



Preferences for implementation of HIV pre-exposure prophylaxis (PrEP): Results from a survey of primary care providers

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ABSTRACT

Primary care physicians (PCPs) are critical for promoting HIV prevention by prescribing HIV pre-exposure prophylaxis (PrEP). Yet, there are limited data regarding PCPs' preferred approaches for PrEP implementation. In 2015, we conducted an online survey of PCPs' PrEP prescribing and implementation. Participants were general internists recruited from a national professional organization. We examined provider and practice characteristics and perceived implementation barriers and facilitators associated with preferred models for PrEP implementation. Among 240 participants, the majority (85%) favored integrating PrEP into primary care, either by training all providers ("all trained") (42%) or having an onsite PrEP specialist ("on-site specialist") (43%). Only 15% preferred referring patients out of the practice to a specialist ("refer out"). Compared to those who preferred to "refer out," participants who preferred the "all trained" model were more likely to spend most of their time delivering direct patient care and to practice in the Northeast. Compared to participants who preferred the "refer out" or on-site specialist" models, PCPs preferring the all trained model were less likely to perceive lack of clinic PrEP guidelines/protocols as a barrier to PrEP. Most PCPs favored integrating PrEP into primary care by either training all providers or having an on-site specialist. Time devoted to clinical care and geography may influence preferences for PrEP implementation. Establishing clinic-specific PrEP protocols may promote on-site PrEP implementation. Future studies should focus on evaluating the effectiveness of different PrEP implementation models on PrEP delivery.

1. Introduction

Globally, an estimated 2.1 million adults are infected with HIV annually, including approximately 40,000 new HIV infections in the United States (U.S.) (Centers for Disease Control and Prevention, 2014; UNAIDS, 2016). To reduce HIV incidence, there is urgent need to optimize HIV prevention strategies. Emtricitabine-tenofovir (Truvada®), the only currently Food and Drug Administration (FDA) approved formulation for pre-exposure prophylaxis (PrEP), is an innovative HIV prevention strategy, which reduces HIV transmission by over 90% when taken consistently (Grant et al., 2010). Based on clinical trials in diverse

populations (Baeten et al., 2012; Choopanya et al., 2013; Grant et al., 2010; Thigpen et al., 2012), PrEP is recommended by international and national guidelines for use by people at substantial risk for HIV (U. S. Preventive Services Task Force et al., 2019; US Public Health Service, 2014; World Health Organization, 2015). Over 1.2 million Americans are estimated to be eligible for PrEP (Smith et al., 2015). However, < 90,000 individuals were actively prescribed PrEP as of 2016 despite its FDA approval in 2012 (Huang et al., 2018).

Primary care physicians (PCPs) are ideally situated to increase PrEP prescribing, given their role in disease prevention, routine access to individuals at substantial risk for HIV, and large representation in the

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physician work force (Silapaswan et al., 2016). Given this context, it is important to further examine PCPs' preferences surrounding PrEP implementation within their own clinical practices, including different models of training and coordination. Drawing from the substance use and behavioral health treatment literature, PrEP care could be incorporated into primary care practices through a range of approaches with varying levels of coordination, co-location, and integration (Heath and Reynolds, March 2013). Specifically, potential models of PrEP implementation include training all PCPs within a practice to provide PrEP care ("all trained"), having a single onsite PrEP specialist (to whom other PCPs in the practice could refer) ("on-site specialist"), or referring primary care patients to an offsite PrEP specialist ("refer out"). Previous data lend support for models of care that facilitate "shared care" across primary care and specialty care for long-term conditions (Smith et al., 2017).

Although PrEP has now been implemented in a range of settings (e.g. STI clinics, HIV clinics, and primary care) (Marcus et al., 2016), there are limited data on perspectives of PCPs regarding approaches to implementing and potentially integrating PrEP into Primary Care (Calabrese et al., 2016; Petroll et al., 2016). Thus, among a sample of PCPs, we sought to examine provider and practice characteristics associated with preferred models of PrEP implementation and perceived implementation facilitators and barriers associated with preferred PrEP implementation models. These data will serve to inform future efforts to promote PrEP in primary care.

