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Adolescent and Parent Management of Controlled Prescription Medications

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Abstract

Background: Most adolescents who misuse controlled prescription medications acquire them from home settings. However, little is known regarding household management (storage, administration and disposal) of these medications.

Objective: to describe household management of controlled medications

Methods: This was a cross-sectional study with paired data using brief, online, confidential surveys of adolescents and parents via an adolescent medicine clinic associated with a large academic center. Eligible adolescents were 12–18 years with at least one controlled prescription medication in the home. Six core safe management strategies for controlled medications were identified based on current recommendations. Data were collected and analyzed in 2017.

Results: Of the 243 adolescent-parent dyads, 78.2% (n=190) dyads store medication out of sight, 68.7% (n=167) lock up medications, 78.2% (n=190) do not store pills besides a school nurse's office or a parent's place of work, 43.6% (n=106) provide periodic parental monitoring, 64.6% (n=157) frequently dispose of unused controlled medications (at least every 3–4 months), and 80.2% (n=195) dispose of controlled medications in a prescription drug take-back program or by flushing. Families with an adolescent prescription for a controlled medication were more likely to use several core management strategies (periodic parental monitoring, frequent disposal, and appropriate disposal location). Families with a household pain reliever were 8.7 times (95% CI 3.3, 23.3) as likely to not keep spare pills in inappropriate locations.

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Conflicts of Interest

- Stacey A. Engster, MD, MS – none
- Debra L. Bogen, MD – none
- Brooke S.G. Molina, PhD – none

Conclusions/Importance: Most families do not practice all recommended safe management strategies for controlled medications. Healthcare professionals should promote safe management to reduce controlled prescription medication misuse.

Introduction

Misuse of controlled prescription medications is a significant problem in the United States. The 2015 National Survey on Drug Use and Health (NSDUH) defines misuse of medications as use without one's own prescription, use in greater amounts, more frequently, for longer periods of time than prescribed, or in any way not intended or directed by the prescriber. The most misused controlled medications are pain relievers, stimulants, sedatives, and tranquilizers, classified as Schedule II, III, and IV substances by the Drug Enforcement Administration (DEA) due to their potential for abuse, physiologic or psychologic dependence, and associated risk to public health (Controlled Substances Act 2012). Data from the 2016 NSDUH demonstrated that 1.6% (400,000) of 12–17 year old adolescents and 4.6% (1.6 million) of 18–25 year old young adults were current misusers of at least one of these medications, defined as misuse in the past month (Substance Abuse and Mental Health Services Administration 2017). Adolescent misuse of controlled medications is likely multifactorial in etiology and this study focuses on family practices of controlled medications, including storage, administration and disposal.

Because misuse of controlled medications is dangerous, these drugs and substances are highly monitored and regulated under existing federal law by The Controlled Substances Act. More specifically, Schedule I drugs, including heroin, ecstasy, and lysergic acid diethylamide (LSD), currently have no accepted medical use and have a high potential for abuse. Schedule II drugs, including cocaine, methamphetamine, oxycodone, and methadone, also have a high potential for abuse, potentially leading to severe psychological or physical dependence. Schedule III drugs are defined as those with a moderate to low potential for physical and psychological dependence, and include Tylenol with codeine, ketamine, and anabolic steroids. Schedule IV drugs have a low potential for abuse and dependence and include tramadol, zolpidem, lorazepam, diazepam, and alprazolam. Schedule V drugs have limited quantities of certain narcotics and are generally used for antitussive and analgesic purposes (Drug Enforcement Administration of the United States: Drug Scheduling).

