



Published in final edited form as:

Am J Prev Med. 2021 April ; 60(4): 546–551. doi:10.1016/j.amepre.2020.10.011.

Trends in Urine Drug Testing Among Long-term Opioid Users, 2012–2018

Shaden A. Taha, MS^{1,2}, Jordan Westra, MPH^{2,3}, Mukaila A. Raji, MD^{4,5}, Yong-Fang Kuo, PhD^{2,3,4,5}

¹Department of Nutrition and Metabolism, University of Texas Medical Branch, Galveston, Texas

²Department of Preventive Medicine and Population Health, University of Texas Medical Branch, Galveston, Texas

³Office of Biostatistics, University of Texas Medical Branch, Galveston, Texas

⁴Department of Internal Medicine, University of Texas Medical Branch, Galveston, Texas

⁵Sealy Center on Aging, University of Texas Medical Branch, Galveston, Texas

Abstract

Introduction: Long-term opioid therapy increases the risk of opioid overdose death. Government agencies and medical societies including the Center for Disease Control and Prevention and American Society for Clinical Oncology emphasized risk mitigation strategies including urine drug testing, in published guidelines. Urine drug testing rates, time trends, and covariates among long-term opioid therapy users were examined to gauge guideline adherence.

Methods: Using Optum's De-identified Clinformatics DataMart, an incidence cohort (n=28,790) and prevalence cohort (n=621,449) were created to measure baseline and annual urine drug testing respectively, from 2012 to 2018. Urine drug testing time trends were evaluated by demographics, pain conditions, and Elixhauser comorbidity index. A multivariable generalized estimating model was developed in 2020 to examine factors associated with urine drug testing.

Results: Annual urine drug testing rates doubled from 25.6% in 2012 to 52.2% in 2018, whereas baseline urine drug testing also increased, from 3.75% to 11.1%. Annual urine drug testing increased within each age group over time; however, older patients (OR=0.21, 95% CI=0.21, 0.22, >79 years) and cancer patients (OR=0.82, 95% CI=0.80, 0.84) were less likely to receive urine drug testing. Patients residing in the South (OR=1.99, 95% CI=1.96, 2.01), with back pain (OR=2.04, 95% CI=2.02, 2.06) or other chronic pain (OR=1.64, 95% CI=1.62, 1.66) were significantly more likely to be tested. Independent predictors of baseline urine drug testing were similar to predictors of annual urine drug testing.

Conclusions: Despite increasing urine drug testing trends from 2012 to 2018, annual and baseline urine drug testing remained low in 2018, relative to numerous guideline recommendations. Findings suggest a need for research on better guideline implementation strategies and effectiveness of urine drug testing on patient outcomes.

INTRODUCTION

Long-term opioid therapy (LTOT; >90 days) presents serious risks, including development of substance use disorder and overdose death.¹ Numerous agencies and medical societies, including the Centers for Disease Control and Prevention and the American Society of Clinical Oncology, have published guidelines recommending risk-assessment strategies, drug monitoring, and urine drug testing (UDT) to assist providers in safe opioid prescribing.^{1–8}

Although evidence on improved patient outcomes resulting from UDT is lacking, UDT is important for monitoring compliance and detecting non-prescribed or illicit drug use.^{1,6,9–12} UDT should include screening and definitive urine testing to effectively identify compliance or misuse¹³; failure to confirm results, whether positive or negative, has been considered poor practice,^{7,14} though may be costly. Guidelines generally suggest baseline UDT of chronic pain patients (including cancer) before initiating LTOT, and at least annually thereafter. Others suggest increasing the frequency of UDT based on patient risk assessments.^{1,6–8,15,16}

Rates of UDT vary substantially, from 2% to 50%, with most studies being cross-sectional, limited in sample size, or from regional samples.^{17–22} This study uses insurance claims to examine national trends and characteristics associated with UDT among LTOT users from 2012 to 2018. This population-based study informs policymakers on potential changes needed to improve guideline-recommended UDT adherence by prescribers.

METHODS

This study used Optum’s De-identified Clinformatics DataMart,²³ a large national commercial insurance database. The UDT prevalence cohort included LTOT users with chronic pain conditions between 2012 and 2018. Prevalent LTOT users could be counted for multiple years if they had 90 days of opioid use in each calendar year. UDT incidence included LTOT users without opioid use in the year prior to initiation of LTOT, with their first opioid prescription >28 days. Exclusion criteria for each cohort are in Appendix Table 2. Calendar year was used for the prevalence cohort in order to report annual UDT rates, whereas rolling year was used for continuous enrollment in the incidence cohort to capture the time window specific for opioid initiation.

The study outcomes were annual UDT, defined as receiving any UDT within 1 year in the prevalence cohort, and baseline UDT defined as receiving any UDT in the 7 days before or after LTOT initiation in the incidence cohort. Any UDT refers to either presumptive urine screening or definitive testing (Appendix Table 2).

Patient characteristics included age at LTOT initiation, sex, U.S. Census region, Elixhauser comorbidity score, and pain condition. Additionally, opioid morphine milligram equivalents per day, number of opioid prescriptions, and UDTs were included in the prevalence cohort. Elixhauser comorbidities were summed together for score after removing alcohol abuse, drug abuse, psychoses, and depression, which are major risk factors associated with LTOT.^{24,25} Chronic pain conditions included back pain, joint pain, nerve pain or neuropathy,

cancer, musculoskeletal pain, or other chronic pain identified by ICD codes (Appendix Table 2).²⁶

Descriptive statistics were generated for each cohort. Annual and baseline UDT rates were calculated by year and stratified by age and region. To assess the association between the listed variables and UDT, multivariable generalized estimating models with a binomial distribution and AR1 covariance matrix were used in each cohort. All analyses were performed in 2020 using SAS, version 9.4.

RESULTS

The prevalence cohort included 1,228,044 person years, with mean age of 63.4 (SD=13.1) years, while the incidence cohort included 29,202 person years, with mean age 65.5 (SD=14.2) years (Table 1). Patients were mostly female (56%–58.2%), residing in the South (45.5%–48.9%), with prevalent back pain (38.5%–51.4%) or joint pain (30.2%–30.6%).

Annual UDT rates increased from 25.6% in 2012 to 52.2% in 2018 (Figure 1), and generally decreased with age (62.9% in people aged <50 years, 29.1% in those aged >79 years, in 2018) (Appendix Table 3). Baseline UDT rates were significantly lower (3.75%–11.1%). By region, relative increases in UDT of both cohorts were highest in the South and Midwest (Appendix Table 4).

