Examining the Critical Need for Tailored Adolescent Opioid Education: A National Study

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OBJECTIVE Prescription opioid education can be a preventative measure for opioid misuse. However, most research focuses on adult perspectives rather than adolescents. This study aimed to understand adolescents' attitudes, perceptions, knowledge about prescription opioids, and preferences and prior educational exposure to opioid safety.

METHODS Data were collected from November to December 2020. Quota sampling through Qualtrics was used to recruit a national sample of 13- to 18-year-old adolescents who lived in the United States and could understand English.

RESULTS A total of 774 responses were analyzed. The most frequently reported source of opioid information was speaking with parents (72%). More than half (54.7%) of participants preferred technology-based education. Participants with a personal history of opioid prescription scored no differently on safe handling and storage of opioids. There was a strong relationship between participants who reported prior knowledge of what opioids are and stopping their friend from using an opioid medication for non-medical purposes (χ^2 (1, $N = 684$) = 3.5; $p = 0.042$). Participants with prior education on opioid disposal did not know that returning opioids to the pharmacy was correct (χ^2 (1, $N = 425$) = 3.8; $p = 0.254$).

CONCLUSIONS Participants were less knowledgeable about safe storage and disposal of opioids, preferred technology-based education, and were extremely likely to talk to their parents about opioid information. Findings reaffirm the significance of opioid safety education and communication between adolescents and parents. Adolescent demographic characteristics, preferences, and prior knowledge should be considered when providing opioid safety education.

ABBREVIATION CDC, Centers for Disease Control and Prevention

KEYWORDS adolescents; opioid education; opioids; serious games; technology-based education

Introduction

The opioid epidemic has been labeled a public health crisis in the United States because it affects all groups of people, including adolescents.[1,2] In 2021, the Centers for Disease Control and Prevention (CDC) found prescription opioid misuse was associated with 73% of all pediatric opioid-related deaths.[3] Additionally, recent data on US pediatric opioid-prescribing practices showed nearly half of pediatric opioid prescriptions were categorized as high-risk (meaning prescriptions that increase the risk of adverse events, including death).[4] Prescription opioid use in children and adolescents is associated with a risk of future opioid misuse, opioid-related adverse events, and emergency department visits or hospitalizations.[5–9] Previous research indicates that adolescents who are exposed to opioids are at risk for short- and long-term heroin and prescription opioid misuse.[10–15] The situation

is problematic because long-term use of prescription opioids can lead to tolerance, an increased potential for drug dependence, and addiction.[16]

Adolescents who misuse prescription opioids typically obtain them from friends, family members, or through a prescriber.[17,18] Research shows parents often model inappropriate prescription opioid use by sharing unused medications with their children to treat minor injuries, giving their children incorrect dosages (either intentionally or unintentionally), and/or improperly storing opioids.[19–21] Unused prescription opioids in the home provide adolescents with an additional opportunity to misuse them and are identified as a primary source for non-medical opioid use in adolescents.[20–22] Furthermore, several studies have demonstrated that adolescents have inadequate knowledge about opioid use and safety.[23,24] With easy access to prescription opioids and a lack of understanding or awareness of

opioid medication safety, adolescents are at risk for prescription opioid misuse.[23–25]

Education on the safe use of prescription opioids for adolescents can be a preventive measure for future opioid misuse.[4,5,25–27] Few studies are aimed towards adolescent-specific education on prescription opioid use.[15,20–27] To develop effective opioid education for adolescents, researchers need to understand what teens know about opioids, what opioid knowledge is lacking, their behaviors related to opioid medication use, and their preferred way to receive opioid education. Our main objectives for this study were to 1) understand adolescents' attitudes, perceptions, and knowledge about prescription opioids; 2) identify adolescents' preferences for opioid safety education; and 3) determine adolescents' prior opioid education experiences and how their education correlates to current opioid knowledge and behaviors.

Methods

Participants and Procedures. Participants were adolescents, aged 13 to 18 years, who could understand English. The study team partnered with Qualtrics to recruit a national sample of adolescent participants and to administer the survey. Preexisting research panels whose participants indicated a willingness to participate in the survey were contacted. Quota sampling methods were used when targeting eligible participants to create a demographic distribution similar to that of 2010 United States census distributions in sex and race/ethnicity.[28,29]

The online survey was open from November to December 2020 (approximately 1 month). Eligible panel members were screened and consented. Assent for adolescents was also completed. Participants who completed the online survey were financially compensated through their predetermined contract with Qualtrics Panels (e.g., airline miles, gift cards, sweepstakes entrance, vouchers, coupons for food, e-cash, or more). This study was approved by the University of Wisconsin-Madison Institutional Review Board.

