visits Exclusion: Did not continue WCC visits because of poor adherence, moving, or changing to another physician	IG: 3-part series of age-appropriate, tailored safety information requiring active parent participation given by physician at 6-, 9-, and 12-mo WCC visit. CG: Routine safety information was given as part of WCC visits.
Liberato et al., 1989 (28)	Infant and child car seats	PC pediatrics	RCT (randomized clinics); Phoenix, AZ; 6 randomly selected county outpatient care clinics, medically indigent, 66.9% minority	n = 900 people (observed driving in the clinic parking lot) Age: NR % male: NR % minority: NR SES: NR	IG, 25.1%; CG, 12.2%	Inclusion: Parents of children age 0–4 y receiving outpatient care at clinic Exclusion: Did not drive to clinic	IG: Parking lot drivers with unrestrained children (age 0–4 y) were given a printed warning, recommended to obtain a safety seat, and advised to avoid a city citation fee by contacting the health educator who would encourage attendance at a formal class. Drivers with restrained children were given sunshades. Buckle-up stickers and cups with information were distributed in waiting rooms; waiting room presentation participants were given sunshades; bulletin boards displayed information. Clinic staff (not physicians) provided verbal reinforcement and incentives when subject arose. Monthly 1-h meetings by health educator and lottery drawing of a car seat. CG preintervention: Patients received usual care in maternity clinics and WCCs on the importance of safety seats.

Continued on following page

Appendix Table 6—Continued

Study, Year (Reference)	Target Behavior	Setting	Study Design; Location; Target Population	Study Population	Baseline Data on Use	Inclusion and Exclusion Criteria	Description of Intervention
Reisinger et al., 1981 (37)	Infant car seat	PC postpartum and PC WCC visit	CCT; Pittsburgh, PA	Overall: n = 269 Age: NR % male: 0 % minority: NR, "almost entirely white" SES: "middle and upper middle class" IG: n = 127 Age: 27 y % male: 0 % minority: NR CG: n = 142 Age: 26 y % male: 0 % minority: NR	NA	Inclusion: Requested 3 pediatricians within a group practice and came in for ≥1 follow-up visit Exclusion: NR	IG: Received education on infant car seat delivered by physician-pediatrician at postpartum hospital stay and WCC visits at 1 mo and 2 mo. Pamphlet and formal prescription at postpartum visit; tailored message at 1 mo and 2 mo; demonstration by pediatrician of seat use at 1 mo. CG: Received educational messages that did not include car seat use.
Scherz, 1976 (38)	Infant car seats	PC pediatrics	CCT; WCC in a U.S. Army medical center in Tacoma, WA	n = 500 Age: NR % male: NR % minority: NR SES: NR	NR	Inclusion: Attendance at 4-wk WCC visit Exclusion: NR	IG4: Display, pamphlet, 1–5 min with physician-pediatrician encouraging purchase of infant car seat. IG3: Display, pamphlet, 1–2 min from registered nurse encouraging purchase of infant car seat. IG2: Display and pamphlet. IG1: Information display only. CG: No stimulus.
Antepartum PC setting only Alvarez and Jason, 1993 (29); study 2	Infant car seats	PC prenatal visit	RCT; Chicago, IL; low-income Hispanic population	n = 14 Age: NR % male: 0 % minority: 100 SES: 2 single mothers on public assistance, 12 married women whose husbands were laborers	13 of 14 infants were not restrained in a random sample of newborns at same clinic	Inclusion: NR Exclusion: NR	IG1: At a prenatal visit during the last month of pregnancy with an unspecified type of provider, participants received discussion of Illinois child passenger legislation, an explanation of the benefits of automobile restraint devices along with behavior modification strategies for use, a list of available infant and toddler restraints, and a demonstration of appropriate use of 1 type of restraint. At initial visit, participants received an infant automobile restraint device on loan for 5 mo for a \$10 deposit. IG2: Same as above, but the restraint device was made available at the 6-wk postpartum visit instead of during the last month of pregnancy.
Serwint et al., 1996 (30)	Infant car seats	PC prenatal pediatrics Breastfeeding; emergency department visits; circumcision; health maintenance; mother–pediatrician relationship	RCT (block randomization); urban, hospital-based, resident clinic; low-income, primarily African-American families	Overall (n = 156) IG: n = 81 Mean age: 20.2 y (SD, 2.1) % male: 0 % minority: 91 African American SES: 98 (medical assistance) CG: n = 75 Mean age: 20.7 y (SD, 2.5) % male: 0 % minority: 91 African American SES: 95 (medical assistance)	NA	Inclusion: Nulliparous women, age ≥18 y, fetus of gestational age ≤28 wk, not yet selected a pediatrician Exclusion: Admitted to prenatal drug use, had a recognized psychiatric illness, or had HIV	IG: Had a prenatal visit with a pediatrician scheduled between 32 wk and 36 wk of gestation; received a welcome letter to the pediatric clinic with a brochure for proper health care utilization; counseled by a postgraduate year–2 pediatric resident on multiple anticipatory guidance topics if attended visit. CG: Not offered a visit; received card with future pediatrician information, welcome letter, and brochure.
Peripartum inpatient setting only Christophersen and Sullivan, 1982 (31)	Infant car seats	Peripartum hospitalization	RCT; suburban Kansas City, MO, hospital	n = 30 Age: NR % male: 0 % minority: NR SES: NR (see comments)	NA	Inclusion: Delivered a single live-born infant; baby's physician within 10 miles Exclusion: NR	IG: Discharge staff person brought in a free loaner car seat at time of discharge and then offered to demonstrate proper infant placement in seat before leaving room, carrying infant in seat, and correct restraining with lap belt in family's vehicle; if mother declined, no further effort was made. CG: Usual care.

