



Published in final edited form as:

Addict Behav. 2013 June ; 38(6): 2230–2235. doi:10.1016/j.addbeh.2013.01.019.

Pilot of a Brief, Web-Based Educational Intervention Targeting Safe Storage and Disposal of Prescription Opioids

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Abstract

Prescription opioid misuse has been declared an American epidemic and a significant proportion of misused opioids are diverted from legitimate prescriptions. Patient education regarding appropriate use and the dangers of misuse has been identified as a key intervention target. The current study presents findings from the open pilot of a patient-tailored, brief, web-based intervention designed to improve knowledge of safe medication use, storage and disposal.

Methods—Subjects were 62 treatment-seeking outpatients at two diverse outpatient health clinics (dental and pain management) who were prescribed an opioid medication. Subjects completed an online assessment of risk factors for prescription opioid misuse and the 15-minute Script Safety intervention. Knowledge and misuse behaviors were assessed at baseline, immediately post intervention (knowledge only) and at one-week and one-month follow up. Knowledge regarding safe prescription opioid use, storage and disposal improved significantly from pre to post intervention and was sustained at follow up (% correct from baseline to one-month follow up: unsafe to retain unused pills, 66.1% vs. 96.5%; unsafe to borrow pills from family/friends, 87.1% vs. 98.2%; best to store pills in cool, dry, secure location, 45.2% vs. 89.5%; not recommended to use expired medications, 75.8% vs. 96.5%; not recommended to flush all medications down the toilet, 45.2% vs. 82.5%, $p < .01$). Reductions in self-reported misuse behaviors were also observed. Although preliminary, the findings highlight the potential utility of integrating brief, web-based educational interventions in community and primary health care settings.

Keywords

prescription opioid misuse; web; computer; primary care; dental

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Contributors

Drs. Back, McCauley, & Brady designed the study and wrote the protocol. Authors Back, McCauley, & Brady conducted literature searches and provided summaries of previous research studies. Dr. Back conducted the statistical analysis. Drs. Back and McCauley wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

1. Introduction

1.1 Scope of the Problem

Opioid analgesics are among the most effective treatments for pain and are the most commonly prescribed medication of any category in the United States (Kuehn, 2007). As the rate of legitimate prescriptions for opioids has increased significantly over the past decade, so has the incidence of medication misuse and associated negative sequelae, such as addiction and overdose (Becker, et al., 2008; FDA, 2011; Hall, et al., 2008). Data from the 2008 National Survey on Drug Use and Health (NSDUH; $N=68,736$) show that approximately 4.7 million individuals 12 years of age and older endorsed non-medical use of prescription opioids in the past month, and approximately 1.7 million individuals meet criteria for prescription opioid abuse or dependence (Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). Data from the Treatment Episode Data Set (TEDS) indicate that, from 1998 to 2008, the proportion of treatment-seeking patients reporting prescription opioid abuse increased more than fourfold (SAMHSA, 2010). Furthermore, prescription opioids are the most commonly implicated drug in unintentional overdose fatalities, which increased 124% from 1999 to 2007, largely due to increases in opioid analgesic overdoses (Centers for Disease Control and Prevention [CDC], 2010; Hall, et al., 2008).

1.2 Role of Dental and Primary Care Practitioners

While some misusers obtain opioid analgesics from family and friends, many obtain them from physicians. A recent study of prescription opioid dependent individuals found that the majority of men (58.3%) and women (83.3%) reported being initially introduced to prescription opioids by a physician (Back, et al., 2010). In most cases, patients described suffering a physical injury (e.g., broken limb) or having a medical procedure (e.g., wisdom teeth removal) that necessitated an opioid analgesic to relieve pain. After the pain subsided, however, patients continued to use the opioid medication for alternative reasons (e.g., to get “high” or decrease anxiety). Specifically, dentists and primary care/family medicine practitioners are the leading prescribers of immediate release opioids (Denisco, et al., 2011; Rigoni, 2003). Interventions provided in primary health care and dental settings that educate patients on the proper use, storage and disposal of opioid analgesics have been identified as one feasible step to curtail prescription opioid misuse while preserving patient care (Denisco et al., 2011; FDA, 2012).

1.3 Utility of Web-Based Intervention Approaches

Technologic advances in intervention delivery, such as the use of e-health platforms, provide alternative service delivery models that can overcome many of the challenges associated with providing interventions in health care settings, primarily the lack of physician and staff time. Brief web- and computer-based interventions have been successfully used to reduce hazardous use of substances, including alcohol and nicotine (Cunningham, et al., 2009; Hester, et al., 2009; Hutton, et al., 2011; Neighbors, Larimer, & Lewis, 2004; . Pemberton, et al., 2011; Vogl, et al., 2009). Further, web- and computer-based interventions offer efficient, cost-effective methods of delivering standardized patient information in busy health care settings (Christensen & Hickie, 2010). For example, Gilbert et al. developed an interactive “Video Doctor” computer-based program that simulates an ideal conversation with a health care provider concerning HIV risk behaviors (Gilbert, et al., 2008). The program was successfully integrated in five diverse outpatient HIV medical clinics ($N=476$) and resulted in significantly reduced drug and sexual risk behaviors.

