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Outcomes after injury prevention counseling in a pediatric office setting: A 25-year review

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Manuscripts

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3 Outcomes after injury prevention counseling in a pediatric office setting: A 25-year review
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ABSTRACT

Objective

Injury is the leading cause of death and acquired disability in children. Primary care providers (PCPs) routinely provide age-appropriate injury prevention (IP) counseling during healthcare visits. The objective was to review all evaluations of the effectiveness of office-based pediatric injury prevention counseling research studies.

Design

This review identified studies from July 1991 through June 2016 of children ≤ 5 years and their caretakers to determine the effectiveness of office-based counseling on IP knowledge, behaviors, and outcomes. Studies were included if they had: 1) an intervention for a family with a child < 5 years of age; 2) an unintentional injury mechanism addressed during counseling; 3) one or more mechanisms recommended to be discussed for children < 5 years in the 2007 AAP Policy Statement; 4) counseling occurring in the office setting; 5) an assessment of an outcome (e.g. change in knowledge, behavior, or injury occurrences), and 6) English-language publication. Study characteristics (whether or not the study was controlled, randomized, and/or blinded), target safety behaviors, the sample size, outcomes assessed (injuries, behavior changes, and/or education changes), and demonstrated effects were summarized.

Results

Sixteen articles met inclusion criteria. Twelve were randomized controlled trials, 3 were non-randomized trials, and 1 was a pre-posttest study. Fourteen measured a change in knowledge or reported behavior, 4 included observed behavior change, and 5 measured change in injury outcomes. Thirteen of the 16 studies had positive effects demonstrated for certain outcomes.

Conclusions

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3 Published outcomes-based IP-related counseling research in the primary care setting for young
4 children is infrequent, and additional research is necessary to further describe the effectiveness of
5 these primary prevention efforts.
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10 11 12 13 14 15 16 17 INTRODUCTION

18 19 Background

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21 Injuries continue to cause more deaths in US children than all non-communicable and infectious
22 diseases combined.¹ However, these deaths are only a small part of the problem. For every child
23 that dies, approximately 25 children are hospitalized and 925 are treated in emergency
24 departments, costing close to \$300 billion annually to US citizens.^{2,3} Injury prevention (IP)
25 advocates continue to find ways to address this problem through new product innovations,
26 passing legislation, or making environments safer for children. Another technique is to educate
27 families about potential age-appropriate risks so that caregivers are aware of potential hazards,
28 and they can implement preventative strategies. Primary care providers (PCPs) have typically
29 been tasked with screening families for risk of unintentional injuries and providing age-
30 appropriate safety counseling. Professional societies and national task forces encourage PCPs to
31 have these conversations at every office encounter.⁴⁻⁶ The American Academy of Pediatrics
32 (AAP), in its Bright Futures recommendations for health maintenance, recommends specific
33 topics for injury prevention counselling at each well-child visit (Bright Futures reference).
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3 Several factors make the provision of IP counselling during well-child visits challenging. Lack
4 of time during visits, a plethora of recommended topics that need to be addressed, and little
5 training in and comfort with IP counseling have been cited as barriers.⁷⁻⁹ Also, with no
6 reimbursement by insurance companies for these efforts, injury prevention conversations may be
7 less emphasized and given less time during visits. To overcome some of these barriers physicians
8 have tried providing tailored messages through cellphone applications, computerized kiosks or
9 standardized screening tools.¹⁰⁻¹⁴ However, despite recommendations and because of the barriers
10 and the inconsistent strategies employed among PCPs, IP screening and counseling is
11 infrequently employed.
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26 Gaps remain in our understanding about what works in an office setting to promote safe
27 behaviors and prevent future injuries. In 1993, Bass and colleagues published a critical review of
28 the literature regarding the effectiveness of IP counseling in the primary care setting.¹⁵ They
29 found that the published evidence at that time demonstrated that counseling resulted in greater
30 knowledge, less risky behaviors, and a reduction in injury occurrence. The purpose of this paper
31 is to present a review of the injury prevention literature published in the quarter century since the
32 Bass publication in order to examine new research and evidence on the effectiveness of office-
33 based IP counseling encouraging behavior changes and prevention of injuries to children ≤ 5
34 years of age.
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49 METHODS

50 Study team

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3 Four authors and one study research assistant completed the review. All authors have had recent
4 leadership roles in the AAP's Council on Injury, Violence and Poison Prevention and each has
5 contributed extensively to the injury prevention literature.
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10 11 12 Article Selection

