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Firearm safety counseling among caregivers of high-school age teens: Results from a National Survey

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Abstract

Firearms are the leading cause of death for high-school age teens. To inform prevention efforts, we characterize the prevalence of healthcare provider (HCP) counseling of caregivers of teens around firearm safety, safety conversation elements, and caregiver receptivity towards counseling. A

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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cross-sectional web survey (6/24/2020–7/22/2020) was conducted among caregivers ($n = 2924$) of teens (age:14–18). Weights were applied to generate nationally representative estimates. Bivariate analyses and multivariate regressions were examined. Among respondents, 56.0% were women, 75.1% were non-Hispanic White, and mean (SD) age was 47.4. Firearm safety was the least discussed topic among caregivers reporting their teen received HCP preventative counseling (14.9%). For caregivers receiving counseling, the most common issues discussed were household firearms screening (75.7%); storing firearms locked (66.8%); and storing firearms unloaded (53.0%). Only 24.6% of caregivers indicated firearm safety was an important issue for teen HCPs to discuss and only 21.9% trusted teen HCPs to counsel about firearm safety. Female caregivers (aOR = 1.86;95%CI = 1.25–2.78), those trusting their teen’s HCP to counsel on firearm safety (aOR = 9.63;95%CI = 6.37–14.56), and those who received teen HCP firearm safety counseling (aOR = 5.14;95%CI = 3.02–8.72) were more likely to favor firearm safety counseling. Caregivers of teens with prior firearm safety training (aOR = 0.50;95%CI = 0.31–0.80) were less likely to agree that firearm safety was an important preventative health topic. In conclusion, few caregivers receive preventive counseling on firearm safety from their teen’s HCP, with trust a key barrier to effective intervention delivery. Future research, in addition to understanding barriers and establishing effective strategies to increase safety practices, should focus on increasing provider counseling competency.

Keywords

Firearm; Injury prevention; Safe storage; Counseling; Preventative health; Caregiver; Teen

1. Introduction

Firearms are the leading cause of death for high-school aged teens (age 14–18) in the U.S., with 59% resulting from homicide, 37% from suicide, and 3% from unintentional injuries (Cunningham et al., 2018; Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2022). Fatal firearm injuries among teens have increased nearly 44% since 2013, with increases for both homicide and suicide (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2022). During the past decade, non-fatal firearm injuries among were responsible for ~100,000 emergency department (ED) visits among teens (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2022). Such injuries are associated with long-term consequences, including increased risk for substance use disorders (Walton et al., 2017), mental health issues (*e.g.*, PTSD) (Garbarino et al., 2002), physical disabilities (DiScala and Sege, 2004), and repeat fatal/non-fatal firearm injuries (Cunningham et al., 2015a; Rowhani-Rahbar et al., 2015). Disparities exist, with firearm homicides/assaults disproportionately affecting Black teens within urban settings and firearm suicides and unintentional injuries disproportionately affecting White and American Indian/Alaskan native teens within suburban/rural settings (Cunningham et al., 2018; Centers for Disease Control and Prevention, National Center for Health Statistics, 2020). Economic costs are substantial, with acute medical treatment for pediatric firearm injuries estimated at nearly \$110 million annually before including long-term costs (*e.g.*, lost wages/productivity) (Taylor et al., 2021; Peek-Asa et al., 2017). Given elevated mortality and economic costs,

national medical organizations have highlighted the urgent need for research identifying public health solutions that reduce adolescent firearm injury risk (Cunningham et al., 2019; Damari et al., 2018; McLean et al., 2019).

Firearm access remains the most significant risk factor for teen firearm injuries, regardless of underlying intent (Grossman et al., 1999; Johnson et al., 2010; Schnitzer et al., 2019; Miller et al., 2007). In 80% of completed teen firearm suicides and 90% of fatal unintentional firearm injuries, the firearm was obtained from the decedent's home or the home of a relative (Grossman et al., 1999; Monuteaux et al., 2019). Ecologic studies also demonstrate an association between household firearm ownership rates and teen firearm homicide (Miller et al., 2007). An estimated 34% of U.S. households with children own/maintain firearms, with 21% storing firearms unlocked and loaded, though storing firearms locked and unloaded is considered the safest firearm storage practice (Azrael et al., 2018). Compared to households with younger children, households with teens are more likely to store firearms unlocked and loaded, increasing access and injury risk (Johnson et al., 2006). Given that healthcare provider (HCP) behavioral counseling of caregivers has been shown to increase household locked storage practices in prior studies (Rowhani-Rahbar et al., 2016) and that 92% of adolescents had a well-child visit in 2019 (National Center for Health Statistics, 2019), increasing HCP firearm safety counseling has the potential to reduce teen firearm access and associated injury outcomes.