1.4 Aims of the Current Study

In response to the critical need to curtail prescription opioid misuse and in line with recommendations for patient education highlighted by the recent Food and Drug Administration (FDA) Risk Evaluation and Mitigations Strategies (REMS) for extended release/long-acting opioids (FDA, 2012), we developed a brief, interactive intervention (“Script Safety”) to help educate patients about the risks of misuse and ways to safely use, store and dispose of prescription opioid medications. The decision to provide this information through a web-based approach was driven by the following considerations: (1) Potential to overcome low-literacy barriers through the use of video or audio narrated content throughout the site that did not require provider or staff resources for delivery; (2) evidence suggesting that interactive learning approaches facilitate knowledge acquisition and retention (e.g., Di Noia, Schwinn, Dastur, & Schinke, 2003; Tait, Voepel-Lewis, Mosucci, Brennan-Martinez, & Levine, 2009; Webb, Joseph, Yardley, & Michie, 2010); (3) ability to standardize dosage (i.e., users could not advance in the site until after the completing the designated content and web analytic data confirmed completion of the site); (4) ability to provide personalized feedback regarding responses to post-knowledge check questions (i.e., key content); (5) ease of updating information to keep pace with the state of the science; and, (6) potential for low-cost scalability and dissemination should Script Safety demonstrate efficacy in subsequent controlled trials.

The primary aim of this open pilot trial was to test the feasibility and preliminary efficacy of Script Safety with respect to increasing patient knowledge in two diverse health care settings (pain management and dental clinics). In addition to the primary outcome of changes in knowledge regarding safe use of prescription opioids, exploratory analyses were conducted to examine self-reported misuse behaviors over a one-month follow-up period.

2. Methods and Materials

2.1 Participants

Participants were 62 adult outpatients who presented for treatment at an academic chronic pain management clinic or dental clinic. Clinics served a range of patients, including individuals with private insurance, self-pay, and Medicaid/Medicare eligible; however, few Medicaid/Medicare patients typically presented to the dental clinic due to lack of coverage for the majority of standard procedures. Prior to conduct of this study, neither clinic standardly provided patients with content analogous to that delivered by Script Safety; however, the chronic pain management clinic physicians did complete an Opioid Therapy Treatment Agreement with patients at the outset of treatment. Both clinics had Institutional Review Board (IRB) approval.

Each time a patient was prescribed an opioid analgesic, clinic staff screened the patient for study interest. Interested patients then met with a research assistant in a private office to discuss the study, evaluate inclusion criteria, and answer any questions. For inclusion in the study, individuals were required to (1) be between the ages of 21 and 80, (2) be a patient at one of the participating clinics, (3) have been prescribed a prescription opioid medication at the appointment, (4) be accessible for follow-up via telephone, and (5) possess the cognitive and physical capabilities necessary to complete the web-based intervention. Eligible patients were given a full description of the study and asked to read and sign an IRB-approved informed consent form before any study procedures occurred. Ineligible patients were referred to treatment-as-usual.

2.2 Procedures

Following informed consent, patients remained in the private office and completed the Script Safety intervention on an internet-connected laptop computer. The research assistant accessed the Script Safety website and indicated the specific opioid medication that the patient was prescribed so that the information would be tailored specifically to that medication (e.g., some opioids may be flushed down the toilet whereas others must be disposed of in the garbage/returned to pharmacy or designated “take back” sites). The most commonly prescribed opioids were: Vicodin (43.5%), Methadone (11.3%), and Oxycodone or OxyContin (14.6%). Participants were given headphones to listen to the program. Following completion of the intervention, usability of the Script Safety site was briefly assessed. At one-week and one-month post intervention, the study research assistant contacted participants by telephone to assess knowledge change and/or retention, medication misuse behaviors, and patient satisfaction. Participants received \$10 for completing the Script Safety intervention at the initial visit, \$15 for the one-week follow-up and \$20 for the one-month follow-up.