Appendix Table 6—Continued

Study, Year (Reference)	Target Behavior	Setting	Study Design; Location; Target Population	Study Population	Baseline Data on Use	Inclusion and Exclusion Criteria	Description of Intervention
Lindqvist, 1993 (39)	Infant car seats	Peripartum hospitalization	CCT (group-level); Sweden; 3 community hospitals in smaller cities	Overall: n = 1157 Age: NR % male: 0 % minority: NR SES: NR IG: n = 764 SES: 97.9% car ownership CG: n = 393 SES: 96.4% car ownership	NA	Inclusion: Live birth at the participating hospitals during the test period Exclusion: NR	IG: An infant car seat was loaned free of charge during the mother's postpartum inpatient hospitalization; maternity ward staff demonstrated the use of the seat and parents viewed videotape; seats were returned at 9 mo. CG: Usual care.
Reisinger and Williams, 1978 (40)	Infant car seats	Peripartum hospitalization	CCT; Pittsburgh, PA; couples before postnatal discharge	n = 1103 Age: NR % male: 0 % minority: NR SES: NR	NA	Inclusion: Delivered live baby within the study period Exclusion: Babies who were to be adopted, those whose babies died, did not speak English or were deaf, no car ownership, were not discharged before next treatment group was initiated	IG1: Received 2 pamphlets from research staff with training on child safety seat use and given in-room access to purchase car seat; seat delivered to room and correct use demonstrated for women who purchased it. IG2: Same as IG1, but also visit from health educator on use of car seat. IG3: Same as IG1 and offered free car seat. CG: Car seats available for purchase in gift shop.
Tietge et al., 1987 (41)	Infant car seats	PC peripartum hospitalization	CCT; major community hospital in San Diego, CA	n = 93 Age: NR % male: 0 % minority: 16 (calculated value) SES: 73.29% had some college education or more; 65.6% had income ≥\$2000/mo	NA	Inclusion: First-time mothers, gave consent, or were discharged during experimental period Exclusion: Could not verify that participant viewed video, or video was not viewed at discharge	IG2: Watched 14-min video from Physicians for Automotive Safety (including demonstration of proper use of infant safety seat) and 5-min, face-to-face instruction session, which included practice by participant. IG1: Viewed video. CG: Given no safety seat information.
PC-R education courses Barone, 1988 (32)	Car seat	PC-R parent education classes Other behaviors: water temperature, smoke detectors	RCT (group-level); suburban Kansas City, MO, medical center; parents who elected to participate in a continuing education series	Overall: n = 79 couples or individuals IG: n = 41 couples or individuals Mean age: 32 y (mother), 34 y (father) % male: NR % minority: NR SES, education: mean, 2.98† SES, income: mean, 4.7‡ CG: n = 38 couples or individuals Mean age: 32 y (mother), 33 y (father) % male: NR % minority: NR SES, education: mean, 2.87† SES, income: mean, 4.54‡	NR for IG and CG	Inclusion: Participation in toddler education class, consented to a home visit and safety assessment, attended health and safety education presentation, lived in dwelling where they could control the setting of the water heater, not engaged in major water use 2 h before home visit Exclusion: NR	IG: Viewed home safety slides; slides addressing water temperature, smoke detectors, and child restraints; 6-min film on crash tests of restrained and unrestrained children; received education packet and digital thermometer. CG: Viewed home safety slides only.
Goodson et al., 1985 (42)	Infant car seats	PC-R prenatal classes	CCT (group-level); San Francisco, CA; prenatal couples	Overall: n = 163 Age: NR % male: 0 % minority: NR SES: NR Hospital A: n = 67 Age: NR % male: 0 % minority: 24 SES: Median education, 16 y Hospital B: n = 69 Age: NR % male: 0 % minority: 77 SES: Median education, 12 y	Seat belt use of parents: hospital A, 6% never wear; hospital B, 38% never wear	Inclusion: Attendance at hospital prenatal class Exclusion: No car ownership	IG: Half-hour lecture given by social worker, including a discussion; demonstration of correct use of infant safety seat with a doll; 10-min film by the Insurance Institute for Highway Safety that illustrated crash results of unrestrained infant; question-and-answer session; and brochures. CG: Usual cursory mention of child passenger safety.

