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# Firearm Injury Prevention Counseling: Are We Missing the Mark?

Elise C. Becher, MD, MA\*, and Nicholas A. Christakis, MD, PhD, MPH‡

**ABSTRACT.** *Objective.* To determine whether pediatricians accurately estimate the likelihood of gun ownership among their patients' families.

*Design.* Self-administered, written surveys completed simultaneously by pediatricians and their patients' parents.

*Setting.* A total of 23 pediatric practices and hospital-based clinics in three cities in the United States.

*Subjects.* A total of 66 pediatricians paired with 169 of their patients' parents.

*Main Outcome Measures.* Parent survey: ownership and storage of guns, willingness to admit gun ownership, and previous counseling by pediatrician. Pediatrician survey: estimated prevalence of gun ownership, likelihood of gun ownership by each participant family, and beliefs about firearm injury prevention counseling.

*Results.* All parents who owned guns indicated they would acknowledge owning a gun if asked by their pediatricians. Of the participating families, 28% owned at least one gun; 39% of the homes with guns contained a gun that was unlocked, loaded, or both. Of the parents, 11% reported that their pediatrician had discussed firearm safety with them. Pediatricians' average estimate of the overall prevalence of gun ownership in their patient populations was 25%. When asked to predict the likelihood of gun ownership by the specific families in the study, pediatricians predicted a 0% likelihood of gun ownership for 33% of the families. Of those families, 30% reported owning at least one gun. Considering physician predictions of any likelihood of gun ownership >0% (1%–100%) to be a positive prediction and using parent reports as the gold standard, physician estimates of gun ownership were only 65% sensitive. Approximately half (55%) of the participating pediatricians believed that pediatricians should discuss gun safety with all families, and 98% believed that pediatricians should discuss gun safety with all gun-owning families.

*Conclusions.* Pediatricians believe that all families with guns should receive firearm safety counseling. However, pediatricians significantly underestimate the likelihood of gun ownership by specific families. Parents who own guns indicate that they would acknowledge gun ownership if their pediatrician asked about guns in the home. Therefore, rather than relying on assumptions about whether particular patients seem likely to be gun owners, pediatricians should ask all families whether

they own guns. *Pediatrics* 1999;104:530–535; *firearms, injury prevention, safety counseling, child, injury.*

Over 35 000 firearm fatalities have occurred in America each year since 1989,<sup>1</sup> and it is estimated that there are ~3 nonfatal firearm injuries for each death associated with a firearm.<sup>2</sup> Many of these fatal and nonfatal injuries occur in and around the home and often involve guns kept in the home for recreation or protection. The presence of a gun in the home is associated with increased risks of homicide, suicide, and accidental injury for its inhabitants.<sup>3–13</sup> Studies report firearm presence in 25% to 50% of American homes.<sup>4,14–17</sup> Despite recent attention to the hazards of keeping a gun in the home and the finding that dangers increase with unsafe storage practices,<sup>9</sup> as many as one third<sup>18,19</sup> to one half<sup>20,21</sup> or more<sup>17</sup> of all gun-owning families store their guns in unsafe ways.

The American Academy of Pediatrics recommends that physicians provide firearm injury prevention counseling to patients and their families.<sup>22</sup> Pediatricians have reported that they believe they have some responsibility to counsel their patients' parents about the risks associated with gun ownership.<sup>23–25</sup> Parents have indicated that they would be receptive to discussing firearm safety with their pediatricians,<sup>15,16</sup> and parents who own guns have indicated their willingness to consider or to follow their pediatrician's advice about safe storage practices.<sup>15</sup> Despite these facts, approximately half of all pediatricians report that they never counsel patients' parents about the risks associated with owning firearms.<sup>23,24</sup> Furthermore, the majority of those who do counsel families about firearm safety report that they do so only occasionally.<sup>23,24</sup>

