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## Adolescents' Access to Their Own Prescription Medications in the Home

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### Abstract

**Purpose**—The objective of this descriptive study was to determine adolescents' access to their own medications at home, specifically prescription pain, stimulant, anti-anxiety, and sedative medications.

**Methods**—Semi-structured interviews were conducted with a cohort of 501 adolescents from two southeastern Michigan school districts. Participants were asked what medications had been prescribed to them during the previous six months; if they had received prescription medications, they were asked in-depth questions about them, including how medications were stored and supervised at home.

**Results**—The sample was comprised of adolescents in the 8<sup>th</sup> and 9<sup>th</sup> grades, and 50.9% were male. Participants were primarily White (72.9%, n = 365) or African American (21.6%, n = 108). Slightly less than half of the adolescents (45.9%, n=230) reported having been prescribed medications in the previous six months. Of this group, 14.3% (n = 33) had been prescribed pain medications, 9.6% (n = 22) stimulants, 1.7% (n = 4) anti-anxiety medications, and 0.9% (n = 2) sedatives. In total, 57 adolescents were prescribed medications in the pain, stimulant, anti-anxiety, or sedative categories (including controlled medications), and the majority (73.7%, n=42) reported that they had unsupervised access to medications with abuse potential.

**Conclusions**—The majority of adolescents who were prescribed medications in the pain, stimulant, anti-anxiety or sedative categories during the previous six months had unsupervised access to them at home. It is critical that clinicians educate parents and patients about the importance of proper storage and disposal of medications, particularly those with abuse potential.

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#### Implications and Contribution

This investigation revealed that 73.7% (n = 42) of adolescents, recently prescribed medications in controlled categories, reported unsupervised access to them at home. This finding suggests the need for clinicians to educate adolescent patients and parents about the proper storage, disposal, and supervision of medications with abuse liability.

The authors have no conflicts of interest to report.

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## Key Words or Short Phrases

Adolescents; Prescription Medications; Prescription Drugs; Controlled Medications; Parental Supervision; Parental Monitoring; Medication Storage; Diversion; Interview; Epidemiology

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## Introduction

Over the past two decades, there has been a significant increase in the prescribing of controlled medications to adolescents in the United States [1–3]. Concomitantly, the nonmedical use of prescription medications (NUPM) has been an increasing problem among adolescents and young adults [4–6]. Between 2004 and 2008, it was estimated that among patients younger than 21 years of age, emergency room visits for nonmedical use of prescription narcotic pain relievers alone more than doubled [7]. In 2009, the Centers for Disease Control and Prevention documented that in 15–19 year olds, death by poisoning (in part due to prescription drug overdoses), was the second leading cause of death, reflecting a 91% increase between 2000 and 2009 [8].

Several studies have shown that adolescents are more likely to obtain controlled medications for nonmedical use from family members or friends rather than from drug dealers/strangers or the internet [5, 9–13], and growing evidence indicates adolescents and young adults are *most likely* to obtain these medications from their peers [5, 11–12, 14]. Further, Johnston and colleagues found that between 35% and 40% of high school seniors, who reported nonmedical use of prescription opioids in the past 12 months, had obtained these medications from their own previous prescriptions [5]. Despite the availability of controlled medications among adolescents, there is a lack of research examining the storage practices of controlled medications within adolescents' homes. Safety with these medications is of particular concern because of their potential for abuse and dependence, as well as their additive effects with alcohol and other drugs, which oftentimes leads to overdose or poisoning [7–8, 15–17].

To more fully understand the problem of NUPM, the objective of our study was to determine adolescents' access to their own prescription medications at home, with particular attention to those listed by the Controlled Substances Act (CSA), since these have high potential for abuse and dependence, as well as unintentional death through overdose or mixing with other medications or alcohol [7–8, 15–17]. The CSA is a federal drug policy under which certain substances are regulated by law, including, but not limited to, their distribution, use, and possession [18]. We focused on four classes of controlled medications, opioid analgesics, stimulants, anti-anxiety, and sedative/sleep medications, but we also examined other categories of prescribed medications to determine whether there were differences in adolescents' access between controlled medications and those not in this group.

