Association of Care Practices with Suicide Attempts in US Veterans Prescribed Opioid Medications for Chronic Pain Management

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IMPORTANCE: Patients receiving opioid therapy are at elevated risk of attempting suicide. Guidelines recommend practices to mitigate risk, but it is not known whether these are effective.

OBJECTIVE: Our aim was to examine associations between the receipt of guideline-recommended care for opioid therapy and risk of suicide attempt.

DESIGN, SETTING, AND PARTICIPANTS: This was a retrospective analysis of administrative data for all Veteran patients prescribed any short-acting opioids on a chronic basis or any long-acting opioids from the Veterans Health Administration during fiscal year 2010.

MAIN OUTCOMES AND MEASURES: Multivariate, mixed-effects logistic regression analyses were conducted to define the associations between the risk of suicide attempt and receipt of guideline-recommended care at the individual level and rates of use of recommended care at the facility level, while accounting for patient risk factors.

RESULTS: At the individual level, having a mood disorder was highly associated with suicide attempts (odds ratios [ORs]=3.5, 3.9; 95 % confidence intervals [CIs]=3.3–3.9, 3.3–4.6 for chronic short-acting and long-acting groups, respectively). At the facility level, patients on opioid therapy within the facilities ordering more drug screens were associated with decreased risk of suicide attempt (ORs=0.2, 0.3; CIs=0.1–0.3, 0.2–0.6 for chronic short-acting and long-acting groups, respectively). In addition, patients on long-acting opioid therapy within the facilities providing more follow-up after new prescriptions were associated with decreased risk of suicide attempt (OR=0.2, CI=0.0–0.7), and patients on long-acting opioid therapy within the facilities having higher sedative co-prescription rates were associated with increased risk of suicide attempt (OR=20.3, CI=1.1–382.2).

CONCLUSIONS AND RELEVANCE: Encouraging facilities to make more consistent use of drug screening, provide follow-up within 4 weeks for patients initiating new opioid prescriptions, and avoid sedative co-prescription in combination with long-acting opioids may help prevent suicide attempts. Some clinicians may selectively employ guideline-recommended practices with at-risk patients.

KEY WORDS: opioid therapy; suicide attempt; clinical practice guideline.

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INTRODUCTION

Patients receiving opioid therapy (OT) are at elevated risk of attempting suicide,¹ but definitive research to guide clinical practice for risk mitigation is lacking. Unmanaged severe, chronic and intermittent pain conditions increase risk of suicide attempt,^{2–9} a finding that might encourage providers to take aggressive action to reduce chronic pain in at-risk patients. However, available opioids also provide means for attempting suicide,¹⁰ potentially discouraging prescribing of these analgesics. Competing pressures have led experts to focus on clinical strategies for reducing the risk of adverse events in patients prescribed opioids.

In 2010, the Veterans Health Administration (VHA) and Department of Defense released a *Clinical Practice Guideline for the Management of Opioid Therapy for Chronic Pain (CPG for OT)*.¹¹ Like other guidelines for OT for chronic pain,^{12,13} this guideline provides recommendations, based primarily on expert consensus, for recognizing patient populations at higher risk of opioid-related adverse events, and intensifying care or monitoring such patients to minimize risk. For all patients, especially higher risk patients, the guideline recommends intensified clinical management, such as timely follow-up after new prescriptions.

To track and encourage adherence to this emerging practice standard, a team including the guideline co-chairs; VHA national pain, pharmacy, and addictions policy leadership; primary care, specialty pain and mental health clinicians; and measurement experts developed a set of administrative data-based process measures to evaluate current use of key guideline-recommended practices.¹⁴ Examination of variation in use of recommended practices across VHA showed two common patterns: (1) for some recommendations, facility rates were consistent across the system, but indicated incomplete adherence to the recommendation; (2) for other recommendations, rates of adherence varied greatly across facilities. Because most guideline recommendations have been based on

expert consensus rather than evidence-based research, it is not clear whether recommended care delivery, or the observed variations in clinical practice, impact patient risk for adverse outcomes.

Here, we examine associations between use of guideline recommendations for OT and risk of suicide attempt. Because clinical practices may be adapted based on patient characteristics associated with risk, solely examining patient-level or facility-level associations between clinical practice and outcomes can encourage logically flawed inferences regarding clinical practice effects.¹⁵ Thus, we aim to examine associations between *individual-level and facility-level* delivery of guideline-recommended care and *individual-level* suicide attempts. Notably, although the guideline provides detailed information to guide dosing of specific opioids during initiation, titration, and cessation, it does not specify prescription details such as choice of drug. Thus, such variables, while potentially relevant for suicide risk, were not included in these analyses.

METHODS

Data

All Veteran patients prescribed any short-acting opioids on a chronic basis (chronic short-acting, CSA) or any long-acting (LA) opioids from the VHA during fiscal year 2010 (FY10) were included in this analysis (see Appendix 1 for CSA and LA definitions). Chronic use of short-acting opioids was defined as having at least 90 days of supply in FY10.¹⁴ Notably, 91 % of the patients in the LA group also received short-acting opioids in FY10, but were exclusively counted in the LA group. Clinical expert advisors suggested that long-acting medications may pose greater risk for adverse events, and that these medications are typically prescribed by specialists and in non-primary care settings. Here, we examine populations receiving any long-acting and chronic short-acting opioids separately, to clarify if and where differences in the patient risk and care practices exist. All patients receiving long-acting prescriptions were included, rather than just those with more than 90 days of supply, to allow for comparison with other published data on this population.¹⁶ Given concerns about prescribing opioids to patients diagnosed with substance use disorder (SUD), additional analyses examined individual-level and facility-level factors associated with suicide attempts among the patient population.

Data were extracted from the VHA National Patient Care Database and VHA Decision Support System pharmacy and laboratory files; databases were linked by matching patients' scrambled social security numbers. This study was approved and overseen by the Stanford University Human Research Protection Program and the VA Palo Alto Health Care System Research and Development Committee.

Measures

The dependent variable in this study is a binary indicator of whether a Veteran patient had completed or attempted suicide after being prescribed any CSA or LA opioids (hereafter referred to as "suicide attempts"). We included all documented incidents, confirmed or suspected, occurring in the first 180 days after any prescription was initiated during FY10 (see Appendix 2 for definition).

Individual-Level Predictors. Demographic variables included age, gender, and marital status. Age was categorized into three groups: younger than 31 years old, 31–55 years old, and greater than 55 years old. Physical/mental health status was represented by indicator variables for medical frailty, drug/alcohol/mood disorder, and traumatic brain injury (see Appendix 3 for definitions).

We used binary indicator variables to identify whether patients received guideline-recommended care. The covariates were chosen from the *CPG for OT*¹¹ and employed metrics developed for VHA that measured delivery of guideline-recommended care.¹⁴ Here, we include the following guideline-recommended care delivery measures (see Appendix 4 for rationale and definitions): psychosocial assessment or therapy, sedative co-prescription (e.g., benzodiazepines, barbiturates, and carisoprodol [Soma]), follow-up, drug screening, medication management, avoidance of sole reliance on opioids, and SUD specialty treatment.

Facility-Level Predictors. We included facility-level guideline-recommended care delivery rates in the analysis. These rates were calculated for each VHA facility by dividing the number of patients on OT receiving each guideline-recommended service by the total number of patients on OT within the VHA facility.