Survey Instrument. A survey previously developed to explore adolescent perceptions on prescription opioid use and safety was used in this study.[23] The online survey consisted of closed-ended questions with *yes*, *no*, and *I don't know* response options or a 5-point Likert scale. Survey questions were categorized into 4 core principles: 1) awareness and knowledge on prescription opioids; 2) attitudes and intentions related to prescription opioid misuse; 3) past experiences of prescription opioid safety education; and 4) interest in and preferences for opioid education. Demographic information was collected, including self-reported participant age, sex, school grade, race/ethnicity, and total number of children younger than 18 years in the household. To ensure data quality, the survey contained 2 attention check questions (e.g., "Please select *Not at all*. This question is to make sure you are still paying attention.").

The survey immediately ended for participants who incorrectly responded to either question. Participants could skip any survey questions they did not want to answer, except for the attention checks and age questions. Participants were required to provide their age for additional screening purposes.

Statistical Analysis. Participants who missed attention checks, straight-lined responses, and whose IP addresses were located outside of the United States were removed prior to data analysis. Survey outcome questions were divided into 14 concept scores in which questions within each concept had the same opening instructions and set of answers. Question groups with *yes*, *no*, and *I don't know* response options were summarized by the sum of desirable or correct answers, either *yes* or *no* depending on the wording of the question. Question groups with Likert scaling were mapped to discrete values (i.e., 1, 2, 3, 4, 5) and summarized by the mean, with 5 consistently representing the most desirable answer. Concept scores were described by overall mean ± SD and stratified by sex (female and male), race (White non-Hispanic and not White non-Hispanic), and having been personally prescribed opioids within the past 2 years. Associations between concept scores and these categorical factors were analyzed with Kruskal-Wallis tests. The relationship between concept scores by age and school grade was described by Kendall tau and determined by Kendall correlation test.

A secondary analysis aimed to determine associations between history of personal, friend, and family prescription opioid use with demographic factors. Participants with unknown (answered *I don't know*) opioid history were considered negatives. The mean ± SD, age, and school grade were reported for participants with and without opioid history, and associations were tested with Kruskal-Wallis tests. Counts (%) of opioid history by sex and race were reported and tested by using chi-square tests.

Additional analysis focused on survey questions related to opioid misuse, storage, and disposal and the participant's prior opioid education. Data were summarized with descriptive statistics. Chi-square tests were used to examine associations between reported knowledge of opioid misuse and safety with reported previous education on opioid misuse and safety. Kruskal-Wallis tests were run to assess p values. No p value adjustments were made to account for inflated type 1 error rate. Statistical analysis was performed with R version 4.1.1 (August 10, 2021) and significance was assessed at the alpha = 0.05 level.

Results

A total of 774 responses were used in analysis. The sample consisted of 377 (48.7%) females, 389 (50.3%) males, 480 (62.1%) White non-Hispanic participants, 142 (18.3%) Hispanic participants, 89 (11.5%) Black or African

American participants, and 32 (4.1%) Asian participants with a mean age of 15.16 years (SD = 1.42). Participant characteristics are shown in Table 1.

The most frequently reported sources of opioid information among participants included speaking with their parents (72%), Google or other search engines (69.9%), online videos (59.6%), and talking to doctors or nurses (54.1%). When asked how helpful various sources would be for opioid safety education, 54.7% indicated online videos would be very/extremely helpful, followed by educational websites (52.4%), instructor-led lectures (43.8%), and educational video games (42.7%). Descriptive statistics of survey responses for key variables are presented in Table 2.

Associations Between Concept Scores and Age and School Grade. Age was positively associated with familiarity with narcotics (tau = 0.15, p < 0.001), opioid terms (tau = 0.13, p < 0.001), and having a prior opioid education experience (tau = 0.06, p = 0.045) (Table 3). Similarly, school grade level was positively associated with familiarity of narcotics (tau = 0.17, p < 0.001) and opioid terms (tau = 0.19, p < 0.001).