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14 The goal of the project was to review all evaluations of the effectiveness of office-based
15 pediatric injury prevention counseling research studies that were published after Bass' article.
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17 (REF) Using Google Scholar, the study team identified all peer-reviewed articles published
18 between July 1, 1991 and June 1, 2016 that referenced the Bass article. Since Bass' article was
19 instrumental in showing patient behavior change and injury reduction following pediatric office
20 counseling, we began with all published studies that cited the report by Bass. All articles chosen
21 were initially vetted by one research assistant to ensure they met inclusion criteria. These criteria
22 included: 1) an intervention for a family with a child <5 years of age; 2) an unintentional injury
23 mechanism addressed during counseling; 3) one or more mechanisms recommended to be
24 discussed for children < 5 years in the 2007 AAP Policy Statement; 4) counseling occurring in
25 the office setting; 5) an assessment of an outcome (e.g. change in knowledge, behavior, or injury
26 occurrences), and 6) English-language publication.. One-time behavioral surveys and other
27 observational study designs were not included. Age less than or equal to 5 years was chosen in
28 order to focus on preschoolers who spend a significant amount of time at home. Also, children of
29 this age commonly attend well-child visits with their parent/guardian and these caregivers are the
30 ones that would primarily be making the behavior change after receiving counseling. Full
31 manuscripts of those identified by the research assistant were then reviewed by the four authors
32 to ensure that all inclusion criteria were met and to resolve any discrepancies. Conflicts between
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3 reviewers on design or outcome were discussed as a team and resolved by consensus. After the
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5 initial articles were chosen, references of all articles that met inclusion were reviewed and they
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7 went through the same process as above.
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11 In order to be as inclusive as possible, the study team also performed a literature review using
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13 key search terms to attempt to ensure that all office-based injury prevention counseling papers
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15 with an outcome that met our inclusion criteria were reviewed. The key words chosen included:
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17 a) counseling or "anticipatory guidance," b) unintentional injury or safety, c) child or childhood
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19 or pediatric or paediatric or children, and d) office-based. All duplicate articles were deleted and
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21 the remaining articles were independently reviewed by the authors to assess for eligibility and
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23 discussed by the team to alleviate any controversies. A complete flow chart of the search strategy
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25 can be found in Figure 1.
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33 Determination of Study Characteristics and Outcomes 34 35 36 37

38 After the literature search was completed, the study characteristics (whether or not the study was
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40 controlled, randomized, and/or blinded) and outcomes assessed (injuries, behavior changes,
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42 and/or education changes) were summarized. Also summarized were the target safety behaviors,
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44 the sample size, and any demonstrated effect.
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49 RESULTS 50

51 From the search of articles that referenced the Bass article, we identified 14 studies that met our
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53 inclusion criteria, and from our keyword search, we identified 2 additional articles that met
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3 inclusion criteria.¹⁶⁻³¹ Of the 16 articles, 12 were randomized controlled trials, 3 were non-
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5 randomized trials, and 1 was a pre-posttest study. (Table 1) The investigators were blinded in 5
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7 of the studies, but participants were not blinded in any. Fourteen studies measured a change in
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9 knowledge or reported behavior change, 4 included observed behavior change, and 5 measured
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11 changes in injury outcomes. The most common topics covered were fall prevention, poison
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13 prevention, burn prevention, fire safety, and traffic safety. (Table 2). Thirteen of the 16 studies
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15 had positive effects demonstrated for certain outcomes, while 10 showed no differences between
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17 study groups for other outcomes.
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26 DISCUSSION

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28 In this update to the 1991 Bass article, we found increasingly rigorous evidence of the benefit of
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30 office-based injury prevention counseling on the promotion of injury prevention knowledge, self-
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32 reported safe behaviors, and injury outcomes for children aged ≤ 5 years. In particular, there was
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34 increased knowledge and self-reported safe behaviors surrounding fire and burn safety
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36 (fireguards, smoke alarms, electric outlets), home safety (locks on cupboards, door slam devices,
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38 windows, stairs, walkers, bathing, cribs) and road traffic safety (helmets, car seats, seat belts).
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40 Notably, nearly all the studies focused on knowledge and behaviors and not injury outcomes, the
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42 gold standard for injury-related outcomes research.
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49 Our study is subject to several limitations. Perhaps most important is the possibility of
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51 publication bias. Just as in all reviews, negative studies are more likely to remain unpublished.
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54 Investigators may be more motivated to write and journals may be more interested in publishing
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3 articles that found an effect of IP counseling. To the extent that this is true in this case, our work
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5 may be biased towards reporting a more favorable effect of IP counseling than truly exists. It is
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7 also possible that we did not find all eligible studies in our search. We attempted to prevent this
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9 through a systematic approach, including the use of broad search terms initially and inspection of
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11 the references of papers. We also reviewed all articles that cited the original Bass paper. We
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13 also limited our search to English language publications which may have excluded articles of
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15 value from non-English journals. We only reviewed studies that provided evidence of IP
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17 counseling for children aged ≤ 5 years.
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24 We conclude that, in the past quarter century since the review of the same topic by Bass, there is
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26 accumulating evidence of the benefit of IP counseling done in the clinical setting on the
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28 knowledge, self-reported safety behaviors and injury outcomes among children aged ≤ 5 years.
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30 Given the magnitude of the problem of childhood injury and its contribution to child morbidity
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32 and mortality, clinicians who care for children should continue to provide such counseling to
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34 protect their patients. Further research should be undertaken to better refine what aspects of
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36 counseling are most effective for different injury types.
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41 **What is already known on this subject**

- 42 • Primary care providers (PCPs) routinely provide injury prevention counseling during
43 healthcare visits
- 44 • One prior review in 1993 by Bass et al supported the inclusion of injury prevention
45 information in the pediatric primary care setting
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48 **What this study adds**

- 49 • This is the first contemporary review of studies from 1991 through 2016 focused on
50 office-based counseling on IP knowledge, behaviors, and outcomes
- 51 • Published outcomes-based IP-related counseling for young children in the primary care
52 setting is infrequent, but the majority of the existing studies demonstrated effectiveness
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Competing interests None declared.