## Methods

The 5-year prospective, longitudinal study on which this investigation was based is funded by the National Institute for Drug Abuse specifically to examine “Non-Medical Use of Prescription Medications by Adolescents” (Principal Investigator, C. J. Boyd), with protocols approved by the Human Subjects Review Board at the University of Michigan. Consent was sought from parents of all 7<sup>th</sup>–12<sup>th</sup> grade adolescents in two school districts (one “near urban” and the other “suburban/semi-rural”) to participate in an annual web-based survey, the *Secondary Student Life Survey* (SSLS), during school hours. Surveys were completed by 2744 consented adolescents during the 2009–2010 academic year.

Parents of all 7<sup>th</sup> and 8<sup>th</sup> grade adolescents who completed the web survey during that first year, then received an additional consent form seeking permission for their children to participate in the “interview” arm of the study. A total of 501 adolescents (then in the 8<sup>th</sup> and 9<sup>th</sup> grades) participated in the semi-structured interviews in the Fall of 2010, and provided the data on which this paper is based.

The semi-structured interviews were conducted during the participants’ school lunch periods by one of two licensed clinicians trained in the research protocols. In the event that adolescents had moved out of the school districts during the study period, interviews were conducted by phone. Prior to the start of each interview, adolescents provided assent. Participants received a gift card of \$5 for completion of the first interview, \$10 beginning with the second interview, and \$15 during the final year of the study. The *Youth Interview Guide* (developed by C. J. Boyd) contained two questions asked of all adolescents, with additional follow-up ones based on their responses to the initial questions. One question asked participants: “In the past six months, have you used any prescription medications for medical problems that you received from a doctor, dentist, nurse practitioner, or other medical professional?” If they responded in the affirmative, they were asked “What are the names of the medicines; what are they used for; and how are they prescribed?” They were also asked “How are the medicines stored at home?” and “Is the storage supervised? Supervised storage was measured subjectively. Interviewers asked respondents if they were able to freely access their medications to take them when required, or whether access to their medications was supervised by an adult. Medications were recorded as “supervised” if respondents indicated that they were dispensed or laid out for adolescent self-administration by an adult. These questions formed the basis of the study reported here.

A content analysis was conducted on the responses of the 230 adolescents who had been prescribed medications in the past six months (n = 374 medications mentioned), as well as the storage locations of these medications in their homes (n = 270 locations mentioned). (Some respondents were prescribed more than one medication, or cited more than one storage location.) After reading all responses, the first author constructed 10 mutually exclusive categories for medication classification, and 11 mutually exclusive categories for the storage locations of medications. After creating these categories, the first author coded all of the adolescents’ responses to these two questions.

In cases where respondents were unable to specifically name their prescribed medications, they were classified based on the reasons adolescents stated they were prescribed. Fifty-seven adolescents were prescribed medicines that were categorized in the pain reliever/anti-anxiety/stimulant/sedative categories. Just over half of these respondents (50.9%, n = 29) named specific medications covered under the CSA, while the remainder described their prescribed medications and the reasons they were given. For example, when medications were not specifically named, they were classified in the “pain” category when adolescents were prescribed them for pain for reasons such as “a broken leg,” “a broken shoulder,” “a broken thumb,” “a broken foot,” “mouth surgery,” or “extraction of four wisdom teeth.” Medications were placed in the anti-anxiety category for reasons such as “tranquilizer prior to gum work procedure” or “medication for emotional sensitivity.”