Statistical Analyses

To examine individual-level and facility-level factors associated with patients' suicide attempts, we conducted multivariate mixed-effects logistic regression, with a random effect for each facility to account for the clustering of patients within VHA facilities.¹⁵ Mixed-effects logistic regression is a branch of logistic regression having a binary outcome as a dependent variable (e.g., whether a patient attempted suicide after being prescribed only CSA or LA opioids). Traditional single-level logistic regression assumes observations are independent conditional on the covariates and uncorrelated residual errors, which may not hold when analyzing nested data.^{16,17} In contrast, mixed-effects logistic regression considers variations derived from the data's hierarchical structure and allows for simultaneous examination of effects of facility-level and individual-level variables on individual-level outcomes while accounting for the non-independence of observations within facilities.¹⁷

The analyses were performed for CSA and LA OT groups separately, and in addition, for SUD-diagnosed patients within each group. We chose a p value of < 0.05 as a threshold for statistical significance. All multivariate mixed-effects logistic regression analyses were conducted using the `glmmPQL` function in the MASS package¹⁸ of R statistical software (version 2.15.0).¹⁹

RESULTS

Overview

Table 1 shows individual-level predictors of suicide attempts among patients on OT. During FY10, 487,462 Veteran patients received OT at 139 VHA facilities. Of these patients, 393,657 (80.8 %) received CSA opioids, and 93,805 (19.2 %) received LA opioids. Within the first 180 days after opioid prescriptions, 6,482 (1.6 %) CSA patients and 1,982 (2.1 %) LA patients attempted suicide. According to Table 2, 47,771 (12.1 %) were diagnosed with SUD, and 3,440 (7.2 %) of them attempted suicide among patients on CSA OT. Among patients on LA OT, 13,732 (14.6 %) were diagnosed with SUD, and 1,144 (8.3 %) of them attempted suicide.

Table 3 shows facility-level guideline-recommended care delivery rates for patients receiving OT. For patients on both CSA and LA OT, the guideline-recommended care most frequently provided was rehabilitation medicine (72.4 and 74.7 % for patients on CSA and LA OT, respectively). The guideline-recommended care least frequently provided was specialty pain pharmacotherapy with TCAs (14.3 and 19.0 % for patients on CSA and LA OT, respectively). The standard deviations of facility-level propensities to order drug screens for patients on both CSA and LA OT were largest compared to their mean propensities. This indicates that drug screens were not provided consistently to patients on CSA or LA OT across facilities.

Chronic Short-Acting Opioid Prescribed Population

Table 4 summarizes the multivariate, mixed-effects logistic regression results for patients receiving CSA OT. Insignificant variables are shaded in the table. At the individual level, suicide attempts were associated with being younger, female, currently unmarried, and having medical frailty, drug/alcohol/mood disorder, or traumatic brain injury. In particular, having a mood disorder was highly associated with suicide attempts (odds ratio [OR]=3.5, 95 % confidence interval [CI]=3.3–3.9). Moreover, patients receiving psychosocial assessment/therapy, sedative co-prescription, drug screening, medication management, rehabilitation medicine, and anti-inflammatory or specialty pain pharmacotherapy were associated with increased risk of suicide attempt. At the facility-level, patients prescribed CSA OT within VHA facilities ordering more drug screens were

associated with decreased risk of suicide attempt (OR=0.2, CI=0.1–0.3).

Table 4 also summarizes results for SUD-diagnosed patients on CSA OT. In general, the pattern of individual-level findings were similar to those for the entire CSA OT group; however, unlike the entire CSA OT group, gender and anti-inflammatory and specialty pain pharmacotherapy (SNRIs) were not significant predictors of suicide attempts for the SUD-diagnosed group on CSA OT. Similar to results for the entire CSA OT group, having a mood disorder was highly associated with suicide attempts (OR=5.4, CI=4.6–6.3). At the facility-level, SUD-diagnosed patients on CSA OT within VHA facilities ordering regular drug screens (defined as at least one drug screen for every 90 days of opioid supply) more consistently or providing more SUD specialty treatment/SUD-specific pharmacotherapies were associated with decreased risk of suicide attempt (ORs=0.3, CI=0.2–0.6).

Long-Acting Opioid Prescribed Population

Results for patients on LA OT (Table 5) were consistent with results for patients on CSA OT. For the entire LA OT group, suicide attempts were associated with being younger, currently unmarried, and having medical frailty, drug/alcohol/mood disorder, or traumatic brain injury. Similarly, having a mood disorder was highly associated with suicide attempts (OR=3.9, CI=3.3–4.6). Patients receiving psychosocial assessment/therapy, sedative co-prescription, drug screening, medication management, rehabilitation medicine, or specialty pain pharmacotherapy were associated with increased risk of suicide attempt. Consistent with the entire CSA OT group, the LA OT group within VHA facilities ordering more drug screens was associated with decreased risk of suicide attempt (OR=0.3, CI=0.2–0.6); in addition, the LA OT group within VHA facilities providing more follow-up after new prescriptions was associated with decreased risk of suicide attempt (OR=0.2, CI=0.0–0.7), and the LA OT group within VHA facilities having higher sedative co-prescription rates was associated with increased risk of suicide attempt (OR=20.3, CI=1.1–382.2).

Table 5 also summarizes results for the SUD-diagnosed group on LA OT. The pattern of individual-level findings was identical to those for the entire LA OT group, except that being currently unmarried was not associated with suicide attempts for patients with SUD. Similar to the entire LA OT group, among SUD-diagnosed group on LA OT, having a mood disorder was highly associated with suicide attempts (OR=5.9, CI=4.4–7.8). At the facility-level, SUD-diagnosed group on LA OT within VHA facilities providing more rehabilitation medicine were associated with decreased risk of suicide attempt (OR=0.3, CI=0.1–0.9), while SUD-diagnosed patients within VHA facilities having higher sedative co-prescription rates and providing more SNRIs were associated with increased risk of suicide attempt (ORs=30.2 and 62.2; CIs=1.1–829.3 and 2.2–1,769.3, respectively).

Table 1. Individual-Level Predictors and Suicide Attempts in the Entire Population Prescribed Opioid in the VHA in FY10