Adolescents are particularly susceptible to the misuse of controlled medications, which can lead to serious health consequences. Previously identified risk factors for misuse of prescription drugs include male sex, white race, low parental education, low academic performance, no plans for college attendance, truancy/delinquent behavior, more evenings away from home, and other substance use (Substance Abuse and Mental Health Services Administration, McCabe, Teter et al. 2004, Catalano, White et al. 2011, Young, Glover et al. 2012, Nargiso, Ballard et al. 2015, Wang et al. 2015). Misuse of controlled medications by adolescents is associated with adverse or risky behaviors and health concerns, including school problems, risky sexual behaviors, riding with impaired drivers, mental health disorders, suicide attempts and increased risk of mortality (Fergusson and Lynskey 1996, Windle 2004, Mathers, Toumbourou et al. 2006, Miller, Naimi et al. 2007, Clark, Martin et al. 2008, Cranford, McCabe et al. 2013). The annual incidence of hospitalizations for

prescription opioid poisonings among 15–19 year-olds increased 176% between 1997 and 2012 (3.69 to 10.17 per 100,000) (Gaither, Leventhal et al. 2016). Deaths due to opioid overdose in 15–24 year-olds increased six-fold from 1999 to 2010 (0.5 to 3.38 per 100,000 persons) (Calcaterra, Glanz et al. 2013). One study found that although most prescription sedative or tranquilizer misuse ceased over time, over one-third of misusers had a substance use disorder three years later (Boyd, West et al. 2018). These increasing trends are a significant public health concern and demonstrate a need for preventive efforts.

One promising prevention approach to adolescent misuse is to address potential sources and access to controlled prescription medications. Among adolescent and young adult misusers, the leading sources of prescription opioids are their family members, peers, and leftover medications from previous prescriptions (McCabe and Boyd 2005). In fact, one study found that 35–40% of high school seniors who misused opioids obtained them from their own previous prescriptions (Johnston 2011). In another study, 83% of 8th and 9th graders had unsupervised access to any of their own prescription medications (including controlled medications), and of those with supervised administration, more than half had medications stored in easily accessible places (Ross-Durow, McCabe et al. 2013).

Currently, no universal guidelines exist on proper management for families with any household controlled prescription medication. Perhaps, this is because different recommendations are needed for individuals with their own prescription or for different classes of controlled medications. It's also challenging to develop universal guidelines for maturing adolescents given their need to learn independence and responsibility, including managing their own medications. Several governing medical associations, including the American College of Preventive Medicine (ACPM), American Academy of Pediatrics (AAP), the US Food and Drug Administration (FDA), and several pharmacy programs (e.g. AWARe and GenerationRx) have recommendations on safe use and disposal of controlled medications for people with their own prescriptions. These recommendations are described in Figure 1, and focus on storage, administration, and disposal. The AAP supports the transition of medical care and responsibility of medication management from parent to adolescent once the adolescent displays signs of independence, but the AAP recommends that “the caregiver should continue to periodically supervise medication administration (Harstad et al 2014).” The FDA provides specific guidelines on proper disposal of controlled medications, which can vary significantly from other over-the-counter or prescribed medications.

Despite these recommendations, little is known about family utilization of safe management recommendations with any household controlled medication. In order to better comprehend adolescent misuse of controlled medications, more information is needed regarding adolescent and parent household management. Therefore, this cross-sectional study of adolescents and parents aims to describe management practices (storage, administration, and disposal) of controlled medications within the home. Increasing public awareness, treatment interventions, and prevention strategies have been recommended and implemented during the opioid epidemic in the United States. In addition to interventions for prescribers, there is significant evidence suggesting that prevention and promotion programs for the general public can significantly decrease substance use (Mathis S, Hagemeier N, Hagaman A, et al

2018). Based on growing public awareness of the dangers of many controlled prescription medications, we hypothesized that the majority of families would practice some, but not all recommended safe management strategies. More specifically, we tested the likelihood that families would practice six core management strategies if: 1) an adolescent vs. someone else in the home had a prescription for a controlled medication, and 2) if the controlled medication was a pain reliever vs. another controlled medication (e.g. stimulant, sedative, or tranquilizer). We felt that most families would not be practicing all recommended strategies as there are multiple recommendations, some of which are specific, time-intensive, and might not be applicable to each individual family.