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Table 1: Study characteristics and outcomes

	Study characteristics			Outcomes assessed		
	Controlled	Randomized intervention	Investigators Blinded	Educational (including reported behaviors)	Behavioral (observed)	Injuries
Clamp et al, 1998	X			X		
Kendrick et al, 1999	X	X	X	X		X
Gielen et al, 2001	X	X		X	X	
Nansel et al, 2002	X	X		X		
Mock et al, 2003	X			X		
Tan et al, 2004	X	X	X	X		X
Watson et al, 2005	X	X		X	X	X
McDonald et al, 2005	X	X		X		
Kendrick et al, 2005	X	X	X	X		
Sangvai et al, 2007	X	X	X		X	X
Pless et al, 2007	X	X		X	X	
Nansel et al, 2008	X	X	X	X		
Powell et al, 2010	X	X		X		
van Beelen et al, 2014	X	X		X		
Franz et al, 2014				X		
Brixey et al, 2014	X					X

Table 2: Target injuries, sample size, and effects demonstrated

	Target safety behaviors	Sample size	Positive effect demonstrated	No effect demonstrated
Clamp et al, 1998	<ul style="list-style-type: none"> • Fire, electric outlet, sharp object, poison safety, and injuries from doors 	<ul style="list-style-type: none"> • 165 	<ul style="list-style-type: none"> • Use of fireguards, smoke alarms, electric outlet covers, locks on cupboards, and door slam devices • Safe practice in storage of sharp objects and medicines, and safety regarding windows, fireplaces, sockets, smoke alarms, and door slams. 	<ul style="list-style-type: none"> • No differences in proportion of families regarding stairway safety behavior or storage of cleaning materials
Kendrick et al, 1999	<ul style="list-style-type: none"> • Any unintentional injury seen at an emergency department • Equipment provided: stair gates, fireguards, cupboard locks, smoke alarms. 	<ul style="list-style-type: none"> • 1124 intervention • 1028 control 	<ul style="list-style-type: none"> • More confident in dealing with choking incidents and more likely to know correct action for bleach ingestion 	<ul style="list-style-type: none"> • No difference in injury frequencies • No difference in secondary outcome measures • No differences between in scores for perceptions of risk of injury or risk of hazards
Gielen et al, 2001	<ul style="list-style-type: none"> • Hot water, smoke alarm, baby walker, stair, poison, safety 	<ul style="list-style-type: none"> • 196 		<ul style="list-style-type: none"> • No differences in knowledge or behaviors
Nansel et al, 2002	<ul style="list-style-type: none"> • Car, burn/fire, drowning, poison, fall 	<ul style="list-style-type: none"> • 85 intervention • 89 control 	<ul style="list-style-type: none"> • Greater adoption of home and car safety behaviors among group receiving tailored information 	
Mock et al, 2003	<ul style="list-style-type: none"> • Bike helmets, hot water temperature, smoke detector, child passenger and road traffic safety 	<ul style="list-style-type: none"> • 1124 children before counselling • 625 after it had been given 	<ul style="list-style-type: none"> • Increase in mean percent safe response scores • Improved use of bicycle helmets in middle and lower socioeconomic groups • Increased use of car seats by children aged 0–4 years in lower socioeconomic group 	<ul style="list-style-type: none"> • Even with improvement, overall use of safety devices suboptimal even after counselling with discrepancies between socioeconomic strata • Minimal to no changes seen regarding knowledge on crossing roads safely, burn and prevention

Tan et al, 2004	<ul style="list-style-type: none"> • Infant walkers 	<ul style="list-style-type: none"> • 708 	<ul style="list-style-type: none"> • Decreased walker use after intervention 	<ul style="list-style-type: none"> • No difference in walker injuries between groups
Watson et al, 2005	<ul style="list-style-type: none"> • Falls, fires, poisoning, window falls 	<ul style="list-style-type: none"> • 3428 families (3995 children) 	<ul style="list-style-type: none"> • More likely to be safe with stairs, smoke alarms, windows, and storage of cleaning products/ sharp objects 	<ul style="list-style-type: none"> • Intervention group had <i>higher</i> attendance rate for injury in primary care but no other differences in injury outcomes seen
McDonald et al, 2005	<ul style="list-style-type: none"> • Smoke alarm, poison, fall, child passenger safety 	<ul style="list-style-type: none"> • 70 intervention • 74 control 	<ul style="list-style-type: none"> • More knowledge about inappropriateness of young children riding in the front seat of a car, less likely to believe that teaching a child to mind you is the best way to prevent injuries, and more likely to report that they have syrup of ipecac and know how to use it.* 	<ul style="list-style-type: none"> • No difference in groups for 7 other safety items and 3 other belief items.
Kendrick et al, 2005	<ul style="list-style-type: none"> • Baby walker safety 	<ul style="list-style-type: none"> • 539 intervention • 635 control 	<ul style="list-style-type: none"> • Less likely to: own or use walker, plan to use walker with their next child, or agree that walkers keep children safe • Some evidence they were less likely to recommend walker to friend or agree that they help children to walk more quickly 	
Sangvai et al, 2007	<ul style="list-style-type: none"> • Child safety seats • Smoke detectors • Safe storage of hazardous substances and poisons • Tap water temperature • Gun storage 	<ul style="list-style-type: none"> • 160 intervention • 159 control 	<ul style="list-style-type: none"> • More likely to have: smoke detectors present and functional and hazardous substances not found in low cabinets 	<ul style="list-style-type: none"> • No difference in rate of medically attended injuries
Pless et al, 2007	<ul style="list-style-type: none"> • Knowledge and behaviors related to window blind cords and cords from clothing drawstrings 	<ul style="list-style-type: none"> • 369 intervention • 439 control 		<ul style="list-style-type: none"> • No difference in behavior (cutting cords) or injury related to window blind cords or clothing drawstrings
Nansel et al, 2008	<ul style="list-style-type: none"> • Car, burn, fall, 	<ul style="list-style-type: none"> • 305 (3 arms) 	<ul style="list-style-type: none"> • More likely to adopt new injury 	

