

Diffusion of Newer HIV Prevention Innovations: Variable Practices of Frontline Infectious Diseases Physicians

Douglas S. Krakower,^{1,2} Susan E. Beekmann,³ Philip M. Polgreen,^{3,4} and Kenneth H. Mayer^{1,2}

¹Division of Infectious Diseases, Beth Israel Deaconess Medical Center, and ²The Fenway Institute, Fenway Health, Boston, Massachusetts; Departments of ³Internal Medicine, and ⁴Epidemiology, University of Iowa Carver College of Medicine, Iowa City

Background. US Public Health Service guidelines recommend early initiation of antiretroviral treatment (ART) for human immunodeficiency virus infection (HIV)-infected patients and preexposure prophylaxis (PrEP) as a prevention option for persons at risk for HIV acquisition. Before issuance of these guidelines, few clinicians reported prescribing early ART or PrEP.

Methods. The Emerging Infections Network, a national network of infectious diseases physicians in the United States and Canada, was surveyed in September 2014 to assess practices of adult HIV-care providers with early ART, PrEP, and other guideline-recommended HIV prevention methods.

Results. Almost half of the 1191 active members invited (48.1%) participated; 415 (72.4%) were HIV-care providers. Most providers (86.5%) indicated that they typically recommended ART initiation at diagnosis, irrespective of CD4⁺ cell count. However, for patients with a CD4⁺ cell count >500/μL, clinicians would defer ART if patients did not feel ready to initiate ART (94.7%) or had uncontrolled substance abuse (66.0%). Many providers had counseled HIV-infected patients about PrEP for partners (59.0%) or offered visits for partners to discuss PrEP (40.7%), and 31.8% had prescribed PrEP. Clinicians who deferred ART were less likely to endorse and engage in aspects of PrEP provision.

Conclusions. Concordant with guidelines, most infectious diseases physicians recommend early ART, and many have experience with aspects of PrEP provision, suggesting recent evolution of clinician practices. Providers who defer ART are also cautious about PrEP. Interventions that help physicians motivate patients to initiate ART and identify missed opportunities to provide PrEP could enhance HIV prevention.

Keywords. HIV prevention; healthcare provider; early antiretroviral treatment; preexposure prophylaxis.

Because there are 50 000 new immunodeficiency virus infection (HIV) infections in the United States annually [1], implementing effective HIV prevention strategies is a public health priority. Recent studies have demonstrated that several biobehavioral interventions can greatly reduce HIV transmission. Early antiretroviral treatment (ART), in which HIV-infected persons start ART at the time of diagnosis, irrespective of immunologic status, can reduce HIV transmission within HIV-serodiscordant couples by 96% [2]. Observational studies of heterosexual and same-sex HIV-serodiscordant couples have also shown that HIV-infected persons who achieve virologic suppression with ART are unlikely to transmit HIV to partners [3]. Additional studies have demonstrated that preexposure prophylaxis (PrEP), the use of antiretroviral medications by HIV-uninfected persons at risk for acquiring HIV, can reduce HIV transmission for men and transgender women who have sex with men [4],

HIV-serodiscordant couples [5], heterosexual persons with multiple sexual partners [6], and persons who inject drugs (PWID) [7].

HIV treatment guidelines from the US Department of Health and Human Service have recommended early ART since 2012 [8]. In 2011, the Centers for Disease Control and Prevention (CDC) issued guidance recommending that clinicians consider prescribing PrEP to persons at risk for HIV acquisition [9], and in May 2014, the CDC released comprehensive guidelines recommending PrEP as an HIV prevention option [10]. Additional CDC guidelines also recommend that clinicians support efforts to reduce HIV transmission by facilitating access to risk-reduction interventions for PWID, including provision of sterile syringes and opiate substitution treatment, and by delivering behavioral risk-reduction counseling to HIV-infected patients at initial and subsequent clinical visits [11].

However, studies conducted before guidelines recommended early ART and PrEP found that few clinicians routinely prescribed ART irrespective of CD4⁺ cell count [12] and that few had prescribed PrEP [13]. Additional studies have found that a minority of HIV-care providers routinely deliver risk-reduction counseling [14] and that most do not feel prepared to provide substance abuse treatment to PWID [15]. Because infectious diseases specialists could play a pivotal role in implementing early ART, PrEP, and

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Correspondence: D. S. Krakower, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, 110 Francis St, Lowry Medical Office Bldg, Ste GB, Boston, MA 02215 (dkrakowe@bidmc.harvard.edu).