Associations Between Concept Scores and Sex, Race or Ethnicity, and Personal Opioid History. Male participants had greater familiarity with opioid and narcotics terms. Males scored higher on source of information, but lower than female participants on opinion of opioid harms, opioid behavior intentions, and prescription opioid intentions (Table 4). Male participants were more likely to have a personal history or friend with an opioid prescription.

White non-Hispanic participants scored higher on familiarity with opioid and narcotics terms, discussing opioid medications, source of opioid information, and prior opioid education experience but scored lower than participants who are not White non-Hispanic on opioid behavior intentions and prescription opioid intentions. White non-Hispanic participants were also more likely to have a history of personal, friend, and family opioid prescription than participants who are not White non-Hispanic.

Those with a personal history of opioid prescription scored no differently on safe handling and storage of prescription opioids or opinion on prescription opioid misuse. However, they scored lower on opinion of opioid harms, opioid behavior intentions, and prescription opioid intentions than participants who reported no personal history of an opioid prescription. Participants who had been prescribed an opioid scored higher on all education concept scores, opioid epidemic effect on adolescents, and had greater familiarity with opioid and narcotic terms.

Discussion

The aim of this study was to understand adolescents' attitudes, perceptions, and knowledge about prescription opioids, their preferences for opioid safety educa-

Table 1. Participant Characteristics	
Variable	**n (%)**
Sample size	N = 774
School grade	
7th	47 (6.1)
8th	109 (14.1)
9th	151 (19.5)
10th	172 (22.2)
11th	154 (19.9)
12th	141 (18.2)
Sex*	
Female	377 (48.7)
Male	389 (50.3)
Other	8 (1)
Age ± SD, yr	15.16 ± 1.42
Race or ethnicity†	
Asian	32 (4.1)
Black or African American	89 (11.5)
Hispanic	142 (18.3)
Other or multiple categories	31 (4)
White non-Hispanic	480 (62.1)

* Three options were presented to participants to select for their sex: *male*, *female*, and *other*. Thus, "male" is defined as selecting *male* while not selecting other choices, and "female" is defined as selecting *female* while not selecting other choices; "other" was defined as all other combination of choices that occurred.

† Five different categories were available to select from for race or ethnicity, including *Asian Black or African American*, *Hispanic or Latino*, and *White*. Participants were defined as "Black," "Hispanic," or "White" if they only selected the associated category and no other selection was made; all other combinations of selections were defined as "Other."

tion, and how their prior opioid education affected their current knowledge and behaviors. Most adolescents in this study reported having prior education on what opioids are, what opioids do, how opioids are misused, and the results of misuse.[21,23,30] However, fewer adolescents reported having education on how to safely store and dispose of opioids. Study findings support the effectiveness of opioid safety education in the adolescent population. For example, participants with prior education on what opioids are used for were more likely to stop a friend from using an opioid for non-medical purposes than those without prior opioid education and knew that opioids could harm a person's physical health, mental health, ability to do well in school, and relationships. Considering participants with prior opioid history did not score higher on safe handling and storage of prescription opioids than those without prior opioid history, adolescent patients likely require more comprehensive and salient opioid safety education with an emphasis on safe storage and disposal.

Adolescents in this study reported using several sources for opioid information. Talking to parents and using Google, or other search engines, were the most common sources of opioid information, followed by online videos and speaking to doctors or nurses. This

Table 2. Descriptive Statistics

Individual Survey Questions	n (%)*
Prior opioid education experience†	
What opioids are	684 (88.4)
What do opioids do	641 (83)
How opioids are misused, and the results of misuse	629 (81.3)
How to safely store opioids	472 (61.1)
How to dispose of opioids	425 (55)
Source of opioid information†	
Talking to your parents	557 (72)
Google or other search engines	541 (69.9)
Online videos	461 (59.6)
Talking to doctors or nurses	419 (54.1)
Educational games	303 (39.2)
Newspapers	269 (34.8)
Podcasts	236 (30.6)
Medical journals	213 (27.5)
Opinion on prescription opioid misuse (Is someone misusing opioids if...)	
they use opioids at a larger dose or more often than their prescription calls for?	590 (76.2)
they use someone else's prescription to get opioids for themselves from a pharmacy?	580 (74.9)
they use someone else's opioid medication?	574 (74.2)
they share their opioid medication with others?	557 (72.1)
they are using an opioid after their prescription expired?	505 (65.3)
they return their unused opioid medication to the pharmacy when the prescription expires?	181 (23.4)

Opioid education preference (Thinking of ways to get educated about opioid medication safety, how helpful would each of the following be for you?)