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	poison, airway obstruction, drowning		prevention behavior	
Powell et al, 2010	<ul style="list-style-type: none"> Home – falls, burns, drowning 	<ul style="list-style-type: none"> 371 	<ul style="list-style-type: none"> Increase in education in both groups following discussion 	
van Beelen et al, 2014	<ul style="list-style-type: none"> Falls, poisoning, drowning, burns 	<ul style="list-style-type: none"> 1292 	<ul style="list-style-type: none"> Increase in safe behavior for stairs, storage of cleaning products, bathing of child, drinking of hot fluids, using rear hotplates, and composite safety score 	<ul style="list-style-type: none"> No significant differences for other specific behaviors
Franz et al, 2014	<ul style="list-style-type: none"> Crib, hot water, child passenger safety 	<ul style="list-style-type: none"> 84 (pre-post test) 	<ul style="list-style-type: none"> Increased knowledge 	
Brixey et al, 2014	<ul style="list-style-type: none"> Any unintentional injury 	<ul style="list-style-type: none"> 1368 		<ul style="list-style-type: none"> No difference in groups; very small sample of injured patients

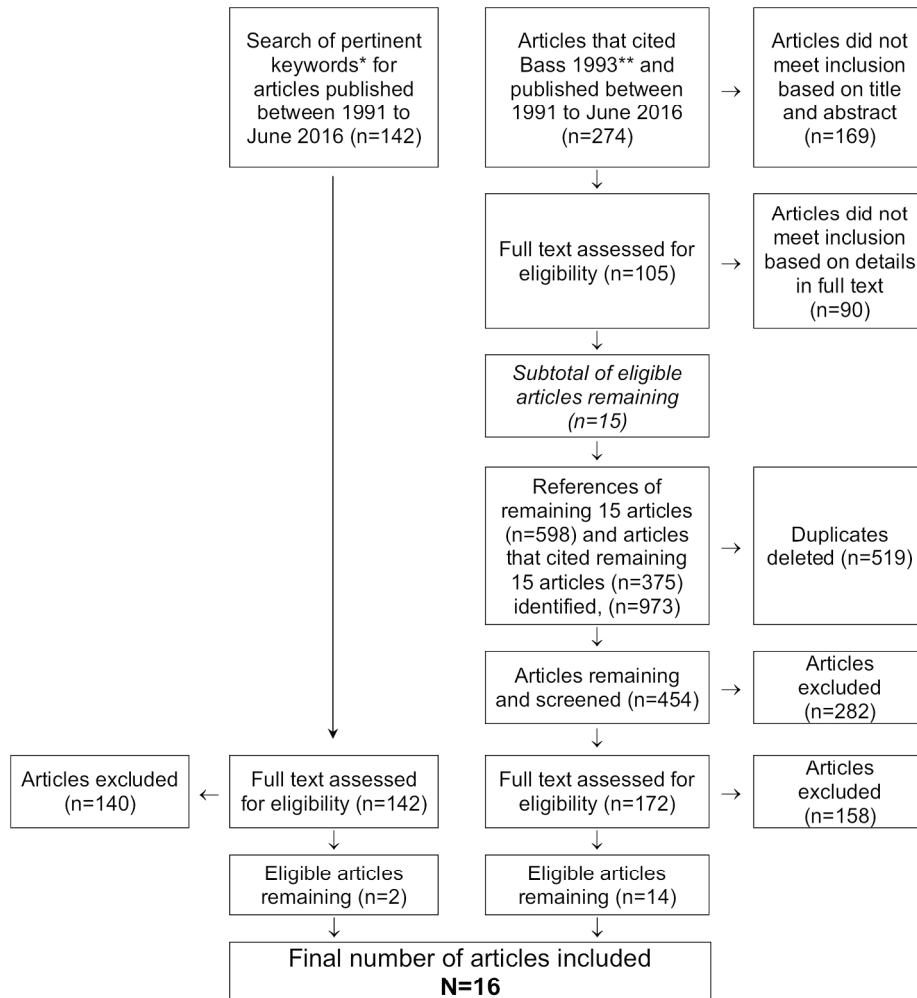
* Note: Since the publication of McDonald et al, 2005, syrup of ipecac has no longer been recommended to be used by parents

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Figure. Flow chart of search strategy

Confidential: For Review Only

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*Keyword search: (counseling or "anticipatory guidance") AND (unintentional injury or safety) AND (child or childhood or pediatric or paediatric or children) AND (office or primary care or clinic) for publications between 7/1/1991 to 6/1/2016

** Bass JL, Christoffel KK, Widome M, et al. Childhood injury prevention counseling in primary care settings: a critical review of the literature. *Pediatrics*. 1993 Oct;92(4):544-50.

186x234mm (300 x 300 DPI)

BMJ Paediatrics Open

Outcomes after injury prevention counseling in a pediatric office setting: A 25-year review

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Keywords:	Injury Prevention, General Paediatrics, Paediatric Practice

SCHOLARONE™
Manuscripts

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3 Outcomes after injury prevention counseling in a pediatric office setting: A 25-year narrative
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5 review
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ABSTRACT

Objective

Injury is the leading cause of death and acquired disability in children. Primary care providers (PCPs) routinely provide age-appropriate injury prevention (IP) counseling during healthcare visits. The objective was to review all evaluations of the effectiveness of office-based pediatric injury prevention counseling research studies.