It is unclear at present what factors physicians consider when deciding whether to counsel about firearms. Previous work has suggested that some physicians do not counsel patients about the risks associated with owning firearms either because they believe that they do not have time or because they are uncertain about what to say.<sup>23,24</sup> We hypothesized that physicians also may believe that firearm injury prevention is important for only a small subset of the population. When deciding how to focus injury prevention efforts, physicians may estimate the likelihood that a patient will be exposed to particular hazards. It is common for pediatricians to consider their patients' age when deciding which topics are the highest priority for discussion at various visits. A pediatrician is unlikely to counsel the parents of a 7-year-old child about the dangers associated with

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the use of infant walkers (unless the parents are planning to have another child). However, age is not the only factor that is likely to be considered. In the case of an environmental hazard such as a firearm, a person of any age may be exposed. For the majority of households, the factor that may have the most impact on a child's risk of firearm injury is whether the child's parents own a firearm. Many pediatricians may believe that firearm injury prevention counseling is indicated only for gun-owning families.

If pediatricians believe that the need for firearm injury prevention counseling is dependent on firearm ownership, then pediatricians' knowledge or perceptions about the likelihood that their patients are firearm owners may determine who receives counseling. We hypothesized that pediatricians counsel a minority of their patients about firearm injury prevention, at least in part, because they may not identify accurately which of their patients' homes contain firearms. Our primary objectives for this study were to answer these two questions: 1) Do pediatricians believe that the need for firearm injury prevention counseling is dependent on firearm ownership?; and 2) How accurate are pediatricians' estimates of the likelihood of gun ownership by their patients' families?

## METHODS

### Setting and Sample

To achieve a mix of practice types and locations, we selected three university medical centers (the University of Chicago, the University of Rochester, and the University of Virginia) as bases for recruitment of physicians. With few exceptions, the hospital-run outpatient practices of each institution and the group practices using the university hospitals as tertiary care referral centers were asked to participate. The study was conducted in accordance with the institutional review board regulations at the relevant institutions.

Physician participants were recruited through an introductory phone call by one of the authors (E.B.). A total of 29 sites were contacted. A total of 66 pediatricians at 23 of the 29 sites enrolled in the study. At the 23 participating sites, all physicians who met enrollment criteria did enroll. At the 6 sites where no physicians participated, an office manager or single physician declined participation for the entire group at that site. There were 31 pediatricians caring for patients at those 6 sites. We do not have information about what proportion of those 31 pediatricians were aware of the study or would have been eligible to participate. We attended each participating multiphysician office during routine hours of patient care. All physicians seeing patients at each site were enrolled if they were seeing any of their regular patients on the study day. A regular patient was defined as one the physician participant had seen at least one time previously for a well-child examination.

Patient participants were chosen on the day of study, after their arrival in the physician's office. A systematic selection algorithm based on the order of appointments was used to select parent participants. In most cases, parent enrollment for each physician began with the third patient presenting to the office. We then enrolled each succeeding patient's parent until 3 of each physician's patients' parents were enrolled or until the half-day ended, whichever came first. We asked each parent whether the child he or she accompanied was scheduled to see his or her regular doctor that day (for either a sick visit or for well-care) and whether the child ever had a check-up with the same doctor in the past. If the parent answered yes to both questions, he or she was asked to participate in the study. The parents of children of all ages were eligible. As few as 1, and as many as 3 patients' parents were approached for each physician. Only 1 parent per family was asked to participate. Each participating parent completed only one

survey. Of all the parents offered enrollment, 98% enrolled in the study.

### Survey Instruments

Each participating parent and physician completed self-administered, written surveys. Separate survey instruments were created for parents and physicians. Each parent completed a six-page survey. This survey contained questions about the family's relationship with their pediatrician, the safety-counseling topics covered by the pediatrician in previous visits, safety practices in and around the home (use of smoke detectors, car seats and seat belts, and bike helmets), the family's gun ownership and storage practices, and their attitudes about gun ownership. All parents received the survey while seated in the office waiting room.