Type of opioid	CSA ^a		LA ^b	
Number of cases	Suicide attempt 6,482 (100.0 %)	No suicide attempt 387,175 (100.0 %)	Suicide attempt 1,982 (100.0 %)	No suicide attempt 91,823 (100.0 %)
<i>Demographic factors</i>				
Age				
≤ 30 (reference)	368 (5.7 %)	11,916 (3.1 %)	107 (5.4 %)	2,742 (3.0 %)
31–55	3,109 (48.0 %)	105,276 (27.2 %)	960 (48.4 %)	26,891 (29.3 %)
> 55	3,005 (46.4 %)	269,983 (69.7 %)	915 (46.2 %)	62,190 (67.7 %)
Gender				
Female (reference)	616 (9.5 %)	25,249 (6.5 %)	159 (8.0 %)	5,988 (6.5 %)
Male	5,866 (90.5 %)	361,926 (93.5 %)	1,823 (92.0 %)	85,835 (93.5 %)
Currently married	7 missing	1,285 missing	1 missing	278 missing
No (reference)	3,925 (60.6 %)	180,108 (46.5 %)	1,185 (59.8 %)	42,804 (46.6 %)
Yes	2,550 (39.3 %)	205,782 (53.1 %)	796 (40.2 %)	48,741 (53.1 %)
<i>Physical and mental health factors</i>				
Medical frailty ^c		2 missing		2 missing
No (reference)	2,634 (40.6 %)	169,917 (43.9 %)	769 (38.8 %)	38,432 (41.9 %)
Yes	3,848 (59.4 %)	217,256 (56.1 %)	1,213 (61.2 %)	53,389 (58.1 %)
Drug use disorder		2 missing		2 missing
No (reference)	3,641 (56.2 %)	360,346 (93.1 %)	969 (48.9 %)	82,882 (90.3 %)
Yes	2,841 (43.8 %)	26,827 (6.9 %)	1,013 (51.1 %)	8,939 (9.7 %)
Alcohol use disorder		2 missing		
No (reference)	3,618 (55.8 %)	349,672 (90.3 %)	1,154 (58.2 %)	82,802 (90.2 %)
Yes	2,864 (44.2 %)	37,501 (9.7 %)	828 (41.8 %)	9,021 (9.8 %)
Any mood disorder ^d		2 missing		2 missing
No (reference)	803 (12.4 %)	238,743 (61.7 %)	190 (9.6 %)	52,900 (57.6 %)
Yes	5,679 (87.6 %)	148,430 (38.3 %)	1,792 (90.4 %)	38,921 (42.4 %)
Traumatic brain injury				
No (reference)	6,286 (97.0 %)	385,832 (99.7 %)	1,913 (96.5 %)	91,473 (99.6 %)
Yes	196 (3.0 %)	1,343 (0.3 %)	69 (3.5 %)	350 (0.4 %)
Type of opioid	CSA		LA	
Number of cases	Suicide attempt 6,482 (100.0 %)	No suicide attempt 387,175 (100.0 %)	Suicide attempt 1,982 (100.0 %)	No suicide attempt 91,823 (100.0 %)
<i>Receipt of clinical practice guideline interventions^e</i>				
Psychosocial assessment or therapy		6 missing		2 missing
No (reference)	850 (13.1 %)	227,340 (58.7 %)	220 (11.1 %)	50,703 (55.2 %)
Yes	5,632 (86.9 %)	159,829 (41.3 %)	1,762 (88.9 %)	41,118 (44.8 %)
Sedative co-prescription				
No (reference)	4,104 (63.3 %)	275,273 (71.1 %)	1,020 (51.5 %)	56,906 (62.0 %)
Yes	2,378 (36.7 %)	111,902 (28.9 %)	962 (48.5 %)	34,917 (38.0 %)
Follow-up				
No (reference)	3,849 (59.4 %)	253,109 (65.4 %)	1,316 (66.4 %)	62,952 (68.6 %)
Yes	2,633 (40.6 %)	134,066 (34.6 %)	666 (33.6 %)	28,871 (31.4 %)
Any drug screening				
No (reference)	2,720 (42.0 %)	311,571 (80.5 %)	712 (35.9 %)	67,555 (73.6 %)
Yes	3,762 (58.0 %)	75,604 (19.5 %)	1,270 (64.1 %)	24,268 (26.4 %)
Medication management				
No (reference)	3,113 (48.0 %)	302,321 (78.1 %)	871 (43.9 %)	69,006 (75.2 %)
Yes	3,369 (52.0 %)	84,854 (21.9 %)	1,111 (56.1 %)	22,817 (24.8 %)
Rehabilitation medicine				
No (reference)	699 (10.8 %)	107,917 (27.9 %)	192 (9.7 %)	23,511 (25.6 %)
Yes	5,783 (89.2 %)	279,258 (72.1 %)	1,790 (90.3 %)	68,312 (74.4 %)
Anti-inflammatory pharmacotherapy (NSAID or acetaminophen)				
No (reference)	2,984 (46.0 %)	217,460 (56.2 %)	976 (49.2 %)	54,096 (58.9 %)
Yes	3,498 (54.0 %)	169,715 (43.8 %)	1,006 (50.8 %)	37,727 (41.1 %)
<i>Receipt of clinical practice guideline interventions</i>				
Specialty pain pharmacotherapy (TCA ^f)				
No (reference)	4,982 (76.9 %)	332,499 (85.9 %)	1,414 (71.3 %)	74,544 (81.2 %)
Yes	1,500 (23.1 %)	54,676 (14.1 %)	568 (28.7 %)	17,279 (18.8 %)
Specialty pain pharmacotherapy (SNRI ^g)				
No (reference)	4,634 (71.5 %)	325,417 (84.0 %)	1,275 (64.3 %)	72,589 (79.1 %)
Yes	1,848 (28.5 %)	61,758 (16.0 %)	707 (35.7 %)	19,234 (20.9 %)
Type of opioid	CSA		LA	
Number of cases	Suicide attempt 6,482 (100.0 %)	No suicide attempt 387,175 (100.0 %)	Suicide attempt 1,982 (100.0 %)	No suicide attempt 91,823 (100.0 %)
Specialty pain pharmacotherapy (anticonvulsants)				
No (reference)	3,405 (52.5 %)	268,558 (69.4 %)	880 (44.4 %)	56,198 (61.2 %)
Yes	3,077 (47.5 %)	118,617 (30.6 %)	1,102 (55.6 %)	35,625 (38.8 %)

^a Short-acting opioid medications on a chronic basis (chronic short-acting)^b Long-acting^c Congestive heart failure, cardiac arrhythmia, valvular disease, pulmonary circulation disorder, peripheral vascular disorder, paralysis, other neurological disorder, chronic pulmonary disease, hypothyroidism, renal failure, liver disease, peptic ulcer disease - excluding bleeding, aids, lymphoma, metastatic cancer, solid tumor without metastasis, rheumatoid arthritis/collagen vascular, coagulopathy, weight loss, fluid and electrolyte disorders, blood loss anemia, or deficiency anemias^d Depression, anxiety disorder, PTSD, or affective psychosis (bipolar)^e Please refer to Appendix Table 4^f Tricyclic antidepressants^g Serotonin-norepinephrine reuptake inhibitors

Table 2. Individual-Level Predictors and Suicide Attempts in the Population Diagnosed with Substance Use Disorder and Prescribed Opioid in the VHA in FY10

