Acceptability and Use of Evidence-Based Practices for Firearm Storage in Pediatric Primary Care

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Abstract

Objectives—Promoting safe firearm storage in pediatric primary care is one way to address youth suicide by firearm. The study objective is to determine perspectives of primary care physicians (PCPs) and leaders of primary care practices regarding acceptability and use of

screening, counseling, and firearm locks, three components of an adapted evidence-based intervention, the *Firearm Safety Check*.

Methods—In 2016, an online survey was conducted in two large United States health systems. PCPs (n = 204) and leaders (n = 57) from 83 clinics were invited to participate. Respondents included 71 clinics (86%), 103 PCPs (50%), and 40 leaders (70%). Main outcomes included acceptability (1-6 Likert with higher scores indicating better acceptability) and use of the three intervention components (1-4 Likert with higher scores indicating more use) measured by an adapted validated instrument.

Results—Analyses were conducted in 2017. PCP acceptability of screening ($M = 4.28$, $SD = 1.12$) and counseling ($M = 4.56$, $SD = .89$) were high while acceptability for firearm lock provision was more neutral ($M = 3.78$, $SD = 1.16$). Most PCPs endorsed sometimes screening (85%) and counseling (80%). Few PCPs offered firearm locks to caregivers (15%). Leaders reported consistent information.

Conclusion—Acceptability of screening for firearms and safe storage counseling was high; both components were used commonly but not routinely. The acceptability of providing firearm locks was neutral and use was rarely endorsed. This study provides important insights about areas of focus for future implementation efforts from policy and research perspectives.

What's New—Evidence-based practices for safe firearm storage endorsed by the American Academy of Pediatrics are variably considered to be acceptable and are inconsistently implemented in pediatric primary care, highlighting the importance of efforts to actively increase the use of these intervention components as a universal suicide prevention strategy.

Keywords

firearm safety; pediatric primary care; evidence-based practice

INTRODUCTION

Suicide is the second leading cause of death among young people aged 12-24 in the United States.[1,2] Firearms are the most common and lethal method; over 85% of attempts by firearm result in death.[3,4] Access to firearms is a robust, yet modifiable, risk factor for suicide.[5,6] Given that one in three homes in the United States contain a firearm,[7] widespread implementation of evidence-based approaches to reducing access to firearms is essential.[8] Youth suicide prevention strategies have been successfully implemented in behavioral health settings.[9] However, only one third of youth who attempt suicide receive behavioral health treatment in the 12 months preceding.[10] In contrast, three out of four youth who die by suicide visit primary care in the year prior to their death.[11] Therefore, primary care settings may be an important setting to explore implementation of universal suicide prevention strategies.

Several studies have examined the effectiveness of screening for firearms, counseling, and/or the provision of storage devices in pediatric primary care. The two studies in which free firearm storage devices were provided demonstrated improvement in safe firearm storage practices.[12,13] A third study focused on counseling and provision of coupons for firearm

safety devices found no effect with regard to changes in safe firearm storage.[14] A final study focused on counseling without free firearm locks did not find improvements in safe firearm storage.[15] Taken together, these results and a systematic review suggest that providing free firearm storage devices may be an important component of evidence-based approaches to promote firearm safety.[16]

Few safe firearm storage interventions have been tested in primary care as a universal approach to suicide prevention. *Safety Check* is an evidence-based prevention program guided by social cognitive theory.[12,17] There were multiple components of the original *Safety Check* intervention; three components are related to firearms and include screening about access to firearms, brief counseling regarding safe storage, and provision of firearm locks (i.e., cable locks). In a cluster randomized controlled trial, guardians of children 2-11 who received the *Safety Check* intervention were 21.4% more likely to store their firearms safely than guardians in the control group six months following. An adapted *Safety Check* (*Firearm Safety Check*) focusing on suicide prevention and targeting adolescents has not been tested.

Aims.