After the initial coding was completed, the data were given to another clinician to independently code responses on the same two questions using the categories previously constructed by the first author. This procedure was important since some respondents were unable to specifically name their prescribed medications, but could identify reasons why they were prescribed. Using every case, interrater reliability was determined by percent agreement on the categorization of variables by the two independent coders. The index of agreement for categorization of medications was determined by summing the 10 attained

percent agreements, and then dividing the total by 10. The average percent agreement for medication categorization was 98.4%. Likewise, the index of agreement for categorization of storage locations of medications was determined by summing the 11 attained percent agreements, and then dividing the total by 11. The average percent agreement for storage location categorization was 98.1%.

## Results

Data from 501 participants were collected from September 2010 through January 2011. Approximately 51% (50.9%,  $n = 255$ ) of the sample was male. White participants made up the majority at 72.9% ( $n = 365$ ), with 21.6% ( $n = 108$ ) African American, and the remaining 5.6% ( $n = 28$ ) from other racial categories. The mean age of the sample was 14.1 years ( $SD = 0.6$ ); 49.9% ( $n = 250$ ) of the participants were in the 8<sup>th</sup> grade and 50.1% ( $n = 251$ ) were in the 9<sup>th</sup> grade. Table 1 summarizes additional sample characteristics. Analyses revealed that there were no significant differences in the 501 adolescents who participated in the interviews and the 458 who did not on the basis of sex ( $\chi^2 = .56$ ,  $d.f. = 1$ ,  $p = .45$ ), race ( $\chi^2 = 3.2$ ,  $d.f. = 2$ ,  $p = .20$ ), or grade ( $\chi^2 = .51$ ,  $d.f. = 1$ ,  $p = .48$ ).

Slightly less than half of the participants (45.9%,  $n = 230$ ) reported being prescribed medications in the previous six months. Among those adolescents, pain medicines (e.g., “Tylenol #3,” “Vicodin,” “Strong pain medication”) were prescribed to 14.3% ( $n = 33$ ), stimulants (e.g., “Adderall,” “Concerta,” “Ritalin”) to 9.6% ( $n = 22$ ), anti-anxiety medications to 1.7% ( $n = 4$ ), and sedatives to 0.9% ( $n = 2$ ). (Four adolescents were prescribed medications in two of these four categories.) Further, participants often reported being prescribed several different medications during the previous six months. Other categories of medicines, in addition to those specified above, were endorsed by 86.1% ( $n = 198$ ). Antibiotics were the most common category (26.7%,  $n = 53$ ), followed by inhalers (25.3%,  $n = 50$ ), allergy/decongestants (19.7%,  $n = 39$ ), non-stimulant Attention Deficit Hyperactivity Disorder (ADHD) medications such as “Strattera” or any ADHD medication that participants were unable to specifically name (7.1%,  $n = 14$ ), antidepressants (4.0%,  $n = 8$ ), with “other” categories accounting for 47.0% ( $n = 93$ ). Some examples of additional medications in the “other” category included acne treatments, topical creams for various conditions, insulin, antacid preparations, and thyroid hormone replacements.

Of those adolescents prescribed medications in the previous six months ( $n = 230$ ), 229 answered the question about medication storage supervision in their homes. The majority of adolescents (83.4%,  $n = 191$ ) reported that the storage of their prescribed medications was unsupervised, and that they had access to them. Of the 57 participants who were taking medications classified as controlled (viz., prescription pain relievers, anti-anxiety medications, stimulants, and sedatives), 73.7% ( $n = 42$ ) reported unsupervised access to their medications. Of the 33 adolescents prescribed pain relievers, 10 (30.3%) reported supervision, while 5 of the 22 (22.7%) prescribed stimulants did (one who reported supervision was prescribed both of these medications.) One of the four (25%) participants prescribed anti-anxiety medications reported supervision, while neither of the two adolescents prescribed sedatives did. Table 2 summarizes statistics related to prescribed medications and their storage status. Chi-square analyses revealed no significant differences in storage supervision of prescribed medications based on grade ( $\chi^2 = .32$ ,  $d.f. = 1$ ,  $p = .57$ ) or sex ( $\chi^2 = .01$ ,  $d.f. = 1$ ,  $p = .93$ ) of the adolescents.