Patients were less likely to receive annual UDT if they were older (OR=0.21, 95% CI=0.21, 0.22, >79 years) or had cancer (OR=0.82, 95% CI=0.80, 0.84), and more likely if they resided in the South (OR=1.99, 95% CI=1.96, 2.01), had back pain (OR=2.04, 95% CI=2.02, 2.06), or other chronic pain (OR=1.64, 95% CI=1.62, 1.66) (Table 2). Associations with baseline UDT were similar, though cancer patients were even less likely to receive baseline UDT (0.46, 95% CI=0.28, 0.75).

DISCUSSION

The UDT rates increased from 2012 to 2018; however, 48% of prevalent LTOT users and 89% of incident users remained untested in 2018. Between 2009 and 2016, many opioid-prescribing guidelines were released, most of which included UDT recommendations for LTOT patients.^{1–5,15,27} In 2015, a total of 37 states (50 states by 2017) issued guidelines ranging from advisory to required by law, though UDT requirements varied.²⁸

Rates of UDT were lower in older patients and those with cancer, and higher among patients in the South with back or other chronic pain. Higher rates of opioid prescribing in the South may contribute to the corresponding increase in UDT. The findings on cancer patients and those with higher Elixhauser scores were consistent with previous literature.^{29,30} However, older patients have a higher risk of LTOT use,^{31,32} so lower UDT rates in this population were unexpected. It may be that UDT was used to detect misuse, which is higher in younger adults.³³

Use of UDT is recommended for risk mitigation among LTOT patients, where aberrant toxicology may lead to opioid discontinuation.³⁴ Adherence to guideline-recommended

UDT and other mitigation strategies is linked to improved patient adherence; however, evidence is lacking on effectiveness of UDT on patient outcomes.^{1,21,35} This study concluded low rates of adherence to UDT recommendations, specifically in baseline testing. Early UDT rates may reflect disagreement on the importance of UDT, inexperience in UDT interpretation, insurance and resource limitations, and lack of standardized opioid prescribing. Some of these factors may still affect current practice and explain low UDT rates in recent years.

Providers tend to assess individuals as low risk, though UDT results show otherwise.⁴¹ Self-reported behavior may not accurately predict misuse, and risk assessments alone may miss an opportunity to prevent substance use disorder.^{1,37} Universal UDT has been suggested to eliminate subjectivity of providers and reduce opioid misuse; however, it is expensive, may result in fraudulent overuse of testing, and potentially harm the patient-provider relationship if misinterpretation of UDT occurs.^{12,38}

Important strengths of this study include the large, diverse population, specificity to identify use of the UDT and chronic pain, and the ability to control for LTOT risk factors (alcohol abuse, drug use, psychoses, and depression).²⁴

Limitations

Results from commercial insurance data cannot be generalized to the entire U.S. population. The continuous enrollment requirement further limits generalizability to those with short coverage. LTOT was measured by prescriptions claims, rather than consumption. UDT by private labs or the Department of Veteran's Affairs were not captured. Race and SES were not available, though African Americans on LTOT are tested at a higher rate than White patients.³⁴

CONCLUSIONS

Among LTOT patients with chronic pain, UDT rates increased from 2012 to 2018, indicating there has been some response to opioid prescribing guidelines. However, UDT rates were still disproportionately low by 2018, specifically baseline UDT. Low guideline adherence may be a lost opportunity to identify patients at high risk of substance use disorder and opioid-related toxicity. Research on the effect of UDT on patient outcomes and analysis of cost benefits may provide evidence for a better approach to drug monitoring and guideline adherence.

ACKNOWLEDGMENTS

This work was supported by grant R01-DA039192 from the NIH. The funder had no role in the design or conduct of the study; collection, management, analysis, or interpretation of the data; preparation, review, or approval of the manuscript; or decision to submit the manuscript for publication.

No financial disclosures were reported by the authors of this paper.

Appendix

Appendix Table 1.

Cohort Flow Descriptions

Step	Description	Number of patients	Number of person-years
Prevalence cohort			
1	All opioid users	12,930,228	
2	At least 90 days opioid use (opioid use periods) ^a	1,298,048	2,570,004
3	Continuous eligibility for entire calendar year and previous year ^a	727,693	1,580,955
4	At least 18 years old at time of first opioid use, had known gender, region	721,843	1,570,054
5	Had no acute pain conditions for entire calendar year	621,449	1,228,044
Incidence cohort			
1	All opioid users	12,930,228	
2	At least 90 days opioid use (opioid use periods) ^a	1,298,048	2,570,004
3	Continuous eligibility for 1 year prior to start of long-term opioid use	665,377	1,311,672
4	No prior opioid use in 1 year prior to start of long-term opioid use	49,893	50,426
5	At least 18 years old at time of first opioid use, had known gender, region	49,508	50,040
6	First opioid prescription for at least 28 days	35,682	36,194
7	Had no acute pain conditions in prior to first opioid use	28,790	29,202

^aLTOT users could be counted for multiple years if they had at least 90 days of opioid use in each calendar year. For users with only 1 episode of 90 days use which spanned across 2 calendar years, the earlier year was used as the year of use, if it included at least 30 days of use. Otherwise, the later year was selected. For example, an LTOT user with 90 days' use starting December 1, 2012 and ending February 28, 2013 would count for 2012 because the episode had 31 days' use in 2012. An LTOT user with 90 days use starting December 3, 2012 and ending March 2 would count for 2013 because the episode included only 29 days of use in 2012.

LTOT, long term opioid therapy.

Appendix Table 2.