Design

This review identified studies from July 1991 through June 2016 of children ≤ 5 years and their caretakers to determine the effectiveness of office-based counseling on IP knowledge, behaviors, and outcomes. Studies were included if they had: 1) an intervention for a family with a child < 5 years of age; 2) an unintentional injury mechanism addressed during counseling; 3) one or more mechanisms recommended to be discussed for children < 5 years in the 2007 AAP Policy Statement; 4) counseling occurring in the office setting; 5) an assessment of an outcome (e.g. change in knowledge, behavior, or injury occurrences), and 6) English-language publication. Study characteristics (whether or not the study was controlled, randomized, and/or blinded), target safety behaviors, the sample size, outcomes assessed (injuries, behavior changes, and/or education changes), and demonstrated effects were summarized.

Results

Sixteen articles met inclusion criteria. Twelve were randomized controlled trials, 3 were non-randomized trials, and 1 was a pre-posttest study. Fourteen measured a change in knowledge or reported behavior, 4 included observed behavior change, and 5 measured change in injury outcomes. Thirteen of the 16 studies had positive effects demonstrated for certain outcomes,

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3 including for fall, poisoning, burn, fire, traffic injury, and drowning prevention, while 10 showed
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5 no differences between study groups for other outcomes.
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10 **Conclusions**

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12 Published outcomes-based IP-related counseling research in the primary care setting for young
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14 children is infrequent, and additional research is necessary to further describe the effectiveness of
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16 these primary prevention efforts.
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26 **INTRODUCTION**

27 **Background**

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30 Injuries continue to cause more deaths in US children than all non-communicable and infectious
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32 diseases combined.¹ However, these deaths are only a small part of the problem. For every child
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34 that dies, approximately 25 children are hospitalized and 925 are treated in emergency
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36 departments, costing close to \$300 billion annually to US citizens.^{2,3} Injury prevention (IP)
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38 advocates continue to find ways to address this problem through new product innovations,
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40 passing legislation, or making environments safer for children. Another technique is to educate
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42 families about potential age-appropriate risks so that caregivers are aware of potential hazards,
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44 and they can implement preventative strategies. Primary care providers (PCPs) have typically
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46 been tasked with screening families for risk of unintentional injuries and providing age-
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48 appropriate safety counseling. Professional societies and national task forces encourage PCPs to
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50 have these conversations at every office encounter.⁴⁻⁶ The American Academy of Pediatrics
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3 (AAP), in its Bright Futures recommendations for health maintenance, recommends specific
4 topics for injury prevention counselling at each well-child visit (Bright Futures reference).
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10 Several factors make the provision of IP counselling during well-child visits challenging. Lack
11 of time during visits, a plethora of recommended topics that need to be addressed, and little
12 training in and comfort with IP counseling have been cited as barriers.⁷⁻⁹ Also, with no
13 reimbursement by insurance companies for these efforts, injury prevention conversations may be
14 less emphasized and given less time during visits. To overcome some of these barriers physicians
15 have tried providing tailored messages through cellphone applications, computerized kiosks or
16 standardized screening tools.¹⁰⁻¹⁴ However, despite recommendations and because of the barriers
17 and the inconsistent strategies employed among PCPs, IP screening and counseling is
18 infrequently employed.
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33 Gaps remain in our understanding about what works in an office setting to promote safe
34 behaviors and prevent future injuries. In 1993, Bass and colleagues published a critical review of
35 the literature regarding the effectiveness of IP counseling in the primary care setting.¹⁵ Their
36 study used a panel from an AAP injury panel to review journal articles from May 1964 to July
37 1991 focused on childhood unintentional IP counseling in the primary care setting. Twenty
38 articles met inclusion criteria, 18 of which showed positive effects of counseling, and 15 for
39 which physicians performed counseling. They found that the published evidence at that time
40 demonstrated that counseling resulted in greater knowledge, less risky behaviors, and a reduction
41 in injury occurrence. The purpose of this paper is to present a review of the injury prevention
42 literature published in the quarter century since the Bass publication in order to examine new
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3 research and evidence on the effectiveness of office-based IP counseling encouraging behavior
4 changes and prevention of injuries to children ≤ 5 years of age.
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10 METHODS

11 Study team

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14 Four authors and one study research assistant completed the review. All authors have had recent
15 leadership roles in the AAP's Council on Injury, Violence and Poison Prevention and each has
16 contributed extensively to the injury prevention literature.
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24 Article Selection