2. Methods

2.1. Study participants and procedures

As previously described, we conducted a survey of academic general internists from April through May 2015 (Blackstock et al., 2016; Edelman et al., 2017). We recruited a convenience sample of practicing physicians who were members of the Society of General Internal Medicine (SGIM), a national society of approximately 3,000 general internists affiliated with United States-based academic institutions. Potential participants were recruited by informational materials distributed during the national annual meeting; emails sent through the online community forum for SGIM members; and direct e-mailings. Using Qualtrics® survey software, data were collected online over a six-week period. Eligible individuals included those who were SGIM members and provided direct or indirect (i.e., supervision of trainees in an outpatient setting) clinical care. Participants who completed the survey were offered entry into a raffle to win one of two Apple iPads.™ The study was reviewed and considered exempt by both Yale University and Albert Einstein School of Medicine's Human Investigation Committees.

For this analysis, we excluded duplicate surveys (based on the presence of the same Internet Protocol [IP] address and at least 80% duplication of responses). Additionally, we excluded those participants with missing data or who responded "other" for the outcome of interest.

2.2. Survey tool

Based on existing literature and a previously conducted provider survey (Lum et al., 2011), we developed the survey and then refined the items in an iterative fashion based on piloting with a diverse group of physicians, researchers, and community members with expertise in HIV prevention and treatment to create the *PCP PrEP Survey* (Blackstock et al., 2017; Edelman et al., 2017). After presenting brief background information about PrEP, providers were invited to complete a 57-item survey. This analysis focused on the following domains: 1) PrEP-related prescribing and related preferences, including preferred models for PrEP implementation (focus of the current analysis); 2) PCP socio-demographic, clinical, and practice characteristics; and 3) perceived barriers and facilitators to PrEP implementation. The full survey has

been previously published (Blackstock et al., 2017).

2.3. Measures

2.3.1. Preferred model for PrEP implementation

To determine PCPs' preferred model for PrEP implementation, we asked participants: *In your opinion, which approach do you think would be most feasible to implement PrEP into your clinical practice setting?* Mutually exclusive response options included: A) *All providers in the practice receive training to provide PrEP and prescribe to eligible patients;* B) *One provider in the practice is appointed as a PrEP specialist;* and C) *No providers in the practice receive training or provide PrEP; rather, patients are referred outside the practice,* or D) *Other*, which included an option for free text.

2.3.2. Other provider characteristics

We collected data on PCP characteristics, including age, race/ethnicity, gender, sexual orientation, current medical role, years in practice, and percent of time allocated to different professional activities (e.g., *direct patient care, research*). We also measured clinical and practice characteristics, including: practice location based on region of the country (*Northeast, Midwest, South, and West*) and urbanicity (*urban, suburban, or rural practice setting*), type of clinical setting (*clinic at an academic medical center, clinic at a public hospital, community health center, clinic or VA hospital, or other*), and main focus of the clinic (*primary care [no on-site HIV care], primary care with on-site HIV care, other*).

Our measure of perceived barriers and facilitators to PrEP implementation was developed based on the existing literature (Edelman and Fiellin, 2013; Underhill et al., 2010a, 2010b) and feedback from community members involved in HIV prevention research. Participants were asked to *Rate the degree to which each of the following is a potential barrier to/would facilitate your prescribing PrEP at your primary care clinic on a 4 point Likert scale ranging from 1 = not at all likely to be a barrier/to facilitate to 4 = extremely likely to be a barrier/to facilitate* (Text Box).

Text Box. Potential Barriers and Facilitators to PrEP Implementation.