Physician participants completed three-page surveys. They answered a one-page series of questions about their own attitudes and practices regarding gun ownership and counseling only once, and they then completed a separate two-page series of questions pertaining to each of their patient families participating in the study. The two-page series of questions asked about the pediatrician's relationship with each indicated family, his or her perceptions about various parenting practices, and the likelihood of gun ownership by that family (0%–100%). Once the parent participants were enrolled, the physicians' surveys were attached to the fronts of the patients' charts, and the charts then were placed in the racks outside of the examining rooms. The physicians completed the questions about the family before the visit with the patient. The physicians were told they were welcome to refer to the patients' charts for information if they desired to do so. Both physician and parent participants were told that the purpose of the study was to help us to understand parents' and doctors' views about safety issues and parenting styles. The study administrator assured all parent participants that strict confidentiality would be maintained and that neither their survey forms nor the information contained therein would be shared with their pediatricians.

### Paired Survey Question Methodology

A few of the survey questions were part of a special set targeted for linked pair analysis. For example, on the parent survey, the following question appeared: "Is there any kind of a real gun in your home, garage, or car?" Yes and no answers were provided for the parents to circle. On each physician survey, the following inquiry appeared: "Please estimate (in percentage terms from 0 to 100) the probability that this family owns at least one real gun." The answers given by each physician were linked to those given by the corresponding parent. The questions posed to the parent and to the pediatrician were worded as similarly as possible. Thus, parent responses could be used as a gold standard for comparison (self-report of gun ownership is used customarily as the gold standard)<sup>8,9,11,14–18,21,23,26–28</sup> to physician responses. We did not define the term real gun along with the questions, although we did ask the parents to specify whether the guns they owned were one or more of the following: handguns, rifles, shotguns, air guns, or BB guns.

We obtained 169 linked pairs of surveys for analysis. Of our physicians, 68% (45) participated in 3 physician–patient pairings; 20% (13) participated in 2 physician–patient pairings; and 12% (8) participated in only 1 physician–patient pairing. One of the physicians who participated in only one pairing stated she was unable to participate further, because she was too busy. All other physicians (20) participating in 1 or 2 pairs did so because their schedules on the day of study did not supply more patients meeting enrollment criteria. Each participating physician accounted for <2% of the total data collected. Each physician prediction about likelihood of gun ownership was based on a unique combination of patient and physician characteristics and interactions, and thus, was assumed to be an independent event for the purpose of our analyses. A technique similar to ours has been used to compare physicians' predictions to patients' actual feelings regarding end of life care.<sup>29</sup>

### Statistical Analysis

All analyses were conducted in STATA. Univariate statistics were used to summarize patient and physician demographic characteristics, gun ownership, and attitudes about injury prevention counseling. Pearson  $\chi^2$  was used to determine differences in re-

sponse by various groups. We measured sensitivity and specificity to determine the accuracy of physician estimates (in terms of percent likelihood) of patients' ownership of guns. For the sensitivity and specificity measurements, we transformed the physician prediction of likelihood of parents' gun ownership (given as a percent from 0 to 100) into a dichotomous variable. We considered a physician prediction of 0% likelihood of patient gun ownership to be an answer of no, and any number >0, we considered to be an answer of yes. We chose this extreme measure because our intent was to obtain a conservative estimate for the frequency with which physicians were confident in their negative responses.

## RESULTS

### Participant Characteristics

The mean ( $\pm$ SD) age of parent participants was 33 ( $\pm$ 8) years. Of the parent respondents, 88% were women. The median number of children per household was 2, and the mean age of the oldest child in the family was 7 ( $\pm$ 5) years.

The mean age of physician participants was 42 ( $\pm$ 13) years. They had been in practice an average of 17 ( $\pm$ 12) years. Of the physician participants, 42% were female; 75% were spending at least 90% of their time in outpatient clinical practice; and 45% had cared for at least 1 patient in their practice who had been shot. Of the participating physicians, 63% stated that their patient population was primarily suburban; 32% reported a primarily urban patient population; and 5% cared for primarily rural patients.