Methods

Study and Survey Design

We conducted one-time electronic surveys from a convenience sample of adolescents and one of their interested parents. We confidentially collected surveys online through Qualtrics survey software from May through July 2017. Prior to distribution, the surveys were piloted with a multidisciplinary group of primary care physicians and postdoctoral scholars for content validity, followed by five adolescent-parent dyads for face validity and feasibility. We recruited participants in one of two ways: 1) through flyers posted in an academic Adolescent Medicine clinic and advertisements on their website (98%); 2) our Clinical and Translational Science Institute Research Registry composed of adults and children interested in participating in research (2%).

Adolescents or parents initiated interest in participation by emailing the study team. The study team then emailed our eligibility questions and asked adolescents to obtain parental permission and an email address. Once adolescents confirmed eligibility, a Qualtrics link was sent with an additional email explaining the survey. If adolescents provided a parent email address, a separate email was also sent to the parent. By clicking on the link, participants then read our full consent page (again reiterating eligibility), and by clicking “Next” were agreeing to participate in this study. Our first three questions confirmed eligibility and sent potential participants to the end of the survey if they were not eligible. Participants were required to provide an answer for each survey question, but all questions had an appropriate “opt-out” response option (e.g. “Not applicable,” “I don’t know,” “I prefer not to answer”). Participants were compensated with a \$10 electronic gift card. IRB approval was obtained through the University of Pittsburgh.

Sample

Eligible adolescents were 12–18 years of age, currently enrolled in school, living with a parent or primary caretaker, English-speaking, able to provide an email address, and had at least one controlled prescription medication in the home (defined as a stimulant, opioid, sedative, or tranquilizer). Adolescents (or their parents) were excluded if they received care in one of six pediatric practices participating in a related study. Surveys were sent to a total of 519 interested participants. Fifteen participants were ineligible based on practice location and adolescent age. A total of 253 adolescents and 250 parents were eligible and completed the survey. We excluded incomplete dyads (five adolescents and two parents), and those

recruited from Pitt+Me as it provided such a small contribution to our overall sample (five dyads). Our final analyzable sample included 243 adolescent-parent dyads.

Measures

In addition to demographics (e.g. gender, age, education, race, ethnicity), we assessed controlled medications and household management by storage, administration, and disposal.

Controlled prescription medications—We assessed which individuals in the home were prescribed specific controlled medications. Response options for whom in the home had a controlled medication included: myself, parent, siblings, grandparents, other family members, spouse/partner, adolescent, or other children. A list of controlled medications was provided based on those included in the 2015 NSDUH questionnaire, including opioids, stimulants, sedatives, and tranquilizers (Molina, Hinshaw et al. 2013). Participants were asked typical storage locations, if parents monitor these medications (i.e. know where the medication is, how many pills remain), and the frequency and location of disposal. These questions were adapted from previous research about adolescent access to medication and had moderate-high reliability at a two-week test-retest reliability analysis (intra-class correlation coefficients (ICC) of 0.604–0.705 (Molina et al 2017, Ross-Durow 2013, McCabe et al. 2013). Adolescents were also asked the earliest age they knew of a controlled medication being in the home.

Controlled prescription medication management—Described in the bottom panel in Figure 1, we established six core strategies for safe storage (3), administration (1), and disposal (2) of controlled prescription medications in the home. There are no universal guidelines for proper household management of controlled medications, so we combined recommendations from the ACPM for pain prescription medicines (ACPM), the AAP for stimulant medications (Harstad E), and disposal recommendations from the FDA (U.S. FDA). We purposefully did not include all recommendations if they: 1) only applied to a subset of our sample with their own prescription, or 2) did not allow for adolescent transition to independence and responsibility in managing their own medication. The FDA recommends disposing of unused medications as soon as possible, but does not provide more specific guidelines. Because a surplus of unused medications could increase supply for adolescent misuse, we included frequent disposal (at least every 3–4 months) in our strategies.

Analytic Procedures

In addition to descriptive statistics, logistic regression was performed to assess the likelihood of families utilizing controlled medication management strategies among adolescents with their own-prescription, and if there was a pain-relieving medication (likely opioid) in the home. Because we were primarily interested in parental management of controlled medications within the home, we deferred to parent responses if there were discrepancies within adolescent-parent dyads (<5% of answers). There was no missing data as all participants completed the survey in entirety. All statistical procedures were performed in SPSS Statistics version 24.