To survey primary care physicians (PCPs) and leaders of primary care practices in two large, nationally representative health systems from geographically (i.e., urban vs. rural) and socioeconomically distinct areas. The primary objective was to understand acceptability of three firearm components of the adapted *Safety Check* intervention (i.e., screening for the presence of firearms in the home, brief counseling, and the firearm locks) in pediatric primary care and to understand how frequently PCPs endorse using these practices. We also explored the acceptability and perceived use of these components from the perspective of leaders of practices given that they are important individuals who can increase implementation of evidence-based practices based on their beliefs and behaviors.[18] Finally, we sought to understand factors that predict PCP acceptability and use of each of the three practices.

METHODS

Participants.

Participants were drawn from the 83 primary care practices serving youth in two large health systems, Henry Ford Health System [HFHS] and Baylor Scott & White Health [BSW], which are part of the Mental Health Research Network (www.mhresearchnetwork.org). Both health systems have large health maintenance organization health plans which cover a portion of patients with health insurance, but also provide services for a wide range of patients with other insurances, similar to the vast majority of systems around the country. Because both systems offer a diversity of services, they cover the majority of practices operated nationally.

HFHS serves one million patients annually throughout southeast Michigan (i.e., the Detroit Metropolitan area). Services are provided by 1200 physicians in 4 large medical hospitals, a psychiatric hospital, and 36 medical clinics. Although HFHS has been a leader in suicide

prevention in behavioral health settings,[19] they had not yet implemented suicide prevention efforts in pediatric primary care at the time of this study. BSW has a very large service area across central Texas (29,000 square miles) and operates 12 hospitals, 140 clinics and have >1200 physicians. Both sites have Level 1 trauma centers, emergency room facilities, and at least 40 medical specialties; we focused our inquiry on the primary care sites (i.e., we did not include emergency department physicians). These two health systems were selected to participate in this study based on their diversity (racial/ethnic; rural/urban; geography) and generalizability so that findings may be most representative of the larger United States healthcare landscape.

A Virtual Data Warehouse (VDW) at each system includes information about patient service use as derived from electronic health records. The VDW was used at each site to identify PCPs who had seen 100 or more youth (ages 12-24) patients within the preceding one year. Eligibility for responding to the survey was based upon physician-level criteria. Leaders were physician managers of primary care practices where youth were seen (i.e., pediatrics, family medicine, internal medicine, adolescent medicine) who were also identified within each system.

Primary Data.

We developed two parallel surveys to query acceptability and use, one for PCPs and one for leaders. Acceptability questions were adapted from an existing measure.[20] (Surveys are available from the author by request.) We asked respondents to report on the acceptability of the intervention components with regard to both the general population and with youth that they perceived to be at high risk for suicide. Responses were provided using a 1 (strongly disagree) to 6 (strongly agree) Likert scale. PCPs reported about their own use of these three intervention components using a Likert Scale from 0 (never) to 4 (always). Leaders reported on their perceptions of PCP behavior in the practices they directed. Specifically, they reported on the percentage of providers in their practice who used each of the three components (0%, 1-24%, 25-50%, 51-74%, 75-100%) and the frequency of how often they believed the PCPs used each of the components using a 1 (rarely) to 4 (always) Likert Scale.

Secondary Data.

To identify factors associated with acceptability and use of the three intervention components, we supplemented the survey data with information derived from an electronic health record, including: PCP demographics (age, gender, race, ethnicity, and specialty); patients' demographics (age, gender, race, ethnicity, and Patient Health Questionnaire-9 [PHQ-9][21]scores); and volume of caseload encounters related to self-inflicted injury and suicide.[1] We also obtained 5-year county-level youth (i.e., aged 12-24) suicide death data for each PCP's practice county from the National Vital Statistics System.[1]

Procedure.

A brief survey was emailed to eligible PCPs and leaders from the study investigator at their health system in 2016. The Tailored Design Method[22] was used; eligible participants received no more than 6 contacts by phone or email. The study was approved by the

appropriate Institutional Review Boards. Participants received $10 for participation. Survey participation was completed between October and December 2016.

Statistical Analysis.

