Prescribing of Human Immunodeficiency Virus (HIV) Pre-exposure Prophylaxis by HIV Medical Providers in the United States, 2013–2014

John Weiser, Shikha Garg, Linda Beer, and Jacek Skarbinski
Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia

Background. Clinical trials have demonstrated the effectiveness of human immunodeficiency virus (HIV) pre-exposure prophylaxis (PrEP) for reducing HIV acquisition. Understanding how HIV care providers are prescribing PrEP is necessary to ensure success of this prevention strategy.

Methods. During 2013–2014, we surveyed US HIV care providers who also provided care to HIV-negative patients. We estimated percentages who had prescribed PrEP and assessed associations between provider characteristics and PrEP prescribing.

Results. An estimated 26% (95% confidence interval [CI], 20–31) had ever prescribed PrEP. Of these, 74% (95% CI, 61–87) prescribed for men who have sex with men (MSM), 30% (95% CI, 21–39) for women who have sex with men, 23% (95% CI, 9–37) for men who have sex with women, 23% (95% CI, 15–30) for uninfected partners in HIV-discordant couples trying to conceive, and 1% (95% CI, 0–2) for persons who inject drugs. The following provider characteristics were significantly associated with having prescribed PrEP: male vs female (32% vs 16%; adjusted prevalence ratio [aPR], 1.5; 95% CI, 1.0–2.2), lesbian/gay/bisexual vs heterosexual orientation (50% vs 21%; aPR, 2.0; 95% CI, 1.3–2.9), and HIV caseload (>200, 51–200, and ≤50 patients, 39%, 29%, and 14%, respectively; >200 vs ≤50 patients, aPR 2.4, 95% CI 1.1–5.2, and 51–200 vs ≤50 patients, aPR 2.2, 95% CI 1.2–4.0).

Conclusions. In 2013–2014, one quarter of HIV care providers reported having prescribed PrEP, most commonly for MSM and rarely for persons who inject drugs. Lesbian/gay/bisexual providers and male providers were more likely than others to have prescribed PrEP. Additional efforts may enable more providers to prescribe PrEP to underserved clients needing the service.

Keywords. HIV; pre-exposure prophylaxis PrEP provider survey.
of patients and provided information about whether they had ever prescribed PrEP. Among these providers, we estimated the percentages of providers who reported ever having prescribed continuous daily dosing of tenofovir/emtricitabine for HIV PrEP.

We estimated percentages and corresponding 95% confidence intervals (CIs) for provider demographics, qualifications and experience, and practice characteristics. Demographics included age, gender, and race/ethnicity (white, non-Hispanic/Latino; black/African American, non-Hispanic/Latino; Hispanic/Latino; or other) and sexual orientation (heterosexual; or lesbian, gay, or bisexual). Qualifications and experience included profession (physician, ie, Doctor of Medicine [MD] or Doctor of Osteopathic Medicine [DO]), nurse practitioner, or physician assistant), physician board certification, which included infectious diseases (ID), internal medicine, family medicine, pediatrics, or other/not board certified (physicians who were board certified in ID were classified as ID physicians regardless of any additional board certifications), years caring for HIV patients, HIV patient caseload, and the percentage of patients for whom the provider currently, for any reason, deferred prescribing antiretroviral therapy (ART). Respondents reported the percentage of non-white patients and MSM in their practices, which were then categorized to ≤50% vs >50%. Whether providers’ practices received Ryan White HIV/AIDS Program (RWHAP) funding or provided onsite adherence counseling was ascertained using data from a previous MMP facility survey [17]. Among providers who had ever prescribed PrEP, we estimated the percentages who reported having prescribed for MSM, men who have sex with women (MSW), women who have sex with men (WSM), uninfected partners in HIV-discordant couples attempting to conceive, PWID, or others. We computed weighted prevalence estimates with 95% CIs of demographic, professional, and practice characteristics of providers who reported having prescribed PrEP, and we used Rao-Scott χ² tests and univariate logistic regression to assess associations between those characteristics and PrEP prescription. We used multivariate logistic regression to assess independent predictors of PrEP prescription, including in the model variables that were conceptually and statistically (P < .05%) associated with PrEP prescription. We considered estimates with a coefficient of variation greater than 0.3 unreliable. The data were weighted based on probability of selection, and adjustments were made to the probability weights based on factors associated with nonresponse such as number of HIV care providers practicing at the facility and provider profession. The sample design and weighting methods allow inference to all HIV care providers at outpatient HIV healthcare facilities in the United States between January 1 and April 30, 2012. We used SAS/STAT (version 9.3) and SUDAAN (version 11) procedures for the analysis of complex sample survey data.