Results

Study Population

Characteristics of the adolescent and parent participants are provided in Table 1.

Adolescents were a mean age of 15.8 years old ($SD=1.42$) and were mostly white and male. Most parents were 36–40 years old (range 31–45 years), white, and had graduated college.

Controlled Prescription Medications

Most adolescents and about half of parents had households with controlled medications prescribed for other people, not themselves. Of the 243 adolescents, 40 (16.5%) had their own prescription for a controlled medication, compared to 122 (50.2%) of the 243 parents. For participants answering questions about their own medication, no one reported additional medications in the home prescribed for someone else. The mean age of adolescents knowing a controlled medication was in their home was 13.4 years ($SD=2.4$), although 13 (7.4%) adolescents knew about household controlled medications prior to the age of 10 years.

All four classes of prescription medications were present in homes, but opioids were most prevalent. Adolescents with their own prescriptions most commonly were given opioids (70%, $n=28$), followed by sedatives (17.5%, $n=7$), tranquilizers (15%, $n=6$), and stimulants (5%, $n=2$). Medications for parents with their own prescription were opioids (48.4%, $n=59$), followed by sedatives (31%, $n=38$), tranquilizers (18%, $n=22$), and stimulants (4%, $n=5$). A full listing of these medications can be found in the eTable in the online supplement.

Controlled Prescription Medication Management

Adolescent and parent controlled medication management is described in Table 2.

Storage: About two-thirds of adolescents (66.3%, $n=161$) and more than three-quarters of parents (84%, $n=204$) stored controlled medications “out of sight,” such as in a cabinet or drawer, yet still a significant minority stored these medications “in plain sight,” such as on a countertop or tabletop. About a third of adolescents and parents did not lock up controlled medications ($n=70$, 28.8% and $n=76$, 31.3%). When medications were locked up, 21 (8.6%) adolescents had access to these medications. Seventeen (7%) parents reported giving adolescents access to locked medications. Most adolescents (80%, $n=32$) did not keep spare pills in other locations, yet many parents (21.4%, $n=53$) kept spare pills in a backpack/bag/purse or car. The majority of adolescents and parents stored controlled medications in the original pharmacy bottle (78%, $n=189$ and 88%, $n=214$), followed by a lockbox (37%, $n=90$ and 41%, $n=100$), and a day-of-the-week pill dispenser (24%, $n=59$ and 35%, $n=85$). Adolescents and parents stored these medications in the parent’s bedroom (86%, $n=208$ and 87%, $n=211$), followed by the adolescent’s bedroom (11%, $n=27$ and 13.6%, $n=33$) and lastly, in a backpack/bag/purse that is always carried with the parent (11%, $n=27$ for both). Five (2%) adolescents reported the kitchen as the main storage site, while 11 (4.5%) parents stored medications in the kitchen.

Administration: About half of adolescents (55%, $n=22$) and parents (43.6%, $n=106$) report parental monitoring of any controlled medications in the home (i.e., knowing where

the medicine is, how many pills are remaining, etc.). In other words, 44% of parents monitored any controlled medication in the household (whether prescribed for themselves or someone else), while only 20.7% of parents (n=25) monitor their adolescents' controlled medications. For the 40 adolescents with their own prescription, the majority of adolescents and parents (87.5%, n=35 for both) noted the adolescent could take controlled medications alone, without a parent present. Of the adolescents with their own prescription, over a third (35%, n=14) said their parent watches them take the medication most of the time and over half (57.5%, n=23) said some of the time. Of adolescents with their own prescription, 36 (90%) took their medication in the kitchen on most days, followed by the adolescent's bedroom (10%, n=4). Of the 122 parents with their own prescription, 59 (24.3%) took their controlled medication in the kitchen on most days, while 62 (25.5%) took it in their bedroom.