2.3 Study Intervention

Script Safety is a brief (approximately 15 minutes), interactive, patient-tailored, web-based intervention designed to provide patient education regarding the hazards of prescription opioid misuse, and ways to safely use, store and dispose of prescription opioids. Script Safety delivers critical information recommended in the Food and Drug Administration’s Risk Evaluation and Mitigation Strategies (REMS, 2012) for opioid analgesics. It is easy to understand (6th grade reading level) and uses an engaging multimedia format to convey the information. Script Safety consists of the following components: (1) assessment of demographics and opioid medication misuse risk factors (e.g., family history of addiction, previous prescription drug misuse behaviors); (2) pre-intervention assessment of knowledge regarding appropriate use, storage and disposal of prescription opioids; (3) interactive educational program including a “Video Doctor” consultation (Gilbert et al., 2008) reviewing the risks, and proper handling and disposal of the patient’s specific opioid medication; (4) post-intervention assessment of knowledge to measure comprehension of material and provide immediate corrective feedback; and (5) a personalizable handout highlighting key learning points regarding the appropriate use, storage, and disposal of their opioid medication.

2.4 Measures

Demographic information collected at the outset of the intervention included age (in years), gender, ethnicity, race, and employment status. Family history of addiction was assessed with the question: “Is there a history of alcohol or drug abuse in your family, even among your grandparents, aunts, cousins, or uncles?” Personal history of addiction was assessed with the question: “Have you ever had a problem with alcohol or drugs (e.g., alcohol, marijuana, cocaine, pills, etc.)?” Living with a person at risk of addiction was assessed by the question: “Has anyone in your household had, or do they currently have, a problem with alcohol or drug use (e.g., marijuana cocaine, pills, etc.)?”

Usability items were administered immediately following completion of the intervention via a self-report survey and included: (1) ease/difficulty of use; (2) helpfulness of information; and (4) likelihood of using the site in the future. Response options were Likert scale ratings, where lower values indicate more positive responses to the site.

Knowledge regarding appropriate prescription opioid use was assessed at four time-points (prior to intervention, immediately post-intervention, one-week, and one-month post-intervention) by a series of multiple choice and True/False questions regarding: storage of

opioids, use of expired opioids, borrowing opioids, lending opioids, and disposal of opioid medication.

Misuse behaviors assessed included: (1) saving unused prescription pills in case they were needed later; (2) taking more pills than the doctor prescribed or taking pills more often than prescribed; (3) lending medications to someone else; (4) borrowing or taking pills from someone else; (5) using pills for reasons other than those prescribed (e.g., improve sleep, improve mood, relieve stress, calm nerves). Misuse behaviors were assessed via self-report questions administered on the computer prior to viewing intervention materials, and at one-week and one-month follow-up via telephone interview.

3. Calculations

Primary outcomes, analyzed using Related-Samples Wilcoxon Signed Ranks Tests, included change in knowledge and self-reported misuse behaviors immediately post-intervention (knowledge only) and at 1-week and 1-month follow up. Alpha was set at .05 for all analyses.

4. Results

4.1 Demographic Characteristics

As shown in Table 1, the majority of participants were Caucasian (77.4%) and unemployed (59.7%). Participants at the pain clinic were more likely to be unemployed as compared to participants at the dental clinic ($p=.004$). However, with the exception of employment status' association with borrowing medication among dental clinic patients ($X^2[1, N=30]=5.00, p<.05$), employment status was not significantly associated with baseline misuse behaviors. No other significant differences in demographic characteristics were revealed. Almost half (45.2%) of the sample reported a family history of addiction and 11.3% reported a personal history of addiction. Approximately 10% of participants indicated that they were living with someone who had a current or lifetime history of addiction.

4.2 Patient Satisfaction and Retention

Patient satisfaction regarding the intervention was favorable and the large majority (95.2%) rated the intervention as "easy" or "very easy" to use. The majority of patients rated the site as helpful/very helpful (80.6%) and indicated that they would be at least somewhat likely to return the site for information on subsequent prescriptions were it available (71.0%). Similarly, patient retention was high: 100.0% of consented patients completed Script Safety, 96.8% completed the one-week and 91.9% completed the one-month follow up.

4.3 Prescription Opioid Knowledge

Before completing the intervention, more than half of participants were unaware of safe locations to properly store opioid medications or how to properly dispose of unused pills (54.8%). Over half of participants correctly identified that borrowing pills from others (87.1%) and saving unused pills (66.1%) are unsafe behaviors. In addition, the majority of participants were aware that using expired medications is not recommended (75.8%), and that lending their medication to others is unsafe behavior (95.2%).

Subsequent to completing the intervention, patient knowledge regarding the safe use, storage and disposal of prescription opioids improved significantly and was sustained at one-month follow up. Script Safety produced significant increases in knowledge regarding: (1) where to properly store pills, which improved; (2) how to properly dispose of medications; (3) borrowing pills from others; (4) saving unused opioid pills; and (5) using expired

medications. The large majority of participants correctly identified that lending pills to others was an unsafe behavior at pre-intervention (95.2%). Following the intervention, knowledge regarding lending pills to others improved 3%. Effects of the intervention were largely consistent across clinic sites (see Table 2).