* CCT = controlled clinical trial; CG = control group; IG = intervention group; MVOI = motor vehicle occupant injury; NA = not applicable; NR = not reported; PC = primary care; PC-R = referable to primary care; RCT = randomized, controlled trial; SES = socioeconomic status; WCC = well-child care.

† SES education of 2 = high school; SES education of 3 = baccalaureate.

‡ SES income of 4 = \$31 000–\$40 000 per year; SES income of 5 = \$41 000–\$50 000 per year.

Appendix Table 7. Included Studies: Children Age 0 to 4 Years, Continued*

Study, Year (Reference)	Goal and Intervention Format	Follow-Up Time Frame	Outcomes	Results	USPSTF Quality Rating
PC setting during WCC visits					
Guyer et al., 1989 (36)	PC, hospital-based, and community-based programs to reduce accidental childhood injuries Parents Individual, unclear Intensity varied Counseled on seating location: unclear	2 y	Behavioral outcomes: Self-reported use of child safety restraints from approximately 5% of population Health outcomes: MVOI rates (age-adjusted); surveillance through hospitals; measured injuries requiring medical treatment in an emergency department or hospitalization or resulting in death Harms measure: NR	Self-reported use: IG: Before, 49.1%; after, 65.0% CG: Before, 49.6%; after, 63.3% <i>P</i> = NR MVOI rates (per 10 000 children): IG: Before, 46.54; during, 21.54 CG: Before, 44.53; during, 60.77 Adjusted OR, 2.78 (95% CI, 1.66–4.66)†	Fair: Baseline characteristics NR, but communities matched on important characteristics; outcomes measured at population level, adjusted for SES
Kelly et al., 1987 (27)	To reduce incorrect child restraint behavior through tailored education Parents Individual, print 3 contacts for 45 min total Counseled on seating location: unclear	6 mo after first visit	Behavioral outcomes: Child riding without restraints or sitting in front seat, assessed through interview or home visit by blinded staff Health outcomes: NR Harms measure: NR	Usually riding without restraint: IG: 67% CG: 70% <i>P</i> = NS Usually sitting in front seat: IG: 33% CG: 53% <i>P</i> < 0.05	Fair to poor: High attrition >30%; analyzed completers only; self-reported outcome; did not specify correct use
Liberato et al., 1989 (28)	To increase car seat use through education, coercion, and incentives Parents of children age 0–4 y Group, individual, print, other Counseled on seating location: no	6 mo, 12 mo	Behavioral outcomes: Observed every third car with a passenger age 0–4 y for car seat use; correct use was not assessed; assumption that the random sampling was representative of seat belt use even though sample was not necessarily the direct recipient of the intervention Health outcomes: NR Harms measure: NR	Safety seat nonuse: IG: 0 mo, 74.9%; 6 mo, 62.3%‡; 12 mo, 64.7%‡ CG: 0 mo, 87.8%; 6 mo, 89.1%; 12 mo, 70.0 (<i>P</i> = NS)	Fair to poor: Unclear whether groups were similar at baseline; observed outcome but did not specify correct use; unclear whether assessor was blinded
Reisinger et al., 1981 (37)	To increase car seat use through education and tailored counseling and modeling Parent Individual, print, modeling 3 contacts over 2 mo; time NR Counseled on seating location: NR	1, 2, 4, and 15 mo	Behavioral outcomes: Observation of correct use of infant car seat upon arrival for WCC visits Health outcomes: NR Harms measure: NR	Observed correctly using restraint: 1 mo: IG, 38%; CG, 31% 2 mo: IG, 50%; CG, 29% 4 mo: IG, 47%; CG, 43% 15 mo: IG, 56%; CG, 50%	Fair: Reported some but not all important baseline characteristics; blinded observation of outcome, correct use specified; 5% attrition at 2 mo and 23% attrition at 15 mo; analyzed completers only