Type of opioid	CSA		LA	
Number of cases	Suicide attempt 3,440 (100.0 %)	No suicide attempt 44,331 (100.0 %)	Suicide attempt 1,144 (100.0 %)	No suicide attempt 12,588 (100.0 %)
<i>Demographic factors</i>				
Age				
≤ 30 (reference)	211 (6.1 %)	1,887 (4.3 %)	72 (6.3 %)	485 (3.9 %)
31–55	1,901 (55.3 %)	18,069 (40.8 %)	597 (52.2 %)	5,223 (41.5 %)
> 55	1,328 (38.6 %)	24,375 (55.0 %)	475 (41.5 %)	6,880 (54.7 %)
Gender				
Female (reference)	219 (6.4 %)	2,010 (4.5 %)	65 (5.7 %)	585 (4.6 %)
Male	3,221 (93.6 %)	42,321 (95.5 %)	1,079 (94.3 %)	12,003 (95.4 %)
Currently married	4 missing	137 missing	1 missing	29 missing
No (reference)	2,427 (70.6 %)	29,442 (66.4 %)	767 (67.0 %)	8,123 (64.5 %)
Yes	1,009 (29.3 %)	14,752 (33.3 %)	376 (32.9 %)	4,436 (35.2 %)
<i>Physical and mental health factors</i>				
Medical frailty				
No (reference)	1,395 (40.6 %)	19,148 (43.2 %)	425 (37.2 %)	5,134 (40.8 %)
Yes	2,045 (59.4 %)	25,183 (56.8 %)	719 (62.8 %)	7,454 (59.2 %)
Drug use disorder				
No (reference)	689 (20.0 %)	19,571 (44.1 %)	157 (13.7 %)	4,203 (33.4 %)
Yes	2,751 (80.0 %)	24,760 (55.9 %)	987 (86.3 %)	8,385 (66.6 %)
Alcohol use disorder				
No (reference)	770 (22.4 %)	12,559 (28.3 %)	365 (31.9 %)	5,022 (39.9 %)
Yes	2,670 (77.6 %)	31,772 (71.7 %)	779 (68.1 %)	7,566 (60.1 %)
Any mood disorder				
No (reference)	183 (5.3 %)	15,309 (34.5 %)	50 (4.4 %)	3,974 (31.6 %)
Yes	3,257 (94.7 %)	29,022 (65.5 %)	1,094 (95.6 %)	8,614 (68.4 %)
Traumatic brain injury				
No (reference)	3,256 (94.7 %)	43,152 (97.3 %)	1,082 (94.6 %)	12,279 (97.5 %)
Yes	184 (5.3 %)	1,179 (2.7 %)	62 (5.4 %)	309 (2.5 %)
Type of opioid	CSA	LA	CSA	LA
Number of cases	Suicide attempt 3,440 (100.0 %)	No suicide attempt 44,331 (100.0 %)	Suicide attempt 1,144 (100.0 %)	No suicide attempt 12,588 (100.0 %)
<i>Receipt of clinical practice guideline interventions</i>				
SUD specialty treatment or SUD-specific pharmacotherapies				
No (reference)	550 (16.0 %)	18,597 (42.0 %)	232 (20.3 %)	5,407 (43.0 %)
Yes	2,890 (84.0 %)	25,734 (58.0 %)	912 (79.7 %)	7,181 (57.0 %)
Sedative co-prescription				
No (reference)	2,150 (62.5 %)	30,885 (69.7 %)	592 (51.7 %)	7,636 (60.7 %)
Yes	1,290 (37.5 %)	13,446 (30.3 %)	552 (48.3 %)	4,952 (39.3 %)
Follow-up				
No (reference)	1,939 (56.4 %)	25,905 (58.4 %)	564 (49.3 %)	6,583 (52.3 %)
Yes	1,501 (43.6 %)	18,426 (41.6 %)	580 (50.7 %)	6,005 (47.7 %)
<i>Receipt of clinical practice guideline interventions</i>				
Regular drug screening				
No (reference)	1,615 (46.9 %)	31,276 (70.6 %)	594 (51.9 %)	8,726 (69.3 %)
Yes	1,825 (53.1 %)	13,055 (29.4 %)	550 (48.1 %)	3,862 (30.7 %)
Medication management				
No (reference)	1,499 (43.6 %)	29,101 (65.6 %)	443 (38.7 %)	7,804 (62.0 %)
Yes	1,941 (56.4 %)	15,230 (34.4 %)	701 (61.3 %)	4,784 (38.0 %)
Rehabilitation medicine				
No (reference)	328 (9.5 %)	8,441 (19.0 %)	88 (7.7 %)	2,157 (17.1 %)
Yes	3,112 (90.5 %)	35,890 (81.0 %)	1,056 (92.3 %)	10,431 (82.9 %)
Anti-inflammatory pharmacotherapy (NSAID or acetaminophen)				
No (reference)	1,507 (43.8 %)	22,155 (50.0 %)	524 (45.8 %)	6,723 (53.4 %)
Yes	1,933 (56.2 %)	22,176 (50.0 %)	620 (54.2 %)	5,865 (46.6 %)
Specialty pain pharmacotherapy (TCA)				
No (reference)	2,579 (75.0 %)	36,124 (81.5 %)	803 (70.2 %)	9,550 (75.9 %)
Yes	861 (25.0 %)	8,207 (18.5 %)	341 (29.8 %)	3,038 (24.1 %)
Specialty pain pharmacotherapy (SNRI)				
No (reference)	2,453 (71.3 %)	34,837 (78.6 %)	747 (65.3 %)	9,384 (74.5 %)
Yes	987 (28.7 %)	9,494 (21.4 %)	397 (34.7 %)	3,204 (25.5 %)
Type of opioid	CSA	LA	CSA	LA
Number of cases	Suicide attempt 3,440 (100.0 %)	No suicide attempt 44,331 (100.0 %)	Suicide attempt 1,144 (100.0 %)	No suicide attempt 12,588 (100.0 %)
Specialty pain pharmacotherapy (anticonvulsants)				
No (reference)	1,748 (50.8 %)	28,236 (63.7 %)	495 (43.3 %)	6,974 (55.4 %)
Yes	1,692 (49.2 %)	16,095 (36.3 %)	649 (56.7 %)	5,614 (44.6 %)

DISCUSSION

Consistent with expectations, patients with medical frailty, drug/alcohol/mood disorder, and/or traumatic brain injury evidenced higher risk of suicide attempt.

A striking finding was a pattern of conflicting individual-level and facility-level associations with suicide attempts. We believe this pattern suggests that at the individual-level, guideline recommendations were applied to higher-risk patients selectively, as patient receipt of guideline-recommended care

Table 3. Facility-Level Guideline Adherence Rates for the Opioid Prescribed Population in the VHA in FY10

Type of opioid	Facility metric (Receipt of clinical practice guideline interventions)	Sample size	Mean % across facilities	Standard deviation across facilities	Minimum % across facilities	Maximum % across facilities
CSA	Psychosocial assessment or therapy	393,657 (Entire population)	42.0	9.7	24.5	89.6
	Sedative co-prescription		29.0	2.0	23.7	35.5
	Follow-up		34.7	6.2	23.7	66.0
	Any drug screening		20.2	11.8	0.0	50.2
	Medication management	47,771 (SUD population)	22.4	9.7	4.3	78.9
	Rehabilitation medicine		72.4	8.8	44.4	90.3
	Anti-inflammatory pharmacotherapy (NSAID or acetaminophen)		44.0	3.5	34.7	53.5
	Specialty pain pharmacotherapy (TCA)		14.3	1.9	9.6	20.9
	Specialty pain pharmacotherapy (SNRI)		16.2	1.7	10.5	20.5
	Specialty pain pharmacotherapy (anticonvulsants)		30.9	3.3	22.2	40.0
	SUD specialty treatment or SUD-specific pharmacotherapies		59.9	7.3	35.0	85.8
	Regular drug screening		31.2	15.0	0.0	68.8
LA	Psychosocial assessment or therapy	93,805 (Entire population)	45.7	9.8	26.1	91.6
	Sedative co-prescription		38.2	2.4	28.8	46.8
	Follow-up		31.5	6.3	17.8	55.8
	Any drug screening		27.2	15.0	0.2	67.6
	Medication management	13,732 (SUD population)	25.5	10.9	4.7	83.2
	Rehabilitation medicine		74.7	8.3	47.3	91.0
	Anti-inflammatory pharmacotherapy (NSAID or acetaminophen)		41.3	3.7	31.4	52.1
	Specialty pain pharmacotherapy (TCA)		19.0	2.1	12.8	25.0
	Specialty pain pharmacotherapy (SNRI)		21.3	2.4	15.5	28.0
	Specialty pain pharmacotherapy (anticonvulsants)		39.2	3.7	27.9	50.5
	SUD specialty treatment or SUD-specific pharmacotherapies		58.9	9.7	32.4	89.5
	Regular drug screening		32.2	16.7	0.0	64.6

was associated with increased risk of suicide attempt across most measures.¹⁹ This suggests that, within VA, patients with increased risk of suicide attempt, most likely related to more severe or unmanaged chronic pain or comorbid mental health conditions, tend to receive more intensive, cautious, and comprehensive chronic pain and opioid management. We assume that this association is due to selective treatment of patients with greater pain or mental health severity or risk, rather than to guideline-recommended treatment increasing suicidality. An exception to this pattern was the recommendation to avoid co-prescribing sedative medications with opioids; patients on LA OT and co-prescribed sedatives were at higher risk of suicide attempts at both the individual and the facility level.

Examination of associations between facility-level guideline-recommended care delivery rates and risk of suicide attempt help to determine the value of regular or universal implementation of specific recommendations. Across CSA and LA populations, more consistent use of drug screening was associated with lower risk of suicide attempts. Drug screening is recommended to identify patients who may be using illicit substances or non-prescribed medications, so that the clinician can address risks and engage the patient in treatment for substance use problems. Active substance use is known to increase risk for suicide²⁰; insofar as drug screening is a first step towards helping patients cease active substance use, it should reduce this risk. Moreover, identification of substance use should trigger clinicians to reduce a patient's access to abusable medications that could be used in a suicide attempt. Reducing access to means of suicide is a well-established method for reducing suicidal behaviors.²¹ If drug

screening causally reduces suicide attempt risk, we estimate that universal drug screening would reduce the risk of suicide attempt in patients prescribed CSA or LA opioids by a factor of 3 to 6 across the models. These findings support the guideline recommendation that all patients considered for or receiving an opioid prescription should be screened for drug use.

Consistently providing follow-up visits to patients initiating new LA opioids was associated with lower risk of suicide attempts. Follow-up within 4 weeks after new opioid prescriptions may help identify patients for whom opioids worsen mental health or are not effective in reducing severe pain. For patients on LA opioids, if follow-up is causally related to risk, consistently completing follow-up encounters within the time frame recommended in the guideline is estimated to reduce the risk of suicide by roughly 5.4 times.

Sedative drugs and/or alcohol are often found in fatal opioid poisonings, both intentional and accidental,^{22,23} and sedative prescription has been associated with higher risk of fatal accidental drug poisoning²⁴ and suicidal ideation and attempts.²⁵ Here, in both the overall and SUD-diagnosed subpopulation prescribed LA opioids, higher facility-level rates of sedative co-prescription were associated with much higher (20–30 times) risk of suicide attempt. Studies in VA populations have suggested that patients on high-dose opioids and with mental health disorders are more likely to also be co-prescribed sedatives.^{26,27} Acknowledging that it is possible that suicide attempts are more commonly observed in people co-prescribed opioids and benzodiazepines because these are

Table 4. Multivariate, Mixed-Effects Logistic Regression Model Predicting Suicide Attempts of the CSA Opioid Prescribed Population in the VHA

Overall ^h	Estimate	OR	SE	DF	t value	p value
(Intercept)	-5.448		0.814	392,202	-6.692	<0.001
<i>Demographic factors</i>						
Age (reference: ≤ 30)	-0.295	0.745	0.024	392,202	-12.121	<0.001
Gender (reference: female)	-0.123	0.885	0.048		-2.540	0.011
Currently married (reference: no)	-0.133	0.875	0.029		-4.596	<0.001
<i>Physical and mental health factors</i>						
Medical frailty (reference: no)	0.197	1.218	0.029	392,202	6.782	<0.001
Drug use disorder (reference: no)	0.885	2.424	0.034		26.145	<0.001
Alcohol use disorder (reference: no)	0.690	1.994	0.033		21.212	<0.001
Any mood disorder (reference: no)	1.266	3.548	0.045		28.330	<0.001
Traumatic brain injury (reference: no)	0.269	1.309	0.087		3.087	0.002
<i>Individual-level receipt of clinical practice guideline interventions</i>						
Psychosocial assessment or therapy (reference: no)	0.861	2.366	0.044	392,202	19.431	<0.001
Sedative co-prescription (reference: no)	0.109	1.115	0.029		3.815	<0.001
Any drug screening (reference: no)	0.983	2.673	0.033		29.891	<0.001
Medication management (reference: no)	0.443	1.557	0.030		14.840	<0.001
Rehabilitation medicine (reference: no)	0.305	1.357	0.045		6.817	<0.001
Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.067	1.069	0.028		2.412	0.016
Specialty pain pharmacotherapy (TCA) (reference: no)	0.085	1.089	0.033		2.579	0.010
Specialty pain pharmacotherapy (SNRI) (reference: no)	0.080	1.083	0.031		2.586	0.010
Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	0.223	1.250	0.028		8.005	<0.001
<i>Facility-level receipt of clinical practice guideline interventions</i>						
% Psychosocial assessment or therapy (reference: no)	-0.576	0.562	0.407	128	-1.415	0.160
% Sedative co-prescription (reference: no)	-0.195	0.823	1.833		-0.106	0.915
% Follow-up (reference: no)	-1.289	0.275	0.668		-1.931	0.056
% Any drug screening (reference: no)	-1.782	0.168	0.347		-5.129	<0.001
% Medication management (reference: no)	0.332	1.394	0.387		0.857	0.393
% Rehabilitation medicine (reference: no)	-0.487	0.615	0.472		-1.032	0.304
% Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.394	1.482	1.271		0.310	0.757
% Specialty pain pharmacotherapy (TCA) (reference: no)	2.051	7.779	2.153		0.953	0.343
% Specialty pain pharmacotherapy (SNRI) (reference: no)	0.947	2.579	2.204		0.430	0.668
% Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	0.456	1.578	1.259		0.362	0.718
SUD ⁱ	Estimate	OR	SE	DF	t value	p value
(Intercept)	-4.884		0.864	47,474	-5.653	<0.001
<i>Demographic factors</i>						
Age (reference: ≤ 30)	-0.269	0.764	0.032	47,474	-8.316	<0.001
Gender (reference: female)	0.035	1.036	0.077		0.457	0.648
Currently married (reference: no)	-0.091	0.913	0.041		-2.233	0.026
<i>Physical and mental health factors</i>						
Medical frailty (reference: no)	0.222	1.249	0.039	47,474	5.731	<0.001
Drug use disorder (reference: no)	0.904	2.470	0.049		18.298	<0.001
Alcohol use disorder (reference: no)	0.594	1.811	0.047		12.519	<0.001
Any mood disorder (reference: no)	1.679	5.362	0.079		21.312	<0.001
Traumatic brain injury (reference: no)	0.258	1.295	0.086		2.999	0.003
<i>Individual-level receipt of clinical practice guideline interventions</i>						
SUD specialty treatment or SUD-specific pharmacotherapies (reference: no)	0.410	1.507	0.052	47,474	7.867	<0.001
Sedative co-prescription (reference: no)	0.208	1.232	0.038		5.430	<0.001
Regular drug screening (reference: no)	0.685	1.984	0.042		16.303	<0.001
Medication management (reference: no)	0.373	1.451	0.040		9.346	<0.001
Rehabilitation medicine (reference: no)	0.233	1.262	0.063		3.724	<0.001
Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.046	1.047	0.037		1.231	0.218
Specialty pain pharmacotherapy (TCA) (reference: no)	0.090	1.094	0.043		2.099	0.036
Specialty pain pharmacotherapy (SNRI) (reference: no)	0.076	1.079	0.041		1.850	0.064
Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	0.247	1.281	0.037		6.649	<0.001
<i>Facility-level receipt of clinical practice guideline interventions</i>						
% SUD specialty treatment or SUD-specific pharmacotherapies (reference: no)	-1.231	0.292	0.493	128	-2.495	0.014
% Sedative co-prescription (reference: no)	-0.292	0.747	1.854		-0.158	0.875
% Follow-up (reference: no)	-1.111	0.329	0.702		-1.583	0.116
% Regular drug screening (reference: no)	-1.125	0.325	0.309		-3.645	<0.001
% Medication management (reference: no)	0.454	1.574	0.401		1.131	0.260
% Rehabilitation medicine (reference: no)	-0.785	0.456	0.478		-1.641	0.103
% Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.483	1.621	1.324		0.365	0.716
% Specialty pain pharmacotherapy (TCA) (reference: no)	2.344	10.426	2.205		1.063	0.290
% Specialty pain pharmacotherapy (SNRI) (reference: no)	1.206	3.339	2.241		0.538	0.592
% Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	1.398	4.048	1.295		1.080	0.282

^h Overall patient population prescribed CSA opioidsⁱ Patient population diagnosed with SUD and prescribed CSA opioids

the most anxious and depressed patients, our findings at the patient and facility levels provide the guideline

recommendation that sedatives *not* be prescribed in combination with opioids, at least for patients on LA opioids.

Table 5. Multivariate Mixed-Effects Logistic Regression Model Predicting Suicide Attempts of the LA Opioid Prescribed Population in the VHA

Overall ^j	Estimate	OR	SE	DF	t value	p value
(Intercept)	-7.289		0.870	93,367	-8.377	<0.001
<i>Demographic factors</i>						
Age (reference: ≤ 30)	-0.266	0.766	0.044	93,367	-6.099	<0.001
Gender (reference: female)	0.032	1.032	0.092		0.348	0.728
Currently married (reference: no)	-0.167	0.846	0.051		-3.252	0.001
<i>Physical and mental health factors</i>						
Medical frailty (reference: no)	0.160	1.173	0.052	93,367	3.067	0.002
Drug use disorder (reference: no)	1.041	2.832	0.057		18.276	<0.001
Alcohol use disorder (reference: no)	0.627	1.871	0.056		11.147	<0.001
Any mood disorder (reference: no)	1.352	3.867	0.086		15.664	<0.001
Traumatic brain injury (reference: no)	0.408	1.504	0.147		2.772	0.006
<i>Individual-level receipt of clinical practice guideline interventions</i>						
Psychosocial assessment or therapy (reference: no)	0.896	2.450	0.082	93,367	10.884	<0.001
Sedative co-prescription (reference: no)	0.186	1.205	0.049		3.790	<0.001
Any drug screening (reference: no)	0.826	2.284	0.059		13.893	<0.001
Medication management (reference: no)	0.474	1.606	0.053		8.864	<0.001
Rehabilitation medicine (reference: no)	0.268	1.307	0.083		3.216	0.001
Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.040	1.041	0.050		0.804	0.421
Specialty pain pharmacotherapy (TCA) (reference: no)	0.054	1.055	0.055		0.980	0.327
Specialty pain pharmacotherapy (SNRI) (reference: no)	0.140	1.150	0.052		2.679	0.007
Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	0.180	1.198	0.050		3.596	<0.001
<i>Facility-level receipt of clinical practice guideline interventions</i>						
% Psychosocial assessment or therapy (reference: no)	-0.625	0.535	0.406	128	-1.538	0.127
% Sedative co-prescription (reference: no)	3.012	20.326	1.497		2.012	0.046
% Follow-up (reference: no)	-1.689	0.185	0.668		-2.528	0.013
% Any drug screening (reference: no)	-1.086	0.338	0.295		-3.678	<0.001
% Medication management (reference: no)	-0.471	0.625	0.356		-1.324	0.001
% Rehabilitation medicine (reference: no)	-0.294	0.745	0.496		-0.593	0.554
% Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.267	1.306	1.127		0.237	0.813
% Specialty pain pharmacotherapy (TCA) (reference: no)	-0.685	0.504	1.725		-0.397	0.692
% Specialty pain pharmacotherapy (SNRI) (reference: no)	2.837	17.062	1.539		1.843	0.068
% Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	1.853	6.380	1.099		1.686	0.094
SUD^k	Estimate	OR	SE	DF	t value	p value
(Intercept)	-7.284		1.028	13,546	-7.083	<0.001
<i>Demographic factors</i>						
Age (reference: ≤ 30)	-0.221	0.802	0.055	13,546	-3.991	<0.001
Gender (reference: female)	0.131	1.140	0.136		0.963	0.336
Currently married (reference: no)	-0.073	0.930	0.067		-1.085	0.278
SUD^k	Estimate	OR	SE	DF	t value	p value
<i>Physical and mental health factors</i>						
Medical frailty (reference: no)	0.239	1.270	0.067	13,546	3.581	<0.001
Drug use disorder (reference: no)	1.090	2.974	0.094		11.541	<0.001
Alcohol use disorder (reference: no)	0.606	1.833	0.074		8.234	<0.001
Any mood disorder (reference: no)	1.775	5.899	0.144		12.296	<0.001
Traumatic brain injury (reference: no)	0.404	1.498	0.147		2.752	0.006
<i>Individual-level receipt of clinical practice guideline interventions</i>						
SUD specialty treatment or SUD-specific pharmacotherapies (reference: no)	0.317	1.373	0.083	13,546	3.839	<0.001
Sedative co-prescription (reference: no)	0.223	1.250	0.063		3.549	<0.001
Regular drug screening (reference: no)	0.430	1.537	0.071		6.018	<0.001
Medication management (reference: no)	0.515	1.674	0.069		7.519	<0.001
Rehabilitation medicine (reference: no)	0.389	1.476	0.116		3.363	0.001
Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.098	1.102	0.063		1.538	0.124
Specialty pain pharmacotherapy (TCA) (reference: no)	0.003	1.003	0.069		0.042	0.967
Specialty pain pharmacotherapy (SNRI) (reference: no)	0.141	1.151	0.067		2.099	0.036
Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	0.169	1.184	0.064		2.635	0.008
<i>Facility-level receipt of clinical practice guideline interventions</i>						
% SUD specialty treatment or SUD-specific pharmacotherapies (reference: no)	-0.395	0.673	0.443	128	-0.892	0.374
% Sedative co-prescription (reference: no)	3.409	30.235	1.690		2.018	0.046
% Follow-up (reference: no)	-0.440	0.644	0.766		-0.575	0.566
% Regular drug screening (reference: no)	-0.481	0.618	0.345		-1.393	0.166
% Medication management (reference: no)	-0.560	0.571	0.401		-1.396	0.165
% Rehabilitation medicine (reference: no)	-1.156	0.315	0.537		-2.152	0.033
% Anti-inflammatory pharmacotherapy (NSAID or acetaminophen) (reference: no)	0.389	1.475	1.286		0.302	0.763
% Specialty pain pharmacotherapy (TCA) (reference: no)	-2.453	0.086	1.909		-1.285	0.201
% Specialty pain pharmacotherapy (SNRI) (reference: no)	4.130	62.165	1.708		2.417	0.017
% Specialty pain pharmacotherapy (anticonvulsants) (reference: no)	2.036	7.659	1.220		1.669	0.098

^j Overall patient population prescribed LA opioids^k SUD patient population prescribed LA opioids

Studies within and outside VA have suggested that patients diagnosed with SUD and other mental health disorders are

more likely to receive opioids than patients without these conditions, and that prescription rates have increased more

rapidly in these higher-risk populations.²⁸ VA patients with SUD on chronic OT have also been found to be more likely to show aberrant behaviors that increase drug supply, such as borrowing medication and requesting early refill²⁹; these behaviors may additionally increase risk of impulsive intentional overdose. The guideline suggests that SUD diagnosis should be an absolute contraindication for chronic OT unless the patient is receiving SUD treatment. Our findings support that recommendation: we found that (1) SUD-diagnosed patients have substantially higher rates of suicide attempt overall, and (2) among SUD-diagnosed patients prescribed CSA opioids, more consistent receipt of SUD treatment was associated with reduced suicide risk. If treatment is causally related to risk, universal SUD treatment in this population is estimated to reduce suicide attempt risk by a factor of roughly 3.4.

Encouragingly, SUD-diagnosed patients prescribed LA opioids whose care facilities consistently engaged them in rehabilitative treatments that focus on functional improvement had reduced risk of suicide attempt. These rehabilitative treatments may not only be effective for reducing pain, but may also improve function and decrease disability. Disability may contribute to suicidality^{30,31}; rehabilitative treatments may limit suicide attempts by reducing functional impairment. The finding that SUD-diagnosed patients prescribed LA opioids have substantially elevated suicide attempt risk at facilities where SNRIs are prescribed at higher rates was unexpected, and should be explored in future studies before drawing inferences.

Our analysis has several limitations. First, this study examines associations in cross-sectional data; thus causality and directionality of identified relationships cannot be determined. Additionally, this study relies on administrative coding of diagnoses and adverse events in the electronic medical record. The accuracy and consistency of this coding may vary by provider. Moreover, VA may not be notified of all suicide attempts or deaths. In 2008, however, the VA Uniform Mental Health Services Handbook³² instituted a requirement that all VA facilities employ suicide prevention coordinators, whose role includes reliably documenting and flagging patients with suicide attempts in the medical record to facilitate proper management of these patients. We expect that the availability of these staff at each VA facility improved reliability of suicide attempt coding across VA facilities, though it is likely that there is still some under-counting of events. Additionally, this study looks only at use of practices from the *CPG for OT* and does not comprehensively consider health care practices that might reduce suicide risk for this population. Lastly, we did not have data regarding the severity of Veteran patient pain intensity, functional limitations, chronicity and response to pain treatments. These factors have associated with suicide risk³³ and may underlie some of the associations observed in this study.

The associations identified between use of guideline recommendations for OT and risk of suicide attempt provide a rational basis for prioritizing implementation of guideline

recommendations and encouraging facility-level adherence to the prioritized guideline recommendations. Future trials are needed to determine whether implementation of guideline recommendations for OT can reduce risk of suicide attempt for high risk populations. The findings here should help guide development and targeting of implementation interventions for such a trial.

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APPENDICES

Appendix 1

Table 6. Internal Entry Numbers (IENs)* Used to Identify and Categorize Opioids

Type of opioids		IENs
Short-acting	Codeine	00027–00029, 00036, 00039, 00040, 00679–00681, 01838–01847, 04300, 05061, 05062, 05240–05242, 05919–05923, 06099–06103, 07105–07107, 07119, 07120, 07180, 07181, 07239, 13911, 15762
	Morphine	00355–00357, 00363–00367, 00372–00374, 00376, 00377, 00379, 00381, 00383, 00385, 00386, 15713, 20095–20098
	Propoxyphene	00594–00597, 00675–00678, 01774–01778, 07995, 07996, 15130, 16563, 17324
	Levorphanol	01587
	Oxycodone	02482–02488, 02490, 04602–04604, 04608, 04610, 14291, 14293, 14294, 14740, 15611, 16537, 17204, 17826, 18246–18249, 19974, 20099, 20100, 20326
	Meperidine	02639, 02643, 02646, 02647, 02658, 03691, 15709
	Hydromorphone	02695–02699, 02705, 02710, 15710
	Dihydrocodeine	02821, 02835, 06612, 06912, 07244, 15610, 21187
	Butorphanol	03270
	Pentazocine	03789, 03791, 03792
	Fentanyl	05804–05806, 13981–13984, 18015–18018
	Hydrocodone	04410–04423, 06421, 07203, 07610, 07611, 07666, 12782, 13360–13362, 15046, 15915, 16373, 16778, 17696, 19984, 20205
	Oxymorphone	07142, 17841–17844
	Tapentadol	20923–20925
Long-acting	Methadone	00135, 00136, 00138–00166, 15703, 20101
	Morphine	00362, 00378, 00387, 00394–00396, 15361, 15362, 15712, 15714, 15763, 16556, 16557, 20983–20986, 20988, 20989, 21479
	Oxycodone	04605–04607, 04609, 14617, 15716–15718, 19163–19165
	Fentanyl	05799–05802, 17264, 17697
	Hydromorphone	17319–17322
	Oxymorphone	17833–17840, 20834, 21341

* The first five digits of the VHA Decision Support System (DSS) feeder key. We used this number to find pharmacy records in the DSS Pharmacy Laboratory National Data Extracts (NDEs). The DSS feeder key contains a 17-digit number that identifies the drug or supply dispensed. The first five digits contain an IEN that points to the entry in the VISA VA PRODUCT File (#50.68) for the drug dispensed. The last 12 digits contain the 12-digit version of the National Drug Code (NDC). The 17-digit number may be used to link the records to the National Drug File (NDF) (Source: <http://www.virec.research.va.gov/RUGs/RUG-PBM-2nd-Ed-CY08-ER.pdf>)

Appendix 2

Table 7. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) Codes Used to Identify Suicides or Suicide Attempts

	ICD-9-CM codes
Possible and confirmed suicide attempts	E950-E959, E980.6, E980.8, E981-E984, E988, V62.84

Appendix 3

Table 8. International Classification of Diseases, ninth revision, Clinical Modification (ICD-9-CM) Codes Used to Identify Physical and Mental Health Status

	ICD-9-CM codes
Medical frailty*	
Congestive heart failure	398.91, 402.11, 402.91, 404.11, 404.13, 404.91, 404.93, 428
Cardiac arrhythmia	426.10, 426.11, 426.13, 427.0, 427.2, 427.31, 427.60, 427.9, 785.0, V45.0, V53.3, 426.2–426.53, 426.6–426.89
Valvular disease	V42.2, V43.3, 093.20–093.24, 394.0–397.1, 424.0–424.91, 746.3–746.6
Pulmonary circulation disorder	416, 417.9
Peripheral vascular disorder	441.2, 441.4, 441.7, 441.9, 447.1, 557.1, 557.9, V43.4, 440.0–440.9, 443.1–443.9
Paralysis	342.0–342.12, 342.9–344.9
Other neurological disorder	331.9, 332.0, 333.4, 333.5, 340, 348.1, 348.3, 780.3, 784.3, 334.0–335.9, 341.1–341.9, 345.00–345.11, 345.40–345.51, 345.80–345.91
Chronic pulmonary disease	494, 506.4, 490–492.8, 493.00–493.91, 495.0–505
Hypothyroidism	243–244.2, 244.8–244.9
Renal failure	403.11, 403.91, 404.12, 404.92, 585, 586, V42.0, V45.1, V56.0, V56.8
Liver disease	070.32, 070.33, 070.54, 456.0, 456.1, 456.20, 456.21, 571.0, 571.2, 571.3, 571.5, 571.6, 571.8, 571.9, 572.3, 572.8, V42.7, 571.40–571.49
Peptic ulcer disease - excluding bleeding	531.70, 531.90, 532.70, 532.90, 533.70, 533.90, 534.70, 534.90, V12.71
AIDS	042
Lymphoma	238.6, 273.3, V10.7, 200.00–202.38, 202.50–203.01, 203.8–203.81
Metastatic cancer	196, 197, 198, 199.0, 199.1
Solid tumor without metastasis	174, 175, V10, 140.0–172.9, 179–195.8
Rheumatoid arthritis/collagen vascular	701.0, 710, 714, 720, 725
Coagulopathy	286, 287.1, 287.3, 287.4, 287.5
Weight loss	260, 261, 262, 263
Fluid and electrolyte disorders	276
Blood loss anemia	280.0
Deficiency anemias	285.9
Drug use disorder	292, 304, 305.2–306
Alcohol use disorder	291, 303, 305.0
Mood disorder†	311, 309.0, 309.1, 301.12, 300.4
Depression	300.02
Anxiety disorder	309.81
PTSD	296.0–296.2, 296.4–296.9
Affective psychosis (bipolar)	850.0–859.9
Traumatic brain injury	

* Patients with any of the codes in the right-hand column were coded to have medical frailty

† Patients with any of the codes in the right-hand column were coded to have mood disorder

Appendix 4

Table 9. Coding Definitions Used to Identify and Categorize Clinical Practice Guideline (CPG)-Based Services