4.4 Exploratory Analysis of Medication Misuse Behaviors

Medication misuse behaviors were fairly common at baseline. As can be seen in Table 3, 67.7% of participants endorsed saving unused leftover opioid analgesics. Approximately one-fifth of participants endorsed borrowing pills from others, lending pills to others (see Figure 1), and consuming more pills than were prescribed by their doctor. A smaller proportion (6.5%) endorsed using their medication for non-medical reasons (e.g., to reduce anxiety, sleep better).

Reductions in self-reported behavior change were observed from pre to post intervention (see Table 3). At one-month follow-up, patients were significantly less likely to lend (see Figure 1) or borrow pills from others ($p < .01$). In addition, patients were significantly less likely to consume more opioids than prescribed ($p < .05$) and save unused medication ($p < .01$). No significant changes occurred with respect to taking medication for reasons other than prescribed.

5. Discussion

5.1 Summary of Primary Findings

As the rate of legitimate prescriptions for opioids has increased significantly over the past decade, so has the incidence of medication misuse and serious adverse outcomes. Given that many misused prescription opioids originate with a legitimate prescription from dentists and physicians, patient-education interventions that are integrated into community health care settings may help curtail prescription opioid misuse while preserving patient care. This study is the first to our knowledge to develop and test a brief, web-based intervention targeting patient education of prescription opioids in dental and pain management clinic settings. Although preliminary, the findings demonstrate the feasibility and potential utility of implementing the intervention in these diverse health care settings.

Examination of baseline risk factors for opioid medication misuse revealed that risk factors are common among individuals presenting to outpatient community health care clinics. In particular, almost half of participants endorsed a family history of addiction and 11% endorsed a personal history of addiction. Furthermore, 10% of participants indicated that they were living with someone who had a current or lifetime history of addiction. These findings are noteworthy, as many providers may be unaware that a significant proportion of their patients are at-risk for medication misuse. The relatively frequent presentation of patient risk factors for misuse highlights the need to work closely with physicians to develop cost-effective methods of screening and intervening.

Examination of pre-intervention knowledge regarding the safe use, storage and disposal of prescription opioids revealed critical deficits. Almost half of participants did not know where or how to properly dispose of prescription opioids. Approximately one-third (34%) of participants were unaware that it is unsafe to retain unused leftover opioid pills. Although not as common, 13% of participants were unaware that it is unsafe to borrow pills from family or friends. Pre-intervention deficits in risk knowledge were paralleled by concerning rates of unsafe medication misuse behaviors. The most commonly reported behavior, endorsed by 68% of the sample, was saving unused, leftover opioid medications. This risk behavior is particularly alarming given its identification as one of the main ways that high-risk youth obtain prescription opioids to misuse (Boyd, McCabe, & Teter, 2006; McCabe &

Boyd, 2005; McCabe, et al., 2007). Parents, grandparents and other family members need to be educated on the risks associated with maintaining leftover medications in the home after they are no longer needed, and they need to counsel their adolescents and young adult children about the risks of medication misuse.

Interestingly, disconnect emerged between knowledge and self-reported behavior was observed with respect to the appropriate use and storage of prescription opioids, and represents an important target for preventative and intervention efforts. For example, at pre-intervention the large majority (95.2%) of participants correctly identified that lending pills to others is an unsafe behavior. Despite this knowledge, however, almost 20% of participants reported lending pills to others (see Figure 1). Further, despite the significant improvement observed in knowledge regarding the hazards of retaining unused leftover prescription opioids, 18.2% of participants continued to engage in this behavior one month following the intervention. Not only is it important that patients understand the risks associated with lending medications to others or retaining unused medications, it is critical that patients modify their behaviors. Research would benefit from assessment of motives underlying misuse behaviors, including saving unused medication, as concerns such as cost of medication may drive this behavior. Further, research on ways to increase the likelihood that knowledge change will result in parallel behavior change is needed, and may include addressing patient-level barriers to barriers to behavior change, as well as expansion of the patient-oriented intervention to incorporate provider-level interventions targeting pain management, for example treatment contracts and monitoring of patient opioid use through use of urine drug screening or prescription drug monitoring databases (CASA, 2005; Chou et al., 2009; Liebschutz & Alford, 2011; Weaver & Scholl, 2002).

5.2 Implications of Current Findings

Taken together, the current findings underscore the immediate need for patients who are prescribed an opioid analgesic to be educated on the safe use, storage and disposal of the medication (Volkow & McLellan, 2011). E-health platforms provide a useful tool for the delivery of brief, standardized patient education that is tailored to the patient's personal risk factors and prescribed medication. Furthermore, such educational information would allow patients to make more informed decisions about initiating prescription opioid treatment or pursuing alternative methods of pain management (e.g., in the case of a history of personal addiction). In addition to the need for improved patient education there is a strong need for improved provider education in order to decrease diversion, abuse, and overdose of opioid medications. Web-based trainings could be utilized to provide updated clinical teaching and training for physicians, nurses, dentists, and pharmacists in the areas of pain management, opioid pharmacology, the principles of addiction, and the application of recommended universal precautions when initiating opioid therapy (Volkow & McLellan, 2011).