Disposal: More than half of adolescents (50.6%, n=123) and parents (75.7%, n=184) had household leftover medication. Most parents disposed of controlled medications every 3–4 months (64.6%, n=157), yet some parents (15.2%, n=37) never disposed of them. Nearly half the adolescents (43.6%, n=106) were unsure of the frequency of household medication disposal. Only some adolescents said their family disposed of controlled medications in a Prescription Takeback/Pill drop program (34.6%, n=84), compared to most parents (77%, n=187). A small number of parents disposed of controlled medications by flushing in a toilet (8.6%, n=21). Of note, 177 (72.8%) parents reported 1 disposal location, 54 (22.2%) reported 2 locations and 11 (4.5%) reported 3 or more disposal locations.

Overall Management: Of our overall sample, 78.2% (n=190) of dyads store medication out of sight, 68.7% (n=167) lock up medications, 78.2% (n=190) do not store spare pills besides a school nurse's office or a parent's place of work, 43.6% (n=106) provide periodic parental monitoring, 64.6% (n=157) frequently dispose of unused controlled medications (at least every 3–4 months), and 80.2% (n=195) dispose of controlled medications in a prescription drug take-back program or by flushing. Family utilization of the six core safe management strategies are displayed in Figure 2, showing that the majority of adolescent-parent dyads practice several strategies for storage, administration, and disposal. Most commonly, 31.7% (n=77) of families utilize 3 safe management strategies, while 29.6% (n=72) utilize 4 safe management strategies.

We found significant associations with families' utilizing safe management strategies among adolescents with their own prescription, and household pain relievers (Table 3). While controlling for adolescent gender, age, race, year in school, and parent gender, age and education, families with an adolescent prescription for a controlled medication (compared to families with another household member with a prescription) were 3.2 times as likely to have periodic parental monitoring, 3.4 times as likely to dispose of controlled medication frequently (at least every 3–4 months), and 12 times more likely to dispose of controlled medications in a proper location, such as a prescription drug take-back program or by flushing in a toilet. Families with an adolescent prescription for a controlled medication were less likely to lock up these medications, and were less likely to not keep spare pills in various locations. Families with a household pain reliever (compared to families with a

stimulant, sedative, or tranquilizer) were 8.7 times as likely to not keep spare pills in inappropriate locations, yet were less likely to practice other management strategies, including locking up these medications, and disposing of them frequently, and in appropriate locations. We found no significant associations with adolescent prescription status and household pain relievers among the number of safe management strategies that families utilized.

Discussion

This study describes household management of controlled prescription medications, based on current recommendations for safe storage, administration, and disposal. As hypothesized, families are practicing safe strategies, but very few are practicing all six identified as core strategies. Families with a controlled prescription medication in the home have a variety of Schedule II, III, and IV medications, and adolescents are aware of these medications, even if not prescribed for themselves. Families with an adolescent prescription for a controlled medication were more likely to have parental monitoring, and to dispose of these medications frequently and in appropriate locations, however, they were less likely to lock up these medications. This difference may be due to parents decreasing safe management strategies as adolescents mature, or that parents over-report strategies given younger maturity levels of their children. Families may not be locking up these medications if they are teaching the adolescent responsibility with managing their own medications. Furthermore, families with pain-relieving controlled medications were more likely to not keep spare pills, compared to families with other types of controlled medications. It's possible families do not want these medications stored in other places, and perhaps this survey is not adequately deciphering all of these individual strategies. It's interesting that families with pain relievers were less likely to practice other management strategies, and this finding does not support recent increases in public awareness of the dangers of opioid medication. Furthermore, it's interesting that although most medications were taken in the kitchen, they were often stored in bedrooms. This difference could relate to unsupervised access to medications and potential adolescent misuse. Inadequate storage, administration, and disposal of controlled medications could lead to harm including poisoning/overdose or facilitate misuse or diversion.

We found a lower rate of adolescent access to their own prescription medication than previously reported. Ross-Durow (2013) found that 73.7% (n=42) of adolescents prescribed controlled medications in the previous six months had unsupervised storage, and by extension, unsupervised access to them. Our study evaluated access to locked medications, which only a small proportion of the sample reported. Additional reasons for this difference could be due to sample characteristics, study design, or recall bias. Their data were collected from semi-structured interviews about any prescription medication prescribed in the last six months, including controlled medications (Ross-Durow, McCabe et al. 2013). Furthermore, the interpretation of supervised vs. unsupervised access could have different definitions across these two studies.