ICD, CPT and HCPCS Codes for Urine Drug Testing and Chronic Pain Conditions

Category	Code
Presumptive UDT codes	G0477, G0478, G0479, 0007U, G0430, G0431, G0434, H0003, 80100, 80101, 80104, 80300, 80301, 80302, 80304, 80303, 80305, 80306, 80307
Definitive UDT codes	83925, 80364, 80102, 80152, 80154, 80160, 80166, 80323, 80324, 80325, 80326, 80329, 80330, 80331, 80332, 80333, 80334, 80335, 80336, 80337, 80338, 80339, 80340, 80341, 80342, 80344, 80345, 80346, 80347, 80348, 80349, 80350, 80351, 80352, 80353, 80354, 80355, 80356, 80357, 80358, 80359, 80360, 80361, 80362, 80363, 80365, 80366, 80367, 80368, 80369, 80370, 80371, 80372, 80373, 80374, 80375, 80376, 80377, 82101, 82520, 82646, 82649, 82742, 83925, 83992, G0481, G0482, G0483, G6037, 0006U, G0480, G0659, G6031, G6032, G6034, G6036, G6037, G6041, G6042, G6043, G6044, G6045, G6048, G6050, G6053, G6056
Back pain	ICD-9: 720.1, 720.2, 720.81, 720.89, 720.9, 721.0, 721.1, 721.2, 721.3, 721.41, 721.42, 721.5, 722.0, 722.10, 722.11, 722.2, 722.30, 722.31, 722.6, 722.83, 723.0, 723.1, 723.2, 723.3, 723.5, 723.6, 724.00, 724.01, 724.02, 724.03, 724.09, 724.1, 724.8, 756.10, 756.11, 756.12, 756.13, 756.14, 756.15 ICD-10: M43.27, M43.28, M43.6, M43.8X9, M46.00, M46.1, M46.40, M46.45, M46.47, M46.80, M46.90, M47.10, M47.12, M47.14, M47.16, M47.812, M47.814, M47.817, M47.819, M48.00, M48.02, M48.04, M48.06, M48.06, M48.08, M48.10, M48.20, M48.30, M48.9, M49.80, M50.00, M50.20, M50.30, M50.80, M50.90, M51.04, M51.05, M51.06, M51.24, M51.25, M51.26, M51.27, M51.34, M51.34, M51.35, M51.35, M51.36, M51.36, M51.37, M51.37, M51.44, M51.45, M51.46, M51.47, M51.84, M51.85, M51.86, M51.87, M51.9, M51.9, M51.9, M51.9, M51.9, M51.9, M53.0, M53.1, M53.2X7, M53.2X8, M53.3, M53.3, M53.3, M53.82, M53.9, M54.02, M54.08, M54.14, M54.15,