Potential Barriers to PrEP Implementation	Potential Facilitators to PrEP Implementation
Lack of provider training/education regarding PrEP	Access to resources such as PrEP prescription guidelines and protocols
Lack of clinic guidelines/protocols for prescribing/monitoring PrEP	On-site support (i.e., risk reduction or adherence counselors, social workers)
Clinical and lab monitoring requirements (e.g. seeing patient and obtaining HIV tests and STI screening every 3 months; checking renal function every 6-months)	Practice or institutional willingness to implement new clinical protocols
Staffing/time constraints related to risk reduction and PrEP adherence counseling (also medication knowledge/counseling re: Truvada®, adverse effects, etc.)	Peers who are knowledgeable about or supportive of PrEP provision within your practice
Lack of insurance coverage and out-of-pocket patient costs for PrEP and related care (e.g. lab work)	

2.4. Statistical analysis

First, we used descriptive statistics to characterize the proportions of the sample preferring each type of PrEP implementation model as well as means and standard deviations for responses to items assessing barriers and facilitators to PrEP implementation. Second, to compare provider and practice characteristics by type of preferred PrEP implementation model ("all providers trained", "PrEP Specialist", or "refer out"), we used Chi-square tests for categorical variables and one-way Analysis of Variance (ANOVA) for continuous variables. Lastly, for the Likert scale outcomes of perceived barriers and facilitators to PrEP

Table 1
Participant characteristics, overall and by preferred PrEP implementation model.

Characteristic	Preferred PrEP Implementation Model				p value
	Overall (N = 240)	All Providers Trained (n = 103)	PrEP Specialist (n = 101)	Refer Out (n = 36)	
Age (years), mean (SD)	40.4 (9.4)	40.3 (9.8)	40.3 (9.2)	41.1 (9.0)	0.92
Race, % (n)					0.42
White	72 (158)	67 (62)	75 (71)	76 (25)	
Black	5 (11)	4 (4)	4 (4)	9 (3)	
Asian/Asian American	20 (43)	25 (23)	16 (15)	15 (5)	
Other	4 (9)	4 (4)	5 (5)	0 (0)	
Ethnicity, Hispanic, % (n)	8 (17)	10 (10)	5 (5)	6 (2)	0.37
Gender, Female, % (n)	63 (147)	62 (63)	62 (61)	68 (23)	0.24
Sexual orientation, % (n)					0.14
Heterosexual	93 (216)	90 (91)	94 (92)	100 (33)	
Gay/lesbian/bisexual/other	7 (16)	10 (10)	6 (6)	0 (0)	
Role, % (n)					0.18
Attending physician	78 (181)	72 (72)	83 (82)	79 (27)	
Fellow/resident	22 (52)	28 (28)	17 (17)	21 (7)	
Years in practice, % (n)					0.71
≤ 10	51 (89)	46 (32)	56 (44)	50 (13)	
> 10–15	20 (35)	22 (15)	20 (16)	15 (4)	
> 15	29 (50)	32 (22)	24 (19)	35 (9)	
Percent of time allocation, mean (SD)					0.02
Direct patient care	44.2 (29.2)	49.9 (29.8)^a	41.2 (28.1)	35.7 (27.5)^b	0.02
Research	21.5 (26.6)	18.9 (27.3)	21.2 (29.8)	30.2 (34.5)	0.16
Medical education	20.4 (19.2)	17.7 (16.3)	23.6 (20.4)	19.6 (22.4)	0.09
Administration	12.5 (16.8)	13.2 (16.5)	11.8 (17.8)	12.6 (15.5)	0.85
Other	1.4 (5.9)	0.4 (2.8)	2.2 (7.5)	1.9 (6.9)	0.09

Note: Boldface indicates statistical significance ($p < 0.05$). P value for overall test; significant post-hoc comparisons indicated by different superscripts (i.e. “a” indicates significant difference from “b”).

prescribing by preferred implementation model, we used Kruskal Wallis tests with post-hoc pair comparisons. We considered $p < 0.05$ to be statistically significant. All analyses were performed using SPSS/PASW 21.0 software (IBM Corporation, Somers, NY).