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26 The goal of the project was to review all evaluations of the effectiveness of office-based
27 pediatric injury prevention counseling research studies that were published after Bass' article.
28 (REF) Using Google Scholar, the study team identified all peer-reviewed articles published
29 between July 1, 1991 and June 1, 2016 that referenced the Bass article. Since Bass' article was
30 instrumental in showing patient behavior change and injury reduction following pediatric office
31 counseling, we began with all published studies that cited the report by Bass. All articles chosen
32 were initially vetted by one research assistant to ensure they met inclusion criteria. These criteria
33 included: 1) an intervention for a family with a child < 5 years of age; 2) an unintentional injury
34 mechanism addressed during counseling; 3) one or more mechanisms recommended to be
35 discussed for children < 5 years in the 2007 AAP Policy Statement; 4) counseling occurring in
36 the office setting; 5) an assessment of an outcome (e.g. change in knowledge, behavior, or injury
37 occurrences), and 6) English-language publication.. One-time behavioral surveys and other
38 observational study designs were not included. Age less than or equal to 5 years was chosen in
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3 order to focus on preschoolers who spend a significant amount of time at home. Also, children of
4 this age commonly attend well-child visits with their parent/guardian and these caregivers are the
5 ones that would primarily be making the behavior change after receiving counseling. Full
6 manuscripts of those identified by the research assistant were then reviewed by the four authors
7 to ensure that all inclusion criteria were met and to resolve any discrepancies. Conflicts between
8 reviewers on design or outcome were discussed as a team and resolved by consensus. After the
9 initial articles were chosen, references of all articles that met inclusion were reviewed and they
10 went through the same process as above.
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24 In order to be as inclusive as possible, the study team also performed a literature review using
25 key search terms to attempt to ensure that all office-based injury prevention counseling papers
26 with an outcome that met our inclusion criteria were reviewed. The key words chosen included:
27 a) counseling or "anticipatory guidance," b) unintentional injury or safety, c) child or childhood
28 or pediatric or paediatric or children, and d) office-based. All duplicate articles were deleted and
29 the remaining articles were independently reviewed by the authors to assess for eligibility and
30 discussed by the team to alleviate any controversies. A complete flow chart of the search strategy
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45 Determination of Study Characteristics and Outcomes

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49 After the literature search was completed, the study characteristics (whether or not the study was
50 controlled, randomized, and/or blinded) and outcomes assessed (injuries, behavior changes,
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3 and/or education changes) were summarized. Also summarized were the target safety behaviors,
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5 the sample size, and any demonstrated effect.
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10 RESULTS

11 From the search of articles that referenced the Bass article, we identified 14 studies that met our
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13 inclusion criteria, and from our keyword search, we identified 2 additional articles that met
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15 inclusion criteria.¹⁶⁻³¹ Of the 16 articles, 12 were randomized controlled trials, 3 were non-
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17 randomized trials, and 1 was a pre-posttest study. (Table 1) The investigators were blinded in 5
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19 of the studies, but participants were not blinded in any. Fourteen studies measured a change in
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21 knowledge or reported behavior change, 4 included observed behavior change, and 5 measured
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23 changes in injury outcomes. The most common topics covered were fall prevention, poison
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25 prevention, burn prevention, fire safety, and traffic safety. (Table 2).
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33 For fall prevention, 8 of the studies demonstrated positive changes on knowledge or behavior
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35 while 3 did not. Similarly, positive changes for poison prevention were seen in 7 studies, 1 did
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37 not demonstrate any changes in education or behavior, and 1 showed both positive and no effect
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39 for different aspects of poisoning. Regarding burn prevention and fire safety (including hot water
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41 safety, smoke alarms, fireguards, and fireplaces), positive changes in knowledge and/or
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43 behaviors were seen in 7 of the studies, while no effects were demonstrated in 4 of the studies
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45 that measured these outcomes. Changes in traffic safety knowledge or behavior were seen in 4 of
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47 the studies, with one additional study showing positive effects for some aspects of road traffic
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49 safety but minimal to no change with other aspects. Overall, 13 of the 16 studies had positive
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3 effects demonstrated for certain outcomes, while 10 showed no differences between study groups
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5 for other outcomes.
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11 12 13 14 15 DISCUSSION

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17 In this update to the 1991 Bass article, we found increasingly rigorous evidence of the benefit of
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19 office-based injury prevention counseling on the promotion of injury prevention knowledge, self-
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21 reported safe behaviors, and injury outcomes for children aged ≤ 5 years. In particular, there was
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23 increased knowledge and self-reported safe behaviors surrounding fire and burn safety
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25 (fireguards, smoke alarms, electric outlets), home safety (locks on cupboards, door slam devices,
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27 windows, stairs, walkers, bathing, cribs) and road traffic safety (helmets, car seats, seat belts).
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29 Notably, nearly all the studies focused on knowledge and behaviors and not injury outcomes, the
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31 gold standard for injury-related outcomes research.
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38 Our study is subject to several limitations. Perhaps most important is the possibility of
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40 publication bias. Just as in all reviews, negative studies are more likely to remain unpublished.
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42 Investigators may be more motivated to write and journals may be more interested in publishing
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44 articles that found an effect of IP counseling. To the extent that this is true in this case, our work
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46 may be biased towards reporting a more favorable effect of IP counseling than truly exists. It is
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48 also possible that we did not find all eligible studies in our search. We attempted to prevent this
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50 through a systematic approach, including the use of broad search terms initially and inspection of
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52 the references of papers. We also reviewed all articles that cited the original Bass paper. We
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3 also limited our search to English language publications which may have excluded articles of
4 value from non-English journals. We only reviewed studies that provided evidence of IP
5 counseling for children aged ≤ 5 years.
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11 We conclude that, in the past quarter century since the review of the same topic by Bass, there is
12 accumulating evidence of the benefit of IP counseling done in the clinical setting on the
13 knowledge, self-reported safety behaviors and injury outcomes among children aged ≤ 5 years.
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15 Given the magnitude of the problem of childhood injury and its contribution to child morbidity
16 and mortality, clinicians who care for children should continue to provide such counseling to
17 protect their patients. Further research should be undertaken to better refine what aspects of
18 counseling are most effective for different injury types.
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30 **What is already known on this subject**

- 31 • Primary care providers (PCPs) routinely provide injury prevention counseling during
32 healthcare visits
- 33 • One prior review in 1993 by Bass et al supported the inclusion of injury prevention
34 information in the pediatric primary care setting
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36 **What this study adds**

- 37 • Published outcomes-based IP-related counseling for young children in the primary care
38 setting is infrequent, but the majority of the existing studies demonstrated effectiveness
- 39 • Further research is necessary to identify the most effective IP-related counseling in the
40 primary care setting
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46
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50 MAG, KPQ, and WJP critically revised manuscript, gave final approval, and agree to be
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Provenance and peer review Not commissioned; externally peer reviewed.