	Not at All, n (%)	A Little, n (%)	Somewhat, n (%)	Very, n (%)	Extremely, n (%)	Mean ± SD
Instructor-led lectures	67 (8.7)	136 (17.6)	232 (30)	191 (24.7)	148 (19.1)	3.28 ± 1.21
Online videos	40 (5.2)	84 (10.9)	225 (29.2)	253 (32.8)	169 (21.9)	3.55 ± 1.1
Written information sheets	70 (9)	120 (15.5)	266 (34.4)	200 (25.8)	118 (15.3)	3.23 ± 1.15
Educational video games	121 (15.6)	116 (15)	206 (26.6)	186 (24)	145 (18.7)	3.15 ± 1.32
Educational websites	44 (5.7)	96 (12.4)	228 (29.5)	246 (31.9)	158 (20.5)	3.49 ± 1.12
Podcasts	139 (18)	137 (17.7)	229 (29.6)	161 (20.8)	108 (14)	2.95 ± 1.29

Discussing opioid medications (Thinking of people you could get information from about opioids, how likely would you be to discuss opioid medications with...)

	Not at All, n (%)	Slightly, n (%)	Somewhat, n (%)	Very, n (%)	Extremely, n (%)	Mean ± SD
Someone at your school, such as a teacher, nurse, or coach?	110 (14.2)	136 (17.6)	230 (29.7)	176 (22.7)	122 (15.8)	3.08 ± 1.26
Your parents?	48 (6.2)	80 (10.3)	136 (17.6)	253 (32.7)	257 (33.2)	3.76 ± 1.19
Your siblings?	153 (19.8)	98 (12.7)	188 (24.3)	202 (26.1)	133 (17.2)	3.08 ± 1.36
Your friends?	79 (10.2)	109 (14.1)	203 (26.2)	235 (30.4)	148 (19.1)	3.34 ± 1.23
Your doctor?	75 (9.7)	87 (11.2)	164 (21.2)	197 (25.5)	251 (32.4)	3.6 ± 1.3
Your pharmacist?	137 (17.7)	90 (11.6)	173 (22.4)	166 (21.5)	207 (26.8)	3.28 ± 1.43

Table 2. Descriptive Statistics (cont.)

Opinion on opioid harms (How much harm does opioid misuse do to one's...)

	None, n (%)	A Little, n (%)	Some, n (%)	Quite a Bit, n (%)	A Great Deal, n (%)	Mean ± SD
Physical health?	25 (3.2)	43 (5.6)	126 (16.3)	239 (30.9)	341 (44.1)	4.07 ± 1.05
Mental health?	27 (3.5)	39 (5)	118 (15.3)	218 (28.2)	372 (48.1)	4.12 ± 1.06
Ability to do well in school?	28 (3.6)	46 (5.9)	126 (16.3)	234 (30.2)	340 (43.9)	4.05 ± 1.08
Relationships with their family?	22 (2.8)	44 (5.7)	131 (16.9)	216 (27.9)	361 (46.6)	4.1 ± 1.05
Relationships with their peers and friends?	20 (2.6)	47 (6.1)	147 (19)	217 (28.1)	342 (44.2)	4.05 ± 1.05

Opioid behavior intentions (How likely would you be to...)[§]

	Not at All, n (%)	Slightly, n (%)	Somewhat, n (%)	Very, n (%)	Extremely, n (%)	Mean ± SD
Use an opioid that was prescribed to your friend for your own pain relief?	523 (67.7)	74 (9.6)	69 (8.9)	64 (8.3)	43 (5.6)	1.75 ± 1.24
Offer an opioid that you have a prescription for to a friend for their pain relief?	507 (65.5)	90 (11.6)	75 (9.7)	55 (7.1)	47 (6.1)	1.77 ± 1.24
Use a prescription opioid medication your grandparents have in their house?	564 (73)	48 (6.2)	61 (7.9)	57 (7.4)	43 (5.6)	1.66 ± 1.22
Use someone else's opioid pain relief medication that you find in your house?	552 (71.3)	52 (6.7)	63 (8.1)	68 (8.8)	39 (5)	1.7 ± 1.23
Stop your friend from using an opioid medication for non-medical purposes?	131 (16.9)	62 (8)	130 (16.8)	204 (26.4)	247 (31.9)	3.48 ± 1.44