3. Results

3.1. Provider and practice characteristics

Among the 363 individuals who initiated the survey, we excluded those who were not SGIM members ($n = 64$), did not provide clinical care ($n = 12$), or had a duplicate survey ($n = 3$) (note: reasons not mutually exclusive). This reflected an estimated response rate of 9% of SGIM members who were sent a survey. We also excluded those surveys with a missing response to the outcome of interest ($N = 30$) or if the participant responded *other* ($n = 14$). Among the 240 remaining participants, the mean age was 40 years and the majority were white (72%), non-Hispanic (92%), and women (63%) (Table 1). The majority were attending physicians (78%), with < 10 years of practice (51%). The mean percent time delivering direct patient care was 44%, which was higher than time devoted to other activities such as research (22%) and medical education (20%).

Participants were most commonly located in the Northeast (49%) and practiced in urban settings (85%) and within academic medical centers (69%) (Table 2). Participants most commonly practiced in clinics where the focus was primary care, with no on-site HIV care (59%).

3.2. Preferred PrEP implementation model

Participants favored on-site models for integrating PrEP into primary care (85%) rather than referring patients out of the practice (“refer out”) (15%, $p < 0.001$), with similar support for training all providers (“all trained”) (42%) as having an onsite PrEP specialist (“onsite specialist”) (43%) (Table 1). Of the “other” responses ($n = 14$), most ($n = 12$) were a blending of “all trained” and “on-site specialist” such that a preference between the two options was not clear. The other

2 responses suggested other alternatives.

3.3. Overall perceived barriers and facilitators for PrEP implementation

Overall, lack of provider training/education regarding PrEP was perceived as most likely to be a barrier to PrEP implementation (mean [standard deviation (SD)] = 3.3 [0.9]) while clinical and lab monitoring requirements were perceived as least likely to be a barrier to PrEP implementation (mean [SD] = 2.3 [1.0]) (Table 3).

Overall, within a practice, on-site support (i.e., risk reduction or adherence counselors, social workers) (mean [SD] = 3.4 [0.8]) and peers who are knowledgeable about or supportive of PrEP provision were perceived as most likely to be facilitators to PrEP implementation (mean [SD] = (3.4 [0.8]) (Table 3). On the other hand, practice or institutional willingness to implement new clinical protocols was least likely to be perceived as a facilitator (mean [SD] = (3.1 [0.8]).

3.4. Factors associated with preferred PrEP implementation models

Compared to those who preferred the “refer out” model, those who preferred the “all trained” model spent a higher percent of their time dedicated to direct patient care (36% vs. 50%, $p = 0.02$) (Table 1). In addition, compared to participants preferring the “on-site specialist” model (44%) or the “refer out” model (32%), those who preferred the “all trained” model were more likely to practice in the Northeast (59%, $p = 0.02$) (Table 2). The pattern of responses revealed that participants in the West and Northeast overall favored the “all trained model”, while participants in the Midwest and South overall favored the “on-site specialist” model.

PCPs’ perceived barriers to PrEP implementation differed by their preferred implementation model ($p = 0.02$). As compared with those preferring an “on-site specialist” model, PCPs preferring the “all trained” model were less likely to perceive lack of clinic guidelines/protocol for prescribing/monitoring PrEP as a barrier to PrEP (2.7 [SD 1.0]) vs. 3.0 [SD 1.0], $p = 0.02$), as were those preferring a “refer out” model (2.7 [SD 1.0]) vs. 3.2 [0.8], $p = 0.02$). PCPs’ perceived facilitators to PrEP implementation did not differ by preferred PrEP

Table 2
Practice characteristics, overall and by preferred PrEP implementation model.