Despite the majority of families having leftover or unused controlled medications at home, there were high rates of frequent disposal in proper locations, especially prescription drug

take-back programs. Our results are similar to previous research, which found that as many as 2 of 3 prescription medications (including controlled medications) were unused (Law, Sakharkar et al. 2015). Adolescent misuse has been linked to unused medications in households, and to the distribution of unused medications to other individuals as a means of disposal (Kinrys et al 2018). Although household management requires additional research in the US, several other countries around the world have described their practices with storage, administration, and disposal with medication. A similar online cross-sectional study in Turkey surveyed company employees, and found that 28% keep unused/unwanted medications at home, while one third disposed of unused medication in a garbage, sink or toilet (Akici, Aydin et al. 2018). Although the US FDA currently supports a list of controlled medications that are flushed for disposal, there has been a surge of prescription drug take-back programs. One reason for this is that pharmaceuticals from disposed medications have been found in the water supply, with concerns of potential health impacts to humans and aquatic life (Kostich, Batt et al. 2014). Furthermore, with the passing of the US Secure and Responsible Drug Disposal Act in 2010, pharmacies and healthcare facilities can register as designated collection sites (Traynor 2016). Our results of high rates of frequent disposal, especially with prescription drug take-back programs, support these recent increases in facilities, in addition to increased public education and awareness of these programs.

However, findings from our study and others support the need for additional education to the public and providers/prescribers to instruct adolescents and parents on how to properly store, administer, and dispose of controlled medications (Boyd et al 2011, Ross-Durow et al. 2013, Kinrys, Gold et al. 2018). Parents and adolescents should be advised on the correct dosing, and risks of misusing, sharing, or diverting controlled medications. Developing universal recommendations and educational tools could benefit families and provide a consistent message for providers/prescribers.

This study has several limitations. It was a small, self-selected sample which is not demographically representative of the city of Pittsburgh, nor the US adolescent population at large. Our dyads were selected from a clinic-based sampling pool and are of predominantly non-Hispanic White descent. This homogenous sample could have biased our results, and could also affect the generalizability of our results to other populations. Although this was a confidential online survey, medication management strategies may not be truly representative based on the theory of social desirability. Our results are likely under-represented as adolescents who are misusing controlled medications were less likely to volunteer for this study, and/or they may not respond truthfully. Additionally, many questions allowed participants to select more than one answer choice, e.g., “Where does your family get rid of leftover controlled prescription medications? Check all that apply.” This does not provide information on the frequency of utilizing each of these disposal locations. Therefore, our description of safe management strategies may not be representative of their continuous storage, administration, and disposal practices. Lastly, we had large confidence intervals in our logistic regression analyses due to small cell sizes, supporting the need for additional research in this area.

This cross-sectional study offers a glimpse into describing household management of controlled medications. Additional research is warranted to describe household management