reaffirms the findings from previous research regarding frequently used sources of opioid information in adolescents.[21,23] Additionally, participants identified their parents as the people they would be most likely to approach to discuss opioid information. These results are consistent with current literature, which states parents are the most important source of information for adolescents who are prescribed opioids, especially because they are often the ones administering the medication.[31] Results from this study and others indicate the importance of family communication and education about prescription opioids. Participants also stated online videos and educational websites would be helpful for opioid safety education, suggesting an increased need for reputable online resources on prescription opioids. The Pew Research Center found that 95% of teens had access to a smartphone in 2018, indicating online resources are an accessible method for adolescent education.[32] Additionally, 69.3% of participants in this study reported educational video games would

Table 2. Descriptive Statistics *(cont.)*

Safe handling and storage of prescription opioids (In your opinion, how dangerous would it be to…)

	Not at All, n (%)	Slightly, n (%)	Somewhat, n (%)	Very, n (%)	Extremely, n (%)	Mean ± SD
Store opioids in your bathroom cabinets?	116 (15)	87 (11.2)	175 (22.6)	178 (23)	218 (28.2)	3.38 ± 1.39
Store opioids in dining room or bedroom open cabinets?	116 (15)	80 (10.3)	161 (20.8)	198 (25.6)	219 (28.3)	3.42 ± 1.38
Throw opioids away in the trash bin?	137 (17.7)	99 (12.8)	155 (20)	165 (21.3)	218 (28.2)	3.29 ± 1.45
Flush opioids down the bathroom drain?	269 (34.8)	91 (11.8)	139 (18)	136 (17.6)	139 (18)	2.72 ± 1.52
Return unused opioid medications to the pharmacy?	462 (59.7)	46 (5.9)	76 (9.8)	98 (12.7)	92 (11.9)	2.11 ± 1.5

* Percentage of participants who selected *yes* to *yes*, *no*, and *I don't know* response options.
† Slight variation in total sample size occurs between items owing to non-responders.
§ Likert scales ranged from 1 (*none* or *not at all*) to 5 (*a great deal* or *extremely*).

be at least somewhat helpful for learning about opioid medication safety, and 18.7% said educational video games would be extremely helpful.

Findings on sex differences should be further investigated because there is conflicting literature surrounding sex differences on opioid knowledge and prescribing practices. One literature review found women were more likely to report lifetime use of prescription opioids.[33] Another study found that female children and young adults are more likely to be prescribed an opioid.[4] It is worth noting that much of the prior research examining opioid use and risk factors is in adults rather than adolescents.[15,20–27] More research is required to examine differences in opioid use risk factors based on sex and why these differences exist.

In this study, White non-Hispanic participants scored higher on familiarity with opioid and narcotics terms and were more likely to have a history of personal, friend, and family member with an opioid prescription than not White non-Hispanic participants. This aligns with current literature, which demonstrates non-White patients are less likely to receive opioid prescriptions for specific conditions and could elucidate the presence of disparities among adolescent patients.[34–38] Moreover, racial and ethnic inequities exist in pain management and access to specialized care, which could contribute to the differences in opioid history among adolescent participants.[36–38]

Since 2006, there has been a decrease in rates of large-dosage and long-term opioid prescriptions in adolescents and young adults. Nevertheless, opioids remain readily dispensed and high-risk prescribing practices are still common.[4,39] The results from this study support the critical need for tailored adolescent opioid education for this unique population. Future research should examine the use of a culturally appropriate, technology-based education intervention that focuses on correct opioid use, storage, and disposal.

Limitations

First, the use of quota sampling and recruitment through Qualtrics Panels may limit generalizability. The sample was limited to participants who had internet access to complete the online survey and whose parents participated in Qualtrics Research Panels. This could have introduced selection bias because individuals who have computers and internet access tend to have more socioeconomic advantages. However, the predisposed willingness of Qualtrics Research Panels to be contacted and surveyed could suggest that these individuals might be more open to discuss sensitive and/or stigmatized health issues than the general population. Second, participant characteristics such as opioid prescription history and opioid education experience were self-reported. Therefore, we are unable to verify the accuracy of these characteristics. Third, we are unable to determine whether adolescents completed the surveys independently and privately, and if their responses were influenced by the presence of a family member or other person. Finally, opioid use and knowledge can be a sensitive subject, thus, social desirability bias may have affected survey responses.