The physicians and parents were asked to report on their number of previous encounters. The physician-parent pairs in our study were well acquainted. Both the physicians and parents indicated that the median number of previous encounters was 10. Although families with as few as 1 previous visit were eligible to participate, parents reported 1 previous visit for just 2 (1%) of the physician-parent pairs and fewer than 5 previous visits for only 19 (14%) of the physician-parent pairs.

### Gun Ownership

Of the families who participated in the study, 28% (48/169) reported having a gun in their home, garage, or car. The mean number of guns per gun-owning household was 2.7. Of the families with guns, 45% owned at least one handgun; 30% kept at least one gun unlocked; 11% kept at least one gun loaded; and 2% kept at least one gun both unlocked and loaded. Of the families with handguns, 19% kept at least one gun loaded. All (48/48) of the parent respondents who owned guns stated that they would answer truthfully if asked about gun ownership by their pediatrician. A majority (80%) of the gun owners listed recreation as at least one of the reasons they owned a gun. Approximately one quarter (28%) of the gun owners overall stated that protection of the home was one of the reasons for keeping a gun, although that percentage was higher among handgun owners than among owners of only shotguns and/or rifles (48% vs 12%;  $\chi^2 = 7.56$ ;  $P < .01$ ). Among the families who owned guns at the time of the study, 89% owned the same number of guns as they had owned 1 year previously; 7% owned fewer guns; and 4% owned more guns. Of the parents in

our study, 14% reported that someone who they and their children lived with or someone else who they or their children knew had been shot. Of the pediatricians, 14% (9/66) reported owning guns themselves.

### Beliefs About Counseling

The parent respondents, both those who owned guns and those who did not, overwhelmingly (89%) stated that it would be "OK for my child's doctor to start a discussion about gun safety." There was less agreement about whether it would be "OK for my child's doctor to recommend having no guns in my home." The parents who owned guns agreed with this statement less often than did those who did not own guns (54% vs 90%;  $\chi^2 = 27.6$ ;  $P < .001$ ). Both groups (87%) thought it would be fine for their children to remain in the room during a discussion about gun safety. Both groups indicated willingness to read pamphlets about gun safety if they were distributed by the pediatrician, although more gun owners said that they would read such materials than non-gun owners (94% vs 80%;  $\chi^2 = 4.86$ ;  $P < .05$ ).

The pediatricians overwhelmingly (98%) believed that all families with guns should receive firearm injury prevention counseling, although there was less agreement about whether all families should receive such counseling regardless of gun ownership. Only 55% of the pediatrician participants believed that counseling all families was indicated.

### Pediatricians' Estimates of Gun Ownership in General and in Specific Families

We asked the physicians to estimate the prevalence of gun ownership in their own overall patient populations. The mean ( $\pm$ SD) of the estimates made by the physicians regarding the percentage of their patients who owned guns was 25% ( $\pm$ 17).

We then asked the physicians to predict the likelihood (0%–100%) that the specific patient families participating in the study owned guns. The physician's median response was 10%. We assessed the sensitivity and specificity of the physicians' estimation of the likelihood of each participant family's gun ownership. We made this assessment by comparing the physician predictions to the parent responses. We treated the physician response as a positive prediction of a gun in the household if he or she answered any number >0% likelihood. The sensitivity of physician prediction was only 65% (30/46) in this most extreme case. The specificity was 32% (37/116).

The physicians predicted a 0% likelihood of gun ownership for 33% (53/162) of all participant families. Those families who were assessed to have 0% probability of gun ownership by their physicians reported an equally high prevalence of gun ownership (30%) as did those families assigned all non-zero probabilities (28%). The gun-owning families who were assessed to have 0% likelihood of gun ownership by their pediatricians also reported percentages of handguns and unlocked and loaded guns that were indistinguishable from the study population overall (Tables 1 and 2).