in a representative sample. Although we designed a web-based survey for convenience and feasibility, broader recruitment methods and less stringent inclusion/exclusion criteria should be executed to capture a more generally representative sample. Future research is needed to determine associations between safe management strategies, including household storage, administration, and disposal, and adolescent misuse of controlled prescription medications. Additionally, intervention studies are needed to increase family behaviors to practice safe management of controlled medications. Our findings demonstrate higher likelihoods of families' practicing certain safe management strategies for adolescents with their own prescriptions, and for household pain-relieving medications. All providers interacting with families with a controlled prescription medication should understand these individual nuances and should counsel families on the challenges of managing controlled medications safely with children and adolescents present in the home.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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	Storage	Administration	Disposal
American College of Preventive Medicine	<ul style="list-style-type: none"> Keep under lock and key Keep separate from other family members' drugs Keep in original bottle it came in 	<ul style="list-style-type: none"> Organize and keep track of medicines Do not tell others about the medicines you take 	<ul style="list-style-type: none"> Don't give medicines away (illegal for controlled substances) Don't take back to the pharmacy Don't flush unless approved by FDA
American Academy of Pediatrics	<ul style="list-style-type: none"> Store in safe location at home or in locked office in school Never carry in a backpack or purse Use weekly pill dispensers to support transition of care to adolescent 	<ul style="list-style-type: none"> Only take exactly as prescribed If taken at school, medicine should only be dispensed in school nurse's office or a safe location with adult supervision Periodic parental supervision advised 	<ul style="list-style-type: none"> Do not give away or sell medication
Food and Drug Administration			<ul style="list-style-type: none"> Follow any specific disposal instructions on prescription label or information pamphlet Dispose through National Prescription Drug Take-Back event or DEA-authorized collector See full list of medicines to flush in toilet Follow specific instructions if disposing in trash Don't give medicine to friends When in doubt, ask your pharmacist
Our Core Strategies for Safe Management	<ol style="list-style-type: none"> Keep under lock and key Storing out of sight in a safe location (e.g. drawer/cabinet) Do not keep spare pills kept in other locations except for school nurse's office or parent's place of work 	<ol style="list-style-type: none"> Periodic parental monitoring (e.g. know where the medication is stored, how many pills are remaining and/or watch the adolescent take the medication if applicable) 	<ol style="list-style-type: none"> Discard unused medications at least every 3-4 months Discard unused medications in appropriate locations such as prescription take-back program or by flushing in toilet

Figure 1.
Recommendations and Core Strategies for Storage, Administration and Disposal

Figure 2.
Self-reported number of safe management strategies used by adolescent-parent dyads

Table 1.

Sample Characteristics

	Adolescents Total N=243 n (%)			Parents Total N=243 n (%)		
Age (years)	12–13:	11	(4.5)	31–35:	29	(11.9)
	14–15:	103	(42.4)	36–40:	146	(60.1)
	16–17:	93	(38.3)	41–45:	68	(28)
	18:	36	(14.8)			
Male Sex		183	(75.3)		114	(46.9)
Race						
White		223	(91.8)		229	(94.2)
Black/African-American		8	(3.3)		8	(3.3)
Asian		1	(0.4)		1	(0.4)
Native Hawaiian/Pacific Islander		6	(2.5)		4	(1.6)
American Indian/Alaskan Native		2	(0.8)		-	-
More than one race		3	(1.2)		1	(0.4)
Ethnicity: Hispanic/Latino		11	(4.5)		7	(2.9)
Education	5–6:	7	(2.9)	Technical or special		
	7–8:	88	(36.2)	training:	30	(12.3)
	9–10:	93	(38.3)	Partial College:	42	(17.3)
	11–12:	55	(22.6)	Associate:	36	(14.8)
	Public:	221	(90.9)	College:	131	(53.9)
	Private:	15	(6.2)	Graduate:	4	(1.6)
	Home:	7	(2.9)			
Annual Income (\$)				30,001–42,000:	19	(7.8)
				42,001–48,000:	34	(14.0)
				48,001–54,000:	61	(25.1)
				54,001–60,000:	93	(38.3)
				>60,000:	36	(14.8)
Controlled Medication for Self		40	(16.5)		122	(50.2)
1 prescription		40	(100)		120	(98.4)
2 prescriptions		-	-		2	(1.6)

Table 2:**Management of Controlled Medications: Storage, Administration, Disposal^a**