While data suggests caregivers are receptive to firearm safety counseling (Garbutt et al., 2016; Haught et al., 1995; Forbis et al., 2007), less than 50% of HCPs report conducting routine screening or counseling during patient encounters (Damari et al., 2018). Such research has focused on physician self-report of counseling (Damari et al., 2018; Farcy et al., 2021; Pallin et al., 2019; Juang et al., 2019), with less research examining caregiver attitudes, experiences, and responses to HCP counseling (Garbutt et al., 2016; Haught et al., 1995; Forbis et al., 2007; Fuzzell et al., 2018). Therefore, using data from a nationally representative sample, we: 1) estimate the prevalence of HCP firearm safety screening and/or counseling of U.S. caregivers of high-school age teens in relation to other preventative health topics; 2) assess the key elements of these conversations, as well as any adjustments made to firearm safety practices in response to counseling; and, 3) examine caregiver receptivity towards HCP firearm safety counseling using unadjusted and adjusted logistic regressions. We hypothesized that: 1) firearm safety is the least discussed preventative health topic during teen HCP visits; 2) teen HCP firearm safety counseling is largely focused on storage practices; and 3) caregiver trust in teen HCP and caregiver firearm ownership are key drivers of whether caregivers are receptive towards teen HCP firearm safety counseling. Understanding the teen caregiver's perspective towards HCP firearm counseling will inform opportunities to enhance current counseling practices and clinician training.

2. Methods

Data are from a cross-sectional, web-based survey of 2924 U.S. primary caregivers of teenage children (age 14–18); conducted (6/24/2020–7/22/2020) by Gallup for the Firearm Safety Among Children and Teens (FACTS) Consortium (Sokol et al., 2021a; Sokol

et al., 2021b). Participants were recruited from the Gallup Panel, a probability-based panel of non-institutionalized civilians constructed to be broadly representative of the U.S. population. Gallup regularly recruits panel participants using random-digit dialing (landlines/cell phones) and address-based sampling while intentionally oversampling young adults (age: 18–34), individuals from lower educational backgrounds, and members of racial/ethnic minority groups. Eligible panel participants included biological parents and/or primary caregivers (*e.g.*, grandparents) of high-school aged teens who the teen resided with at least some of the time. Eligible caregivers were randomly sampled from the panel and sent email invitations to participate. Following informed consent, panelists self-administered the web-based survey (~15 min-per-participant). Respondents received \$5 for survey completion. The University of Michigan IRB reviewed/approved all study procedures. Participants were provided links to online substance use, mental health, and violence resources. For this study, the analytic sample was restricted to the caregiver sample.

3. Measures

3.1. Preventative firearm safety counseling

Past five-year caregiver receipt of preventative counseling about firearm safety (yes/no) by the teen's HCP, including firearm access screening and/or safety counseling (*e.g.*, locked storage), was measured using an adapted item based on the Counseling on Access to Lethal Means (CALM) model.³² Parallel items regarding screening/counseling for other teen health issues (*e.g.*, bicycle helmets, seat belts, mood) were selected based on American Academy of Pediatrics (AAP) best-practice recommendations (Hagan et al., 2017).

Caregivers indicating receipt of firearm safety counseling were subsequently asked about conversation elements, including screening for household firearm ownership, firearm accessibility (*i.e.*, locked *vs.* unlocked), storage practices (*i.e.*, loaded *vs.* unloaded), ammunition accessibility, off-property access, and/or discussions centered around reducing teen access during high-risk periods (*e.g.*, when teen is a risk to themselves/others) (Runyan et al., 2016; Zalsman et al., 2016). Response options were not mutually exclusive, reflecting the possibility for discussions with multiple components.

These caregivers were also asked about changes made in response to counseling, including discussing firearm safety with their teen, moving firearms to an inaccessible location (in the home), purchasing/using locking devices, and/or temporary/permanent removal of firearms from the home. A write-in other option recorded additional safety changes, with responses recoded as appropriate to the response options above.

3.2. Firearm safety counseling receptivity

The dependent variable, caregiver receptivity to firearm safety counseling by their teen's HCP, was measured using an adapted item from Southwestern Ohio ambulatory research network (SOAR-Net) firearm safety survey (Haught et al., 1995; Forbis et al., 2007). Respondents indicated level of agreement on a 5-point Likert scale (strongly agree-strongly disagree) with the statement "It is important for healthcare providers to discuss gun safety with teens." For analysis, response options were dichotomized indicating whether

caregivers were receptive towards firearm safety, with neutral categorized as not receptive to counseling, consistent with prior research (agree/strongly agree = agree; strongly disagree/disagree/neutral = disagree) (Jeong and WC., 2016; Sieving et al., 2021).

3.3. Provider trust

Caregiver trust in their teen's HCP to counsel about their teen's health and firearm safety was assessed with two adapted items from the Wake Forest Physician Trust Scale (Hall et al., 2002). Firearm owning caregivers were also asked how respectful their teens' HCP was about family firearm ownership. Responses for all three items were measured using a 5-point Likert scale (strongly agree-strongly disagree) and dichotomized for analysis (Jeong and WC., 2016; Sieving et al., 2021).

3.4. Household firearm ownership

Two items assessed whether the primary caregiver or other household members owned firearm(s) using items from the 2015 National Firearm Survey (Cleveland et al., 2017). Items were collapsed to indicate any household firearm ownership (yes/no). Caregiver household firearm ownership (*e.g.*, self and/or spouse/partner/grandparent) was assessed using an item from the 2019 National Firearm Survey (Conner et al., 2021).