Scherz, 1976 (38)	To increase infant car seat use through various intensities of education Parent Individual, print Counseled on seating location: NR	8 wk	Behavioral outcomes: Correct infant seat use, which included using an approved car seat or car bed attached by seat belt, self-reported on a survey Health outcomes: NR Harms measure: NR	Reported safe car seat use: IG4: 22% IG3: 22% IG2: 8% IG1: 12% CG: 9% <i>P</i> < 0.001 IG3 and IG4 vs. IG1, IG2, and CG: <i>P</i> < 0.001	Fair to poor: Did not report baseline characteristics, report of 100% follow-up at 8 wk is suspicious; 47% attrition at 9–12-mo follow-up (results not shown)
Antepartum PC setting only					
Alvarez and Jason, 1993 (29); study 2	To increase infant car seat use through education, modeling, and access Parent Individual 1 visit Counseled on seating location: NR	Discharge and 6 wk after discharge	Behavioral outcomes: Observed correct use of infant safety seat Health outcomes: NR Harms measure: NR	Proper use at hospital discharge: IG1: 6/7 (86%\$) IG2: 1/7 (14%\$) <i>P</i> < 0.01 Proper use at 6-wk visit: IG1:4/7 (57%\$) IG2:1/7 (14%\$) <i>P</i> = NS	Fair: Outcome assessed by blinded observers; 0% attrition, but very small sample
Serwint et al., 1996 (30)	To see whether prenatal visits to a pediatrician had an effect on health behaviors after birth Parent Individual, print Counseled on seating location: NR	2 mo after birth	Behavioral outcomes: Child did not always use child safety seat in past month, assessed through questionnaire Health outcomes: NR Harms measure: NR	Reported use of car seat at last ride: IG: 77% (<i>n</i> = 54) CG: 86% (<i>n</i> = 51) <i>P</i> = 0.33 Reported ownership of infant car seat: IG: 83% (<i>n</i> = 54) CG: 94% (<i>n</i> = 51) <i>P</i> = 0.15	Fair to poor: High attrition >30%; analyzed completers only; low adherence in IG (57%); self-reported outcome and did not specify correct use
Peripartum inpatient setting only					
Christophersen and Sullivan, 1982 (31)	To increase infant restraint use through demonstration and access to free car seat Parent Format: individual, demonstration, and access 1 contact; time, 2 min—more than time normally needed to discharge patient Counseled on seating location: yes	Discharge and 4–6 wk after birth	Behavioral outcomes: Observed use and correct use of infant car seat Health outcomes: NR Harms measure: NR	Correct use of restraint: Discharge: IG, 67%; CG, 0%‡ 4–6 wk: IG, 29%; CG, 23% (<i>P</i> = NS)	Fair: Observed outcome and low attrition (10% at follow-up), but small sample and other methodological flaws
Lindqvist, 1993 (39)	To increase car seat use through education and tailored counseling and modeling Parent Individual, print, modeling 1 contact; time NR Counseled on seating location: NR	9 mo and 15 mo	Behavioral outcomes: Self-reported use of car seat by questionnaire Health outcomes: Self-report of motor vehicle accidents resulting in injuries during 0–9 mo Harms measure: NR	Reported more or less frequently restrained at 9 mo: IG: 96.2% CG: 49.4% <i>P</i> = NR Reporting car seat use at 15 mo: IG: 98.7% CG: 97.6% <i>P</i> = NR Motor vehicle accident–related injuries during 0–9 mo: No motor vehicle accidents resulted in personal injuries in either group	Fair to poor: Self-reported data and correct use not specified; no effort made to follow up on 13% of infants in intervention group whose mothers did not accept the car seat loan