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other interventions to decrease HIV transmission, a national survey of infectious diseases physicians was conducted to assess clinicians' practices and experiences with early ART, PrEP, and other guideline-recommended HIV prevention strategies.

METHODS

Study Population

The Emerging Infections Network (EIN) is a provider-based network of infectious diseases physicians who are members of the Infectious Diseases Society of America and active in clinical practice. On 9 September 2014, an electronic or faxed confidential survey was sent to the 1320 EIN members practicing adult infectious diseases. Nonrespondents were sent 2 email reminders at weekly intervals. For comparisons between respondents and nonrespondents, only active members who had previously participated in ≥ 1 EIN survey ($n = 1191$) were included [16]. Respondents' practice characteristics (geographic location, employment setting, and years of practice) were imported from the EIN database. No incentives were provided.

Survey

A 9-item survey assessed practices and opinions regarding provision of early ART, PrEP, and additional HIV prevention interventions (Supplementary Appendix 1). Domains surveyed included HIV practice volume (number of HIV-infected patients treated in the prior year); practices with early ART (whether respondents generally recommended initiation of ART at diagnosis, irrespective of CD4⁺ cell count, or deferral of ART until CD4⁺ cell counts were $<500/\mu\text{L}$, <350 cells/ μL , or $<200/\mu\text{L}$; respondents also indicated reasons they would defer ART for CD4⁺ cell counts $>500/\mu\text{L}$); provision of PrEP to HIV-serodiscordant couples (decision making about PrEP for partners, assessed through clinical scenarios; respondents indicated whether counseling HIV-infected patients about PrEP for partners, or prescribing PrEP, should be part of their clinical role and whether they had counseled about or prescribed PrEP); decision making with patients (whether respondents believed that decisions about initiating ART or PrEP should be patient directed, provider directed, or shared equally); additional guideline-recommended HIV prevention practices (opinions about whether sterile syringes, opiate substitution therapy, or PrEP should be offered to PWID and whether providers felt adequately prepared to provide these interventions). Respondents also reported how frequently they had delivered risk-reduction counseling to newly diagnosed and established HIV-infected patients in the prior month [14]. Analyses were restricted to HIV-care providers (ie, those who had treated ≥ 1 HIV-infected patient in the prior year).

Statistical Analyses

Nonresponse bias was assessed by comparing geographic and practice characteristics of nonrespondents and respondents. To assess whether clinicians who recommended early ART differed from those who deferred ART, responses to survey items

were compared between these 2 groups of providers. Categorical variables were compared using χ^2 or Fisher exact tests. A multivariable logistic regression model was fit to assess for clinician factors associated with recommending early ART. Analyses were performed with SAS software (version 9.3; SAS Institute), and differences were considered significant at $P < .05$.

RESULTS

Survey Respondents

Of 1191 active members, 573 responded (response rate, 48%), of whom 415 (72%) were HIV-care providers. The sample was geographically diverse, with 28% from the South, 27% from the Midwest, 23% from the Northeast, 22% from the West, and 5% from Canada. Employment settings were also diverse, with 33% at universities or medical schools, 30% in private or group practice, 30% at hospital-based clinics, and 6% employed by the federal government, 1% by state governments, and 1% by the US Department of Veterans Affairs or the military. Infectious diseases practice experience was variable: 23% had <5 years of experience, 26% had 5–14 years, 27% had 15–24 years, and 24% had ≥ 25 years. The numbers of HIV-infected patients under direct care in the prior year ranged from 1–20 (17%) to 21–50 (25%) and >50 (58%). Respondents were more likely than nonrespondents to have ≥ 15 years of infectious diseases experience ($P < .001$). HIV-care providers and respondents who reported not treating HIV did not differ by practice characteristics. The response rate and demographic variation were similar to those in recent EIN surveys [13, 17].