	Adolescent n (%)			Parent n (%)		
	Total N = 243	Own Rx N=40	Rx For Someone Else N=203	Total N = 243	Own Rx N=122	Rx For Someone Else N=121
STORAGE						
Location stored						
Out of sight (Cabinet/drawer)	161 (66.3)	27 (67.5)	134 (66)	204 (84)	117 (96)	87 (71.9)
In plain sight (Countertop/ table)	42 (17.3)	13 (32.5)	29 (14.3)	70 (29)	22 (18)	48 (39.7)
"I don't know"	40 (16.5)	-	40 (19.7)	7 (2.9)	-	7 (5.8)
Medications Locked Up						
No	70 (28.8)	31 (77.5)	39 (19.2)	76 (31.3)	32 (26.2)	44 (36.4)
Yes, I do	2 (0.8)	2 (5.0)	-	159 (65.4)	86 (70.5)	73 (60.3)
Yes, my parent does	171 (70.4)	7 (17.5)	164 (80.8)	-	-	-
Yes, other family member does	-	-	-	23 (9.5)	10 (8.2)	13 (10.7)
Spare Pills in other locations						
No	-	32 (80)	-	99 (40)	62 (50.8)	37 (30.6)
Work	-	-	-	9 (3.6)	9 (7.4)	-
Backpack/bag/purse	-	3 (7.5)	-	53 (21.4)	51 (41.8)	2 (1.6)
Car	-	-	-	2 (0.8)	2 (1.6)	-
School Nurse's Office	-	5 (12.5)	-	6 (2.4)	-	6 (4.9)
ADMINISTRATION						
Periodic Parental Monitoring	-	22 (55)	-	106 (43.6)	81 (66.4)	25 (20.7)
DISPOSAL						
Frequency of disposal						
Never	30 (12.3)	5 (12.5)	25 (12.3)	37 (15.2)	35 (28.7)	2 (1.6)
Once a year	26 (10.7)	10 (25)	16 (7.9)	45 (18.5)	27 (22.1)	18 (14.9)
Every 6 months	-	-	-	1 (0.4)	1 (0.8)	-
Every 3-4 months	79 (32.5)	23 (57.5)	56 (27.5)	157 (64.6)	59 (48.4)	98 (81)
Once a month	2 (0.8)	-	2 (1.0)	-	-	-
"I don't know"	106 (43.6)	2 (5.0)	104 (51.2)	3 (1.2)	-	3 (2.5)
Location of Disposal^b						
Trash	38 (15.6)	16 (40)	22 (10.8)	68 (28)	32 (26.2)	36 (29.9)
Flushing Down Toilet	9 (3.7)	5 (12.5)	4 (2.0)	21 (8.6)	10 (8.2)	11 (9.1)
Prescription Takeback Program	84 (34.6)	22 (55)	62 (30.5)	187 (77)	78 (63.9)	109 (90.1)
"I don't know"	112 (46.1)	1 (2.5)	111 (54.7)	6 (2.5)	-	6 (4.9)

^aPercentages exceed 100% as participants could choose more than one response. Rx abbreviation is short for prescription.

^bBoth adolescent and parents did not report giving away, selling or trading medications as a method of disposal.

Table 3.Associations of Family Utilization of Six Safe Management Strategies^a

	Adolescent Prescription OR (95% CI)	Household Pain Reliever OR (95% CI)
Safe Management Strategies		
Storing out of Sight	0.536 (0.19, 1.46)	1.502 (0.65, 3.45)
Locking up	0.132^d (0.05, 0.34)	0.309^c (0.16, 0.62)
No Spare Pills	0.035^c (0.004, 0.29)	8.738^d (3.28, 23.27)
Periodic Parental Monitoring	3.187^b (1.19, 8.51)	0.908 (0.45, 1.83)
Frequent Disposal	3.365^b (1.37, 8.29)	0.395^c (0.20, 0.76)
Proper Disposal Location	11.99^c (2.43, 59.14)	0.251^c (0.09, 0.63)
Number of Strategies Used		
1	2.698 (0.49, 14.73)	1.169 (0.22, 6.35)
2	0.959 (0.28, 3.24)	2.016 (0.78, 5.19)
3	0.813 (0.34, 1.94)	1.581 (0.77, 3.24)
4	1.190 (0.49, 2.88)	0.622 (0.31, 1.24)
5	0.985 (0.34, 2.85)	0.488 (0.22, 1.11)
6	1	2.687 (0.44, 16.46)

^aLogistic regression models are controlled for adolescent gender, age, race, year in school, and parent gender, age and education. Adolescent prescription was a binary variable if an adolescent had their own prescription for a controlled prescription medication. Household pain reliever is a binary variable if there was a pain reliever in the house vs. another controlled prescription medication (stimulant, sedative, or tranquilizer).

^bp value < 0.05

^cp value < 0.01

^dp value < 0.001