Analyses were conducted using SPSS Version 24.0 in 2017. Initial analyses compared the characteristics of PCPs and leaders who completed the survey to those who did not using t-tests and X^2 tests. Next, we compared mean scores on the three intervention components that pertained to general versus high-risk youth using paired samples t-tests and difference scores for both PCPs and leaders. Linear and logistic regression analyses examined each individual predictor of PCP acceptability (measured continuously) and frequent use (having a score greater than 3). Given the sample size, and the need for a parsimonious model, we included only one covariate in each model, health system, due to the possibility that this would be the largest source of systematic variance. In order to identify the independent contributions of each variable with the outcomes of interest and to avoid collinearity, we report estimates for each variable while controlling for health system. Missingness was handled via listwise deletion due to low rates of missing data.

RESULTS

There were 83 clinics eligible, 71 (86%) clinics had at least one respondent participate. There were 204 PCPs and 57 leaders eligible; 103 PCPs and 40 leaders participated, reflecting a response rate of 50% for PCPs and 70% for leaders. Results comparing PCP and leader survey responders to non-responders revealed no differences except that older PCPs were less likely to complete the survey relative to younger PCPs ($t(141) = 2.44$, $p = .02$; see online Table 1). Ten PCPs completed the survey anonymously and we were unable to link their responder status with the information extracted from the medical record. Results comparing anonymous to non-anonymous responders revealed no differences.

The PCP sample included 62 females (60%). Mean age was 44.1 years old ($SD = 12.8$).Racial/ethnic composition was 54% White, 24% Asian, 7% Black or African American, 2% other (e.g., American Indian). Thirteen percent elected not to disclose race/ethnicity; 4% identified as Hispanic and/or Latino. The leader sample included 13 females (33%). Mean age was 52.8 ($SD = 9.3$). Racial/ethnic composition was 73% White, 10% Asian, 8% Black or African American, 8% Other. Fiver percent elected not to disclose; 3% identified as Hispanic and/or Latino.

Use and Acceptability of *Firearm Safety Check* Intervention Components

Screening.—Most PCPs ($n = 88$, 85%) endorsed screening for firearms. Two thirds of PCPs screened at a low frequency, while approximately one third frequently screened. Similarly, most leaders reported that PCPs in their practice screened with low frequency, while a quarter of leaders reported that PCPs screened most of the time; only 3 leaders (8%) reported that PCPs did not screen for firearms at all. The majority of PCPs ($n = 77$, 75%) and leaders (n = 30, 75%) reported that screening was acceptable to them (i.e., average acceptability score ≥ 3.5; see Table 1).

Counseling.—The majority of PCPs ($n = 83$, 80%) engaged in counseling around safe firearm storage. Many PCPs discussed safe storage at low rates, while fewer reported frequently providing counseling. Similarly, leaders reported that PCPs engaged in some counseling ($n = 30, 75\%$). Most leaders reported that PCPs provided counseling with low frequency. Fewer reported that PCPs frequently provided counseling. Eight leaders (20%) reported that PCPs did not provide brief counseling around safe firearm storage. Overall, most PCPs ($n = 91$, 88%) and leaders ($n = 32$, 80%) reported that counseling was acceptable to them (i.e., average acceptability score   3.5; see Table 1).

Firearm Lock Provision.—Less than ten percent of PCPs distributed firearm locks. Leaders expressed similar perceptions, with only 3 reporting that PCPs ever offered firearm locks. Overall, 64% of PCPs ($n = 66$) and 65% of leaders ($n = 26$) reported that firearm lock provision was acceptable to them (i.e., average acceptability score   3.5; see Table 1). For PCPs and leaders, firearm lock acceptability ratings were significantly lower than both the acceptability of screening (PCP $t(97)0=3.50$, $p =.001$; leader $t(37)= 2.91$, $p = .006$) and counseling (PCP $t(97)=6.16$, $p <.001$; leader $t(37)= 3.00$, $p = .005$) ratings.

Comparative Acceptability.—Table 1 shows the mean acceptability ratings for screening, counseling, and firearm lock provision as a universal prevention strategy as well as for high-risk youth from the perspectives of PCPs and leaders. Paired sample t-tests comparing acceptability for general versus youth at high-risk for suicide demonstrated that both PCPs and leaders found all three intervention components to be significantly more acceptable for high-risk youth than for the general youth population (all ps < .001).