Most adolescents identified specific locations in their homes where their prescribed medications were stored. Just one (9<sup>th</sup> grade male; unsupervised storage) of the 226 adolescents who responded to the question about storage of their prescription medications reported that he was “unsure” where a pain medication was kept. Only one adolescent

(female, 9<sup>th</sup> grader; supervised storage) reported that her medications were locked (“Concerta” and two asthma inhalers “locked in dad’s office”). Many descriptions of storage locations were very specific (e.g., 8<sup>th</sup> grade male prescribed an “oral steroid” with unsupervised storage: “in mom’s medicine chest in bathroom on top shelf”; 8<sup>th</sup> grade female prescribed “prednisone, Zantac,” and an unknown “pill” with unsupervised storage: “in a box in the computer room with a binder to chart medications”). In at least one case, it appeared that a parent’s attempt to “hide” an adolescent’s medication was not successful. The 8<sup>th</sup> grade female (unsupervised storage), who reported being prescribed an unknown “pill for ADID” (an exact quote), stated that it was “by mother’s sink in bathroom, hidden in a lotion box.”

Table 3 summarizes the storage locations of adolescents’ prescribed medications. What is particularly striking about these findings are the easily accessible storage locations of adolescents’ prescribed medications. Indeed, twenty-one respondents (9.1%) indicated that a relative kept their prescribed medications; however, in one-third of these cases (n = 7), adolescents specifically identified where medications were kept in their relatives’ possession (e.g., “mom’s room drawer,” “kept in father’s dresser,” “mom’s dresser,” “medicine cabinet in mother’s room”). Further, of the 15 adolescents who were taking medications in the prescription pain reliever/anti-anxiety/stimulant category who reported that their medication storage was supervised, 8 (53.3%) described storage locations that would allow accessibility to adolescents (e.g., “Ritalin” kept in “kitchen cabinet,” “Adderall” in “bathroom medicine chest,” “strong pain medication” stored “on shelf in the kitchen,” unknown “prescription pain medication” kept in the “medicine chest in the bathroom”).

## Discussion

This study identified that the majority (83.4%, n = 191) of adolescents prescribed medications in the previous six months had unsupervised access to them. Further, of those participants taking medications in controlled categories, most (73.7%, n = 42) reported that they had unsupervised access to their prescribed medications. Finally, among those who stated that the storage of their prescribed medications in the pain reliever/anti-anxiety/stimulant category was supervised, 8 (53.3%) described storage locations that would allow accessibility to adolescents. These findings are particularly alarming since adolescents included in this study were in the 8<sup>th</sup> and 9<sup>th</sup> grades with a mean age of 14.1 years (SD = 0.6). The lack of parental supervision and proper storage of medicines prescribed to adolescents, including locked cupboards and supervised administration, may facilitate adolescents’ nonmedical use of these medications, putting them at risk for poisoning/overdose. Furthermore, inadequate supervision and improper storage may contribute to the diversion of these medications to others through giving or selling them, or the theft of medications by adolescents who visit households with unsupervised medications. Several studies have reported that the most prevalent sources of controlled medications for nonmedical use among adolescents are peers and their own previous prescriptions [5, 11]. The unsafe storage of medications has been reported internationally [19–20], and interventions for prevention of this problem have been suggested, including cautioning parents to keep psychotherapeutic medications in secure locations, and encouraging physicians and dentists to be prudent about the number of tablets prescribed during a given encounter [21–22].