Appendix Table 7—Continued

Study, Year (Reference)	Goal and Intervention Format	Follow-Up Time Frame	Outcomes	Results	USPSTF Quality Rating
Reisinger and Williams, 1978 (40)	To increase infant restraint use through education and access to car seat, demonstration modeling Parent Format: varied per group: print; individual; access, modeling 1 contact: education component approximately 10 min for IG2 Counseled on seating location: no	Discharge and 2–4 mo after birth	Behavioral outcomes: Observation of correct use of infant carrier (infant car seat restrained with car seat belt) Health outcomes: NR Harms measure: NR	Use at hospital discharge (85.55% sample): CG: 6% IG1: 8% (literature + access) IG2: 8% (literature + access + health education) IG3: 11% (literature + free carrier) Use at follow-up (66.5% sample): CG: 21% IG1: 22% IG2: 20% IG3: 28% P values: NR Baseline for behavior: NR	Fair: Blinded observation of outcome; measured correct use; reported no difference in baseline SES characteristics between groups
Tietge et al., 1987 (41)	To increase infant car seat use through education and modeling Parent Individual, video 1 contact, 19 min total Counseled on seating location: NR	Discharge	Behavioral outcomes: Observed correct use of infant car seat Health outcomes: NR Harms measure: NR	Correct seat use: IG2: 74.2% IG1: 68.8% CG: 63.3% P = NS	Fair to poor: 27% attrition (cannot determine whether differential); analyzed completers only; excluded 5 women in intervention group who did not watch film
PC-R education courses Barone, 1988 (32)	Conflict theory model of decision making; to increase car seat use, compared with control Parent Group One 2-h session Counseled on seating location: unclear	Unclear	Behavioral outcomes: Observed correctly installed car seat Health outcomes: NR Harms measure: NR	Correctly installed car seat: IG: 100% CG: 100% P = NS	Fair to poor: Randomization method unclear; age of children in groups NR; unclear whether outcome assessment was blinded
Goodson et al., 1985 (42)	To increase use of infant car seat through education and modeling Parents Group; film, demonstration, question and answer; one 30-min session Counseled on seating location: NR	4–6 mo after birth	Behavioral outcomes: Use of crash-tested car seat on the last ride self-reported during a telephone interview Health outcomes: NR Harms measure: NR	IG: 96.1% CG: 78.3% P < 0.001	Fair to poor: Baseline characteristics NR; 17% attrition with analysis of completers only; unclear whether outcome assessors were blinded; correct use not specified

* CG = control group; IG = intervention group; MVOI = motor vehicle occupant injury; NR = not reported; NS = not significant; OR = odds ratio; PC = primary care; PC-R = referable to primary care; SES = socioeconomic status; USPSTF = U.S. Preventive Services Task Force; WCC = well-child care.