Predictors of PCP Intervention Acceptability.—After controlling for health system, linear regression analyses indicated that higher PCP ratings of screening acceptability were associated with: not owning a firearm and a higher proportion of ethnic minority youth on one's caseload. Having a family member or close friend who had attempted suicide was associated with higher ratings of counseling acceptability (see Table 2).

Predictors of PCP Intervention Use.—After controlling for health system, logistic regression analyses indicated that frequent use of screening (i.e., most of the time or always screen) was more likely among PCPs who reported: higher screening acceptability, those with a family member or close friend who had attempted suicide, and those with a higher proportion of females on their caseload. Frequent use of brief counseling was more likely among PCPs who reported higher acceptability (see Table 2).

DISCUSSION

Youth suicide by firearm is a public health crisis[23]; experts have called for research[24] focused on implementing evidence-based interventions to decrease access to firearms.[25] This study is among the first to examine the acceptability and use of three firearm safety components as a universal suicide prevention strategy in pediatric primary care from the perspective of PCPs and leaders of primary care practices. Two components of the *Firearm Safety Check* intervention,[12] screening for firearms and brief counseling on safe firearm storage, were endorsed as acceptable interventions that were sometimes used. On the other

hand, providing families with firearm locks, was less frequently used; acceptability ratings were also more neutral. This is of interest given a review[16] suggesting that provision of storage devices may be an important component of reducing access to firearms. These findings suggest that PCPs are inconsistently and not routinely implementing evidence-based practice components as recommended by the American Association of Pediatrics guidelines around firearm safety promotion[26] and underscores the importance of active implementation efforts to increase firearm safety promotion in pediatric primary care.

Both PCPs and leaders of primary care practices reported that screening and brief counseling were generally acceptable. Nevertheless, despite the high acceptability ratings, the majority of PCPs reported that they did not routinely screen or counsel, and this was corroborated by their leaders. These results are supported by work[27] surveying PCPs about screening more broadly. It is possible that PCPs are willing to use these interventions only with youth they perceive to be at risk for suicide. Alternatively, PCPs may not use these intervention components systematically. Given that there is widespread variability in use of evidence-based practices in medicine, understanding physician decision making about which interventions to implement and with whom is of great priority. Another explanation is that physicians do not know the importance of these interventions in reducing suicide risk. A national survey that included healthcare providers found that 2 out of 3 physicians did not agree that having a firearm in the home increases the risk of suicide,[28] suggesting that education on the link between firearms and suicide is necessary.

The provision of firearm locks was less frequently endorsed and rated as more neutral by both groups. Lower acceptability rates may reflect perceptions that giving out storage devices are not feasible; may reflect uncertainty towards the provision of these locks; or may reflect physician perceptions that parents are not interested in these locks.[29] Other safety items, such as bicycle helmets, are provided at cost by a number of hospitals nationally, suggesting a potential model to support the provision of firearm securing devices. Qualitative work suggests that the provision of firearm locks is acceptable and in fact desirable from the perspective of parents who own firearms.[30]

Another consideration in the wide-scale deployment of a suicide prevention strategy in pediatric primary care is the perception that these strategies may be more acceptable for high-risk youth rather than universally. Limiting the firearm components of the *Firearm Safety Check* to high-risk youth may dampen public health impact. This approach assumes that PCPs are able to accurately screen and identify high-risk youth, which is counter to extant literature.[31,32] Given that currently up to 40% of adolescents who die by suicide do not have a mental health diagnosis,[10] screening for depression alone will likely not capture the total population of potential individuals who could benefit.[33] Thus, a universal strategy in which all youth and families are screened for depressive symptoms, suicidal ideation and behavior, and firearms in the home represents the approach with the most promise.