Characteristic	Preferred PrEP Implementation Model				p value
	Overall (N = 240)	All Providers Trained (n = 103)	PrEP Specialist (n = 101)	Refer Out (n = 36)	
Region of country, % (n)					0.002
West	18 (42)	20 (20)	11 (11)	32 (11)	
Midwest	15 (35)	12 (12)	16 (16)	21 (7)	
South	19 (44)	11 (11)	28 (28)	15 (5)	
Northeast	49 (114)	59 (59)^a	44 (44)^b	32 (11)^c	
Rurality/urbanicity of practice, % (n)					0.32
Urban	85 (200)	90 (92)	82 (81)	79 (27)	
Suburban	13 (30)	9 (9)	14 (14)	21 (7)	
Rural	2 (5)	1 (1)	4 (4)	0 (0)	
Main focus of clinic, % (n)					0.31
Primary care (no onsite-HIV care)	59 (139)	55 (56)	61 (60)	68 (23)	
Primary care with onsite HIV-care	34 (81)	41 (42)	31 (31)	24 (8)	
Other	6 (15)	4 (4)	8 (8)	9 (3)	
Type of clinical setting, % (n)					0.72
Clinic at an academic medical Center	69 (164)	71 (72)	69 (68)	71 (24)	
Clinic at public hospital	9 (22)	9 (9)	10 (10)	6 (2)	
Community health center	9 (21)	10 (10)	10 (10)	3 (1)	
Clinic at VA hospital	6 (14)	4 (4)	5 (5)	12 (4)	
Other	7 (17)	7 (7)	6 (6)	19 (3) 14 (5)	

Note: Boldface indicates statistical significance ($p < 0.05$). P value for overall test; significant post-hoc tests indicated by different superscripts (i.e. “a” indicates significant difference from “b” and both significant difference from “c”).

implementation model ($p = 0.52$).

4. Discussion

This is among the first studies to examine preferred models for PrEP implementation among a sample of PCPs and extends existing research by examining how these preferences relate to perceived barriers and facilitators to PrEP implementation. As the US Preventive Services Task Force recently issued guidance recommending that “clinicians offer PrEP with effective antiretroviral therapy to persons who are at high risk of HIV acquisition” as an “A recommendation,” our findings are timely and highly relevant as such guidelines directly inform insurance policies and help improve access to care (U. S. Preventive Services Task Force et al., 2019). Our study reveals several important findings relevant for future PrEP implementation efforts. First, 85% of PCPs preferred that patients received PrEP care within their clinical practice, rather than be referred out, with equal support observed for training all providers to deliver PrEP vs. designating an onsite PrEP specialist. Second, compared to a model of care that involves referring patients out of the practice for PrEP, PCPs who preferred that all providers be

trained to deliver PrEP were more likely to spend the majority of their time delivering direct patient care and practice in the Northeast. Third, we found that PCPs reported that the absence of clinic guidelines and protocols for PrEP implementation was an important barrier to PrEP implementation, but was perceived as less of one among those preferring the PrEP implementation model in which all PCPs were trained.

Given that PrEP adoption has been slower among PCPs relative to Infectious Disease specialists (Petroll et al., 2016), it is encouraging that PCPs prefer models of care that would lead to integrating PrEP into primary care (i.e. on-site). As PCPs vary in their range of comfort with performing clinical activities related to PrEP care, it is not surprising that among those who preferred on-site PrEP care, half preferred that all providers be trained while the other half preferred the option to refer to a designated onsite PrEP specialist. For example, a recent survey conducted across 10 U.S. cities demonstrated that only 59% of PCPs ($n = 278$) were somewhat or fully comfortable with all identified PrEP precursor activities (e.g., discussing sexual activities, ordering a diagnostic test for acute HIV, giving a patient a new HIV diagnosis, etc.) (Petroll et al., 2016). This same study found that 96% of PCPs were willing to refer PrEP candidates to other providers, 76% were willing to

Table 3
PCP's rating of likely barriers and facilitators to PrEP implementation, overall and by preferred PrEP implementation model.