3.5. Teen firearm safety training

Caregivers indicated whether their teen ever received (yes/no) any caregiver or professional (*e.g.*, hunter safety course) firearm safety training (*i.e.*, handling, shooting, or storing firearms) using an item created for this survey.

3.6. Community violence exposure

A 9-item version of the "Things I have seen/heard Survey" assessed past 12-months community violence exposure (Richters and Martinez, 1990). An adapted response scale using dichotomized responses (yes/no) was used and a summary score (range 0–9) was created ($\alpha = 0.7$) (Carter et al., 2016; Carter et al., 2017).

3.7. Risky teen behavior

Eleven items assessed caregiver knowledge about their teen's involvement in risk behaviors (yes/no) in the prior 12-months. Items were based on AAP best-practice recommendations for screening/counseling on risky teen behavior (*e.g.*, unsafe driving, smoking/vaping, fighting) (Hagan et al., 2017). For analysis, a summary score (range 0–11) was created with higher scores indicating more involvement in risky behaviors ($\alpha = 0.7$) (Carter et al., 2020).

3.8. Socio-demographics

Gallup survey items measured socio-demographic characteristics (age, biological sex, race/ethnicity, region, educational attainment, marital status, region, military service). Race/ethnicity and educational attainment were collapsed to indicate whether the respondent was non-Hispanic White (*vs.* other) or had any post-secondary education (yes/no). Respondents were also asked about young children (< age 10, in addition to their teen) living in the

household and receipt of public assistance (yes/no) using items from the 2016 American Community Survey (United States Census Bureau, 2020).

3.8.1. Analysis—Following data collection, Gallup provided final survey weights that combined pre-sample weights for constructing national estimates with study-specific post-stratification weights adjusting for differential survey non-response. To construct the final survey weights, the panel sample frame is first weighted to be representative of the general U.S. adult (18+) population based on age, gender, education, race, ethnicity, census region, and age/gender of children using targets from the U.S. Census Bureau's Current Population Survey 2017 data (United States Census Bureau, 2022). Next, the weighted panel is subset to the intended sample of caregivers with high-school age children (age 14–18), with the resultant weighted distributions used to determine final target population characteristics. Finally, initial weights are adjusted using these targets to address participant non-response and/or case completion. Among invited panelists, 4% ($n = 400$) initiated but did not complete the full survey (non-completers).

It is important to note that given the sampling design/recruitment strategy, it is not possible to calculate a true participant survey response rate for the sample. Specifically, Gallup maintains basic demographic information on panel participants (including whether they have a child), but does not have information on whether a child was in the eligible age range for this study population (*i.e.*, age 14–18). Thus, sampling proceeded, as noted above, by sending the survey invitation to all panelists known to have at least one child ($n = 9352$). Survey invitations highlighted the opportunity to participate in a survey intended for caregivers of high-school age children. Thus, panelists with a child outside of this age range may have chosen not to respond to the invitation knowing they were not eligible (rather than being eligible and refusing to complete the planned survey). Within this context of this limitation, Gallup calculated a conservative response rate of 31% from sampled panelists with at least one child.

The analytic sample was restricted to the 95% of caregivers indicating their teen received regular medical care (unweighted $N = 2924$; restricted sample weighted $N = 2753$). In total, 7.1% of the unweighted sample was missing data for one or more covariates, with no individual covariate missing more than 3.7% of responses. Given this, missingness was considered negligible and the analytic sample was restricted to those with complete data available (final weighted $N = 2535$). We also conducted comparisons across key socio-demographic factors between missing *vs.* non-missing data and found no differences that would suggest systematic bias within the sample due to missingness. Descriptive statistics were analyzed using weighted percentages and corresponding 95% confidence intervals. Key descriptive data (*e.g.*, firearm safety topics discussed by a HCP) were also examined by whether the respondent endorsed household firearm ownership. Unadjusted logistic regressions describe bivariate associations with the dependent variable of interest, HCP counseling receptivity. A multivariable logistic regression model was created to estimate the adjusted covariate effects on receptivity towards firearm safety counseling. Model independent variables were chosen based on theory and bivariate significance. Specifically, we focused on the question of trust as a critical aspect of caregiver receptivity given prior literature on vaccine hesitancy and counseling (Benin et al., 2006; Connors et al., 2017). In

addition, while not significant bi-variately, we included caregiver perceptions of teen risky behavior (*e.g.*, binge drinking) and community violence exposure given the importance of considering the roles of these co-occurring risk behaviors (*e.g.*, Jessor Problem Behavior Theory) and environmental factors to adolescent firearm outcomes (Carter et al., 2017; Jessor, 1987; Goldstick et al., 2017; Carter et al., 2015; Schmidt et al., 2019). Analyses were conducted using SAS software, Version 9.4.