5.3 Limitations

Several limitations warrant consideration. The sample size was small and research with larger samples is needed to confirm the findings. Findings regarding misuse behaviors were based on retrospective self-report, which is limited by recall and social desirability bias. Efforts were made to reduce the influence of demand characteristics (e.g., follow-up via telephone rather than in-person, assurance of confidentiality of responses), however bias may exist and replication employing objective measures of behavior is needed, including: (1) medical record data (e.g., number of early refill requests); (2) biologic data (e.g., urine drug screen); (3) medical record data (e.g., early refill requests); (4) prescription drug monitoring data (e.g., multiple providers, concurrent opioid prescriptions); and, (5) collateral reports (e.g., others living in the home). In addition, future research should consider the use of standardized prescription opioid misuse screeners (Butler, Budman, Fernandez, &

Jamison, 2004; Butler, Fernandez, Benoit, Budman, & Jamison, 2008; Butler et al., 2007). The current investigation represents an open label study. Future studies employing a comparison group(s), such a less intensive drug information pamphlet, would be useful. In addition, a longer follow-up period would be beneficial. Due to the patient characteristics of the participating clinics, our sample demographics - specifically age and employment status - may not be fully representative of other primary care or dental populations. A majority of patients presenting at the pain management clinic were older and more likely to be unemployed, retired, or collecting disability than the general population. Future research should examine the effectiveness of brief interventions among a more diverse patient population, particularly among adolescents and young adults who represent the population at highest risk for initiation of prescription opioid misuse behavior (McCabe, West, Morales, Cranford, & Boyd, 2007; Richardson, et al., 2011).

5.4 Conclusions

Despite these limitations, the findings demonstrate that it is feasible to deliver web-based educational interventions, such as Script Safety, in diverse health care settings, and that such interventions may result in important changes in knowledge and misuse behaviors. Given the continued escalation in prescription opioid misuse, the development of effective, brief interventions that can be delivered in community and primary health care settings without increasing physician or clinic staff burden, or disrupting the clinic workflow is critical.

Acknowledgments

Role of Funding Sources

This study was supported by the South Carolina Clinical & Translational Research (SCTR) Institute, with an academic home at the Medical University of South Carolina, NIH/NCRR Grant number UL1RR029882-02 (KTB), and grant K23 DA021228 (SEB) from the National Institute on Drug Abuse. Funding agencies had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

The authors wish to thank Drs. Arthur Smith, Mary Maudlin, Renata Leite, Kara Grasso, and Ms. Sarah Stein for assistance with data collection.

References

- Back SE, Payne RL, Simpson AN, et al. Gender and prescription opioids: findings from the National Survey on Drug Use and Health. *Addict Behav.* 2010; 35:1001–1007. [PubMed: 20598809]
- Becker WC, Sullivan LE, Tetrault JM, et al. Non-medical use, abuse and dependence on prescription opioids among U.S. adults: psychiatric, medical and substance use correlates. *Drug Alcohol Depend.* 2008; 94(1-3):38–47. [PubMed: 18063321]
- Boyd C, McCabe S, Teter C. Medical and nonmedical use of prescription pain medication by youth in a Detroit-area public school district. *Drug Alcohol Depend.* 2006; 81(1):37–45. [PubMed: 16040201]
- Butler SF, Fernandez K, Benoit C, Budman SH, Jamison RN. Validation of the revised screener and opioid assessment for patients with pain (SOAPP-R). *J Pain.* 2008; 9:360–372. [PubMed: 18203666]
- Butler SF, Budman SH, Fernandez KC, Houle B, Benoit C, Katz N, Jamison RN. Development and validation of the Current Opioid Misuse Measure. *Pain.* 2007; 130(1-2):144–56. [PubMed: 17493754]
- Butler SF, Budman SH, Fernandez K, Jamison RN. Validation of a screener and opioid assessment measure for patients with chronic pain. *Pain.* 2004; 112:65–75. [PubMed: 15494186]
- Centers for Disease Control and Prevention [CDC]. Unintentional drug poisoning in the United States. Atlanta, GA: US: 2010. at <http://www.cdc.gov/HomeandRecreationalSafety/pdf/poison-issue-brief.pdf>