This study demonstrated that a large portion of adolescents had access to their own prescriptions. What is not known is whether prescribers or their staff are teaching their patients and cautioning parents/guardians about the safe storage of medications. Parents should be advised about correct dosing, the risks of sharing, the importance of controlling medications, and the way to dispose of leftovers [23]. It is possible that parents/guardians

may not believe that their children would engage in non-medical use or diversion of prescription medications, and therefore don't take steps to secure prescription medications. It has even been suggested that parents/guardians be held criminally liable for incidents with children and adolescents which involve accessible medications in households, in the same manner that they are held accountable for incidents with guns that are not locked away and are subsequently used by children [24]. Additional research is warranted to document the consistency of clinician education of parents/guardians when medications are prescribed to children and adolescents, as well as the outcomes of this education. Also, intervention studies with parents/guardians need to be undertaken which are aimed at changing their behaviors to keep medications in their homes secure. Without consistent interventions by clinicians, as well as parents, the problem of adolescents' unsupervised controlled medications may continue. Research which examines the association between unsupervised storage of controlled medications and nonmedical use and diversion by adolescents is warranted.

Limitations of this study include the use of a convenience sample of adolescents from only two school districts. Therefore, only those who were currently enrolled in school were invited to participate, not those who had dropped out; thus, findings cannot be generalized beyond the sample. Further, data were based on adolescent self-reports about storage and accessibility of medications which were prescribed to them during the previous six months. This might lead to under-reporting by adolescents based on issues of social desirability, since they were speaking to adult interviewers; further, accurate recall of prescribed medications could also have led to under-reporting. Another limitation is that participants were not consistently able to state the names of their prescribed medications. This could have led to miscategorization of the medications, specifically the 28 cases that were assumed to be controlled medications based on the participants' descriptions. A further limitation is that during the interviews, participants were only asked about access to their own prescribed medications, not those of other family members in their homes. To address this limitation, additional questions were added to the *Youth Interview Guide* to be used in future studies.

Practical considerations include the importance of clinicians consistently educating parents/guardians about the multiple dangers of unsecured prescription medications in their households whenever a prescription is written for children or adolescents, and further, advising them to keep medications in a locked cabinet and to dispense medications to their children. Contracting with parents/guardians, or providing a written handout which they acknowledge receipt of, may also be beneficial [23].

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## Abbreviations Used in Text

|             |  |
|-------------|--|
| <b>NUPM</b> | Nonmedical Use of Prescription Medications |
| <b>CSA</b>  | Controlled Substances Act                  |
| <b>SSLS</b> | Secondary Student Life Survey              |
| <b>ADHD</b> | Attention Deficit Hyperactivity Disorder   |

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Table 1

Sample Characteristics

|                     | Overall Sample |          | Male |          | Female |          |
|---------------------|----------------|----------|------|----------|--------|----------|
|                     | n              | (%)      | n    | (%)      | n      | (%)      |
| Sex                 | 501            |          | 255  | (50.9%)  | 246    | (49.1%)  |
| Race: <sup>*</sup>  |                |          |      |          |        |          |
| White               | 365            | (72.9%)  | 194  | (38.7%)  | 171    | (34.1%)  |
| African American    | 108            | (21.6%)  | 52   | (10.4%)  | 56     | (11.2%)  |
| Asian               | 15             | (3.0%)   | 3    | (0.6%)   | 12     | (2.4%)   |
| Hispanic            | 10             | (2.0%)   | 4    | (0.8%)   | 6      | (1.2%)   |
| American Indian     | 3              | (0.6%)   | 2    | (0.4%)   | 1      | (0.2%)   |
| Grade Level:        |                |          |      |          |        |          |
| 8 <sup>th</sup>     | 250            | (49.9%)  | 127  | (50.8%)  | 123    | (49.2%)  |
| 9 <sup>th</sup>     | 251            | (50.1%)  | 128  | (51.0%)  | 123    | (49.0%)  |
| Age in Years (Mean) | 14.1           | (SD=0.6) | 14.1 | (SD=0.6) | 14.0   | (SD=0.6) |