	Overall (N = 240)	All Providers Trained (n = 103)	PrEP Specialist (n = 101)	Refer Out (n = 36)	p value
Barriers					
Lack of provider training/education regarding PrEP	3.3 (0.9)	3.2 (1.0)	3.4 (0.9)	3.3 (1.0)	0.16
Lack of clinic guidelines/protocol for prescribing/monitoring PrEP	2.9 (1.0)	2.7 (1.0)^a	3.0 (1.0)^b	3.2 (0.8)^b	0.02
Clinical and lab monitoring requirements	2.3 (1.0)	2.4 (1.0)	2.1 (1.0)	2.4 (1.0)	0.10
Staffing time constraints related to risk reduction and PrEP adherence counseling	2.7 (0.9)	2.7 (1.0)	2.6 (0.9)	2.9 (0.9)	0.31
Lack of insurance coverage and out-of-pocket patient costs for PrEP and related care	2.9 (1.0)	2.9 (1.1)	2.9 (1.0)	2.9 (1.0)	0.99
Facilitators					
Access to resources such as PrEP prescription guidelines and protocols	3.3 (0.8)	3.3 (0.8)	3.3 (0.8)	3.0 (0.8)	0.14
On-site support	3.4 (0.8)	3.4 (0.8)	3.5 (0.7)	3.3 (0.8)	0.51
Practice or institutional willingness to implement new clinical protocols	3.1 (0.8)	3.1 (0.9)	3.2 (0.9)	3.1 (0.8)	0.55
Peers who are knowledgeable about or supportive of PrEP provision within your practice	3.4 (0.8)	3.4 (0.8)	3.5 (0.8)	3.2 (0.9)	0.26

Notes: Boldface indicates statistical significance ($p < 0.05$). P value for overall test; significant post-hoc comparisons indicated by different superscripts (i.e. “a” indicates significant difference from “b” and both significant difference from “c”). Scores rated on 4-point Likert scale, where 1 = not at all likely to be a barrier/facilitator and 4 = extremely likely to be a barrier/facilitator.

prescribe PrEP, and 51% would accept patients referred for PrEP (Petroll et al., 2016). Consistent with the roll-out of other novel medications, such as the use of buprenorphine for the treatment of opioid use disorder (Edelman and Fiellin, 2013), the ideal model for integrating PrEP into primary care is likely to vary depending on the setting, provider preferences and experiences, and availability of other resources (Weiss et al., 2011).

Across several provider and practice characteristics, only the percent time allocated to different activities and practice's geographic location were associated with preferred model for PrEP implementation. Not surprisingly, PCPs who spent more time providing direct clinical care favored having a model of care in which all providers were trained to provide PrEP; those providing less direct clinical care, in contrast, favored a model for implementation in which patients were referred out. This may reflect a comfort or necessity with adopting new clinical protocols by those physicians spending more time in direct patient care, who may more often encounter patients needing or wanting PrEP. Similarly, our findings that providers in the Northeast are more likely to prefer that all providers be trained on PrEP is consistent with recent findings demonstrating significant variability in PrEP prescribing across cities. For instance, one study found that only 6% of PCPs in Miami reported prescribing PrEP vs. 36% of PCPs in New York City (Petroll et al., 2016). This may relate to differences in both organizational culture of clinics in these settings, in models for health care delivery that may facilitate one type of implementation model over others, and in the extent of PrEP outreach to PCPs by local departments of health (Ard et al., 2019). Importantly, there are relatively low rates of PrEP uptake in the South despite being the region with the highest number of new HIV diagnoses (AIDSvu). Therefore, given that reliance on specialists may further limit access to this HIV prevention intervention, it is concerning that the preferred model of care among respondents providing care in the South is having a PrEP specialist. Factors that drive such geographic differences in preferred PrEP models of care warrant further investigation.