**TABLE 1.** Percentage of Gun Owners, Handgun Owners, and Unlocked or Loaded Gun Owners in the Overall Study Population (*N* = 169)

Parent Self-reports of Gun Ownership	<i>N</i> * (%)
Gun owners	48 (28)
Gun owners with handgun†	21 (45)
Gun owners with unlocked or loaded gun†	18 (38)

\* The total survey *N* was 169.

† Number of gun owners in row 1 serves as the denominator for rows 2 and 3 (minus missing data for one case).

**TABLE 2.** Percentage of Gun Owners, Handgun Owners, and Unlocked or Loaded Gun Owners in Those Families Believed by Their Pediatrician to be Least Likely to Own Guns (*N* = 53)

Parent Self-reports of Gun Ownership	<i>N</i> * (%)
Gun owners	16 (30)
Gun owners with handgun†	10 (67)
Gun owners with unlocked or loaded gun†	6 (40)

\* *N* of 53. These are the families for whom the physician predicted a 0% likelihood of gun ownership.

† Number of gun owners in row 1 serves as the denominator for rows 2 and 3 (minus missing data for one case).

### Counseling Practices

Pediatricians and parents were asked to report whether they had discussed a variety of injury prevention topics with each other before the day of study. Of all injury prevention topics mentioned in the survey, both physicians and parents reported lower incidence of firearm injury prevention counseling than any other type of counseling about which we inquired. Physician reports of providing safety counseling were higher than were parent reports across all topics that we queried (Table 3).

The pediatricians reported that they had talked with 18% of the patients in the study about firearm safety. When stratified by patient gun ownership, the physicians' reports indicated that they recalled discussing firearm safety with 25% of the patients who owned guns and with 16% of the patients who did not own guns. Parent recall of the frequency of previous firearm injury prevention counseling did not vary with gun ownership. Of the participating parents, 13% with guns and 11% without guns (*P* = .73) reported that their pediatrician had talked to them about firearm safety. Another 8% of the parents reported being unsure about whether they had discussed firearm safety with their pediatrician. Spearman's correlation coefficient for physician and parent reports (considering parents who were unsure to have answered yes) was .24 (*P* = .002).

**TABLE 3.** Pediatricians' and Parents' Reports of Frequency of Injury Prevention Counseling

Topic	Pediatrician Reports of Counseling (%)	Parent Reports of Counseling (%)
Car seats/seat belts	77	55
Bicycle helmets*	68	48
Discipline/spanking	58	30
Smoke detectors	44	19
Firearm safety	18	11

\* Only families with a child 5 years of age or older were included in this row.

### DISCUSSION

Few pediatricians discuss firearm injury prevention with more than an occasional patient family. Previous reports have suggested that a sizable minority of pediatricians are uncertain about how to approach such counseling. Lack of time has been cited as a factor for a smaller number.<sup>23,24</sup> We made two hypotheses that might help to explain additional reasons why firearm injury prevention counseling occurs infrequently. Our first hypothesis was that pediatricians might believe that the need for firearm injury prevention counseling is dependent on the presence or absence of a firearm in the home. For approximately half of the pediatricians in our study, this was in fact the case. Nearly all (98%) of the pediatricians in our study believed that all families with guns in their homes should be counseled, yet only half of the pediatricians believed that families without guns should be counseled. Our second hypothesis was that pediatricians might not estimate accurately the likelihood of gun ownership by specific patient families, and we found that the pediatricians assigned a 0% probability of gun ownership in 33% of all cases. The significance of these findings is that pediatricians who practice selective counseling may choose not to counsel certain patients' families because of uninformed judgments that these families are unlikely to own guns.

The physicians in our study assumed (based on the high number of 0% likelihood predictions) that many of their patients' families definitely did not own guns. However, those families thought to have a 0% likelihood of gun ownership report the same prevalence of gun ownership (30%) as the families of our general pediatric patient population.