† Adjusted for SES.

‡ P < 0.05 from baseline.

§ Calculated value.

Appendix Table 8. Included Studies: Children Age 4 to 8 Years and Booster Seat Use*

Study, Year (Reference)	Target Behavior	Setting	Study Design; Location; Population Targeted	Study Population	Inclusion or Exclusion Criteria	Description of Intervention
Gittelman et al., 2006 (33)	Booster seats	PC-F; ED	RCT; urban hospital, pediatric ED; families with children age 4–7 y residing in low-socioeconomic ZIP codes who presented to the ED for any chief complaint and reported not using booster seats	Overall: n = 225 Age: NR % male: NR % minority: NR SES: 77.2% had Medicaid and 9.8% were self-pay; all participants resided in ZIP codes representing low socioeconomic communities IG1: n = 75 Mean age: 66.2 mo % male: 52 % minority: 71 African American SES: All participants resided in ZIP codes representing low socioeconomic communities IG2: n = 75 Mean age: 64.4 mo % male: 52 % minority: 76 African American SES: All participants resided in ZIP codes representing low socioeconomic communities CG: n = 75 Mean age: 65.3 mo % male: 52 % minority: 77 African American SES: All participants resided in ZIP codes representing low socioeconomic communities No difference in age, race, sex, or number of children in the home among the study groups	Inclusion: Families with child or children age 4–7 y who weighed 40–80 lb, living in target ZIP codes, presenting with any chief complaint Exclusion: Already used a booster seat; critically ill; primary language not English; no home telephone for follow-up; no automobile at visit or able to return with a automobile the same day of visit	IG1: Education-only; certified car seat technician delivered 5-min instruction on importance of booster seats and their correct use, provided instructions on how to obtain a booster seat and where to go for fitting seats, and answered questions; car seat technicians were trained for 32 h before delivering intervention IG2: Educational and booster seat giveaway; same as IG1, with the addition of a free booster seat properly installed at the end of the visit CG: Standard discharge instructions from the ED

* CG = control group; ED = emergency department; IG = intervention group; NR = not reported; NS = not significant; PC-F = feasible for primary care; RCT = randomized, controlled trial; SES = socioeconomic status.

Appendix Table 9. Included Studies: Children Age 4 to 8 Years and Booster Seat Use, Continued*

Study, Year (Reference)	Intervention Format	Follow-Up Time Frame	Outcomes	Results	USPSTF Quality
Gittelman et al., 2006 (33)	To evaluate the effectiveness of booster seat education for families residing in lower-socioeconomic neighborhoods; ED Parent or child Individual; print, video, demonstration 1 session, 5 min Counseled on seat location: NR	1-mo post-ED visit	Behavioral outcomes: Self-reported booster seat use Health outcomes: NR Harms measure: NR	IG1: 8.7% IG2: 98.2% CG: 1.3% <i>P</i> < 0.001 (IG2 vs. IG1 and CG)	Fair to poor: Groups were similar at baseline for reported characteristics; however, high overall attrition (35%), differential attrition across groups, self-reported outcomes, analyzed completers only, and process measures were not reported

* CG = control group; ED = emergency department; IG = intervention group; NR = not reported; USPSTF = U.S. Preventive Services Task Force.