Practices With Recommending Early ART

Most providers (87%) indicated that they typically recommended initiation of ART at diagnosis for HIV-infected patients, irrespective of CD4⁺ cell count (Table 1). However, some clinicians deferred ART until patients had CD4⁺ cell counts $<500/\mu\text{L}$ (11%) or $<350/\mu\text{L}$ (2%). Respondents who recommended early ART did not differ from those who deferred ART in terms of region, employment setting, years of practice, or volume of HIV-infected patients. Nearly all providers indicated reasons why they would defer ART for some patients with CD4⁺ cell counts $>500/\mu\text{L}$, with lack of patient readiness cited most frequently (95%). Additional reasons included uncontrolled alcohol or substance abuse (66%), insurance or financial constraints in paying for ART (49%), and untreated psychiatric illness (45%), among others (Table 1). A majority of providers (69%) believed that decisions about initiating ART should be shared equally between patients and providers (Table 1).

Provision of PrEP to HIV-Serodiscordant Couples

When providing care to members of HIV-serodiscordant couples who were sexually active and used condoms inconsistently, providers indicated they would recommend PrEP when the HIV-infected partner was viremic and either did not intend to initiate ART (80%) or had suboptimal adherence to ART

Table 1. Clinician Practices and Opinions Regarding Initiation of ART and PrEP

Practices and Opinions	Clinicians, No. (%) (n = 415)
Timing of ART initiation for typical HIV-infected patient	
At time of diagnosis, irrespective of CD4 ⁺ cell count	359 (86.5)
Defer until CD4 ⁺ cell count <500/μL	44 (10.6)
Defer until CD4 ⁺ cell count <350/μL	8 (1.9)
Defer until CD4 ⁺ cell count <200/μL	0 (0)
No response	4 (1.0)
Reasons to defer ART initiation for patient with CD4⁺ cell count >500/μL	
Patient unsure about readiness to initiate ART	393 (94.7)
Patient abusing alcohol or recreational drugs and not in recovery	274 (66.0)
Limited financial support to pay for ART or HIV care	204 (49.2)
Untreated depression or other psychiatric illness	188 (45.3)
Increased risk of ART-related toxic effects due to comorbid conditions	126 (30.4)
No HIV transmission behaviors	20 (4.8)
No response	8 (1.9)
Preferred approach to decision making about ART	
Shared decision between patients and providers	285 (68.7)
Patient-directed decision	107 (25.8)
Provider-directed decision	23 (5.5%)
Recommends PrEP for serodiscordant couples	
When HIV-infected partner is viremic and plans to defer ART indefinitely	330 (79.5)
When HIV-infected partner has intermittent viremia and low adherence to ART	312 (75.2)
When HIV-infected partner has undetectable viral load during ART	147 (35.4)
Would not recommend PrEP	27 (6.5)
Not sure	64 (15.4)
Typical approach to conception in serodiscordant couples^a	
Unsure	146 (35.2)
PrEP during periods of noncondom intercourse	100 (24.1)
Noncondom intercourse without PrEP	77 (18.6)
Sperm processing and assisted reproduction	67 (16.1)
None of the above	25 (6.0)
Preferred approach to decision making about PrEP	
Shared decision between patients and providers	209 (50.4)
Patient-directed decision	149 (35.9)
Provider-directed decision	34 (8.2)
No response	23 (5.5)

Abbreviations: ART, antiretroviral treatment; HIV, human immunodeficiency virus infection; PrEP, preexposure prophylaxis.

^a Couples including an HIV-infected man with an undetectable viral load during ART and an HIV-uninfected woman.

(75%) (Table 1). One-third of clinicians would also recommend PrEP when the HIV-infected partner had undetectable viremia. Providers reported diverse experiences with couples in which HIV-infected males with undetectable viremia and their HIV-uninfected female partners desired pregnancy. When asked about the approach to conception that these couples had generally used, 24% of clinicians reported that in addition to ART for the infected partner, couples had used PrEP during periods of