It is important that our findings not be interpreted as a criticism of pediatricians for having misconceptions about their patients. It is not surprising that the physicians in our study were unable to translate their relatively accurate expected population prevalence of gun ownership (mean of 25% in the study) into a more sensitive predictor of the possibility of gun ownership by specific families (never more sensitive than 65% even with a >0% likelihood as the cutoff for a positive prediction). Kahneman and Tversky<sup>30</sup> have documented the fact that study subjects fail to incorporate known prior probabilities into specific predictions, and our work confirms this tendency in pediatricians with respect to patients' gun ownership.

Why should we discuss firearm safety with our patients? Is firearm injury prevention counseling likely to change behavior and prevent injury? We are unaware of studies published to date that directly investigate the effectiveness of firearm injury prevention counseling. Many studies, however, support the effectiveness of health counseling in changing knowledge, attitudes, or behaviors surrounding a variety of health topics, including areas such as smoking cessation<sup>31-37</sup> and other injury prevention topics in pediatrics,<sup>38-43</sup> such as prevention of burns and falls,<sup>44,45</sup> use of car seats,<sup>46-48</sup> and purchase and installation of smoke detectors.<sup>49</sup> Future research should

evaluate the effectiveness of firearm injury prevention counseling. In the meantime, both our results and previously published studies<sup>15,16</sup> suggest that parents would be willing to discuss risks of firearm injury with their pediatricians and would consider complying with recommendations.

Our study has several limitations. First, all behavior discussed in this study is self-reported, although at least two studies have validated our means of ascertaining gun ownership by registered gun owners.<sup>50,51</sup> Second, we used a convenience sample of pediatric offices; however, we sampled pediatricians in widely distributed sites and had a high rate of participation. Although we ideally would have liked to sample a greater number of physicians with an even wider geographic distribution, one of the study authors was needed onsite at each of the participating clinics and private offices to administer surveys. It would not have been possible to obtain the same information about the relationship between pediatricians' perceptions and parents' behaviors using an alternate design; thus, we were limited to 23 sites in three cities. Third, parent participants were chosen from the rosters of patients presenting to the office or clinic for visits on the day of study. Therefore, frequent visitors to the pediatrician may be overrepresented. Perhaps physicians' predictions about less frequent visitors would have been different. We do not know whether this is the case, or if so, in which direction any introduced bias would operate. Fourth, although we worded the key questions about gun ownership as clearly and as closely as possible for both pediatricians and parents, there were other questions that were less specific. For instance, the questions referring to firearm injury prevention counseling were worded as "discussion about firearm injuries and firearm safety." We did not include specific definitions about what exactly was covered or recommended in such discussions (firearm removal vs safer storage), because that was not the primary focus of the study. Careful investigation of what is included in such discussions has been undertaken previously,<sup>23,24</sup> and our primary goal was to understand pediatricians' perceptions about the probability that their patients' families are gun owners. Finally, despite our best efforts to the contrary, it is possible that some physician participants may have completed the survey after (rather than before) the office visit. If this is the case, they may have let their interaction with the patient's family on the day of study affect their survey responses (despite the physicians' representations otherwise). Had this occurred, however, the effect on our findings would have been to make physician predictions more, rather than less, accurate. We would expect that this factor would have increased the sensitivity of physician predictions.

At this time, pediatricians are divided about whether all families should receive firearm injury prevention counseling or whether only those with guns should be counseled. Approximately half of the pediatricians in our study believed that counseling all families (regardless of gun ownership) is necessary. The other half of the pediatricians in our study

believed that counseling is necessary only for gun-owning families. For this group of pediatricians, the strategy of counseling everyone may seem unnecessarily time consuming and burdensome given the increasing pressure to cover so many topics and shorten patient visits at the same time. Many pediatricians may believe that there are certain families they can pass over safely. Unfortunately, the families that pediatricians believe are least likely to own guns actually report the same rates of gun ownership as families that pediatricians consider more likely to be gun owners. Our findings suggest that we cannot rely on uninformed judgments to rule out gun ownership. The only way to know which families own guns is to ask.

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