CPG-based services		Type of codes	Codes
Psychosocial assessment or therapy ¹	Assessment	CPT ¹³	90801, 90802, 96150, 96151
	Therapy	HCPCS ¹⁶ CPT ¹³ HCPCS ¹⁶ ICD-9-CM ⁹ Name ¹⁰	H0002, H0031 90804–90829, 90845–90857, 96152–96155, 97532, 98960–98962, 99401–99404, 99411, 99412, 99510, 4306 F H0004, H0017–H0019, H0023–H0025, H0030, H0032, H0035, H0046, H2001, H2012, H2014, H2017–H2020, H2027, G0177, S9454, T2048 94.31, 94.33, 94.37, 94.38, 94.44, 94.49 Amobarbital, Butabarbital, Carisoprodol, Chlordiazepoxide, Clonazepam, Clorazepate Dipotassium, Diazepam, Estazolam, Eszopiclone, Flurazepam, Lorazepam, Mephobarbital, Meprobamate, Midazolam, Midodrine, Oxazepam, Pentobarbital, Phenobarbital, Quazepam, Ramelteon, Secobarbital, Temazepam, Triazolam, Zaleplon, Zolpidem Tartrate
Sedative co-prescription ²			103, 147, 148, 169, 178, 179, 181, 182, 199, 216, 324, 325, 326, 424, 425, 428, 527, 528, 530, 537, 542, 545, 546, 579, 584, 597, 611, 683, 684, 685, 686, 690, 692, 693, 694, 695, 696, 714, 801, 802, 803
Drug screening ⁴	Morphine-related	IP number ¹²	467, 537, 753, 754, 49338, 49339, 82227, 82228, 82231, 83455
	Non-morphine-related		608, 664, 710, 711, 721, 727, 734, 755, 780, 784, 786, 808, 864, 49340, 49355, 57854, 73744, 81952, 81996, 82229–82236, 82387, 82448, 82449, 82972, 83005, 83162, 83261, 83331, 83402, 83462, 83506, 83508, 83509, 83511, 83727, 83859, 83862, 84383, 84398, 91210, 91211
Other abusable substances			466, 470, 499, 523, 575, 580, 584, 596–600, 606, 607, 611–614, 660, 663, 675, 684–688, 700, 724, 729, 732, 735, 742, 745, 769, 779, 785, 803, 804, 811, 821, 832, 846, 856–860, 862, 863, 45095, 45110, 49337, 49350, 49353, 53008, 54720, 58906, 62505, 66031, 81882, 81997, 82019, 82092–82095, 82225, 82451–82456, 83000, 83001, 83003, 83009, 83010, 83022, 83027, 83028, 83160, 83262, 83272, 83281, 83588, 83713, 83730, 83889, 84075, 84098, 84388, 91215
Medication management ⁵		CPT ¹³	99605–99607, 90862, 1160 F
Rehabilitation medicine ⁶		Clinic stop ¹⁴	160, 176
		ICD-9-CM ⁹ Clinic stop ¹⁴ Bed section ¹⁵ CPT ¹³	93.8, 93.81, 93.83, 93.89, V57 177, 195–199, 201, 202, 205–208, 210, 211, 213–216, 219, 222, 223, 228, 230, 295, 296, 372, 373, 417, 418, 420, 436 20, 22, 23, 35, 41, 54, 64, 82, 103, 112 95831–95834, 95851, 95852, 96000, 96125, 97001–97006, 97036, 97110, 97112, 97113, 97116, 97140, 97150, 97530, 97533, 97535, 97537, 97542, 97545, 97546, 97750, 97755, 97760–97762, 97799, 98940–98943, 99456
Adjunctive pharmacotherapy ⁷	NSAID or acetaminophen	HCPCS ¹⁶ IEN ¹⁷	G0128, G0151, G0152, G0176, G0237, G0238, H2032, S9449, S9451, S9970 01823–01835, 02059, 02060, 02081, 02082, 02084, 02085, 02087, 02088, 02376–02378, 02392–02394, 02824–02831, 04431–04433, 05153, 05154, 05190–05194, 05197, 05199, 05200, 05203–05205, 05207, 05211–05223, 05225, 05229–05233, 05909–05913, 06094–06098, 06105, 06209, 06210, 06309–06324, 06551–06553, 06638–06667, 07111, 07198, 07402, 07450–07452, 07639, 08105–08114, 08153, 08454, 08461–08463, 08814–08820, 09205, 09433–09436, 09498–09501, 09618, 09619, 09644, 09670, 09683, 09684, 09769–09771, 09802, 09953, 10005, 10045, 10250, 13015, 13016, 13023–13026, 13572, 13843, 13847, 14312, 14313, 14487, 14575, 15122, 15127
	TCAs		00603–00607, 01367–01376, 01892–01899, 01946–01956, 02257, 02258, 02815–02818, 05082–05090, 06099–06011, 08586–08588, 12552, 12553, 13053–13055, 13406, 13543, 13570, 13599, 14142, 14143, 14905, 15038, 15335–15337, 15720, 17342, 19490
Adjunctive pharmacotherapy ⁷	SNRIs	IEN ¹⁷	08525, 08526, 11810–11820, 12880–12882, 13076, 14956, 16260, 16458, 16459, 16577, 16710, 16851–16856, 17317, 17463, 17466, 1875018751, 20091–20094, 20304–20307
	Anti-convulsants		02007–02012, 05670, 05671, 11800–11802, 12365–12368, 12665–12667, 12783–12786, 12977, 12997, 12998, 13381, 13382, 13553, 13637–13639, 13672, 13840, 13841, 14094, 14097–14102, 14217–14219, 14485, 14486, 15091–15096, 15175, 15310, 16538, 16634, 16759, 16988–16990, 17096, 17116, 17297–17304, 17455, 18058, 18626, 18708, 18709, 18729, 19226–19229, 20018, 20178–20180, 20494–20505, 20688, 20689, 20732, 20755–20758

(continued on next page)

Table 9. (continued)

CPG-based services	Type of codes	Codes
SUD specialty treatment or SUD-specific pharmacotherapies ⁸	ICD-9-CM ⁹	291–292.9, 303.00–303.02, 303.90–303.92, 304.00–304.02, 304.10–304.12, 304.20–304.22, 304.30–304.32, 304.40–304.42, 304.50–304.52, 304.60–304.62, 304.70–304.72, 304.80–304.82, 304.90–304.92, 305.00–305.02, 305.20–305.22, 305.30–305.32, 305.40–305.42, 305.50–305.52, 305.60–305.62, 305.70–305.72, 305.80–305.82, 305.90–305.92
	Clinic stop ¹⁴	292, 502–514, 516, 519, 522–525, 529, 531–535, 539, 540, 547, 548, 550, 552–554, 557–562, 564, 565, 567, 568, 571–577, 580, 582–584, 588, 590–596, 598, 599
	Bed section ¹⁵ Name ¹⁰	25–27, 37, 39, 85, 88, 109–111 Buprenorphine, Subutex, Suboxone, Acamprosate, Disulfiram

¹ OT patients should receive a full mental health assessment, coping skills and stress management training or psychotherapy procedures within the year

² OT patients should not receive overlapping prescriptions for opioids and sedative medications such as barbiturates, benzodiazepines, and carisoprodol (SOMA)

³ Patients receiving new opioid prescriptions should have a clinical encounter with VHA within 4 weeks. Because this variable is only relevant to patients with new opioid prescriptions, it was only included as a facility-level variable in order to retain all patients in the analyses

⁴ Drug screening can identify patients using illicit substances and who may be in need of additional services and/or support. Medical service providers are recommended to order routine and random drug screenings for all patients with chronic pain prior to and during OT. The laboratory drug screens for heroin/morphine, non-morphine opioid compounds, and non-opioid abusable substances were included

⁵ OT patients should receive pharmacy reconciliation documented by a pharmacy reconciliation encounter

^{6,7} Avoidance of sole reliance on opioids, as defined by receipt of: (a) rehabilitation therapies including physical therapy, physical medicine and rehabilitation, recreational therapy, occupational therapy, pain clinic, or a prescribed exercise program; non-opioid pharmacotherapies including (b) anti-inflammatories (NSAID or acetaminophen), (c) tricyclic antidepressants (TCAs), (d) serotonin-norepinephrine reuptake inhibitors (SNRIs), or (e) anticonvulsants. Note that patients may or may not have received these interventions or prescriptions specifically for their pain condition. These measures examine only whether patients received an intervention or prescription that has been suggested to be beneficial for pain conditions per clinical practice guidelines

⁸ SUD patients should receive SUD specialty treatment or SUD-specific pharmacotherapies while receiving opioid therapy; in addition, SUD patients should receive regular drug screening, defined as at least one for every 90-day supply of the opioid

⁹ ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification codes

¹⁰ Name: Names of the sedatives are used to search by drug description in the VHA Decision Support System (DSS) Pharmacy Laboratory National Data Extracts (NDEs)

¹¹ Telephone stop: Codes used to track follow-ups

¹² IP number: Intermediate Product number found in the DSS Laboratory NDEs. This number is a pointer to the DSS Product Table, which contains information specific to the service provided. The product table includes feeder system, intermediate product department, feeder key, and a description of the procedure

(Source: <http://www.virec.research.va.gov/RUGs/RUG-DSS-NDE-2nd-Ed-CY09-ER.pdf>)

¹³ CPT: Current Procedural Terminology codes used to record procedures in the DSS NDEs

¹⁴ Clinic stop: Codes used to record procedures in outpatient visits

¹⁵ Bed section: Codes used in the recording of inpatient stays

¹⁶ HCPCS: Health Care Common Procedure Coding System codes used to record procedures in the DSS NDEs

¹⁷ IEN: The first five digits of the VHA DSS feeder key used to find pharmacy records in the DSS Pharmacy Laboratory NDEs (Source: <http://www.virec.research.va.gov/RUGs/RUG-PBM-2nd-Ed-CY08-ER.pdf>)