Category	Code
	M54.16, M54.17, M54.2, M54.30, M54.5, M54.6, M54.89, M54.9, M67.88, M96.1, M96.1, M96.1, M96.1, Q76.0, Q76.1, Q76.2, Q76.2, Q76.419, Q76.49, Q76.49, Q76.49, Q76.49, Q76.49
Joint pain	<p>ICD-9: 710.0, 710.1, 710.2, 710.3, 710.4, 710.8, 710.9, 711.00, 711.01, 711.02, 711.03, 711.04, 711.05, 711.06, 711.24, 711.25, 711.26, 711.27, 711.28, 711.29, 711.30, 711.49, 711.50, 711.51, 711.52, 711.53, 711.54, 711.55, 711.74, 711.75, 711.76, 711.77, 711.78, 711.79, 711.80, 711.99, 713.0, 713.1, 713.2, 713.3, 713.4, 713.5, 713.6, 714.0, 714.1, 714.2, 714.30, 714.31, 714.32, 714.33, 715.00, 715.04, 715.09, 715.10, 715.11, 715.12, 715.13, 715.33, 715.34, 715.35, 715.36, 715.37, 715.38, 715.80, 716.00, 716.01, 716.02, 716.03, 716.04, 716.05, 716.24, 716.25, 716.26, 716.27, 716.28, 716.29, 716.49, 716.50, 716.51, 716.52, 716.53, 716.54, 716.85, 716.86, 716.87, 716.88, 716.89, 716.90, 717.0, 717.1, 717.2, 717.3, 717.40, 717.41, 718.00, 718.01, 718.02, 718.03, 718.04, 718.05, 718.26, 718.27, 718.28, 718.29, 718.30, 718.31, 718.65, 718.70, 718.71, 718.72, 718.73, 718.74, 718.94, 718.95, 718.97, 718.98, 718.99, 719.00, 719.01, 719.02, 719.03, 719.04, 719.05, 719.24, 719.25, 719.26, 719.27, 719.28, 719.29, 719.40, 719.41, 719.45, 719.46, 719.47, 719.49, 719.50, 719.51, 719.52, 719.53, 719.54, 719.78, 719.79, 719.80, 719.81, 719.82, 719.83, 720.0, 726.10, 726.5, 729.5, 733.90</p> <p>ICD-10: M00.039, M00.049, M00.059, M00.069, M00.079, M00.08, M00.09, M00.139, M00.149, M00.159, M00.169, M00.179, M00.18, M00.19, M00.239, M00.249, M00.259, M00.269, M00.279, M00.28, M00.29, M00.839, M00.849, M00.859, M00.869, M00.879, M00.88, M00.89, M00.9, M01.X0, M01.X0, M01.X0, M01.X0, M01.X0, M01.X19, M01.X19, M01.X19, M01.X19, M01.X19, M01.X29, M01.X29, M01.X29, M01.X29, M01.X29, M01.X29, M01.X29, M01.X39, M01.X39, M01.X39, M01.X39, M01.X39, M01.X39, M01.X49, M01.X49, M01.X49, M01.X49, M01.X49, M01.X59, M01.X59, M01.X59, M01.X59, M01.X59, M01.X59, M01.X69, M01.X69, M01.X69, M01.X69, M01.X69, M01.X69, M01.X79, M01.X79, M01.X79, M01.X79, M01.X79, M01.X79, M01.X8, M01.X8, M01.X8, M01.X8, M01.X8, M01.X8, M01.X9, M01.X9, M01.X9, M01.X9, M01.X9, M02.10, M02.119, M02.129, M02.139, M02.149, M02.159, M02.169, M02.179, M02.18, M02.19, M02.20, M02.20, M02.30, M02.319, M02.329, M02.339, M02.349, M02.359, M02.369, M02.379, M02.38, M02.39, M02.9, M05.10, M05.30, M05.60, M06.1, M06.4, M06.4, M06.9, M08.00, M08.3, M08.40, M08.40, M12.00, M12.129, M12.139, M12.149, M12.159, M12.169, M12.179, M12.18, M12.19, M12.20, M12.219, M12.229, M12.239, M12.269, M12.279, M12.28, M12.29, M12.30, M12.319, M12.329, M12.339, M12.349, M12.359, M12.369, M12.379, M12.38, M12.39, M12.40, M12.419, M12.429, M12.439, M12.449, M12.459, M12.469, M12.479, M12.48, M12.49, M12.50, M12.519, M12.529, M12.539, M12.549, M12.559, M12.569, M12.579, M12.58, M12.59, M12.80, M12.80, M12.80, M12.80, M12.819, M12.819, M12.829, M12.829, M12.839, M12.839, M12.849, M12.849, M12.859, M12.869, M12.879, M12.879, M12.88, M12.88, M12.89, M12.9, M12.9, M12.9, M12.9, M12.9, M12.9, M12.9, M12.9, M12.9, M12.9, M12.9, M13.0, M13.0, M13.0, M13.0, M13.0, M13.0, M13.0, M13.0, M13.10, M13.10, M13.10, M13.119, M13.129, M13.139, M13.149, M13.159, M13.169, M13.179, M13.80, M13.80, M13.80, M13.819, M13.819, M13.829, M13.829, M13.839, M13.839, M13.849, M13.859, M13.869, M13.869, M13.879, M13.879, M13.88, M13.88, M13.89, M13.89, M14.60, M14.80, M15.0, M15.3, M15.8, M15.8, M15.9, M16.10, M16.7, M16.9, M16.9, M17.10, M17.5, M17.9, M17.9, M18.9, M19.019, M19.029, M19.039, M19.049, M19.079, M19.219, M19.229, M19.239, M19.249, M19.279, M19.90, M19.90, M19.90, M19.90, M19.90, M19.90, M19.90, M19.90, M19.91, M19.91, M19.93, M19.93, M22.40, M23.009, M23.202, M23.229, M23.239, M23.249, M23.259, M23.269, M23.305, M23.329, M23.339, M23.349, M23.359, M23.369, M23.40, M23.50, M23.50, M23.50, M23.50, M23.50, M23.8X9, M23.8X9, M23.90, M24.00, M24.00, M24.019, M24.029, M24.039, M24.049, M24.059, M24.073, M24.076, M24.08, M24.10, M24.10, M24.129, M24.139, M24.149, M24.159, M24.173, M24.176, M24.30, M24.30, M24.30, M24.319, M24.329, M24.339, M24.349, M24.359, M24.40, M24.419, M24.429, M24.439, M24.443, M24.446, M24.459, M24.469, M24.473, M24.476, M24.60, M24.60, M24.60, M24.619, M24.629, M24.639, M24.649, M24.659, M24.669, M24.673, M24.676, M24.80, M24.80, M24.80, M24.80, M24.80, M24.80, M24.819, M24.819, M24.829, M24.829, M24.839, M24.839, M24.849, M24.849, M24.859, M24.859, M24.873, M24.873, M24.876, M24.876, M24.9, M24.9, M24.9, M24.9, M24.9, M24.9, M25.00, M25.00, M25.019, M25.029, M25.039, M25.049, M25.059, M25.069, M25.073, M25.076, M25.08, M25.10, M25.10, M25.119, M25.129, M25.139, M25.149, M25.159, M25.169, M25.173, M25.176, M25.18, M25.40, M25.429, M25.439, M25.449, M25.459, M25.469, M25.473, M25.476, M25.48, M25.50, M25.50, M25.519, M25.529, M25.539, M25.541, M25.542, M25.549, M25.559, M25.569, M25.579, M25.60, M25.60, M25.619, M25.629, M25.639, M25.649, M25.659, M25.669, M25.673, M25.676, M25.80, M25.80, M25.819, M25.829, M25.839, M25.849, M25.859, M25.869, M25.879, M25.9, M25.9, M25.9, M25.9, M25.9, M25.9, M25.9, M25.9, M25.9, M25.9, M33.20, M33.90, M35.2, M35.2, M35.2, M35.2, M35.2, M35.2, M35.2, M35.5, M35.9, M36.2, M36.3, M36.4, M43.4, M43.5X9, M43.5X9, M70.60, M70.70, M75.100, M75.50, M76.10, M76.20, M79.609, M79.646, M85.9, M89.9, M94.9, R29.4, R29.898, R29.898, R29.898, R29.898, R29.898, R29.898, R29.898, R29.898, V13.4</p>
Nerve pain	<p>ICD-9: 337.0, 337.1, 353.0, 353.1, 353.2, 353.3, 353.4, 353.5, 353.6, 353.8, 353.9, 354.0, 354.1, 354.2, 354.3, 354.4, 354.5, 354.8, 354.9, 355.0, 355.1, 355.2, 355.3, 355.4, 355.5, 355.6, 355.7, 355.71, 356.0, 356.1, 356.2, 356.3, 356.4, 356.8, 356.9, 357.0, 357.1, 357.2, 357.4, 357.5, 357.6, 357.7, 357.8, 357.81, 377.33, 377.34, 377.41, 531.3, 723.4, 724.3, 727.2, 729.2</p> <p>ICD-10: B02.23, B26.84, E08.42, E09.42, E10.42, E11.42, E13.42, G54.0, G54.1, G54.2, G54.3, G54.4, G54.5, G54.6, G54.7, G54.8, G54.9, G56.00, G56.10, G56.20, G56.30, G56.40, G56.80, G56.90, G57.00, G57.10, G57.20, G57.30, G57.40, G57.50, G57.60, G57.70, G57.80, G57.90, G58.7, G58.9, G60.0, G60.0, G60.0, G60.1, G60.3, G60.8, G60.9, G61.0, G61.81, G61.82, G61.89,</p>

Appendix Table 3.