- Chou R, Fanciullo GJ, Fine PG, et al. Clinical guidelines for the use of chronic opioid therapy in chronic noncancer pain. *J Pain*. 2009; 10(2):113–130. [PubMed: 19187889]
- Christensen H, Hickie IB. E-mental health: a new era in delivery of mental health services. *Med J Australia*. 2010; 192:S2–S3. [PubMed: 20528702]
- Cunningham JA, Wild T, Cordingley J, et al. A randomized controlled trial of an internet-based intervention for alcohol abusers. *Addiction*. 2009; 104:2023–2032. [PubMed: 19922569]
- Denisco RC, Kenna GA, O’Neil MG, Kulich RJ, Moore PA, Kane WT, Mehta NR, Hersh EV, Katz NP. Prevention of prescription opioid abuse: The role of the dentist. *JADA*. 2011; 142:800–810. [PubMed: 21719802]
- Di Noia J, Schwinn TM, Dastur ZA, Schinke SP. The relative efficacy of pamphlets, CD-ROM, and the internet in disseminating adolescent drug abuse prevention programs: an exploratory study. *Preventive Medicine*. 2003; 37:646–653. [PubMed: 14636798]
- Food and Drug Administration. FDA acts to reduce harm from opioid drugs. U.S. FDA: Consumer Health Information; Washington DC: 2011. at <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm251830.htm>
- Food and Drug Administration. FDA Blueprint for Prescriber Education for Extended-Release and Long-Acting Opioid Analgesics. Washington DC: U.S.: 2012. at <http://www.fda.gov/downloads/Drugs/DrugSafety/InformationbyDrugClass/UCM277916.pdf>
- Gilbert P, Ciccarone D, Gansky SA, et al. Interactive “Video Doctor” counseling reduces drug and sexual risk behaviors among HIV-positive patients in diverse outpatient settings. *PLoS ONE*. 2008; 3:e1988. [PubMed: 18431475]
- Hall AJ, Logan JE, Toblin RL, et al. Patterns of abuse among unintentional pharmaceutical overdose fatalities. *JAMA*. 2008; 300(22):2613–2620. [PubMed: 19066381]
- Hester RK, Delaney HD, Campbell W, et al. A web application for moderation training: initial results of a randomized clinical trial. *J Subst Abuse Treat*. 2009; 37:266–276. [PubMed: 19339137]
- Hutton HE, Wilson LM, Apelberg BJ, et al. A systematic review of randomized controlled trials: web-based interventions for smoking cessation among adolescents, college students, and adults. *Nicotine Tob Res*. 2011; 13:227–238. [PubMed: 21350042]
- Kuehn BM. Opioid prescriptions soar: increase in legitimate use as well as abuse. *JAMA*. 2007; 297(3):249–251. [PubMed: 17227967]
- Liebschutz JM, Alford DP. Safe opioid prescribing: a long way to go. *J Gen Intern Med*. 2011; 26(9):951–952. [PubMed: 21735346]
- McCabe S, Boyd C. Sources of prescription drugs for illicit use. *Addict Behav*. 2005; 30(7):1342–1350. [PubMed: 16022931]
- McCabe S, Cranford J, Boyd C, et al. Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. *Addict Behav*. 2007; 32(3):562–575. [PubMed: 16843611]
- McCabe SE, West BT, Morales M, Cranford JA, Boyd CJ. Does the early onset of non-medical use of prescription drugs predict subsequent prescription drug abuse and dependence? Results from a national study. *Addiction*. 2007; 102:1920–1930. [PubMed: 17916222]
- National Center on Addiction and Substance Abuse (CASA) at Columbia University. Under the counter: the diversion and abuse of controlled prescription drugs in the U.S. National Center on Addiction and Substance Abuse at Columbia University; New York: 2005.
- Neighbors C, Larimer ME, Lewis MA. Targeting misperceptions of descriptive drinking norms: efficacy of a computer-delivered personalized normative feedback intervention. *J Consult Clin Psych*. 2004; 72:434–447.
- Pemberton MR, Williams J, Herman-Stahl M, et al. Evaluation of two web-based alcohol interventions in the U.S. military. *J Stud Alcohol Drugs*. 2011; 72:480–489. [PubMed: 21513685]
- Richardson LP, Fan MY, McCarty CA, et al. Trends in the prescription of opioids for adolescents with non-cancer pain. *Gen Hosp Psychiat*. 2011; 33:423–428.
- Rigoni, GC. Drug Utilization for Immediate- and Modified Release Opioids in the US. Division of Surveillance, Research & Communication Support, Office of Drug Safety, Food and Drug Administration; Silver Spring, Md.: 2003. at www.fda.gov/ohrms/DOCKETS/ac/03/slides/3978S1_05_Rigoni.ppt