Ethics Statement

The MMP, as a public health surveillance activity, was determined to be nonresearch in accordance with the federal human subjects protection regulations at 45 Code of Federal Regulations 46.101c and 46.102d and CDC’s Guidelines for Defining Public Health Research and Public Health Non-Research [18, 19]. Participating states or territories and facilities obtained local institutional review board approval to conduct MMP, if required locally.

RESULTS

Among US HIV care providers in 2013–2014, an estimated 87% (95% CI, 83–92) also provided care for patients without HIV infection. Among these providers, 41% were female and 14% were lesbian/gay/bisexual. Although 38% provided HIV care for ≤50 patients, 39% cared for 51–200 patients, and 23% cared for >200 patients; 48% reported having >50% MSM in their practices (Table 1).

In all, 26% (95% CI, 20–31) of HIV care providers who also provided care for patients without HIV infection reported ever having prescribed PrEP. Among providers who had prescribed PrEP, 74% reported having prescribed for MSM, 30% for WSM, 23% for MSW, 23% for uninfected partners in HIV-discordant couples trying to conceive, and 1% for PWID (Table 2). More male compared with female providers reported having prescribed PrEP (32% vs 16%, P = .0003) as did more lesbian/gay/bisexual compared with heterosexual providers (50% vs 21%, P = .0082) (Table 3). Human immunodeficiency virus caseload was also associated with having prescribed PrEP (>200, 51–200, and ≤50 patients, 39%, 29%, and 14%, respectively; P = .003). The
following provider characteristics were not associated with prescribing PrEP: age, race/ethnicity, profession, physician board certification, years caring for HIV-infected patients, percentage of patients for whom ART is deferred for any reason, delivery of comprehensive sexual risk reduction services to patients with HIV, proportion of non-white patients, and practicing at a facility with RWHAP funding or onsite adherence counseling.

Using a multivariate model that included provider’s gender and sexual orientation, HIV patient caseload, and whether >50% of the provider’s patients were MSM, the following provider characteristics were associated with having prescribed PrEP: male vs female gender (adjusted prevalence ratio [aPR], 1.5; 95% CI, 1.0–2.2), lesbian/gay/bisexual vs heterosexual orientation (aPR, 2.0; 95% CI, 1.3–2.9), patient caseload of >200 vs ≤50 (aPR, 2.4; 95% CI, 1.1–5.2), and patient caseload of 51–200 vs ≤50 (aPR, 2.2; 95% CI, 1.2–4.0) (Table 3).

**DISCUSSION**

In 2013–2014, 1 in 4 US HIV care providers who also cared for HIV-negative patients reported having prescribed PrEP. Three quarters of those who prescribed PrEP, prescribed for MSM, which is not surprising considering that 25% of HIV-negative MSM (an estimated 492,000 persons) have indications for PrEP [20]. One third prescribed for WSM and one quarter prescribed for MSM. Only 1% prescribed PrEP for PWID [20]. Half of lesbian/gay/bisexual providers had prescribed PrEP compared with 1 in 5 of their heterosexual counterparts, and, after accounting for provider, patient, and practice characteristics, lesbian/gay/bisexual providers were twice as likely to have prescribed PrEP. Providers with HIV caseloads over 50 compared with those with smaller caseloads were also twice as likely, and male providers compared with female providers were 50% more likely to have prescribed PrEP.

Our estimate that 26% of HIV care providers had prescribed PrEP falls within the range of studies of members of the American Academy of HIV Medicine 2011 (19%) [8] and clinicians affiliated with the New England AIDS Education and
Training Center in 2013 (19%) [9], and a national network of US and Canadian ID physicians surveyed in September 2014 (32%) [11] after release of the CDC PrEP guidelines in May 2014 [7]. Unlike previous studies, because of our sampling and weighting methods, our estimates have the advantage of being representative of all US HIV care providers who also care for
HIV-negative patients. In all, a relatively small proportion of these providers had prescribed PrEP considering the large body of evidence supporting its effectiveness, their familiarity with prescribing tenofovir/emtricitabine as a component of combination ART, and their experience providing other HIV risk reduction practices. Our survey was conducted before release of the formal clinical practice guidelines for PrEP in 2014, so our findings do not reflect their publication. However, CDC interim guidance for PrEP [21–23] had been published before our survey. In previous surveys, HIV care providers have consistently named several barriers to prescribing PrEP, including concerns about low treatment adherence with subsequent HIV infection resulting in the emergence of viral resistance to tenofovir/emtricitabine, medication toxicity, an increase in risk behavior among patients taking PrEP, lack of medication coverage, the amount of time required of providers to prescribe PrEP, and a lack of demand [8–10].