Urine Drug Testing (UDT) by Age and Year

Age/Year	Prevalent long-term opioid users			Incident long-term opioid users		
	Denominator	Any UDT	Any UDT, %	Denominator	Any UDT	Any UDT, %
<50 years						
2012	29,036	11,213	38.62	687	53	7.71
2013	29,107	12,283	42.20	649	46	7.09
2014	25,338	11,662	46.03	544	61	11.21
2015	23,674	12,128	51.23	657	93	14.16
2016	23,438	12,838	54.77	563	96	17.05
2017	24,205	14,389	59.45	529	92	17.39
2018	21,511	13,527	62.88	354	65	18.36
50–59 years						
2012	38,954	13,015	33.41	710	42	5.92
2013	42,730	16,211	37.94	838	53	6.32
2014	39,423	16,759	42.51	687	53	7.71
2015	38,424	18,390	47.86	923	73	7.91
2016	38,968	20,279	52.04	686	96	13.99
2017	45,529	26,724	58.70	801	118	14.73
2018	42,971	27,033	62.91	445	77	17.30
60–69 years						
2012	37,518	9,355	24.93	964	37	3.84
2013	43,625	12,712	29.14	1,155	48	4.16
2014	41,735	13,822	33.12	940	53	5.64
2015	43,457	16,730	38.50	1,384	72	5.20
2016	48,166	21,323	44.27	1,002	82	8.18
2017	62,862	32,657	51.95	1,300	154	11.85
2018	66,421	37,818	56.94	777	111	14.29
70–79 years						
2012	28,414	4,177	14.70	816	10	1.23
2013	32,924	5,907	17.94	1,049	22	2.10
2014	31,983	6,926	21.66	771	19	2.46
2015	33,132	8,855	26.73	1,615	44	2.72
2016	38,181	12,433	32.56	1,001	43	4.30
2017	52,174	20,661	39.60	1,229	79	6.43
2018	57,195	25,995	45.45	859	65	7.57
>79 years						
2012	17,742	1,122	6.32	713	4	0.56
2013	19,192	1,607	8.37	851	9	1.06
2014	18,805	1,927	10.25	718	4	0.56
2015	18,829	2,524	13.40	867	5	0.58
2016	21,238	3,854	18.15	705	12	1.70

Age/Year	Prevalent long-term opioid users			Incident long-term opioid users		
	Denominator	Any UDT	Any UDT, %	Denominator	Any UDT	Any UDT, %
2017	24,649	5,833	23.66	809	23	2.84
2018	26,494	7,713	29.11	604	19	3.15

Appendix Table 4.

Urine Drug Testing (UDT) by Region and Year

Region/Year	Prevalent long-term opioid users			Incident long-term opioid users		
	Denominator	Any UDT	Any UDT, %	Denominator	Any UDT	Any UDT, %
Midwest						
2012	31,443	5,979	19.02	773	23	2.98
2013	34,178	7,673	22.45	792	24	3.03
2014	33,478	8,875	26.51	728	28	3.85
2015	30,823	9,732	31.57	670	40	5.97
2016	33,657	11,561	34.35	743	43	5.79
2017	39,391	15,831	40.19	995	65	6.53
2018	37,478	15,885	42.38	449	32	7.13
Northeast						
2012	9,856	1,994	20.23	305	6	1.97
2013	12,522	3,062	24.45	361	11	3.05
2014	11,639	3,087	26.52	344	6	1.74
2015	11,876	3,451	29.06	320	17	5.31
2016	11,695	3,968	33.93	289	16	5.54
2017	12,502	4,574	36.59	291	12	4.12
2018	13,045	5,178	39.69	213	7	3.29
South						
2012	72,584	24,658	33.97	1,782	102	5.72
2013	78,666	29,751	37.82	1,881	109	5.79
2014	68,638	29,061	42.34	1,536	121	7.88
2015	71,839	33,717	46.93	2,231	188	8.43
2016	80,390	40,484	50.36	1,928	212	11.00
2017	111,185	62,084	55.84	2,302	302	13.12
2018	116,891	69,830	59.74	1,634	244	14.93
West						
2012	37,781	6,251	16.55	1,030	15	1.46
2013	42,212	8,234	19.51	1,508	34	2.25
2014	43,529	10,073	23.14	1,052	35	3.33
2015	42,978	11,727	27.29	2,225	42	1.89
2016	44,249	14,714	33.25	997	58	5.82
2017	46,341	17,775	38.36	1,080	87	8.06
2018	47,178	21,193	44.92	743	54	7.27

REFERENCES

1. Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain--United States, 2016. *JAMA*. 2016;315(15):1624–1645. 10.1001/jama.2016.1464. [PubMed: 26977696]
2. Jeffery MM, Hooten WM, Hess EP, et al. Opioid prescribing for opioid-naive patients in emergency departments and other settings: characteristics of prescriptions and association with long-term use. *Ann Emerg Med*. 2018;71(3):326–336.e19. 10.1016/j.annemergmed.2017.08.042. [PubMed: 28967517]
3. Manchikanti L, Abdi S, Atluri S, et al. American Society of Interventional Pain Physicians (ASIPP) guidelines for responsible opioid prescribing in chronic non-cancer pain: Part I--evidence assessment. *Pain Physician*. 2012;15(3 suppl):S1–S65. [PubMed: 22786448]
4. Nuckols TK, Anderson L, Popescu I, et al. Opioid prescribing: a systematic review and critical appraisal of guidelines for chronic pain. *Ann Intern Med*. 2014;160(1):38–47. 10.7326/0003-4819-160-1-201401070-00732. [PubMed: 24217469]
5. 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. 10.1016/j.jpain.2008.10.008. [PubMed: 19187889]
6. Jannetto PJ, Bratanow NC, Clark WA, et al. Executive summary: American Association of Clinical Chemistry Laboratory Medicine Practice Guideline—using clinical laboratory tests to monitor drug therapy in pain management patients. *J Appl Lab Med*. 2018;2(4):489–526. 10.1373/jalm.2017.023341. [PubMed: 33636890]
7. Owen GT, Burton AW, Schade CM, Passik S. Urine drug testing: current recommendations and best practices. *Pain Physician*. 2012;15(3 suppl):ES119–ES133. [PubMed: 22786451]
8. Rolfs RT, Johnson E, Williams NJ, Sundwall DN. Utah clinical guidelines on prescribing opioids for treatment of pain. *J Pain Palliat Care Pharmacother*. 2010;24(3):219–235. 10.3109/15360288.2010.503265. [PubMed: 20718642]
9. Christo PJ, Manchikanti L, Ruan X, et al. Urine drug testing in chronic pain. *Pain Physician*. 2011;14(2):123–143. [PubMed: 21412368]
10. Manchikanti L, Manchukonda R, Pampati V, et al. Does random urine drug testing reduce illicit drug use in chronic pain patients receiving opioids? *Pain Physician*. 2006;9(2):123–129. [PubMed: 16703972]
11. Matteliano D, Chang YP. Describing prescription opioid adherence among individuals with chronic pain using urine drug testing. *Pain Manag Nurs*. 2015;16(1):51–59. 10.1016/j.pmn.2014.04.001. [PubMed: 24939349]
12. Wiseman LK, Lynch ME. The utility of universal urinary drug screening in chronic pain management. *Can J Pain*. 2018;2(1):37–47. 10.1080/24740527.2018.1425980.
13. Pergolizzi J, Pappagallo M, Stauffer J, et al. The role of urine drug testing for patients on opioid therapy. *Pain Pract*. 2010;10(6):497–507. 10.1111/j.1533-2500.2010.00375.x. [PubMed: 20412503]
14. Mahajan G. Role of urine drug testing in the current opioid epidemic. *Anesth Analg*. 2017;125(6):2094–2104. 10.1213/ane.0000000000002565. [PubMed: 29189366]
15. Paice JA, Portenoy R, Lacchetti C et al. Management of chronic pain in survivors of adult cancers: American Society of Clinical Oncology Clinical practice guideline. *J Clin Oncol*. 2016;34(27):3325–3345. 10.1200/jco.2016.68.5206. [PubMed: 27458286]
16. Argoff CE, Alford DP, Fudin J, et al. Rational urine drug monitoring in patients receiving opioids for chronic pain: consensus recommendations. *Pain Med*. 2018;19(1):97–117. 10.1093/pm/pnx285. [PubMed: 29206984]
17. Adams NJ, Plane MB, Fleming MF, Mundt MP, Saunders LA, Stauffacher EA. Opioids and the treatment of chronic pain in a primary care sample. *J Pain Symptom Manage*. 2001;22(3):791–796. 10.1016/s0885-3924(01)00320-7. [PubMed: 11532592]
18. Bham B, Brown D, Hariharan J, Anderson J, Balousek S, Fleming MF. Survey of select practice behaviors by primary care physicians on the use of opioids for chronic pain. *Curr Med Res Opin*. 2006;22(9):1859–1865. 10.1185/030079906x132398. [PubMed: 16968589]