4. Results

Among our sample of U.S. caregivers of high-school age teens, mean caregiver age was 47.4 years, 56.0% were female, 78.7% married, 15.2% on public assistance, and 14.2% had prior military experience. Further, 75.1% were non-Hispanic White, with additional race and ethnicity breakdowns as follows: 83.4 White, 7.7% Native Hawaiian or Pacific Islander, 5.4% Asian, 2.5% American Indian of Alaskan Native, and 1.0% Black or African American with 92.3% of the sample identifying as non-Hispanic and 7.7% identifying as of Hispanic ethnicity. Among respondents, 54.9% reported household firearm ownership (94.8% owned by the parent and or spouse/partner) and 57.2% indicated their teen received firearm safety training.

4.1. Preventative health counseling

Past five-year caregiver self-report of preventative health counseling from teen HCP is shown in Fig. 1. Among preventative health topics, firearm safety was the least discussed, with 14.9% of caregivers noting a firearm safety discussion during a teen healthcare visit. Among the subset of caregivers receiving counseling (Table 1), the most discussed topics included the presence (yes/no) of firearms, firearm accessibility, and ammunition accessibility. Less discussed topics included off-property access (*i.e.*, asking about firearms in other homes) and reducing teen access during high-risk periods (*i.e.*, risk to themselves/others). Notably, there were no differences in any of the discussed firearm safety topics between firearm owners (weighted $N = 147.1$) and non-firearm owners (weighted $N = 229.7$).

Among caregivers discussing firearm safety with their teen's HCP, only 9.8% (95% CI = 3.5–16.2) indicated they made safety changes following the discussion. The most common change was to discuss firearm safety with their teen (50.9%; 95% CI = 14.7–87.1), followed by moving the firearm(s) to an inaccessible home area (33.5%; 95% CI = 0.0–68.8). Only 5.9% (95% CI = 0.0–13.7) reported they purchased or started using a locking device (*e.g.*, safe, cable lock) and 4.1% (95% CI = 0.0–10.5) reported temporary/permanent firearm(s) removal. Notably, while 6.4% ($n = 24$) of caregivers received a locking device from the teen's HCP, none used the device.

4.2. Caregiver receptivity towards HCP firearm safety counseling

Among caregivers of high-school age teens, 24.6% indicated they were receptive to their teen's HCP discussing firearm safety (Table 2). Caregivers noting greater receptivity to counseling discussions were more likely female, from advanced educational backgrounds, and less likely to have a military background. Receptivity to firearm safety counseling

also differed by firearm-related factors, with caregivers from firearm owning households and households with teens who received prior firearm safety training less receptive to counseling.

Caregivers indicating they trusted their teen's HCP to counsel them about their teen's health and those receiving HCP firearm safety counseling were three and eight times more likely, respectively, to indicate they were also receptive to firearm safety discussions. These findings were more pronounced when focused specifically on trust in the HCP to counsel around firearm safety, with caregivers trusting their teen's HCP to counsel on firearm safety thirteen times more likely to also be receptive to counseling (Table 2). Notably, trust in HCPs to provide firearm safety counseling were lower among firearm than non-firearm owning households (18.5% vs. 25.9%; OR = 0.65 [95% CI = 0.47–0.91]) and higher among those who received firearm safety counseling (57.5%; OR = 7.30 [95% CI = 4.756–11.185]). Within firearm-owning households, caregivers were noted to be three times more likely to indicate receptiveness to counseling when the HCP was also felt to be respectful of their decision to own firearms (73.3% vs. 45.6%; OR = 3.28 [95% CI = 1.46–7.37]).

In the multivariate analysis (Table 3), female caregivers, those trusting their teen's HCP to counsel on firearm safety, and those receiving HCP firearm safety counseling were more likely to indicate receptivity towards HCP firearm safety counseling. Conversely, caregivers indicating their teen received firearm safety training previously were less likely to be receptive to counseling.

5. Discussion

Despite being the leading cause of death for high-school age teens (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2022), we found that among U.S. caregivers of teens, firearm safety remained the least discussed preventative health issue during routine teen healthcare visits, with less than 15% of caregivers indicating they received counseling by their teen's HCP in the prior five-years. As 94.8% of household firearms are owned by parents and or their spouse/partner in this population, the extent to which caregivers receive firearm safety counseling from their teen's HCP is an important component of firearm injury prevention. Further, while rates of counseling reported by caregivers in our sample are similar to those observed in other studies of caregivers (Garbutt et al., 2016; Haught et al., 1995), they are lower than those reported by HCPs (Damari et al., 2018; Butkus and Weissman, 2014; Finch et al., 2008; Olson et al., 2007), likely reflecting that HCPs may overestimate the frequency of delivering counseling or that counseling discussions they are having are not resonating effectively with caregivers (Ha and Longnecker, 2010). Regardless, findings highlight that few HCPs currently screen or counsel about firearm safety. This is particularly concerning considering the elevated risk for firearm injury that currently exists for U.S. teens (Garbutt et al., 2016; Haught et al., 1995; Forbis et al., 2007; Fuzzell et al., 2018). Low HCP screening/counseling rates may reflect a lack of HCP confidence in their role or ability to counsel on firearm safety (Olson et al., 2007; Ha and Longnecker, 2010; Walters et al., 2012; Roszko et al., 2016; Price et al., 2013), uncertainty that their counseling is efficacious (Price et al., 2013), clinical time constraints (Olson et al., 2007; Roszko et al., 2016; Barkin et al., 1999), political concerns (Walters