- Substance Abuse and Mental Health Services Administration (SAMHSA). Office of Applied Studies. Results from the 2008 National Survey on Drug Use and Health: National Findings. US Department of Health and Human Services; Rockville, MD: 2009. Office of Applied Studies, NSDUH Series H-36, HHS Publication No. SMA 09-4434
- Substance Abuse and Mental Health Services Administration (SAMHSA). Office of Applied Studies. The TEDS Report: Substance abuse treatment admissions involving abuse of pain relievers: 1998-2008. Rockville, MD: Jul 15. 2010
- Tait AR, Voepel-Lewis T, Mosucci M, Brennan-Martinez CM, Levine R. Patient comprehension of an interactive, computer-based information program for cardiac catheterization: A comparison with standard information. *Archives of Internal Medicine*. 2009; 169(20):1907–1914. [PubMed: 19901144]
- Vogl L, Teesson M, Andrews G, et al. A computerized harm minimization prevention program for alcohol misuse and related harms: randomized controlled trial. *Addiction*. 2009; 104:564–575. [PubMed: 19335655]
- Volkow ND, McLellan TA. Curtailing diversion and abuse of opioid analgesics without jeopardizing pain treatment. *JAMA*. 2011; 305(13):1346–1347. [PubMed: 21467287]
- Weaver M, Scholl S. Abuse liability in opioid therapy for pain treatment in patients with an addiction history. *Clin J Pain*. 2002; 18:S61–S69. [PubMed: 12479255]
- Webb TL, Joseph J, Yardley L, Michie S. Using the internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research*. 2010; 12(1):e4. [PubMed: 20164043]

Highlights

- Patient knowledge of safe opioid use revealed key deficits at baseline.
- Open pilot demonstrated intervention feasibility in diverse healthcare clinics.
- Intervention significantly improved patient knowledge of safe opioid use.
- Improvements in knowledge were sustained at one-month follow up.
- Patients reported reductions in some misuse behaviors at one-month follow-up.

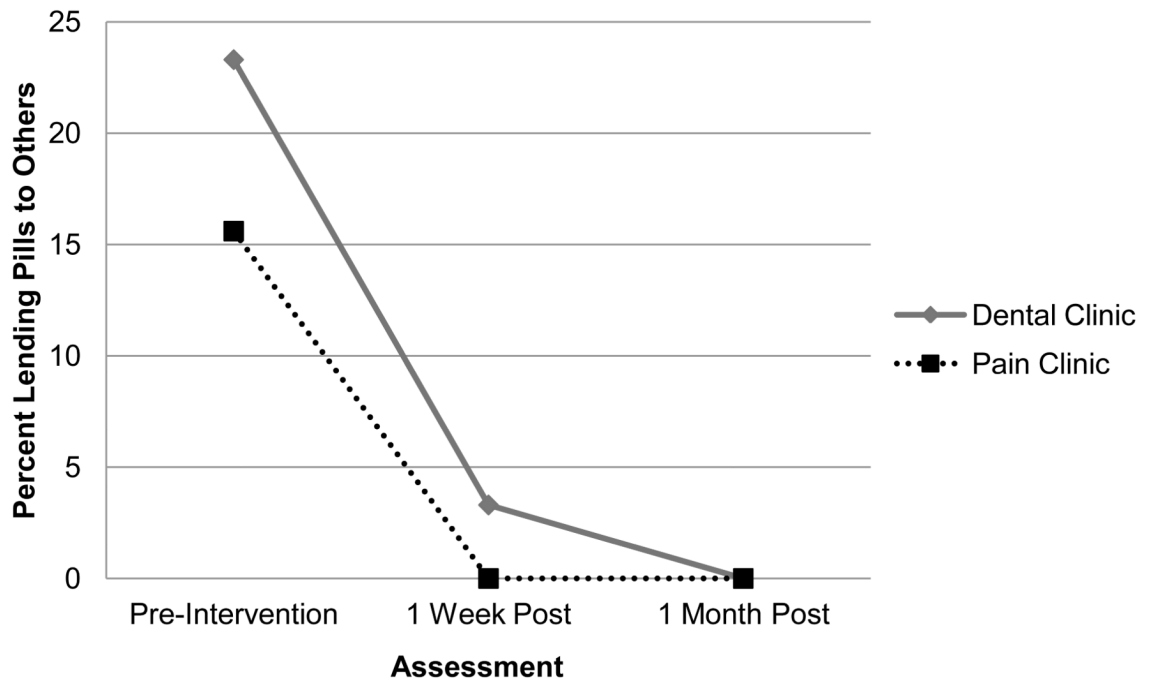


Figure 1.
Rates of lending prescription opioid pills to others

Table 1

Sample Characteristics

	No.(%)			P-value
	Dental Clinic (n=30)	Pain Clinic (n=32)	Total Sample (N=62)	
Age, <i>M</i> (SD) ^a	57.6(12.0)	56.0(11.7)	56.7(11.8)	.60
Gender, male	16(53.3)	15(46.9)	31(50.0)	.62
Race/Ethnicity				
African American	5(16.7)	7(21.9)	12(19.4)	
Caucasian	23(76.7)	25(78.1)	48(77.4)	.50
Asian	1(3.3)	0(0.0)	1(1.6)	
Hispanic	1(3.3)	0(0.0)	1(1.6)	
Employment, unemployed	12(40.0)	25(78.1)	37(59.7)	.004
Family history of addiction	13(43.3)	15(46.9)	28(45.2)	.78
Personal history of addiction	2(6.7)	5(15.6)	7(11.3)	.27
Living with person at risk ^b	2(6.7)	4(12.5)	6(9.7%)	.67

^a*M*(SD) = Mean(Standard Deviation). Analyzed by analysis of variance. All others by χ^2 .

^bDefined as having a current or lifetime substance use problem.

Table 2

Prescription Opioid Knowledge Change

	No.(Valid %) Correct		
	Dental Clinic (n=30)	Pain Clinic (n=32)	Total Sample (N=62)
Storage of Pills			
Pre	13(43.3)	15(46.9)	28(45.2)
Post	29(96.7) *	29(90.6) *	58(93.5) *
Post 1 week	27(90.0) *	29(96.7) *	56(93.3) *
Post 1 month	26(89.7) *	25(89.3) ⁺	51(89.5) *
Saving Unused Pills			
Pre	20(66.7)	21(65.6)	41(66.1)
Post	30(100) ⁺	32(100) ⁺	62(100) *
Post 1 week	30(100) ⁺	29(96.7) ⁺	59(98.3) *
Post 1 month	28(96.6) ⁺	27(96.4) ⁺	55(96.5) *
Borrowing Pills			
Pre	24(80.0)	30(93.8)	54(87.1)
Post	29(96.7) ~	32(100)	61(98.4) ^
Post 1 week	30(100) ^	30(100)	60(100) ⁺
Post 1 month	28(96.6) ~	28(100)	56(98.2) ~
Lending Pills to Others			
Pre	28(93.3)	31(96.9)	59(95.2)
Post	30(100)	32(100)	62(100)
Post 1 week	30(100)	30(100)	60(100)
Post 1 month	29(100)	27(96.4)	56(98.2)
Disposal by Flushing			
Pre	15(50.0)	13(40.6)	28(45.2)
Post	28(93.3) *	27(84.4) *	55(88.7) *
Post 1 week	27(90.0) *	26(86.7) *	53(88.3) *
Post 1 month	25(86.2) ⁺	22(78.6) ⁺	47(82.5) *
Using Expired Pills			
Pre	21(70.0)	26(81.3)	47(75.8)
Post	29(96.7) ⁺	31(96.9) ^	60(96.8) *
Post 1 week	30(100) ⁺	30(100) ^	60(100) *
Post 1 month	28(96.6) ⁺	27(96.4) ^	55(96.5) *

Note. N at 1 week = 60 and N at 1 month = 57 due to attrition.

* Change from pre-test to indicated time point significant at $p < .001$.

⁺ Change from pre-test to indicated time point significant at $p < .01$.

[^] Change from pre-test to indicated time point significant at $p < .05$

[~] Change from pre-test to indicated time point approaching significance at $p = .06$

Table 3

Prescription Opioid Misuse Behaviors

	No.(%)		
	Dental Clinic (n=30)	Pain Clinic (n=32)	Total Sample (N=62)
Lend medication to others			
Pre	7(23.3)	5(15.6)	12(19.4)
Post 1 week	1 (3.3) [^]	0(0.0) [^]	1(1.7) ⁺
Post 1 month	0(0.0) [^]	0(0.0) [^]	0(0.0) ⁺
Borrow medication from others			
Pre	10(33.3)	2(6.3)	12(19.4)
Post 1 week	0(0.0) ⁺	0(0.0)	0(0.0) ⁺
Post 1 month	0(0.0) ⁺	0(0.0)	0(0.0) ⁺
Take more pills than prescribed			
Pre	1(3.3)	11(34.4)	12(19.4)
Post 1 week	0(0.0)	3(10.0) [^]	3(5.0) [^]
Post 1 month	0(0.0)	3(10.7) [^]	3(5.3) [^]
Use medication for reasons other than prescribed			
Pre	3(10.0)	1(3.1)	4(6.5)
Post 1 week	0(0.0)	0(0.0)	0(0.0)
Post 1 month	1(3.4)	0(0.0)	1(1.8)
Save unused pills			
Pre	22(73.3)	20(62.5)	42(67.7)
Post 1 week	-----	-----	-----
Post 1 month	0(0.0) [^]	4(30.8) [^]	4(18.2) ⁺

Note. N at 1 week = 60 and N at 1 month = 57 due to attrition.

* Change from pre-test to indicated time point significant at p<.001.

⁺ Change from pre-test to indicated time point significant at p<.01

[^] Change from pre-test to indicated time point significant at p<.05