\* Percentages exceed 100% due to rounding

**Table 2**  
 Self-Report of Number of Medications Prescribed to Adolescents in Previous 6 Months and Their Storage Status

|  | Overall Sample | Male          | Female        | $\chi^2$       |
|--|----------------|---------------|---------------|----------------|
| Prescribed Medications   | 230/501=45.9%  | 120/230=52.2% | 110/230=47.8% |                |
| Supervised Storage   | 38/229=16.6%*  | 20/119=16.8%* | 18/110=16.4%  |                |
| Unsupervised Storage   | 191/229=83.4%* | 99/119=83.2%* | 92/110=83.6%  | 0.01 (df=1) NS |
| Prescription pain relievers, anti-anxiety medications, stimulants, and sedatives † | 57/230=24.8% ‡ | 33/57=57.9%   | 24/57=42.1%   |                |
| Supervised Storage   | 15/57=26.3%    | 7/33=21.2%    | 8/24=33.3%    |                |
| Unsupervised Storage   | 42/57=73.7%    | 26/33=78.8%   | 16/24=66.7%   | 1.05 (df=1) NS |
| All other categories of prescription medications †                                 | 198/230=86.1%  | 103/198=52.0% | 95/198=48.0%  |                |
| Supervised Storage   | 31/197=15.7%*  | 18/102=17.6%* | 13/95=13.7%   |                |
| Unsupervised Storage   | 166/197=83.8%* | 84/102=82.4%* | 82/95=86.3%   | 0.58 (df=1) NS |

\* There was a missing value for storage supervision on 1 male adolescent who was prescribed "other" categories of medications.

† Adolescents were prescribed medications in the "pain reliever, etc." category as well as the "other" category, so total percentages sum to greater than 100%. Adolescents were counted only once in each category, regardless of the number of medications prescribed in that category.

‡ Four adolescents received two medications in this category, but were counted only once.

**Table 3**

Home Locations Where Adolescents' Prescription Medications were Stored in Past 6 Months (n = 230 adolescents) \*

|  | n (%)      | Supervised Medications <sup>†</sup> |                         |
|--|------------|-------------------------------------|-------------------------|
|  |            | All <sup>‡</sup>                    | Controlled <sup>§</sup> |
|  | n (%)      | n                                   | n                       |
| Kitchen cabinet/drawer   | 75 (32.6%) | 10                                  | 3                       |
| Bathroom medicine cabinet/drawer/countertop  | 60 (26.1%) | 9                                   | 4                       |
| Participant's room   | 33 (14.3%) |                                     |                         |
| Open storage: Kitchen/dining room/living room countertop/table/desktop/basket/jar            | 30 (13.0%) | 1                                   | 1                       |
| Inhalers on person/in sport's bag/sport's locker   | 23 (10.0%) |                                     |                         |
| Relative keeps them on person or in their room   | 21 (9.1%)  | 17                                  | 7                       |
| Respondent's bathroom in cabinet/drawer/on countertop  | 15 (6.5%)  |                                     |                         |
| In refrigerator  | 5 (2.2%)   | 1                                   |                         |
| Medicine cabinet in location other than kitchen/bathroom (hall, linen closet, computer room) | 3 (1.3%)   |                                     |                         |
| "Unsure where kept"  | 1 (0.4%)   |                                     |                         |
| Not specified/recorded   | 4 (1.7%)   |                                     |                         |

\* Percentages sum to greater than 100% since adolescents indicated more than one storage location.

<sup>†</sup> In this study, the term "supervised" means that adolescents indicated during the semi-structured interviews that access to their prescription medications was supervised by an adult. Medications were recorded as "supervised" if respondents indicated that they were dispensed or laid out for adolescent self-administration by an adult.

<sup>‡</sup> This column is a subset of Column 1 and indicates locations of all medications categorized as "supervised." In total, 38 of the 230 adolescents who had taken prescription medications in the previous 6 months were "supervised."

<sup>§</sup> This column is a subset of Column 2 and indicates the supervised medications which were classified in the prescription pain reliever, anti-anxiety, stimulant, or sedative category.