Unlike previous studies, this analysis examined associations between PrEP prescribing and provider and practice characteristics, which could be useful for identifying groups of providers who need additional support to prescribe PrEP. One key finding was that lesbian/gay/bisexual providers were more likely than heterosexual providers to report having prescribed PrEP, and this relationship was independent of the proportion of MSM patients in their practices. Provider age, race/ethnicity, profession, board certification, and whether the provider practiced at a RWHAP-funded facility were not associated with PrEP prescribing, and are therefore also unlikely to explain the association between provider sexual orientation and PrEP prescribing. One possible explanation is that lesbian/gay/bisexual providers may be more aware of the sexual orientation of MSM patients and thus might be more likely to ask about indications for PrEP, such as condomless anal sex [7], in this population. In a study of physicians’ awareness of patients’ sexual orientation, researchers found that MSM who thought their PCPs were gay were 35% more likely to report that their PCPs were aware of their sexual orientation [24], and among Veterans Health Administration healthcare workers, more positive attitudes toward gay people, which were more common among non-heterosexuals, were associated with higher rates of asking patients about sexual orientation [25].

Our observation that male HIV care providers were 50% more likely than female providers to prescribe PrEP was independent of provider sexual orientation or any of the other variables we assessed. The relationship between patient-provider gender concordance and sexual history-taking has been examined among physicians in multispecialty practices affiliated with major teaching hospitals [26]. Researchers found that physicians perceived that their own comfort level and that of their patients are highest during same-gender sexual history interviews. One in 5 male physicians compared with half of female physicians reported discomfort taking sexual histories with male patients. Analogous findings were reported from a Colorado survey of 1300 PCPs in which more female than male providers obtained sexual histories from female patients [27]. The relationship between gender concordance and the rate and quality of sexual-history taking is an area for future qualitative research with patients and providers.

The higher likelihood of PrEP prescribing among providers with larger HIV patient caseloads was not unexpected given their greater familiarity with the medications prescribed for PrEP, which are also prescribed to treat HIV infection. Primary care providers without experience treating patients with HIV, but who may care for patients at risk for acquiring HIV, are likely to be even less knowledgeable about and experienced with provision of PrEP than low-volume HIV care providers, as observed among Massachusetts physicians in 2010–2011 [28] and among a broad cross-section of PCPs in 2013–2014, of whom 4% had prescribed PrEP [12].

Only 1% of HIV care providers who reported having prescribed PrEP, prescribed for PWID, possibly reflecting the relatively small population estimate of past-year injection drug use (IDU) of 0.3% [29]. Although the annual number of new HIV diagnoses among PWID has declined, in 2014 an estimated 6% (2635) of HIV diagnoses were attributed to IDU [1]. In 2014, for the first time, injection of prescription opioids was linked to an outbreak of HIV in a rural US community [30], and the CDC has identified an additional 220 counties that are vulnerable to rapid spread of HIV, if introduced, among PWID [31]. An estimated 115,000 PWID in the United States have indications for PrEP [20]. Considering the efficacy and safety demonstrated in the PrEP trial with PWID [6], prescribing PrEP for persons with injection behaviors that place them at substantial risk of acquiring HIV infection could contribute to HIV prevention for PWID at both the individual and the population level [7]. In contrast to the limited experience of HIV care providers prescribing PrEP for PWID, 22% of a broad distribution of PCPs who had prescribed PrEP reported prescribing for PWID [12]. One possible explanation is that HIV care providers’ decision whether to offer PrEP may be influenced by their experience prescribing ART for HIV-infected PWID. Human immunodeficiency virus care providers who reported that they sometimes deferred prescribing ART cited concerns about treatment adherence due to substance abuse as a common reason for deferring [32]. Similar concerns about adherence to PrEP could cause some HIV care providers to defer prescribing for PWID.

Our study had limitations. Our estimates were based on self-reported prescribing practices and may have been subject to measurement error due to inaccurate recall, although we have no reason to believe that one group of providers was more affected than another. Beyond determining the proportion of MSM in providers’ practices, we were unable to assess the number of patients who requested PrEP or met the risk threshold for a recommendation of PrEP, which could have affected...
providers’ prescribing experience. Third, we were unable to quantify the number of patients for whom, or over what period of time, providers had prescribed PrEP because they were asked only if they had ever prescribed PrEP. Finally, 3.5% of survey respondents did not specify their sexual orientation. Therefore, the precision of our estimate of the percentage of providers who were lesbian, gay, or bisexual may be limited by missing data.