19. Boulanger A, Clark AJ, Squire P, Cui E, Horbay GL. Chronic pain in Canada: have we improved our management of chronic noncancer pain? *Pain Res Manag.* 2007;12(1):39–47. 10.1155/2007/762180. [PubMed: 17372633]
20. Starrels JL, Becker WC, Weiner MG, Li X, Heo M, Turner BJ. Low use of opioid risk reduction strategies in primary care even for high risk patients with chronic pain. *J Gen Intern Med.* 2011;26(9):958–964. 10.1007/s11606-011-1648-2. [PubMed: 21347877]
21. Turner JA, Saunders K, Shortreed SM, et al. Chronic opioid therapy urine drug testing in primary care: prevalence and predictors of aberrant results. *J Gen Intern Med.* 2014;29(12):1663–1671. 10.1007/s11606-014-3010-y. [PubMed: 25217208]
22. Zgierska AE, Vidaver RM, Smith P, et al. Enhancing system-wide implementation of opioid prescribing guidelines in primary care: protocol for a stepped-wedge quality improvement project. *BMC Health Serv Res.* 2018;18:415. 10.1186/s12913-018-3227-2. [PubMed: 29871625]
23. Libucha S Optum Clinformatics Data Mart (CDM) data dictionary [dataset]. Optum; 2016.
24. Amari E, Rehm J, Goldner E, Fischer B. Nonmedical prescription opioid use and mental health and pain comorbidities: a narrative review. *Can J Psychiatry.* 2011;56(8):495–502. 10.1177/070674371105600808. [PubMed: 21878161]
25. Elixhauser A, Steiner C, Harris DR, Coffey RM. Comorbidity measures for use with administrative data. *Med Care.* 1998;36(1):8–27. 10.1097/00005650-199801000-00004. [PubMed: 9431328]
26. Seal KH, Shi Y, Cohen G, et al. Association of mental health disorders with prescription opioids and high-risk opioid use in US veterans of Iraq and Afghanistan [published correction appears in *JAMA* 2012;307(23):2489]. *JAMA.* 2012;307(9):940–947. 10.1001/jama.2012.234. [PubMed: 22396516]
27. Common Elements in Guidelines for Prescribing Opioids for Chronic Pain. Centers for Disease Control and Prevention. https://www.cdc.gov/drugoverdose/pdf/common_elements_in_guidelines_for_prescribing_opioids-a.pdf. Published 2014. Accessed April 2, 2020.
28. Davis C State-by-State Summary of Opioid Prescribing Regulations and Guidelines. The Network for Public Health Law. <https://www.azdhs.gov/documents/prevention/womens-childrens-health/injury-prevention/opioid-prevention/appendix-b-state-by-state-summary.pdf>. Published 2020. Accessed April 30, 2020.
29. Arthur JA. Urine drug testing in cancer pain management. *Oncologist.* 2020;25(2):99–104. 10.1634/theoncologist.2019-0525. [PubMed: 32043770]
30. Johnson SP, Chung KC, Zhong L, et al. Risk of prolonged opioid use among opioid-naïve patients following common hand surgery procedures. *J Hand Surg Am.* 2016;41(10):947–957.e3. 10.1016/j.jhsa.2016.07.113. [PubMed: 27692801]
31. Campbell CI, Weisner C, Leresche L, et al. Age and gender trends in long-term opioid analgesic use for noncancer pain. *Am J Public Health.* 2010;100(12):2541–2547. 10.2105/ajph.2009.180646. [PubMed: 20724688]
32. Chau DL, Walker V, Pai L, Cho LM. Opiates and elderly: use and side effects. *Clin Interv Aging.* 2008;3(2):273–278. 10.2147/cia.s1847. [PubMed: 18686750]
33. Abuse of Prescription (Rx) Drugs Affects Young Adults Most. National Institute on Drug Abuse, NIH; HHS. <https://www.drugabuse.gov/sites/default/files/abuseprescription2016.pdf> Published 2016. Accessed May 1, 2020.
34. Gaither JR, Gordon K, Crystal S, et al. Racial disparities in discontinuation of long-term opioid therapy following illicit drug use among black and white patients. *Drug Alcohol Depend.* 2018;192:371–376. 10.1016/j.drugalcdep.2018.05.033. [PubMed: 30122319]
35. Yee DA, Hughes MM, Guo AY, et al. Observation of improved adherence with frequent urine drug testing in patients with pain. *J Opioid Manag.* 2014;10(2):111–118. 10.5055/jom.2014.0200. [PubMed: 24715666]
36. Setnik B, Roland CL, Pixton GC, Sommerville KW. Prescription opioid abuse and misuse: gap between primary-care investigator assessment and actual extent of these behaviors among patients with chronic pain. *Postgrad Med.* 2017;129(1):5–11. 10.1080/00325481.2017.1245585. [PubMed: 27782769]