Table 3. Associations Between Concept Scores and Continuous Measures of Age, School Grade, and Number of Children in Household

Concept Score	Age		School Grade		Number in Household	
	Tau	p Value	Tau	p Value	Tau	p Value
Awareness and knowledge on prescription opioids						
Familiarity with narcotics term	0.15*	<0.001*	0.17*	<0.001*	0.05	0.08
Familiarity with opioids term	0.13*	<0.001*	0.19*	<0.001*	0.05	0.073
Opioid epidemic effect on adolescents	−0.01	0.776	0.02	0.609	0.09*	0.004*
Safe handling and storage of prescription opioids	0	0.876	−0.02	0.517	0.05	0.15
Attitudes and intentions on misuse						
Opioid behavior intentions	0.03	0.263	0.01	0.795	−0.13*	<0.001*
Opinion on opioid harms	0.02	0.373	0.02	0.399	−0.05	0.103
Opinion on prescription opioid misuse[†]	0.03	0.324	0.03	0.387	−0.01*	0.002*
Prescription opioid intentions	0.03	0.326	0	0.988	−0.04	0.126
Education						
Discussing opioid medications	−0.04	0.112	−0.01	0.69	0.08	0.004
Source of opioid information[†]	−0.05	0.096	−0.01	0.716	0.19*	<0.001*
Educating opioids to others	−0.02	0.422	0.01	0.718	0.1*	<0.001*
Opioid education interests	−0.04	0.165	0.03	0.294	0.14*	<0.001*
Opioid education preference	−0.03	0.216	0.01	0.64	0.12*	<0.001*
Prior opioid education experience[†]	0.06*	0.045*	0.04	0.194	0.06*	0.04*
	Yes vs No, Mean ± SD	p Value	Yes vs No, Mean ± SD	p Value	Yes vs No, Mean ± SD	p Value
Prescription opioid history[‡]						
Family opioid prescription	15.23 ± 1.45 vs 15.11 ± 1.4	0.22	9.97 ± 1.49 vs 9.85 ± 1.49	0.23	1.59 ± 1.22 vs 1.53 ± 1.56	0.185
Friend opioid prescription	15.14 ± 1.44 vs 15.18 ± 1.42	0.777	10.04 ± 1.45 vs 9.84 ± 1.51	0.072	1.91 ± 1.78 vs 1.37 ± 1.17*	<0.001*
Personal opioid prescription	15.22 ± 1.43 vs 15.15 ± 1.42	0.501	10.07 ± 1.41 vs 9.85 ± 1.52	0.081	1.73 ± 1.09 vs 1.5 ± 1.5*	0.001*

* Associations with p < 0.05.

[†] Indicates a concept score that was the sum of *yes* answers in the survey. All other concept scores were summarized by the mean Likert response.

[‡] Mean ± SD of age, grade, and number of children in household are reported for participants with and without a history of prescription opioids and tested with Kruskal-Wallis p values.

Conclusion

This study found that prior opioid education might be helpful in decreasing misuse in adolescents. Overall, participants were knowledgeable about what opioids are, what opioids do, how opioids are misused, and the result of such misuse. However, critical opportunities to improve identifying correct opioid storage and disposal techniques exist. Parents, websites, and online videos were found to be key sources of opioid education for adolescents, supporting the importance

Table 4. Associations Between Concept Scores and Sex, Race or Ethnicity, and Personal Opioid History*