CONCLUSIONS

In conclusion, in 2013–2014, one quarter of US HIV care providers who also cared for HIV-negative patients reported having prescribed PrEP, most commonly for MSM. Experience prescribing PrEP for PWID was limited, and improving access to PrEP in this population could help reduce HIV incidence among PWID. Providers who were lesbian/gay/bisexual or male were substantially more likely than others to have prescribed PrEP. Additional efforts, including training to elicit comprehensive sexual health histories regardless of gender concordance and training in the care of PWID, may enable more providers to prescribe PrEP to underserved patients who might benefit from this service.

Acknowledgments

Author contributions. J. W. contributed to study conception, data analysis, and wrote the article; S. G. contributed to study conception, data analysis, and revised the article; L. B. contributed to study conception and revised the article; J. S. contributed to study conception, data analysis, and revised the article.

We thank the participating Medical Monitoring Project (MMP) providers, facilities, project areas, and Provider and Community Advisory Board members. We also acknowledge the contributions of the Clinical Outcomes Team, the Behavioral and Clinical Surveillance Branch, and other members of the Division of HIV/AIDS Prevention at the Centers for Disease Control and Prevention including Dawn Smith and the MMP 2013 Study Group Members (http://www.cdc.gov/hiv/statistics/systems/mmp/resources.html#StudyGroupMembers). We also thank the Altarum Institute data collection team.

Disclaimer. The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention (CDC).

Financial support. Funding for the Medical Monitoring Project is provided by the Centers for Disease Control and Prevention.

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References

1. Centers for Disease Control and Prevention. HIV Surveillance Report. 2014. Vol. 26. Available at: http://www.cdc.gov/hiv/library/reports/surveillance Accessed 22 April 2016.

2. Grohskopf LA, Chillag KL, Gvetadze R, et al. Randomized trial of daily oral tenofovir disoproxil fumarate among HIV-infected women who have sex with men in the United States. J Acquir Immune Defic Syndr 2013; 64:79–86

3. Grant RM, Lama JR, Anderson PL, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. N Engl J Med 2010; 363:2587–98.

4. Thigpen MC, Kebabetown PM, Paxton LA, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. N Engl J Med 2012; 367:423–34.

5. Baeten JM, Donnell D, Ndase P, et al. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. N Engl J Med 2012; 367:399–410.

6. Choopanya K, Martin M, Suntharasamai P, et al. Antiretroviral prophylaxis for HIV infection in injecting drug users in Bangkok, Thailand (the Bangkok Tenofovir study): a randomised, double-blind, placebo-controlled phase 3 trial. Lancet 2013; 381:2083–90.

7. US Public Health Service. Preexposure Prophylaxis for the Prevention of HIV Infection in the United States - 2014. A Clinical Practice Guideline. Available at: http://www.cdc.gov/hiv/pdf/PrEPguidelines2014.pdf. Accessed 3 May 2016.

8. Tellietian D, Mazznai K, Bredeek UF, Hardy WD. Pre-exposure prophylaxis (PrEP) for HIV infection: results of a survey of HIV healthcare providers evaluating their knowledge, attitudes, and prescribing practices. AIDS Patient Care STDS 2013; 27:553–9.

9. Krakower DS, Oldenburg CE, Mitty JA, et al. Knowledge, beliefs and practices regarding antiretroviral medications for HIV prevention: results from a survey of healthcare providers in New England. PLoS One 2015; 10:e0132398.

10. Karris MY, Beekmann SE, Mehta SR, et al. Are we prepped for preexposure prophylaxis (PrEP)? Provider opinions on the real-world use of PrEP in the United States and Canada. Clin Infect Dis 2014; 58:704–12.

11. Krakower DS, Beekmann SE, Polgreen PM, Mayer KH. Diffusion of newer HIV prevention innovations: variable practices of frontline infectious diseases physicians. Clin Infect Dis 2016; 62:99–105.

12. Smith DK, Mendoza MCB, Stryker JE, Rose CE. PrEP awareness and attitudes in a national survey of primary care clinicians in the United States, 2009–2015. PLoS One 2016; 11:e0156592.

13. Centers for Disease Control and Prevention. Behavioral and Clinical Characteristics Of Persons Receiving Medical Care for HIV Infection. Medical Monitoring Project, United States, 2013 Cycle (June 2013–May 2014). HIV Surveillance Special Report, Number 16. Available at: http://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-hsr-mmp-2013.pdf. Accessed 3 May 2016.

14. Frankel MR, McNaghten A, Shapiro MF, et al. A probability sample for monitoring the HIV-infected population in care in the United States and in selected states. Open AIDS J 2012; 6:67–76.