et al., 2012), and/or concern about the effect of counseling on the provider-caregiver relationship (Garbutt et al., 2016; Olson et al., 2007; Walters et al., 2012). Our finding that over half of caregivers of teens report having firearm(s) in their home is higher than previous studies (Azrael et al., 2018), potentially reflecting increases in firearm ownership since the onset of COVID (Miller et al., 2022), that families with teens have higher household firearm ownership (Schuster et al., 2000), and/or our examination of household firearm ownership rather than individual respondent ownership (Azrael et al., 2000; Coyne-Beasley et al., 2005). Regardless, elevated rates of ownership combined with prior data that 21% of firearm owning households with children keep at least one firearm unlocked and unloaded (Azrael et al., 2018), and that firearm access is the most significant risk factor for teen firearm injuries, suggest a need to increase caregiver screening and safety counseling during routine teen health visits. This is particularly salient given that researchers reported lower rates of pediatric injury and death within households practicing locked storage (Grossman et al., 2005). Behavioral counseling can be efficacious at increasing locked storage, especially when employing a non-judgmental, structured motivational interviewing approach paired with providing safety devices (Rowhani-Rahbar et al., 2016; Carter et al., 2016; Grossman et al., 2005; Barkin et al., 2008; Carbone et al., 2005; Grossman et al., 2012). Considering 92% of adolescents attended a well-child check-up in 2019 (National Center for Health Statistics, 2019), future research should focus on understanding and addressing barriers to HCP firearm screening/counseling.

Among caregivers receiving counseling, our data indicate most conversations were limited to screening for household firearm ownership and/or discussing storage practices, regardless of household firearm ownership. While such conversation elements are critical, a broader focus on firearm safety is also warranted. Given that parents, relatives, friends, or parents of a friend are the source for firearms used in 69% of unintentional firearm injuries/deaths (Grossman et al., 1999), 82% of fatal suicides (Grossman et al., 1999; Johnson et al., 2010), and 74% of school shootings (National Threat Assessment Center, 2019), such conversations would benefit from including a focus on both on- and off-property firearm access, particularly regarding households their teen frequently visits (*e.g.*, grandparents). Further, data on best-practice counseling methods (Carter et al., 2016; Resnicow and McMaster, 2012; Prochaska and Velicer, 1997) emphasizes that providing a menu of harm reduction measures allows patients increased autonomy over their actions and is more effective at evoking behavior change. Thus, in addition to identifying optimal storage practices (*e.g.*, unloaded and locked using locking device and/or firearm safe), expanding discussions to include a range of safety approaches such as making firearms less lethal (*e.g.*, removing firing pin from weapons not currently in use; replacing current firearm with smart firearms) and/or decreasing unsupervised teen access (*e.g.*, storing firearms in an offsite location during high-risk time periods; technology-enhanced firearm safes) may enhance counseling efficacy (Carter et al., 2022). Given that more in-depth counseling approaches are routinely employed for other teen health issues (*e.g.*, safer sex; alcohol/drug use) (Walton et al., 2017; Chin et al., 2012; Cunningham et al., 2015b), our findings may reflect a lack of technical knowledge about firearms and available safety options, especially given that no families used provided safety devices and few instituted safety changes in response to counseling provided in the current context. Taken together, such data highlights that in

addition to addressing barriers to routine counseling as a component of their practice, there is a need to provide clinicians training on counseling approaches and technical aspects of firearm safety that will enhance their counseling competency (Marino et al., 2018; Betz and Wintemute, 2015).