Concept Score	Sex			Race or Ethnicity			Personal Opioid History		
	Female (n = 377)	Male (n = 389)	p Value	Not White Non-Hispanic (n = 294)	White Non-Hispanic (n = 480)	p Value	No or Don't know (n = 590)	Yes (n = 184)	p Value
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
Awareness and knowledge on prescription opioids									
Familiarity with narcotics term	3.32 ± 1.09*	3.53 ± 1.11*	0.012*	3.26 ± 1.13v	3.52 ± 1.07*	0.002*	3.24 ± 1.07*	4.01 ± 0.98*	<0.001*
Familiarity with opioids term	3.12 ± 1.15*	3.31 ± 1.14*	0.027*	3.00 ± 1.2*	3.34 ± 1.1*	<0.001*	2.96 ± 1.09*	4.03 ± 0.91*	<0.001*
Opioid epidemic effect on adolescents	3.73 ± 0.94	3.77 ± 0.98	0.454	3.78 ± 1.01	3.74 ± 0.93	0.393	3.68 ± 0.94*	3.99 ± 1.01†	<0.001*
Safe handling and storage of prescription opioids	3.39 ± 0.93	3.31 ± 0.86	0.135	3.4 ± 0.94	3.3 ± 0.86	0.172	3.33 ± 0.92	3.39 ± 0.89	0.427
Attitudes and intentions on misuse									
Opioid behavior intentions	4.05 ± 0.91*	3.82 ± 1.05*	0.004*	4.14 ± 0.84*	3.80 ± 1.05*	<0.001*	4.18 ± 0.75*	3.12 ± 1.2*	<0.001*
Opinion on opioid harms	4.19 ± 0.86*	3.98 ± 0.94*	0.001*	4.1 ± 0.94	4.06 ± 0.9	0.293	4.13 ± 0.89*	3.9 ± 0.97*	0.002*
Opinion on prescription opioid misuse†	4.44 ± 1.93	4.35 ± 1.89	0.324	4.35 ± 2.01	4.42 ± 1.85	0.829	4.38 ± 1.99	4.33 ± 1.63	0.104
Prescription opioid intentions	3.77 ± 0.79*	3.59 ± 0.77*	0.001*	3.78 ± 0.78*	3.62 ± 0.78*	0.007*	3.79 ± 0.77*	3.34 ± 0.74*	<0.001*
Education									
Discussing opioid medications	3.35 ± 0.92	3.37 ± 0.99	0.611	3.22 ± 1.01*	3.44 ± 0.92*	0.003*	3.25 ± 0.96*	3.69 ± 0.89*	<0.001*
Source of opioid information†	3.67 ± 2.5*	4.06 ± 2.73*	0.034*	3.61 ± 2.48*	4.04 ± 2.69*	0.025*	3.31 ± 2.51*	5.69 ± 2.09*	<0.001*
Educating opioids to others	3.68 ± 0.98	3.63 ± 1	0.42	3.57 ± 1.04	3.7 ± 0.96	0.136	3.56 ± 1.02*	3.96 ± 0.81*	<0.001*
Opioid education interests	3.36 ± 1.07	3.32 ± 1.18	0.88	3.24 ± 1.15	3.39 ± 1.12	0.062	3.16 ± 1.14*	3.87 ± 0.93*	<0.001*
Opioid education preference	3.26 ± 0.91	3.3 ± 0.97	0.572	3.23 ± 0.89	3.3 ± 0.97	0.289	3.16 ± 0.92*	3.64 ± 0.9*	<0.001*
Prior opioid education experience†	4.27 ± 1.85	4.19 ± 1.84	0.467	3.99 ± 2.03*	4.4 ± 1.7*	0.022*	4.0 ± 1.93*	5.05 ± 1.22*	<0.001*

	No. (%)	No. (%)	p Value	No. (%)	No. (%)	p Value
Prescription opioid history‡						
Personal opioid prescription	78 (20.7)*	104 (26.7)*	0.049*	54 (18.4)*	130 (27.1)*	0.006*
Friend opioid prescription	111 (29.4)*	147 (37.8)*	0.015*	69 (23.5)*	192 (40.0)*	<0.001*
Family opioid prescription	154 (40.8)	181 (46.5)	0.113	113 (38.4)*	225 (46.9)*	0.022*

* Associations with $p < 0.05$.

† Indicates a concept score that was the sum of yes answers in the survey. All other concept scores were summarized by the mean Likert response.

‡ Count (%) of prescription opioid history are reported with chi-square p values.

of parent or caregiver involvement in conversations about opioid safety and the need for technology-based educational resources. Adolescents' preferences, prior knowledge, and characteristics should be considered when providing them with opioid safety education. Further research is needed to examine the effectiveness of these adolescent-preferred opioid education sources, as well as the differences in adolescent opioid knowledge and experiences between sexes.

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