15. American Association on Public Opinion Research. Standard definitions: final dispositions of case codes and outcome rates for surveys. American Association of Public Opinion Research, 2011. Available at: https://www.esomar.org/uploads/public knowledge-and-standards/codes-and-guidelines/ESOMAR_StandardDefinitions-Final-Dispositions-of-Case-Codes-and-Outcome-Rates-for-Surveys.pdf. Accessed 3 May 2016.

16. Weiser J, Beer L, West ET, et al. Qualifications, demographics, satisfaction, and future capacity of the HIV care provider workforce in the United States, 2013–2014. Clin Infect Dis 2016; 63:966–75.

17. Weiser J, Beer L, Frazier EL, et al. Service delivery and patient outcomes in Ryan White HIV/AIDS program-funded and -nonfunded health care facilities in the United States. JAMA Intern Med 2015; 175:1650–9.

18. U.S. Department of Health and Human Services (DHHS) and Office of Human Research Protections. Protection of Human Subjects, US Federal Code Title 45 Part 46. 2009. Available at: http://www.hhs.gov/ohrp/regulations-and-policy/regulations/45-cfr-46/index.html#. Accessed 3 May 2016.

19. Centers for Disease Control and Prevention. Distinguishing Public Health Research and Public Health Nonresearch. 2010. Available at: http://www.cdc.gov/od/science/integrity/docs/cdc-policy-distinguishing-public-health-research-nonresearch.pdf. Accessed 3 May 2016.

20. Smith DK, Van Handel M, Wolitski RJ, et al. Vital signs: estimated percentages and numbers of adults with indications for preexposure prophylaxis to prevent HIV acquisition—United States, 2015. MMWR Morb Mortal Wkly Rep 2015; 64:1291–5.

21. Centers for Disease Control and Prevention (CDC). Interim guidance: preexposure prophylaxis for the prevention of HIV infection in men who have sex with men. MMWR Morb Mortal Wkly Rep 2011; 60:65–8.

22. Centers for Disease Control and Prevention (CDC). Interim guidance for clini- cians considering the use of preexposure prophylaxis for the prevention of HIV infection in heterosexually active adults. MMWR Morb Mortal Wkly Rep 2012; 61:586–9.

23. Centers for Disease Control and Prevention. Update to Interim Guidance for Preexposure Prophylaxis (PrEP) for the Prevention of HIV Infection: PrEP for Injecting Drug Users. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6223a2.htm. Accessed 28 August 2016.

24. Pettrol AE, Mosack KE. Physician awareness of sexual orientation and preventive health recommendations to men who have sex with men. Sex Transm Dis 2011; 38:63–7.

25. Sherman MD, Kauth MR, Shipherd JC, Street RL Jr. Provider beliefs and practices about assessing sexual orientation in two veterans health affairs hospitals. LGBT Health 2014; 1:185–91.

26. Burd ID, Nevardusky N, Bachmann G. Impact of physician gender on sexual his- tory taking in a multispecialty practice. J Sex Med 2006; 3:194–200.

27. Torkko KC, Gershman K, Crane LA, et al. Testing for chlamydia and sexual history taking in adolescent females: results from a statewide survey of Colorado primary care providers. Pediatrics 2000; 106:E32.
28. White JM, Mimiaga MJ, Krakower DS, Mayer KH. Evolution of Massachusetts physician attitudes, knowledge, and experience regarding the use of antiretrovirals for HIV prevention. AIDS Patient Care STDS 2012; 26:395–405.
29. Lansky A, Finlayson T, Johnson C, et al. Estimating the number of persons who inject drugs in the United States by meta-analysis to calculate national rates of HIV and hepatitis c virus infections. PLoS One 2014; 9:e97596.
30. Conrad C, Bradley HM, Broz D, et al. Community outbreak of HIV infection linked to injection drug use of oxymorphone—Indiana, 2015. MMWR Morb Mortal Wkly Rep 2015; 64:443–4.
31. Van Handel MM, Rose CE, Hallisey EJ, et al. County-level vulnerability assessment for rapid dissemination of HIV or HCV infections among persons who inject drugs, United States. J Acquir Immune Defic Syndr 2016; 73:323–31.
32. Weiser J, Brooks JT, Skarbinski J, et al. Adoption of guidelines for universal prescribing of antiretroviral therapy in the United States [Abstract 132]. 10th International Conference on HIV Treatment and Prevention Adherence. June 28–30, 2015 (Miami, FL). Available at: http://www.iapac.org/AdherenceConference/Adherence_2015.html. Accessed 28 June 2016.