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45 Table 1: Study characteristics and outcomes

	Study characteristics			Outcomes assessed		
	Controlled	Randomized intervention	Investigators Blinded	Educational (including reported behaviors)	Behavioral (observed)	Injuries
Clamp et al, 1998	X			X		

Kendrick et al, 1999	X	X	X	X		X
Gielen et al, 2001	X	X		X	X	
Nansel et al, 2002	X	X		X		
Mock et al, 2003	X			X		
Tan et al, 2004	X	X	X	X		X
Watson et al, 2005	X	X		X	X	X
McDonald et al, 2005	X	X		X		
Kendrick et al, 2005	X	X	X	X		
Sangvai et al, 2007	X	X	X		X	X
Pless et al, 2007	X	X		X	X	
Nansel et al, 2008	X	X	X	X		
Powell et al, 2010	X	X		X		
van Beelen et al, 2014	X	X		X		
Franz et al, 2014				X		
Brixey et al, 2014	X					X

Table 2: Target injuries, sample size, and effects demonstrated

	Target safety behaviors	Sample size	Positive effect demonstrated	No effect demonstrated
Clamp et al, 1998	<ul style="list-style-type: none"> • Fire, electric outlet, sharp object, poison safety, and injuries from doors 	<ul style="list-style-type: none"> • 165 	<ul style="list-style-type: none"> • Use of fireguards, smoke alarms, electric outlet covers, locks on cupboards, and door slam devices • Safe practice in storage of sharp objects and medicines, and safety regarding windows, fireplaces, sockets, smoke alarms, and door slams. 	<ul style="list-style-type: none"> • No differences in proportion of families regarding stairway safety behavior or storage of cleaning materials
Kendrick et al, 1999	<ul style="list-style-type: none"> • Any unintentional injury seen at an emergency department • Equipment provided: stair gates, fireguards, cupboard locks, smoke alarms. 	<ul style="list-style-type: none"> • 1124 intervention • 1028 control 	<ul style="list-style-type: none"> • More confident in dealing with choking incidents and more likely to know correct action for bleach ingestion 	<ul style="list-style-type: none"> • No difference in injury frequencies • No difference in secondary outcome measures • No differences between in scores for perceptions of risk of injury or risk of hazards
Gielen et al, 2001	<ul style="list-style-type: none"> • Hot water, smoke alarm, baby walker, stair, poison, safety 	<ul style="list-style-type: none"> • 196 		<ul style="list-style-type: none"> • No differences in knowledge or behaviors
Nansel et al, 2002	<ul style="list-style-type: none"> • Car, burn/fire, drowning, poison, fall 	<ul style="list-style-type: none"> • 85 intervention • 89 control 	<ul style="list-style-type: none"> • Greater adoption of home and car safety behaviors among group receiving tailored information 	
Mock et al, 2003	<ul style="list-style-type: none"> • Bike helmets, hot water temperature, smoke detector, child passenger and road traffic safety 	<ul style="list-style-type: none"> • 1124 children before counselling • 625 after it had been given 	<ul style="list-style-type: none"> • Increase in mean percent safe response scores • Improved use of bicycle helmets in middle and lower socioeconomic groups • Increased use of car seats by children aged 0–4 years in lower socioeconomic group 	<ul style="list-style-type: none"> • Even with improvement, overall use of safety devices suboptimal even after counselling with discrepancies between socioeconomic strata • Minimal to no changes seen regarding knowledge on crossing roads safely, burn and prevention

Tan et al, 2004	<ul style="list-style-type: none"> • Infant walkers 	<ul style="list-style-type: none"> • 708 	<ul style="list-style-type: none"> • Decreased walker use after intervention 	<ul style="list-style-type: none"> • No difference in walker injuries between groups
Watson et al, 2005	<ul style="list-style-type: none"> • Falls, fires, poisoning, window falls 	<ul style="list-style-type: none"> • 3428 families (3995 children) 	<ul style="list-style-type: none"> • More likely to be safe with stairs, smoke alarms, windows, and storage of cleaning products/ sharp objects 	<ul style="list-style-type: none"> • Intervention group had <i>higher</i> attendance rate for injury in primary care but no other differences in injury outcomes seen
McDonald et al, 2005	<ul style="list-style-type: none"> • Smoke alarm, poison, fall, child passenger safety 	<ul style="list-style-type: none"> • 70 intervention • 74 control 	<ul style="list-style-type: none"> • More knowledge about inappropriateness of young children riding in the front seat of a car, less likely to believe that teaching a child to mind you is the best way to prevent injuries, and more likely to report that they have syrup of ipecac and know how to use it.* 	<ul style="list-style-type: none"> • No difference in groups for 7 other safety items and 3 other belief items.
Kendrick et al, 2005	<ul style="list-style-type: none"> • Baby walker safety 	<ul style="list-style-type: none"> • 539 intervention • 635 control 	<ul style="list-style-type: none"> • Less likely to: own or use walker, plan to use walker with their next child, or agree that walkers keep children safe • Some evidence they were less likely to recommend walker to friend or agree that they help children to walk more quickly 	
Sangvai et al, 2007	<ul style="list-style-type: none"> • Child safety seats • Smoke detectors • Safe storage of hazardous substances and poisons • Tap water temperature • Gun storage 	<ul style="list-style-type: none"> • 160 intervention • 159 control 	<ul style="list-style-type: none"> • More likely to have: smoke detectors present and functional and hazardous substances not found in low cabinets 	<ul style="list-style-type: none"> • No difference in rate of medically attended injuries
Pless et al, 2007	<ul style="list-style-type: none"> • Knowledge and behaviors related to window blind cords and cords from clothing drawstrings 	<ul style="list-style-type: none"> • 369 intervention • 439 control 		<ul style="list-style-type: none"> • No difference in behavior (cutting cords) or injury related to window blind cords or clothing drawstrings
Nansel et al, 2008	<ul style="list-style-type: none"> • Car, burn, fall, 	<ul style="list-style-type: none"> • 305 (3 arms) 	<ul style="list-style-type: none"> • More likely to adopt new injury 	