While improving counseling competency is essential, it is also important to note that only a quarter of caregivers indicated they were receptive to safety counseling by their teen's HCP. Rates of receptivity in our nationally representative sample were lower than those observed in several other studies (Garbutt et al., 2016; Haught et al., 1995; Forbis et al., 2007), likely reflecting variability in the populations sampled. Prior studies have been mostly conducted among convenience samples of caregivers/parents from pediatric offices as compared to a broad nationally representative sample. Alternatively, this finding may reflect our focus on caregiver receptivity towards the HCP providing firearm counseling to their teen as opposed to direct counseling of caregivers. Future studies should delineate whether caregiver receptivity towards counseling is dependent on their inclusion within the counseling discussion. Further, we found the most salient factor associated with increased receptivity was caregiver trust, indicating that counseling may need to unfold over multiple encounters that address caregiver readiness-to-change and willingness to engage in safety discussions. Regardless, it is vital that such conversations emphasize a patient-centered approach, with non-judgmental, non-confrontational, apolitical discussions about safety/harm reduction (Betz et al., 2018) that respect caregiver values about firearm ownership and safety. Fundamental to increasing trust is to normalize firearm safety conversations in ways that are analogous to discussions about other risk behaviors (*e.g.*, teen drinking and driving). This includes universal firearm safety screening/counseling for all families, not only those owning firearms, as caregivers who received counseling in this sample were more likely to be receptive to counseling and indicated more trust in HCPs to counseling on firearm safety. Further, our findings parallel research on the importance of trust for counseling of caregivers exhibiting vaccine hesitancy, with data demonstrating that building sufficient trust is linked to employing approaches that respect underlying caregiver values, address caregiver concerns, and demonstrate the HCP's knowledge and competence on complex health issues (Benin et al., 2006; Connors et al., 2017). Given prior data indicating that time constraints may limit physicians from having effective conversations (Olson et al., 2007; Roszko et al., 2016; Barkin et al., 1999), it is important to consider how trusted non-physician team members (*e.g.*, social workers, nurses) may be utilized to provide counseling. Alternatively, as technology-assisted brief interventions are efficacious for reducing other risk behaviors (*e.g.*, underage drinking, prescription drug/marijuana use) (Roszko et al., 2016; Cunningham et al., 2015b; Waller et al., 2019), there may be a role for developing technology focused firearm counseling modules. Regardless, our data highlight the importance of considering ways to enhance trust in the provider-patient relationship when considering best-practices for firearm safety counseling.

We also found that receptivity towards counseling was lower among caregivers that provided their teen with firearm safety training, either themselves or through established programs (*e.g.*, hunter-safety training). This is consistent with data demonstrating that firearm owners believe safety training is their personal responsibility (Jager-Hyman et al., 2019; Aitken et al., 2020) and that law enforcement, hunting/outdoor sporting groups, and active-duty

military personnel are more effective safety messengers than physicians (Crifasi et al., 2018). Given such programs and individualized training varies widely (Rowhani-Rahbar et al., 2018; Berrigan et al., 2019; Hemenway et al., 2019) with prior data emphasizing that many skills-based programs lack efficacy for reducing firearm handling/access (Rowhani-Rahbar et al., 2018; Berrigan et al., 2019), it is important that HCPs understand the elements of a teen's prior firearm training and continue to counsel caregivers about limiting unsupervised teen firearm access, especially during high-risk time periods. Yet, given low receptivity to HCP-focused counseling efforts overall, such data also suggests there may be a role for HCPs to work with local trusted community partners to provide critical elements of safety counseling, and/or promote the validity of safety messages provided as part of their practice (Betz and Wintemute, 2015; Aitken et al., 2020; Crifasi et al., 2018). Future research exploring HCP safety counseling that integrates external partnerships with more trusted messengers, such as law enforcement, and enhanced by incorporating caregiver input/feedback on messaging, may be an avenue for addressing the lack of trust for HCP-delivered counseling and ensuring the safety information delivered is more acceptable to caregivers.

Consistent with data demonstrating that women are more likely to seek preventative healthcare for themselves (Thompson et al., 2016; Hughes and Wingard, 2008), as well as for their children (Blumberg et al., 2004; Thakkar et al., 2019), female caregivers were twice as receptive to safety counseling as male caregivers. Despite this, female caregivers personally owning firearms are also more likely than their male counterparts to store at least one firearm loaded and unlocked, citing the need to protect their family (Azrael et al., 2018; Wolfson et al., 2020). Further, among married heterosexual partners, over 80% of men and women report that firearm storage is the husband's responsibility (Coyne-Beasley et al., 2005). Taken together, such data indicates that important gender differences exist and HCP counseling may need to integrate tailored approaches reflecting caregiver roles regarding firearm ownership, motives, counseling beliefs, and safety practices. Future studies may also examine whether fathers/mothers counsel their children differently based on gender.

Study limitations should be considered. First, while self-report measures raise the potential for social desirability and/or recall bias, prior research indicates that this approach retains high reliability/validity when privacy/confidentiality are assured, as was done in this case (Grossman et al., 2000; Webster et al., 1992; Betz et al., 2020; Buchan et al., 2002; Brener et al., 2003; Turner et al., 1998; Wright and Supple, 1998). Further, online survey delivery generates more accurate results and reduces social desirability bias compared to traditional telephone surveys (Kreuter et al., 2008; Chang, 2009); and online selection bias was decreased as participants without email access were mailed surveys to their selected address. Second, while the potential exists for missing data to bias results, we observed that fewer than 1% of the sample did not answer questions regarding firearm ownership and/or attitudes towards HCP counseling, increasing the likelihood that population estimates are valid/accurate. Third, because the sample is representative by U.S. region we are not able to examine such factors of rurality or urbanicity on our outcome variable. Future studies will need to be developed to specifically examine differences in receptivity by rurality/urbanicity. Finally, the cross-sectional nature of our survey study limits the ability for causal attributions.