Among our sample of PCPs, we identified several factors relevant for promoting PrEP implementation. First, lack of provider education and training was rated as the factor with the greatest likelihood to be a barrier to PrEP implementation overall and regardless of preferred model of implementation. This is consistent with prior work demonstrating that provider knowledge is an important factor in predicting future PrEP prescribing (Arnold et al., 2012; Blumenthal et al., 2015). Similarly, lack of clinical guidelines/protocols for prescribing/monitoring for PrEP was also perceived to be an important potential barrier, while having PrEP-knowledgeable peers was perceived to be an important potential facilitator. These findings likely reflect suboptimal knowledge of Centers for Disease Control and Prevention (CDC) guidelines for PrEP prescribing. In a large survey of primary care clinicians (n = 9,023), 31% of whom were internists, only 22% had read the CDC clinical practice guidelines in 2015, which had reflected a steady increase from the prior years (Smith et al., 2016). The fact that these clinicians most commonly (52%) indicated that formal CDC or United States Public Health Service guidelines would have the greatest influence on them to prescribe PrEP (Smith et al., 2016) underscores the importance of including such guidelines as a central component of provider education initiatives. Furthermore, our findings suggest that increasing knowledge of clinical guidelines and implementing clinical protocols for PrEP may impact provider preferences for how to best integrate PrEP into their clinical practice. That is, by providing guidelines and protocols, providers may be less likely to prefer to refer out and may feel more comfortable with on-site care. Since other PrEP dosing strategies (e.g. on-demand PrEP (Molina et al., 2015)) and modalities (e.g., injectable (McPherson et al., 2018)) may be available in the future, streamlining procedures to ensure that providers are up-to-date on the latest science and guidelines is essential. The use of a "local champion" has also demonstrated effectiveness and is likely an important method to promote implementation of novel evidence-based

practices such as PrEP (VA Mental Health, Queri). We also found that on-site support (i.e., risk reduction or adherence counselors, social workers) was perceived as an important facilitator to PrEP implementation regardless of preferred model for PrEP implementation. Multidisciplinary team members involving counselors, pharmacists, and/or nurses, will allow PrEP initiation and monitoring to be more feasible in busy primary care practices (Marcus et al., 2016; Silapaswan et al., 2016) and has been successfully implemented for addressing a range of health needs (Wagner et al., 2017; Weiss et al., 2011).

There are limitations to our study. First, this survey was conducted in 2015 and thus may not reflect recent temporal changes. As adoption of PrEP into clinical practice becomes more widespread and different models of implementation are tested and compared, preferences may evolve accordingly. Second, we surveyed a convenience sample of physicians affiliated with academic institutions and thus our findings may not be generalizable to academic-based physicians who chose not to participate in such a survey. Our response rate, however, parallels that observed in similar studies (Adams and Balderson, 2016; Krakower et al., 2015). Third, our findings may not be generalizable to non-academic and community-based physicians or other types of PCPs (e.g. family physicians, nurse practitioners). Fourth, our sample was largely composed of physicians practicing in urban settings and findings may not be generalizable to physicians practicing in rural and suburban settings. Fifth, as a cross-sectional study, we are unable to make causal inferences. Sixth, we assessed PCP perceptions regarding barriers and facilitators to PrEP prescribing rather than actual barriers and facilitators. Lastly, we provided textual descriptors to define end points of the PrEP barrier and facilitator continuous response scales (1 = not at all likely, 4 = extremely likely), but did not define the meaning of other response values along the continua (i.e., "2" and "3"), which may have led to differences in interpretation of those scale points and response selection among participants.

Despite these limitations, our study has important implications for implementing PrEP into primary care practices. First, given that there was equal support demonstrated by PCPs for having all providers trained or having a designated PrEP specialist, future studies should evaluate approaches for developing these models and compare patient outcomes. Second, regardless of how PrEP will be implemented in a primary care practice, provider education initiatives should emphasize presentation of existing PrEP clinical guidelines as well as strategies that enable the guidelines to be easily accessible (e.g., electronic medical record integration). Partnering with organizations that specialize in academic detailing may help facilitate this process (Avorn, 2017). Third, studies should evaluate use of innovative multidisciplinary care teams for PrEP implementation to optimize on-site support for PrEP delivery given PCP support for on-site PrEP implementation.

In conclusion, we found that the majority of PCPs favor integrating PrEP care into their primary care practices. Models of training all providers versus having a designated PrEP specialist were equally favored in our survey and should be tested in practice to optimize HIV prevention and reach the 1.2 million individuals estimated to be eligible for PrEP.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Disclosures

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