37. Heit HA, Gourlay DL. Urine drug testing in pain medicine. *J Pain Symptom Manage.* 2004;27(3):260–267. 10.1016/j.jpainsymman.2003.07.008. [PubMed: 15010104]
38. Centers for Medicare and Medicaid Services. Laboratory registry. https://www.cms.gov/Regulations-and-Guidance/Legislation/CLIA/Laboratory_Registry.html. Published 3 31, 2016. Accessed June 26, 2016.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

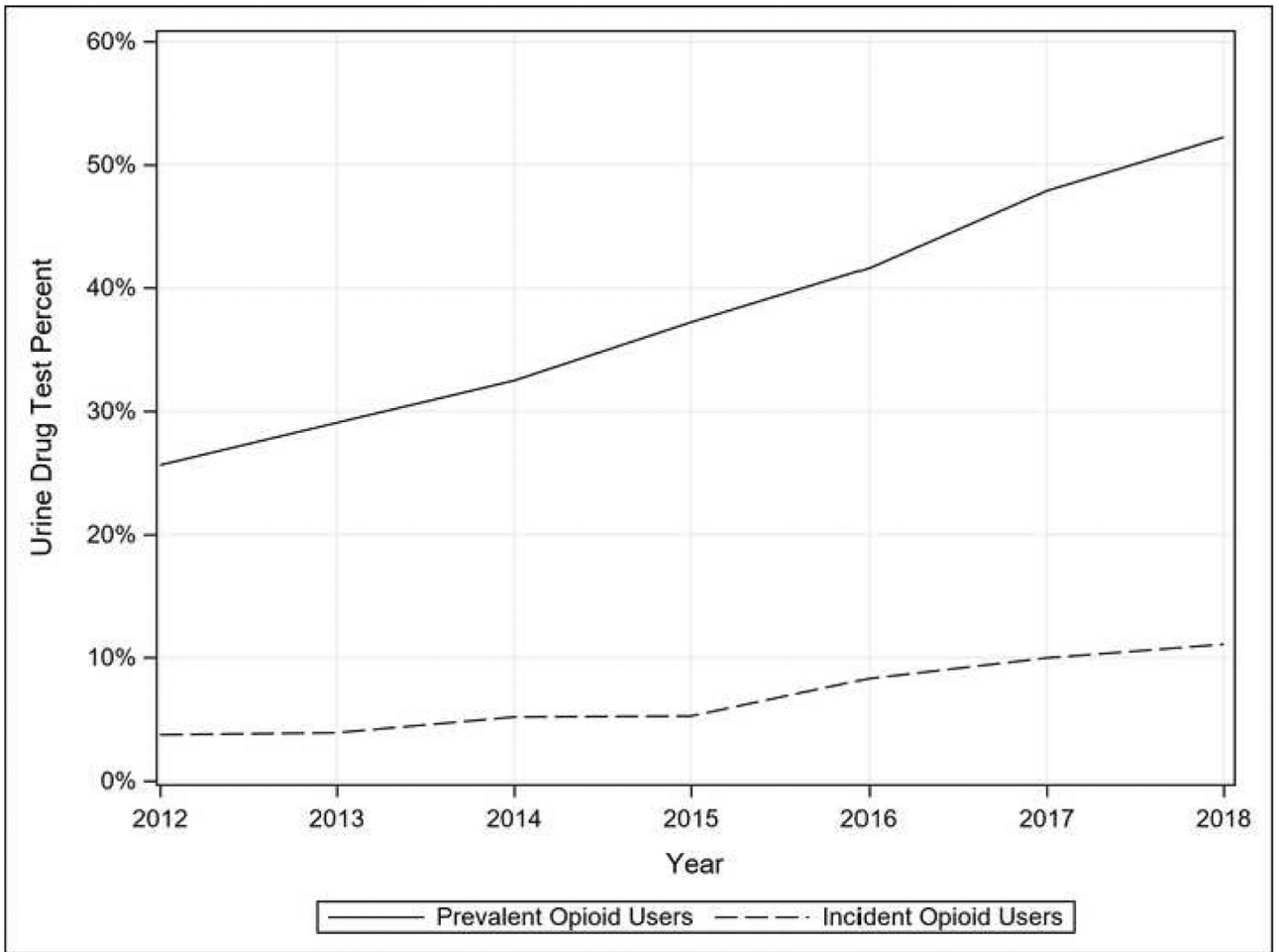


Figure 1. Prevalence and incidence of urine drug testing (UDT) among long-term opioid users, 2012–2018.

Notes: Time trends of UDT represent “any UDT” received by patients with incident or prevalent long-term opioid use. The prevalence cohort represents annual UDT, while the incidence cohort represents baseline UDT.

Table 1.

Patient Characteristics Among LTOT Users in Prevalence and Incidence Cohorts, Describing Age, Sex, Region, Comorbidity Score, and Pain Conditions

Variable	Prevalent opioid use cohort ^a	Incident opioid use cohort ^b
	n (%)	n (%)
Sex		
Female	714,255 (58.2)	16,366 (56.0)
Male	513,789 (41.8)	12,836 (44.0)
Age, years	63.4 (13.1)	65.5 (14.2)
<50	176,309 (14.4)	3,983 (13.6)
50–59	286,999 (23.4)	5,090 (17.4)
60–69	343,784 (28.0)	7,522 (25.8)
70–79	274,003 (22.3)	7,340 (25.1)
>79	146,949 (12.0)	5,267 (18.0)
Region		
Midwest	240,448 (19.6)	5,150 (17.6)
Northeast	83,135 (6.8)	2,123 (7.3)
South	600,193 (48.9)	13,294 (45.5)
West	304,268 (24.8)	8,635 (29.6)
Year		
2012	151,664 (12.4)	3,890 (13.3)
2013	167,578 (13.6)	4,542 (15.6)
2014	157,284 (12.8)	3,660 (12.5)
2015	157,516 (12.8)	5,446 (18.6)
2016	169,991 (13.8)	3,957 (13.6)
2017	209,419 (17.1)	4,668 (16.0)
2018	214,592 (17.5)	3,039 (10.4)
Elixhauser comorbidity score, ^c mean (SD)	3.4 (2.8)	2.8 (2.6)
Elixhauser category		
0	144,195 (11.7)	6,324 (21.7)
1	200,981 (16.4)	4,859 (16.6)
2	212,918 (17.3)	4,813 (16.5)
3	183,107 (14.9)	3,965 (13.6)
4	142,699 (11.6)	2,886 (9.9)
5+	344,144 (28.0)	6,355 (21.8)
Alcohol abuse	33,448 (2.7)	610 (2.1)
Drug abuse	147,414 (12.0)	1,541 (5.3)
Psychoses	34,720 (2.8)	723 (2.5)
Depression	375,798 (30.6)	6,097 (20.9)