6. Conclusions

While firearms are currently the leading cause of death for U.S. high-school age teens, less than 15% of caregivers indicate they received firearm safety counseling from their teen's HCP during the prior five years. Further, only a quarter of caregivers indicate they are receptive to such counseling measures, driven largely by a lack of trust in their teen's HCP to counsel on firearm safety. Future research is needed to understand the best methods for increasing HCP competency to provide effective firearm safety counseling within their current practice, including partnerships with trusted community partners. Also establishing counseling methods that enhance provider-patient trust and lead to increased uptake of firearm safety practices may help decrease the substantial rates of firearm death and injury currently occurring among adolescent populations.

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Data availability

Data will be made available on request.

Appendix A.: Survey Item for Dependent Variable of Interest (Firearm Safety Counseling Receptivity)

Please share the extent to which you agree with the following statement:

“It is important for health care providers to discuss gun safety with teens.”

Select only one.

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree.

Abbreviations:

HCP Healthcare provider

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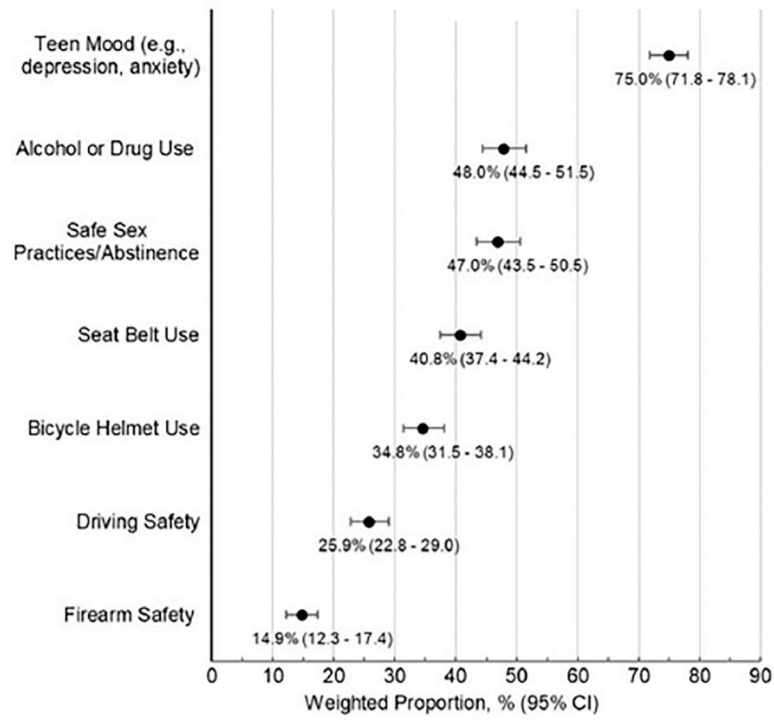


Fig. 1. Caregiver self-report of receiving preventative health counseling for key teen preventive health issues within the past five-years from their teen's HCP. Note: Weighted N=2535; Unweighted N=2522.

Table 1

Caregiver self-report of subject matter discussed with their teen's HCP for the subset of caregivers who reported receiving any firearm safety counseling during a routine clinical encounter in the prior five-years.

Caregiver HCP counseling on firearm safety issues	Caregiver %; (95% CI)
Screening for firearm(s) in the home	75.7 (67.2, 84.2)
Firearm accessibility (<i>i.e.</i> , storing firearms locked)	66.8 (58.0, 75.5)
Storage method (<i>i.e.</i> , storing firearms unloaded)	53.0 (43.7, 62.3)
Ammunition accessibility (<i>i.e.</i> , storing ammunition separately from firearms)	51.9 (42.6, 61.2)
Off-property access (<i>i.e.</i> , access to firearms in homes teens may visit)	44.2 (34.8, 53.5)
Reducing firearm access during high-risk periods	
Teen is at risk of harming others / having behavioral problems	36.7 (27.6, 45.9)
Teen is at risk of harming themselves / experiencing depression	34.9 (25.9, 43.9)

Notes: Subject matter topics are not mutually exclusive; Caregivers may have indicated discussion of more than one topic area; Weighted $N=377$; Unweighted $N=367$

Table 2

Total sample characteristics and unadjusted bivariate comparisons of caregiver factors associated with being receptive or not receptive towards firearm safety counseling as an important preventative health topic.