Appendix Table 10. Included Studies: Children Age 9 to 19 Years*

Study, Year (Reference)	Target Behavior	Setting	Study Design; Location; Population Targeted	Study Population	Baseline Data on Use	Inclusion or Exclusion Criteria	Description of Intervention
Stevens et al., 2002 (34)	Seat belts Other behaviors: alcohol and tobacco use; bicycle helmet use; gun storage	PC	RCT (cluster randomized); 12 rural and urban pediatric PC practices in New England	<i>n</i> = 3145 Age: 11.0/11.0 y % male: 54/50 % minority: NR SES: NR	IG, 74.4%; CG, 71.9%	Inclusion: Fifth- and sixth-grade students attending WCC visits with a parent or guardian Exclusion: Only 1 pair per family could participate	IG: Received counseling from pediatrician during WCC visits; contract for family policy; letter; reminders at follow-up visits; biannual telephone calls alternating parent and child; brochure, newsletters for parents (12) and children (12) on gun safety, seat belt use, and bicycle helmet use CG: Received all the same contacts as the IG, with the information targeting alcohol and tobacco use
Macknin et al., 1987 (43)	Seat belts	PC	CCT; private pediatric group practice; predominantly white, middle class	<i>n</i> = 385 Mean age: 8.35 y % male: NR % minority: NR SES: NR	Pediatricians estimated baseline use <50%	Inclusion: Age 5–19 y; coming in for a WCC Exclusion: NR	IG: Physician-pediatrician asked a screening question regarding seat belt use—if yes, positive reinforcement, and if no, give facts about seat belt use; patient and physician signed a contract promising use CG: No mention of seat belt use was made

* CCT = controlled clinical trial; CG = control group; IG = intervention group; NR = not reported; PC = primary care; RCT = randomized, controlled trial; SES = socioeconomic status; WCC = well-child care.

Appendix Table 11. Included Studies: Children Age 9 to 19 Years, Continued*

Study, Year (Reference)	Intervention Format	Follow-Up Time Frame	Outcomes	Results	USPSTF Quality
Stevens et al., 2002 (34)	To prevent or delay onset of health risk behaviors and enhance safety behaviors Office systems approach Parent and child Individual, print, telephone 34 contacts over 36 mo	12, 24, 36 mo	Behavioral outcomes: Child did not always use seat belt in last month, as assessed through questionnaire Health outcomes: NR Harms measure: NR	ORs (CG to IG): 12 mo: 0.87 (95% CI, 0.73–1.04) <i>P</i> = 0.12 24 mo: 0.96 (CI, 0.79–1.15) <i>P</i> = 0.65 36 mo: 0.89 (CI, 0.73–1.09) <i>P</i> = 0.27	Fair: Reported baseline characteristics and adjusted for several important possible confounding variables; however, self-reported outcomes, 27% attrition, and analyzed completers only
Macknin et al., 1987 (43)	A single, brief physician intervention to increase seat belt use Parent, child, or adolescent Individual, print One contact; time NR Counseled on seat location: NR	12-mo postvisit	Behavioral outcomes: Observed seat belt use: 12-mo follow-up self-report questionnaire of seat belt use Health outcomes: NR Harms measure: NR	Not using seat belt before visit: IG: 63% (calculated value) CG: 61% (calculated value) Not wearing before visit who were wearing after visit: IG: 38% CG: 5% <i>P</i> < 0.001 Reporting seat belt use at 1 y: IC: 62% CG: 67% <i>P</i> = NS	Fair: Reported baseline characteristics and observed outcomes; behavior change analyzed only among those not using seat belts before visit, and very short-term observed follow-up; longer-term follow-up was self-reported, and higher attrition (35%)

* CG = control group; IG = intervention group; NR = not reported; NS = not significant; OR = odds ratio.