	poison, airway obstruction, drowning		prevention behavior	
Powell et al, 2010	<ul style="list-style-type: none"> Home – falls, burns, drowning 	<ul style="list-style-type: none"> 371 	<ul style="list-style-type: none"> Increase in education in both groups following discussion 	
van Beelen et al, 2014	<ul style="list-style-type: none"> Falls, poisoning, drowning, burns 	<ul style="list-style-type: none"> 1292 	<ul style="list-style-type: none"> Increase in safe behavior for stairs, storage of cleaning products, bathing of child, drinking of hot fluids, using rear hotplates, and composite safety score 	<ul style="list-style-type: none"> No significant differences for other specific behaviors
Franz et al, 2014	<ul style="list-style-type: none"> Crib, hot water, child passenger safety 	<ul style="list-style-type: none"> 84 (pre-post test) 	<ul style="list-style-type: none"> Increased knowledge 	
Brixey et al, 2014	<ul style="list-style-type: none"> Any unintentional injury 	<ul style="list-style-type: none"> 1368 		<ul style="list-style-type: none"> No difference in groups; very small sample of injured patients

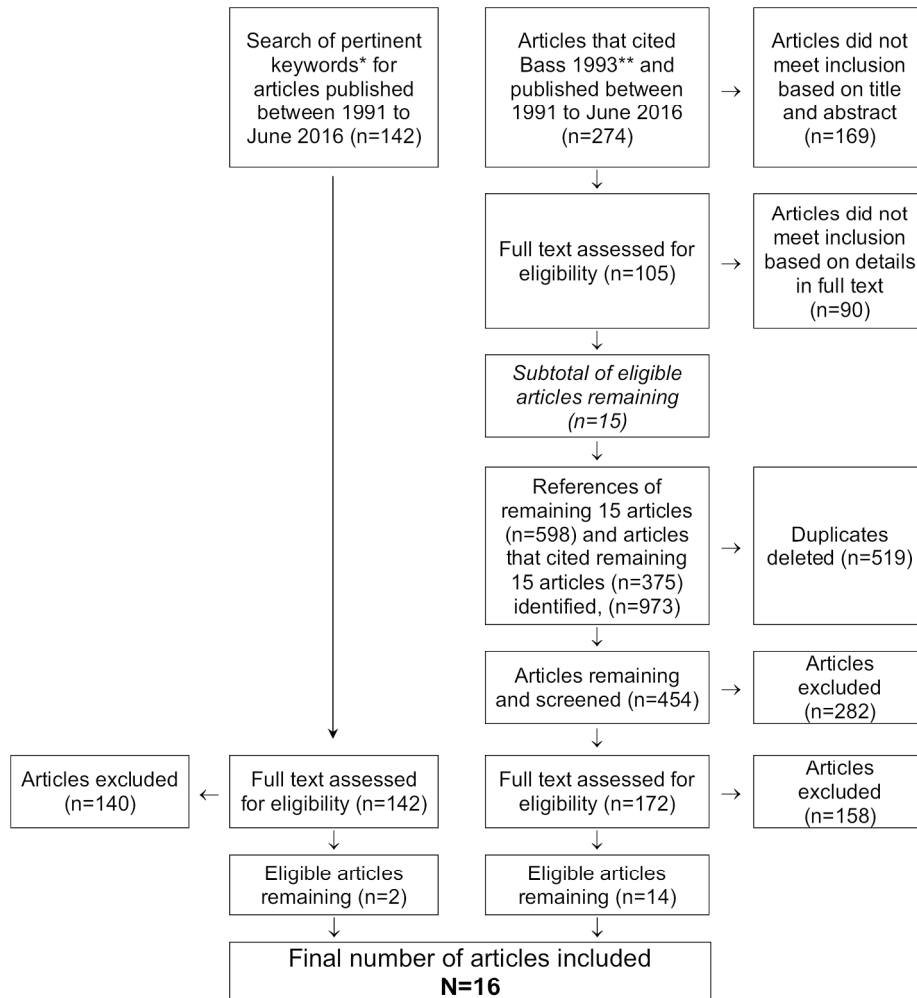
* Note: Since the publication of McDonald et al, 2005, syrup of ipecac has no longer been recommended to be used by parents

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Figure. Flow chart of search strategy

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*Keyword search: (counseling or "anticipatory guidance") AND (unintentional injury or safety) AND (child or childhood or pediatric or paediatric or children) AND (office or primary care or clinic) for publications between 7/1/1991 to 6/1/2016

** Bass JL, Christoffel KK, Widome M, et al. Childhood injury prevention counseling in primary care settings: a critical review of the literature. *Pediatrics*. 1993 Oct;92(4):544-50.

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