	^a Importance of firearm safety Counseling for teens			
	Agree	Disagree	Total % (95% CI)	OR (95% CI)
	24.6% (CI = 21.7–27.5) % (95% CI)	75.4% (CI = 72.5–78.3) % (95% CI)		
SOCIO-DEMOGRAPHICS				
Age (mean age)	47.4 (46.0, 48.9)	47.4 (46.5, 48.3)	47.4 (46.1, 50.2)	1.00 (0.98, 1.02)
Sex (% female)	70.2 (64.1, 76.3)	51.4 (47.3, 55.5)	56.0 (52.5, 59.5)	2.23 (1.60, 3.11)
Race / ethnicity (% non-Hispanic white)	72.8 (66.3, 79.3)	75.8 (72.1, 79.5)	75.1 (71.9, 78.3)	0.85 (0.58, 1.25)
Region				
Northeast	18.1 (13.6, 22.7)	15.2 (12.2, 18.3)	16.0 (13.4, 18.5)	Ref
Midwest	18.7 (13.8, 23.6)	23.4 (19.9, 27.0)	22.3 (19.4, 25.2)	0.67 (0.41, 1.08)
South	36.7 (30.0, 43.5)	37.5 (33.5, 41.4)	37.3 (33.9, 40.7)	0.82 (0.53, 1.29)
West	26.4 (20.8, 32.0)	23.8 (20.4, 27.3)	24.5 (21.5, 27.4)	0.93 (0.59, 1.47)
Education level (% > high school)	78.5 (70.9, 86.1)	68.4 (63.7, 73)	70.9 (66.9, 74.9)	1.69 (1.03, 2.78)
Marital status (% married)	78.3 (72.0, 84.5)	78.8 (75.2, 82.4)	78.7 (75.6, 81.8)	0.97 (0.63, 1.48)
Military service (% served)	7.2 (3.5, 10.9)	16.5 (13.4, 19.6)	14.2 (11.7, 16.8)	0.39 (0.22, 0.72)
Public assistance (% receive)	13.3 (8.8, 17.8)	15.8 (12.6, 19)	15.2 (12.5, 17.9)	0.82 (0.52, 1.30)
^β _{child < 10 y/o in household (% yes)}	24.4 (18.3, 30.6)	27.5 (23.7, 31.3)	26.7 (23.5, 30)	0.86 (0.58, 1.26)
FIREARM OWNERSHIP/SAFETY				
^γ Household firearm ownership (% owners)	43.3 (36.5, 50.0)	58.8 (54.7, 62.8)	54.9 (51.5, 58.4)	0.54 (0.39, 0.74)
Teen firearm safety training (% trained)	43.0 (36.4, 49.7)	61.8 (57.8, 65.8)	57.2 (53.7, 60.6)	0.47 (0.34, 0.64)
HEALTHCARE PROVIDER RELATIONSHIP				
Provider trust (% yes)	94.2 (91.5, 96.9)	83.6 (80.4, 86.8)	86.2 (83.7, 88.8)	3.17 (1.83, 5.50)
Provider trust for firearm safety counseling (% yes)	59.2 (52.7, 65.7)	9.7 (7.3, 12.1)	21.9 (19.1, 24.7)	13.54 (9.24, 19.84)
Received firearm safety counseling (% yes)	38.2 (31.6, 44.8)	7.2 (5.0, 9.4)	14.9 (12.3, 17.4)	7.92 (5.14, 12.19)
VIOLENCE EXPOSURE				
Friend/family shot/ killed by firearms (% yes)	13.2 (7.9, 18.5)	10.7 (8.1, 13.3)	11.3 (9.0, 13.7)	1.26 (0.74, 2.16)
^δ Community violence exposure (mean summary score; (SD))	0.7 (0.6, 0.9)	0.9 (0.8, 1.0)	0.9 (0.8, 1.0)	0.88 (0.77, 1.02)
PERCEIVED TEEN BEHAVIORS				
^ε Risky teen behaviors (mean summary score; (SD))	0.7 (0.5, 0.9)	0.8 (0.7, 1.0)	0.8 (0.7, 0.9)	0.95 (0.82, 1.09)

Weighted N = 2535, Unweighted N=2522

^aResponse categories dichotomized: Agree/strongly agree = agree; strongly disagree/disagree/neutral = disagree.

^βChildren < 10yo living in household, in addition to teen.

^γDefined as household firearm ownership (parent/family member/teen).

^δCommunity violence— summary score (range 0–9) assessing past 12-months exposure (yes/no) to violence in their community.

^εRisky teen behavior— summary score (range 0–11) assessing past 12-months caregiver reports of teen engagement in any of 11 risky behaviors (e.g., unsafe driving; smoking/vaping; physical fights; risky sexual behaviors).

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Table 3

Multiple logistic regression model examining caregiver factors associated with receptivity towards firearm safety counseling as an important preventative health topic for teens.

Caregiver characteristics	AOR [95% CI]
Age	1.01 (0.98, 1.03)
Sex (female)	1.86 (1.25, 2.78)
Race/ethnicity (white, non-Hispanic vs. other)	1.09 (0.68, 1.73)
Public assistance	0.75 (0.37, 1.52)
Educational level	1.40 (0.75, 2.58)
Military service	0.77 (0.42, 1.42)
Household firearm ownership	0.85 (0.53, 1.36)
Provider trust for firearm safety counseling	9.63 (6.37, 14.56)
Received firearm safety counseling	5.14 (3.02, 8.72)
Teen firearm safety training	0.50 (0.31, 0.80)
^a Community violence exposure	0.89 (0.73, 1.09)
^b Risky teen behavior	1.06 (0.92, 1.23)

Weighted N = 2535, Unweighted N = 2522.

^aCommunity violence— summary score (range 0–9) assessing past 12-months exposure (yes/no) to violence in their community.

^bRisky teen behavior— summary score (range 0–11) assessing past 12-months caregiver reports of teen engagement in any of 11 risky behaviors (*e. g.*, unsafe driving; smoking/vaping; physical fights; risky sexual behaviors).