We identified several factors that were related to use of screening and counseling in PCPs including acceptability and personal experience. Acceptability of interventions is an important target for future implementation strategies, or the active process of integrating evidence-based practice into usual care.[34] Potential approaches include engaging in

activities to increase buy-in (e.g., patient testimonials, clinician factsheets), and making it easier to implement (e.g., prompts for screening and counseling scripts in the electronic health record.[30] Given that PCPs with personal experience with suicide were more likely to use screening and counseling, strategies to increase awareness and personal salience of the impact of suicide, such as narrative approaches, are worthy of study.[35]

The debate over how to decrease firearm injury and mortality is a politically charged topic in the United States. Although there are no state or federal laws prohibiting physicians from engaging in firearm-related inquiries, many erroneously believe that the law precludes them from discussing these topics, which may impact acceptability of firearm-related interventions.[36] More research exploring the interplay between political climate and social views with regard to firearm rights and the implementation of firearm safety storage interventions in pediatric primary care is needed. In order to move the needle on this important topic, community-partnered research is sorely needed. One exemplar such partnership includes innovative work conducted by Barber and colleagues in collaboration with firearm shop owners and instructors.[37]

This study has several strengths, including the inclusion of two large health systems from geographically distinct locations serving patients representative of both ethnic minorities and regions (i.e., urban and rural[38]) and national gun ownership patterns (37% of participating physicians endorsed having firearms in their home; gun ownership in the states of Michigan and Texas is 29% and 36% respectively[39]).

Limitations.

First, all associations are correlational. Second, we relied on PCP and leader self-report. We do not know how concordant these reports are with actual practice, although the variability in responses suggests that effects of social desirability were limited. Third, we do not know what kinds of screening and/or counseling PCPs are using in their practice. Fourth, we do not know how reliable leader report is with regard to PCP behavior. Fifth, this study only reports on behavior in two large health systems.

CONCLUSION

Pediatric PCPs are asked to accomplish many tasks in each brief visit, and time is the major rate-limiting step toward the implementation of prevention practices in primary care.[40] However, given their potential to improve both the short- and long-health outcomes of youth, the integration of evidence-based practices such as *Firearm Safety Check* and other interventions may warrant prioritization in pediatric primary care. Future studies are needed, taking a community-partnered approach between stakeholders to test both the effectiveness of the *Firearm Safety Check* on youth patient suicide outcomes and implementation processes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

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Table 1.

Safety Check Use and Acceptability for PCPs and CLs[a]

	PCPs (*n* = 103)					Leaders (*n* = 40)				
	Frequency of PCP-reported Intervention Use					Frequency of CL-reported PCP Intervention Use [a]				
	Never	Rarely	Sometimes	Most of the Time	Always	Never	Rarely	Sometimes	Most of the Time	Always
Screening	11 (10%)	29 (28%)	29 (28%)	20 (19%)	10 (9%)	3 (1%)	8 (20%)	17 (43%)	10 (25%)	0 (0%)
Counseling	15 (15%)	20 (19%)	34 (33%)	23 (22%)	6 (6%)	8 (20%)	8 (20%)	15 (38%)	7 (18%)	0 (0%)
Firearm Locks	88 (85%)	6 (6%)	1 (1%)	2 (2%)	0 (0%)	35 (88%)	1 (.03%)	1 (.03%)	1 (.03%)	0 (0%)

	PCP Acceptability [b]				Leader Acceptability [b]			
	High Risk Youth[c] *M* (*SD*)	General youth *M* (*SD*)	Point estimate of the difference *M* [95% CI]	Test Statistic (df)	High Risk Youth[b] *M* (*SD*)	General youth *M* (*SD*)	Point estimate of the difference *M* [95% CI]	Test Statistic (df)
Screening	5.40 (.76)	4.30 (1.10)	1.10 [1.34, .85]	$t(96) = 8.82$**	5.46 (.80)	4.13 (.96)	1.32 [1.69, .96]	$t(36) = 7.45$**
Counseling	5.39 (.76)	4.56 (.89)	.84 [1.02, .65]	$t(96) = 8.81$**	5.51 (.61)	4.21 (.87)	1.31 [1.61, .99]	$t(36) = 8.54$**
Firearm Locks	4.65 (1.42)	4.66 (1.42)	.89 [1.10, .6]	$t(96) = 8.15$**	4.92 (1.23)	3.70 (1.14)	1.22 [1.49, .94]	$t(36) = 8.99$**

Note. PCP = primary care physician.