Variable	Prevalent opioid use cohort ^a	Incident opioid use cohort ^b
	n (%)	n (%)
Back pain ^d	631,728 (51.4)	11,237 (38.5)
Joint pain	370,338 (30.2)	8,948 (30.6)
Nerve pain	108,651 (8.8)	2,174 (7.4)
Other chronic pain	284,115 (23.1)	4,173 (14.3)
Cancer	62,740 (5.1)	1,435 (4.9)
Musculoskeletal pain	194,478 (15.8)	3,782 (13.0)
MME/Day, mean (SD)	54.4 (81.2)	
50 MME/Day	356,376 (29.0)	
90 MME/Day	184,400 (15.0)	
Number of opioid prescriptions, mean (SD)	14.3 (7.8)	
Number of UDT, mean (SD)	2.9 (2.9)	

Notes: Additionally, information on opioid MME/Day, use of 50 or 90 MME/day use, number of opioid prescriptions and the number of UDT is presented for the prevalence cohort.

^aPrevalence cohort included 1,228,004 person-years for 621,449 patients in 2012–2018.

^bIncidence cohort included 29,202 person-years for 28,790 patients in 2012–2018.

^cElixhauser comorbidity scores were calculated after removing alcohol abuse, drug abuse, psychoses, and depression. Elixhauser comorbidity and pain conditions were assessed in the previous calendar year (prevalence cohort) or in the year prior to LTOT initiation (incidence cohort).

^dIn cases when multiple chronic pain conditions were present on the same day, each condition was noted.

MME, morphine milligram equivalent; LTOT, long term opioid therapy.

Table 2.

Annual and Baseline UDT Among Long-term Opioid Users of Prevalence and Incidence Cohorts Respectively, Stratified by Age, Sex, Year, Region, Elixhauser Score, and Pain Conditions

Parameter	Prevalent long-term opioid users (annual UDT)		Incident long-term opioid users (baseline UDT)	
	Any UDT, %	Any UDT ^a OR (95% CI)	Any UDT, %	Any UDT ^a OR (95% CI)
Age, years				
<50	49.94	ref	12.70	ref
50–59	48.23	0.85 (0.84, 0.86)	10.06	0.75 (0.65, 0.87)
60–69	42.01	0.62 (0.61, 0.63)	7.40	0.59 (0.51, 0.69)
70–79	31.00	0.40 (0.40, 0.41)	3.84	0.36 (0.30, 0.42)
>79	16.73	0.21 (0.21, 0.22)	1.44	0.17 (0.13, 0.22)
Sex				
Female	38.26	ref	5.75	ref
Male	40.32	1.02 (1.01, 1.03)	7.73	1.18 (1.07, 1.31)
Year				
2012	25.64	ref	3.75	ref
2013	29.07	1.21 (1.19, 1.22)	3.92	1.14 (0.90, 1.44)
2014	32.49	1.49 (1.46, 1.51)	5.19	1.37 (1.09, 1.73)
2015	37.22	1.82 (1.79, 1.84)	5.27	1.61 (1.30, 2.00)
2016	41.61	2.14 (2.10, 2.17)	8.31	2.00 (1.62, 2.47)
2017	47.88	2.66 (2.62, 2.70)	9.98	2.12 (1.73, 2.61)
2018	52.23	3.28 (3.23, 3.33)	11.09	2.48 (1.99, 3.09)
Region				
Midwest	31.41	ref	4.95	ref
Northeast	30.45	1.00 (0.98, 1.02)	3.53	0.86 (0.65, 1.14)
South	48.25	1.99 (1.96, 2.01)	9.61	1.99 (1.71, 2.32)
West	29.57	0.98 (0.97, 1.00)	3.76	0.90 (0.75, 1.08)
Elixhauser category				
0	38.13	ref	6.12	ref
1	39.26	1.05 (1.03, 1.06)	8.17	1.06 (0.90, 1.25)
2	38.61	1.09 (1.07, 1.10)	6.79	1.01 (0.85, 1.20)
3	39.11	1.15 (1.14, 1.17)	6.66	1.09 (0.90, 1.31)
4	39.37	1.18 (1.16, 1.20)	7.14	1.26 (1.03, 1.54)
5+	39.67	1.23 (1.21, 1.25)	5.54	1.08 (0.90, 1.29)
Alcohol abuse	49.30	1.07 (1.05, 1.10)	10.00	0.84 (0.61, 1.17)
Depression	45.65	1.16 (1.15, 1.17)	8.35	0.97 (0.86, 1.10)
Drug abuse	66.44	1.87 (1.85, 1.89)	22.71	2.76 (2.35, 3.24)
Psychoses	42.62	1.03 (1.00, 1.05)	6.92	0.99 (0.71, 1.39)
Back pain	51.47	2.04 (2.02, 2.06)	12.91	4.10 (3.65, 4.59)

Parameter	Prevalent long-term opioid users (annual UDT)		Incident long-term opioid users (baseline UDT)	
	Any UDT, %	Any UDT ^a OR (95% CI)	Any UDT, %	Any UDT ^a OR (95% CI)
Cancer	21.05	0.82 (0.80, 0.84)	1.18	0.46 (0.28, 0.75)
Other chronic pain	54.78	1.64 (1.62, 1.66)	18.69	3.66 (3.25, 4.13)
Joint pain	30.54	1.10 (1.09, 1.11)	4.29	1.12 (0.98, 1.28)
Musculoskeletal pain	37.07	0.97 (0.96, 0.98)	7.32	0.84 (0.71, 0.99)
Nerve pain	45.32	1.23 (1.21, 1.24)	8.88	1.25 (1.05, 1.49)

^aAny UDT indicated either receiving of screening test or definitive test. Screening test is usually performed by immunoassay to detect a drug or drug class. Definitive test identifies specific drugs and metabolites, by gas or liquid chromatography and mass spectrometry, or high-performance liquid chromatography.

UDT, urine drug testing.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript