

Patterns of Storage, Use, and Disposal of Opioids Among Cancer Outpatients

AKHILA REDDY,^a MAXINE DE LA CRUZ,^a EDEN MAE RODRIGUEZ,^a JESSICA THAMES,^a JIMIN WU,^b GARY CHISHOLM,^b DIANE LIU,^b SUSAN FRISBEE-HUME,^a SRIRAM YENNURAJALINGAM,^a DAVID HUI,^a HILDA CANTU,^a ALEJANDRA MARIN,^a VICKI GAYLE,^a NANCY SHINN,^a ANGELA XU,^a JANET WILLIAMS,^a EDUARDO BRUERA^a

Departments of ^aPalliative Care and Rehabilitation Medicine and ^bBiostatistics, The University of Texas MD Anderson Cancer Center, Houston, Texas, USA

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Key Words. Cancer • Palliative care • Opioid analgesics • Medical waste disposal • Prescription drug diversion • Drug storage

ABSTRACT

Purpose. Improper storage, use, and disposal of prescribed opioids can lead to diversion or accidental poisoning. Our objective was to determine the patterns of storage, utilization, and disposal of opioids among cancer outpatients.

Patients and Methods. We surveyed 300 adult cancer outpatients receiving opioids in our supportive care center and collected information regarding opioid use, storage, and disposal, along with scores on the CAGE (cut down, annoyed, guilty, eye-opener) alcoholism screening questionnaire. Unsafe use was defined as sharing or losing opioids; unsafe storage was defined as storing opioids in plain sight.

Results. The median age was 57 years. CAGE was positive in 58 of 300 patients (19%), and 26 (9%) had a history of illicit drug use. Fifty-six (19%) stored opioids in plain sight, 208 (69%) kept opioids hidden but unlocked, and only 28 (9%) locked their

opioids. CAGE-positive patients ($p = .007$) and those with a history of illicit drug use ($p = .0002$) or smoking ($p = .03$) were more likely to lock their opioids. Seventy-eight (26%) reported unsafe use by sharing (9%) or losing (17%) their opioids. Patients who were never married or single (odds ratio: 2.92; 95% confidence interval: 1.48–5.77; $p = .006$), were CAGE positive (40% vs. 21%; $p = .003$), or had a history of illicit drug use (42% vs. 23%; $p = .031$) were more likely to use opioids unsafely. Overall, 223 of 300 patients (74%) were unaware of proper opioid disposal methods, and 138 (46%) had unused opioids at home.

Conclusion. A large proportion of cancer patients improperly and unsafely use, store, and dispose of opioids, highlighting the need for establishment of easily accessed patient education and drug take-back programs. *The Oncologist* 2014;19:780–785

Implications for Practice: In our study, a large proportion of cancer outpatients did not store, use, and dispose of opioids safely. Our findings reveal the need for universal education of all patients receiving opioids regarding safety around opioid use to minimize the risks of diversion or accidental poisoning. Strict implementation of patient education resources at the time all opioids are prescribed (by physicians) and dispensed (by pharmacists) could significantly decrease the amount of unused opioids available for diversion or accidental poisoning.

INTRODUCTION

The Centers for Disease Control and Prevention (CDC) reports that prescription drug abuse is growing rapidly in the U.S. [1]. Prescription opioid abuse led to more than 15,000 deaths in 2008 in the U.S. [1, 2]. Physicians are pressured to adequately diagnose and treat uncontrolled pain in all these patients [3–8]. Americans use 80% of the world's supply of opioids while constituting less than 5% of the world's population [9, 10]. Opioid sales in the U.S. increased by 400% from 1997 to 2007 [9]. However, this exponential increase in opioid use has not been matched with an increase in drug take-back programs for the safe disposal of unused or expired opioids. Moreover, the U.S. Food and Drug Administration (FDA), U.S. Drug

Enforcement Administration (DEA), and U.S. Environmental Protection Agency (EPA) have not issued uniform guidelines regarding safe, effective, convenient, and environmentally friendly disposal of opioids [11–13]. Patients are not being educated regarding the proper storage of opioids at home [14]. Improper storage and disposal of opioids may lead to increased availability of these medications for abuse and accidental poisoning. Approximately 70% of the people who abuse prescription opioids in the U.S. obtain them from friends or relatives, and only 5% obtain them from drug dealers or strangers [9, 10, 15]. Although limited information about the storage, use, and disposal practices of patients receiving

Correspondence: Akhila Reddy, M.D., Department of Palliative Care and Rehabilitation Medicine, Unit 1414, The University of Texas MD Anderson Cancer, 1515 Holcombe Boulevard, Houston, Texas 77030, USA. Telephone: 713-792-7567; E-Mail: asreddy@mdanderson.org Received February 19, 2014; accepted for publication May 2, 2014; first published online in *The Oncologist Express* on May 27, 2014. ©AlphaMed Press 1083-7159/2014/\$20.00/0 <http://dx.doi.org/10.1634/theoncologist.2014-0071>

opioids for non-cancer-related pain is available, data on these practices have not been collected in cancer patients specifically [14, 16–21]. Cancer-related pain is one of the foremost reasons for prescribing opioids: up to 90% of patients with advanced cancer require treatment with opioids [22–25]. Cancer patients may experience acute, chronic, and/or breakthrough pain and frequently undergo opioid titrations and rotations to help manage pain and opioid-induced neurotoxicity; consequently, they often possess multiple unused or expired opioids [26]. Improperly storing and disposing of these opioids could increase the likelihood or incidence of abuse. We sought to determine the patterns of storing, using, and disposing of opioids among cancer outpatients in a tertiary cancer hospital.

METHODS

This was an institutional review board-approved prospective cross-sectional survey of outpatients in the Supportive Care Clinic (SCC) at the University of Texas MD Anderson Cancer Center. Consecutive patients who attended the SCC for a follow-up visit between November 1, 2012, and April 1, 2013, were initially screened and then approached if they were at least 18 years old; received opioids for at least 1 month; were able to read, write, and converse in English; and had no cognitive impairment. Only those patients who were returning for a follow-up visit to the SCC and were on a regimen of opioids for at least 1 month as documented in a previous clinic note were invited to participate in the study. This ensured that only those patients who previously received a prescription of opioids and subsequent opioid education from the palliative care team were included in the study. Patients who were in acute symptom distress, as determined by the attending clinic physician, were excluded.

Survey

A self-administered questionnaire was provided to the eligible patients by research staff after obtaining written informed consent. Patients were informed that their responses to the survey would be kept confidential from their medical team. The questionnaire comprised 23 questions related to the patient's home/living situation and storage, use, and disposal of opioids. The questions were formulated by the study investigators based primarily on the recommendations by the FDA and DEA and a literature review regarding safe use, storage, and disposal of prescription pain medications [12, 27, 28]. The questionnaire was not validated. The investigators pilot tested the questionnaire on volunteers to ensure that no more than 15 minutes were required to complete the survey. After completing the questionnaire, the patients were provided with a handout regarding proper medication disposal and storage, including the current FDA guidelines [11, 27]. The research staff also assessed the questionnaire for completeness and approached the patients regarding any unfilled questions. The principal investigator or study collaborators contacted patients whose responses indicated unsafe practices for instruction on and reinforcement of safety principles. Patients' demographic and clinical information, including opioid prescription history, scores on the CAGE (cut down, annoyed, guilty, eye-opener) [29] alcoholism screening questionnaire,

history of tobacco and/or illicit drug use, and the morphine equivalent daily dose (MEDD), was collected through chart review.

The CAGE questionnaire is an important tool with which to detect history of alcoholism in advanced cancer patients. Patients who are CAGE positive are more likely to engage in recreational drug use and thus are at risk for rapid opioid dose escalation and abuse. Previous studies have suggested the routine use of the CAGE questionnaire in cancer patients requiring opioids [30–32].

Our primary objective was to determine the patients' patterns of opioid storage, use, and disposal. Unsafe storage was defined as storing medications where they were visible and/or accessible to people besides the patient and the designated caregiver. Sharing or losing opioids was defined as an unsafe use. Our secondary objectives were to determine predictors of unsafe practices of opioid storage and utilization.

Statistical Analysis

This descriptive protocol was based on a sample of 300 patients who could provide an adequate number of responses for the primary outcome, which was a description of patterns, as well as logistic regression analysis to determine predictors of unsafe storage, use, and disposal. A main effects logistic regression of covariates was performed on the binary outcome of safe and unsafe. We performed univariate analysis of each predictor and included only those significant at .10 in the multivariable logistic regression. Two groups of 150 patients for each binary predictor (e.g., sex) yielded 84% power to detect an odds ratio (OR) of 2.0 when $\alpha = .05$ and assuming no association of the predictor with other predictors in the model. Power was less depending on the strength of association of the predictors.

RESULTS

A total of 383 patients were screened, 32 of whom were ineligible because they did not speak English or had severe symptom distress. Of the 351 eligible patients, 51 (14%) declined participation; therefore, 300 patients (86%) participated in the survey. Table 1 shows the patient characteristics. The mean age was 56 years, 47% were male, 72% were white, and 63% were married. Lung (22%) was the most common cancer type, and 89% had advanced cancer. Of the 300 patients, 58 (19%) were CAGE positive, 26 (9%) had history of illicit drug use, and 120 (40%) had a MEDD greater than 100 mg.

Table 2 shows that only 28 (9%) stored their opioids under lock and key, and 138 (46%) have unused opioids at home. More than half (159 of 300) did not routinely dispose of opioids; of those, 70 (44%) saved opioids for future use, and almost three-fourths (223 of 300) were unaware of proper opioid disposal methods. A total of 78 patients (26%) reported unsafe use by sharing (9%) or losing (17%) their opioids, and 117 (39%) were unaware that their opioid could be fatal when taken by others. However, 254 (85%) acknowledged that pain medications can cause drowsiness, confusion, trouble breathing, seizures, and death when taken by others for whom they were not prescribed.

Table 3 shows that patients with a history of positive CAGE scores ($p = .0069$), illicit drug use ($p = .0002$), and smoking ($p = .0294$) and those living with adult children ($p = .0042$)

Table 1. Patient characteristics

Variable (n = 300)	Result
Age, mean (range)	56 (22–84)
Male, n (%)	141 (47)
Race/ethnicity	
White	216 (72)
Hispanic	30 (10)
Black	45 (15)
Asian	7 (2)
Marital status, n (%)	
Single/never married	46 (15)
Divorced	37 (12)
Widowed	21 (7)
Married	188 (63)
Highest level of education completed, n (%)	
Did not finish high school	33 (11)
High school	71 (24)
Vocational/technical school	19 (6)
Associate degree/some college	81 (27)
Bachelor's degree	64 (21)
Advanced degree	29 (10)
Cancer type, n (%)	
Breast	54 (18)
Gastrointestinal	41 (14)
Gynecological	22 (7)
Head and neck	52 (17)
Lung	67 (22)
Sarcoma	16 (5)
Other	48 (16)
Advanced stage cancer	267 (89)
CAGE positive, n (%)	58 (19)
History of illicit drug use, n (%)	26 (9)
History of smoking, n (%)	162 (54)
MEDD >100 mg, n (%)	120 (40)
Who is living at home, n (%)	
Spouse/significant other	200 (67)
Adult children (age >25 years)	67 (22)
Young adult children (age 18–25 years)	40 (13)
Minor children (age <18 years)	70 (23)
Parents	24 (8)
Alone	29 (10)

Abbreviations: CAGE, cut down, annoyed, guilty, eye-opener (questionnaire); MEDD, morphine equivalent daily dose.

were more likely to keep their opioids locked. Some patients reported patterns of storage that were difficult to characterize as safe or unsafe (e.g., in their handbag or on their bedroom nightstand that was usually locked). These patterns are reported as “other” in Table 3. Patterns of storage were not significantly different according to other variables such as age, cancer type, race or ethnicity, sex, MEDD, level of education, and marital status.

Table 4 shows the significant predictors of unsafe opioid use (sharing or losing). Patients with positive CAGE scores or

Table 2. Patients' knowledge, practices, and attitudes regarding opioid storage, disposal, and use

Variable (n = 300)	n	%
I need assistance with taking my pain medications.	42	14
I have unused pain medications at home.	138	46
I dispose of my pain medications by:		
Giving them to my doctor/pharmacy for disposal	24	8
Flushing down the toilet	55	18
Throwing in the trash	51	17
I do not routinely dispose pain medications.	159	53
I do not dispose of my pain medications because I may need them in the future (n = 159).	70	44
I keep my pain medications:		
Where everybody can see	56	19
Hidden but not locked	208	69
Under lock and key	28	9
I am aware of any proper disposal methods for opioids.	77	26
I tell my family and friends that I am on pain medications.	133	44
I count my pain pills to see how many are left.	115	39
I think that sometimes I have less of the pain medications in my bottle than I expected.	22	7
I have run out of pain medications early.	122	41
I have shared my medications with someone else.	27	9
I have lost some pain medications in the past.	51	17
I agree that abuse of prescription pain medications is a common problem in our society.	223	74
I agree that pain medications can cause excessive sleepiness, confusion, trouble breathing, seizures, and death when taken by others for whom they were not prescribed.	254	85
I am aware that one dose of my current pain killer can be fatal if taken by someone else.	183	61

a history of illicit drug use were more likely to use opioids unsafely. Patients who were never married or single also had higher odds of unsafe use. Other variables were not significantly associated with unsafe opioid use.

DISCUSSION

The unsafe practices around opioid use in cancer patients represent an avenue for increased drug abuse and accidental overdose because of the excessive amounts of opioids that are accessible to others.

Patients who had a history of positive CAGE scores or illicit drug use were more likely to store their opioids securely but also were more likely to share or lose their opioids. These patients are more likely to cope chemically with their psychosocial distress and to be more protective of their medications [30]. Compared with other patients, they may be more aware of the addictive effects of opioids or may participate in drug diversion, rendering them more cautious in their storage practices. An alternate explanation of this finding could be that these patients were attempting to claim safe storage practices to ensure continuing prescription of opioids by the health care team. Many patients currently do not undergo screening for alcoholism or illicit drug use [30]. Our findings indicate the need to collect these data before

Table 3. Predictors of unsafe opioid storage

Variable	Unsafe storage, n (%)	Safe Storage, n (%)			p value ^b
		Hidden	Locked	Other, n (%) ^a	
CAGE score					.0069
Negative	48 (20)	169 (71)	16 (7)	5 (2)	
Positive	6 (10)	38 (65.5)	12 (21)	2 (3)	
History of illicit drug use					.0002
Yes	2 (8)	15 (58)	6 (23)	3 (11.5)	
No	52 (19)	192 (71)	22 (8)	4 (1.5)	
History of smoking					.0294
Yes	31 (19)	103 (64)	22 (14)	4 (2.5)	
No	23 (17)	104 (76.5)	6 (4)	3 (2)	
Living with adult children (age >25 years)					.0042
Yes	11 (16)	42 (62)	14 (21)	0 (0)	
No	43 (19)	165 (72)	14 (6)	7 (3)	

^aPatterns of storage that were difficult to characterize as safe or unsafe (e.g., in their handbag or on their bedroom nightstand that was usually locked).

^bChi-square test or Fisher's exact test.

Unsafe opioid storage is defined as storing opioids openly in plain sight.

Abbreviation: CAGE, cut down, annoyed, guilty, eye-opener (questionnaire).

Table 4. Predictors of unsafe opioid use

Variable	Unsafe use, n (%) ^a	Safe use, n (%) ^a	p value	Unsafe use, univariate ^b			Unsafe use, multivariate ^b		
				OR	95% CI	p value	OR	95% CI	p value
Marital status			.0017			.0065			.0129
Married	39 (21)	148 (80)		1.00			1.00		
Widowed	2 (10)	19 (91)		0.40	0.09–1.79	.23	0.40	0.09–1.81	.23
Single/never married	20 (44)	26 (57)		2.92	1.48–5.77	.0021	2.64	1.32–5.29	.01
Divorced	9 (25)	27 (75)		1.27	0.55–2.91	.58	1.17	0.50–2.72	.72
CAGE score			.0036			.0043			.0086
Positive	23 (40)	35 (60)		1.00			1.00		
Negative	51 (21)	189 (79)		0.41	0.22–0.76		0.43	0.23–0.81	
History of illicit drug use			.0309			.035			
Yes	11 (42)	15 (58)		1.00					
No	63 (23)	209 (77)		0.41	0.18–0.94				

^aChi-square test or Fisher's exact test.

^bLogistic regression.

Unsafe opioid use is defined as self-reported sharing or losing opioids.

Abbreviations: CAGE, cut down, annoyed, guilty, eye-opener (questionnaire); CI, confidence interval; OR, odds ratio.

prescribing opioids to identify patients who are at increased risk of unsafe opioid use. More research is needed to confirm these findings.

Patients who were married were less likely to share or lose their opioids than were single patients. This finding could indicate that spouses or relatives may provide psychosocial support and attention that foster safe practices. Married cancer patients in a recent study also had higher survival rates, which reiterate the impact of psychosocial support [33].

In our study, patients with adult children were more likely to store their opioids securely. Adult children are more likely to misuse their parents' opioids. In addition, patients may feel that allowing their adult children to control or monitor their medication consumption means relinquishing their autonomy. More research is needed to explore this finding.

Our results are similar to some other studies conducted in general (noncancer) patient populations. A survey of patients in pain and in dental clinics revealed 67% did not dispose of their opioids, and 20% admitted to either borrowing, lending, or losing their opioids [16]. In other studies, more than half the patients stored unused opioids at home [20], 67% of patients had leftover pain medication after surgery recovery, and 92% were not educated regarding proper opioid disposal methods [14]. Additional studies have reported unsafe opioid storage and disposal as well as diversion and abuse among patients admitted to emergency rooms and hospices [21, 34]. However, our findings have more serious implications because cancer patients are more likely to need higher doses of opioids and for longer periods of time compared with those in dental clinics or postoperative patients.

Only 25% of the patients in our study were aware of proper opioid disposal methods. The current absence of uniform guidelines for safe and effective opioid disposal represents an increasing availability of unused or expired opioids for abuse and diversion. Unlike some Latin American countries, Canada, and Australia, the U.S. does not have regulated and easily accessible drug take-back programs for consumers [35]. The FDA recommends that opioids be disposed of via drug take-back programs or via household trash by mixing the medications with unpalatable substances like coffee grounds or cat litter in a sealed plastic bag; some medications may be flushed down the toilet [11]. However, the EPA discourages flushing expired or unwanted medication down the toilet to avoid contaminating the water supply [13] because several reports have demonstrated the presence of controlled substances in surface and ground water [36–38]. The DEA does not have clear guidelines for consumers regarding proper disposal of opioids or other controlled substances, and only pharmacies and physicians who are DEA-registered reverse distributors can take back opioids [12].

Uniform national guidelines for the safe disposal of unused opioids are urgently needed. Allowing all pharmacies (even those not registered with the DEA as reverse distributors) to take back unused or expired opioids—which, in turn, could be transferred to the DEA for incineration—may improve the rates at which opioids and other medications are safely disposed. In addition to the DEA's National Take-Back Initiative, which provides safe locations for disposing prescription drugs [12], the National Association of Drug Diversion Investigators launched a drug drop box grant program that offers law enforcement an opportunity to receive free locked boxes to accept unused medications from the community [39].

Apart from safe disposal of opioids, providing access and education with regard to safe storage of opioids is equally important. The Florida Family Partnership started the “Lock Your Meds” campaign to foster safe storage practices in an attempt to minimize prescription drug abuse [40]. A wide variety of currently available medication lock bottles with combination locks may also aid in safely storing opioid medications. A pharmaceutical company with a new opioid product is now voluntarily providing free access to such locking pill bottle caps and discounted safe-storage units to reinforce safe storage practices [41]. More research is necessary to determine the efficacy of such interventions aimed at improving safety around storage of opioids.

Our findings reveal the need for universal education of all patients receiving opioids regarding safe storage, use, and disposal to minimize the risks of diversion or accidental poisoning. Patient education programs have been shown to significantly improve knowledge and practices of safe opioid storage and disposal [16, 18, 20]. Strict implementation of patient education resources at the time all opioids are prescribed (by physicians) and dispensed (by pharmacists) could significantly decrease the amount of unused opioids available for diversion or accidental poisoning. The initial response to prescription drug abuse was primarily law enforcement based; over time, it has become clear that a unified approach involving physicians, pharmacists, other health care providers, and law enforcement is needed. The findings of our study underscore the importance of the role

of prescribing physicians (oncologists and palliative care specialists) in the approach to combating prescription drug abuse. Education materials that are easily accessible may be used in discussing safe opioid storage, utilization, and disposal practices with patients [11, 12, 28, 42].

Our study had many limitations. All survey respondents were English-speaking cancer outpatients in the SCC of a single institution; therefore, our findings may not be generalizable to other cancer patients, to noncancer patient populations, and to non-English-speaking patients. Although the questionnaire was extremely simple, one limitation was that no formal validation was conducted on the questionnaire. There was no control group in which patients were prescribed opioids by other services in our institution or by other cancer centers. The majority of patients in our study had advanced cancer, which puts forward the issue of selection bias, thereby limiting the generalizability of our findings. Our findings need to be replicated in other patient populations. Another limitation is that the information regarding unsafe opioid storage and use is based only on patient self-report. More research is needed to confirm these findings.

CONCLUSION

A large proportion of cancer outpatients do not store, use, and dispose of opioids safely. Incorporating routine patient education programs and creating more drug take-back programs are critical to decreasing the availability of prescription opioids for abuse, diversion, and accidental poisoning.

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AUTHOR CONTRIBUTIONS

Conception/Design: Eduardo Bruera, Akhila Reddy, Maxine de La Cruz, Eden Mae Rodriguez, Jessica Thames, Susan Frisbee-Hume, Sriram Yennurajalingam, David Hui, Hilda Cantu, Alejandra Marin, Vicki Gayle, Nancy Shinn, Angela Xu, Janet Williams

Provision of study material or patients: Akhila Reddy, Maxine de La Cruz, Eden Mae Rodriguez

Collection and/or assembly of data: Eduardo Bruera, Akhila Reddy, Maxine de La Cruz, Eden Mae Rodriguez, Jessica Thames, Hilda Cantu, Alejandra Marin, Vicki Gayle, Nancy Shinn, Angela Xu, Janet Williams

Data analysis and interpretation: Eduardo Bruera, Akhila Reddy, Maxine de La Cruz, Jimin Wu, Gary Chisholm, Diane Liu, Susan Frisbee-Hume, Sriram Yennurajalingam, David Hui

Manuscript writing: Eduardo Bruera, Akhila Reddy, Maxine de La Cruz, Eden Mae Rodriguez, Sriram Yennurajalingam, David Hui

Final approval of manuscript: Eduardo Bruera, Akhila Reddy, Maxine de La Cruz, Eden Mae Rodriguez, Jessica Thames, Jimin Wu, Gary Chisholm, Diane Liu, Susan Frisbee-Hume, Sriram Yennurajalingam, David Hui, Hilda Cantu, Alejandra Marin, Vicki Gayle, Nancy Shinn, Angela Xu, Janet Williams

DISCLOSURES

The authors indicated no financial relationships.

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