*
p < .05 =

**
p < .001 = . 4 PCPs did no report on screening practices, 5 PCPs did not report on counseling practices, 6 PCPs did not report on firearm lock provision practice. 2 leaders did not report on their PCPs practices related screening, counseling, or firearm provision.

[a]Leaders reported on the rates of screening, counseling and firearm lock provision amongst the PCPs in their practice

[b]Acceptability was measured using a 6 point Likert scale (1 = Strongly Disagree to 6 = Strongly Agree); higher scores indicated higher acceptability.

[c]High-risk youth are those considered at risk for suicide

Table 2.

Predictors of Primary Care Physicians use of Safety Check Interventions and Intervention Acceptability for General Population

	Average Acceptability Items [a]				Use [b]
	Screening b (SE)	Counseling b (SE)	Firearm Locks b (SE)	Frequent Screening[d] OR (95%CI)	Frequent Counseling OR (95%CI)
Health System [c]					
System (HFHS =1, BSW = 0)	.43 (.22)	.19 (.18)	.41 (.24)	1.28 (.54, 3.04)	.97 (.40, 2.35)
Safety Check Acceptability					
Screening Acceptability	--	--	--	1.83 (1.12, 2.98)*	--
Counseling Acceptability	--	--	--	--	3.45 (1.66, 7.18)**
Provider Characteristics					
Age	−.003 (.01)	<.001 (.01)	<.001 (.01)	.98 (.94, 1.02)	.99 (.95, 1.03)
Male Gender	−.45 (.24)	−.16 (.20)	−.02 (.27)	.55 (.20, 1.53)	.52 (.19, 1.44)
Non-Minority (White)	−.35 (.24)	−.10 (.20)	.28 (.25)	.96 (.38, 2.45)	.46 (.18, 1.20)
Pediatrician	.48 (.24)	.28 (.18)	−.19 (.47)	1.21 (.46, 3.14)	1.59 (.61, 4.14)
Patient Total	<.001 (.001)	<.001 (.001)	<.001 (.001)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Years in practice	−.02 (.01)	−.01 (.01)	−.01 (.01)	.95 (.89, 1.00)	.95 (.89, 1.00)
Own/Have a Firearm in home	−.62 (.24)*	-.11 (.61)	.12 (.28)	2.38 (.86, 6.54)	.92 (.34, 2.45)
Personal Experience with Suicide	.17 (.29)	.47 (.23)*	.29 (.31)	2.94 (1.02, 8.49)*	1.65 (.56, 4.82)
Patient Caseload Characteristics [e]					
% Young (< 18 years)	.05 (.04)	.04 (.03)	−.04 (.04)	.96 (.82, 1.13)	1.03 (.88, 1.20)
% Female	.16 (.11)	.12 (.09)	.08 (.11)	1.88 (1.12, 3.15)*	1.50 (.95, 2.39)
% Ethnic Minority	.13 (.05)*	.05 (.05)	.03 (.06)	1.06 (.85, 1.32)	1.03 (.83, 1.28)
% Clinical PHQ (score > 9)	−.11 (.78)	.42 (.66)	1.49 (.82)	.16 (.004, 5.71)	.15 (.01, 4.68)
County Characteristics					
CDC Suicide Estimate	−.04 (.05)	.01 (.04)	.01 (.05)	.88 (.71, 1.09)	.95 (.78, 1.16)

Note.

*
p < .05.

**
p < .01. PCP = primary care physician. HFHS = Henry Ford Health System.

BSW = Baylor Scott & White. PHQ = Patient Health Questionnaire.

[a] Acceptability was measured using a 6 point Likert scale (1 = Strongly Disagree to 6 = Strongly Agree); higher scores indicated higher acceptability. Parameters reflect linear regression coefficients for each predictor.

[b] Frequent use was defined as use "most of the time" or "always." Due to low frequency of reported physician use of the gun lock provision component of Safety Check, we did not examine predictors of use of this intervention component. Parameters reflect odds ratios from logistic regressions.

[c] Each predictor was examined independently, controlling for health system. Two PCPs who responded to the survey elected not to identify the health system in which they worked and were excluded in regression analyses via list-wise deletion.

[e] Coefficients reflect the effect of a 10 percent increase on a PCPs caseload.