Appendix Table 12. Included Studies: Adults*

Study, Year (Reference)	Target Behavior	Setting	Study Design; Location; Population Targeted	Study Population	Inclusion or Exclusion Criteria	Description of Intervention
Hempel, 1992 (35)	Seat belts	PC	RCT; rural primary care center in a primarily indigent area	Overall: n = 360 IG: Mean age: 30 y % male: 22.9 % minority: 0 SES: NR CG: Mean age: 30 y % male: 31.1 % minority: 0 SES: NR	Inclusion: Between ages 14 and 60 y Exclusion: Acutely ill (temperature >101.0 °F, severe pain, mental status changes, or other acute distress), declined to sign a release, or could not comprehend the intervention (intellectual impairment or psychosis)	IG: Viewed a 6-min film explaining why one should wear seat belts; nurse practitioner gave an appeal to wear seat belts on the basis of her personal conviction CG: Viewed a 6-min film on general preventive health care guidelines with no mention of seat belts

* CG = control group; IG = intervention group; NR = not reported; PC = primary care; RCT = randomized, controlled trial; SES = socioeconomic status.

Appendix Table 13. Included Studies: Adults, Continued*

Study, Year (Reference)	Intervention Format	Follow-Up Time Frame	Outcomes	Results	USPSTF Quality
Hempel, 1992 (35)	To increase seat belt use Adult Individual; video 2 contacts totaling approximately 8 min over 6 mo	6 mo	Behavioral outcomes: Seat belt use assessed through questionnaire using a linear scale Health outcomes: NR Harms measure: NR	IG seat belt use: Baseline: 22% 6 mo: 37.3% P < 0.001 CG seat belt use: Baseline: 20% 6 mo: 33.6% P < 0.001 P = NS (between groups)	Fair to poor: High attrition (25%); analyzed completers only; outcome was self-reported and was not well masked

* CG = control group; IG = intervention group; NR = not reported; NS = not significant; USPSTF = U.S. Preventive Services Task Force.

Appendix Table 14. Definitions of Types of Occupant Restraints*

Belt-positioning booster seat (BPB): A platform that raises the child (provides a taller sitting height) so adult lap and shoulder belts fit better; some have high backs as well. Never use with only a lap belt across the child.

Belt-shortening clip or heavy duty locking clip: A heavy-duty locking clip intended for use to shorten lap belts that have emergency locking retractors for use with a child restraint. Not to be confused with standard locking clips, heavy-duty locking clips can only be obtained through a vehicle manufacturer.

Booster seats: Are intended to be used as a transition to lap and shoulder belts by older children who have outgrown convertible seats (weight >40 lb). They are available with high backs, for use in vehicles with low seat backs or no head restraints, and without backs; booster bases only.

Car seat: Common term for a specially designed device that secures a child in a motor vehicle, meets federal safety standards, and increases child safety in a crash.

Child safety seat or child restraint (CSS): A crash-tested device that is specially designed to provide crash protection for an infant or a child. A general term for all sorts of devices, including those that are vests or car beds rather than seats.

Convertible child safety seats or restraints: A child restraint that can be used in more than 1 mode; usually rear-facing for infants and forward-facing for toddlers.

Forward-facing child restraint: A restraint that is intended for use only in the forward-facing position for a child at least age 1 year and at least 20 lb but up to 40 lb.

Infant-only restraint: A restraint designed only for use for a baby (usually weighing <17–22 lb) in a semi-reclined, rear-facing position.

Integral or integrated child seat: A child-sized, forward-facing restraint or belt-positioning booster built into a vehicle seat. Some have a full harness and hold children more than 20 lb; others are belt-positioning boosters for use with the adult lap and shoulder belts.

Lap belt: A safety belt anchored at 2 points for use across the occupant's thighs or hips.

Lap/shoulder belts: A safety belt that is anchored at 3 points and restrains the occupant at the hips and across the shoulder; also called a *combination belt*.

Rear-facing infant seat: Type of child restraint system that is specifically meant for use by children from birth up to approximately 20 lb and should be used in the rear-facing mode only.

Seat belt-positioning devices: Products marketed and sold to adjust the vehicle seat belt to fit a child. There are no federal safety standards for these products. The NHTSA recommends the use of child safety seats and booster seats instead of these products.

* Definitions are from reference 51. NHTSA = National Highway Traffic Safety Administration.