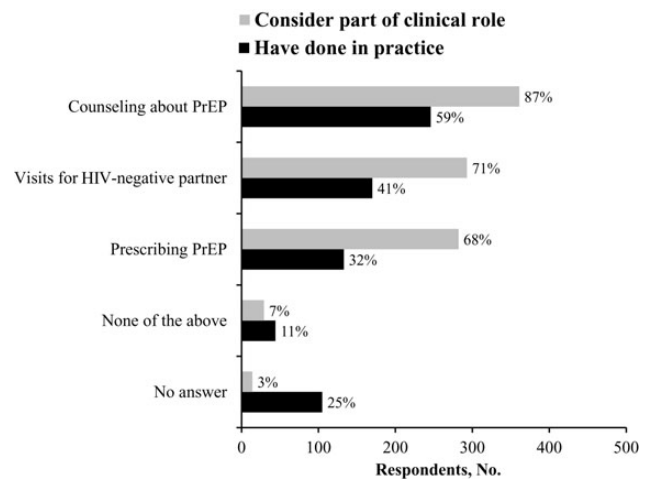


Figure 1. Opinions of human immunodeficiency virus infection (HIV) specialists and experiences regarding provision of preexposure prophylaxis (PrEP) to members of HIV-serodiscordant couples (n = 415). Respondents indicated whether they considered aspects of PrEP provision to be part of their clinical role, including counseling HIV-infected partners about PrEP, offering visits to HIV-uninfected partners to discuss PrEP, and prescribing PrEP. Clinicians also reported on their experiences with these aspects of PrEP provision. Most respondents perceived a duty to engage in aspects of PrEP provision, and many had counseled HIV-infected patients about PrEP, but only 1 in 3 had prescribed PrEP.

noncondom intercourse, while 19% reported noncondom intercourse without PrEP, and 16% reported sperm processing and assisted reproduction. Many respondents considered aspects of PrEP provision to be part of their clinical role, including counseling HIV-infected patients about PrEP for partners (87%), offering visits to HIV-uninfected partners to discuss PrEP (71%), and prescribing PrEP (68%) (Figure 1). Although 59% of providers had counseled HIV-infected patients about PrEP and 41% had offered visits to partners to discuss PrEP, only 32% had prescribed PrEP. Half of respondents would prefer that patients and providers share decisions about initiating PrEP (50%), and 36% believed that patient preferences should guide decision making.

Additional Guideline-Recommended HIV Prevention Practices

Many respondents indicated that PWID should be offered sterile syringes (80%) or opiate substitution therapy (68%) routinely, but few clinicians felt adequately prepared to provide these interventions (Figure 2). Fewer than half of providers (42%) expressed beliefs that PrEP should be offered routinely to HIV-uninfected PWID, and only 26% felt adequately prepared to prescribe PrEP to PWID. More than half of respondents did not respond to questions about preparedness to provide interventions to PWID. Seventy-six percent of clinicians reported delivering HIV transmission risk-reduction counseling to >90% of patients newly diagnosed with HIV infection, compared with 29% for patients with established infection (Figure 3).

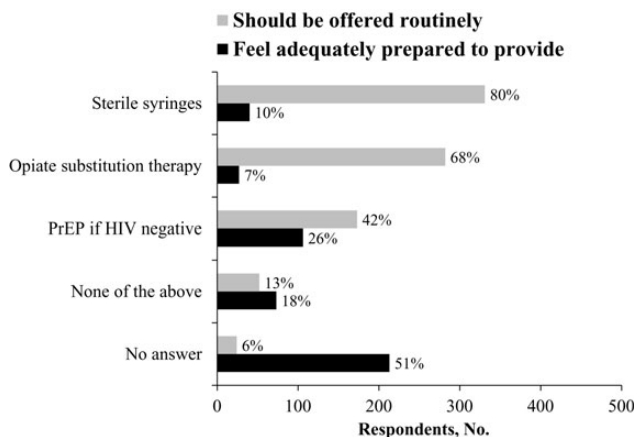


Figure 2. Opinions of human immunodeficiency virus infection (HIV) specialists and perceptions regarding provision of HIV prevention interventions to persons who inject drugs (PWID) (n = 415). Respondents indicated whether or not they agreed that several prevention interventions should be offered routinely to PWID, including sterile syringes, opiate substitution therapy, and preexposure prophylaxis (PrEP). They also reported whether they felt adequately prepared to provide each of these interventions. Many respondents supported provision of preventive interventions to PWID, but few felt prepared to provide these.

Differences in Practices of Clinicians Who Typically Deferred ART Compared With Those Who Recommended Early ART

Compared with providers who recommended early ART, clinicians who typically deferred ART were more likely to defer it for patients with financial barriers ($P = .02$) or comorbid conditions that could increase risks of medication toxic effect ($P = .008$) or

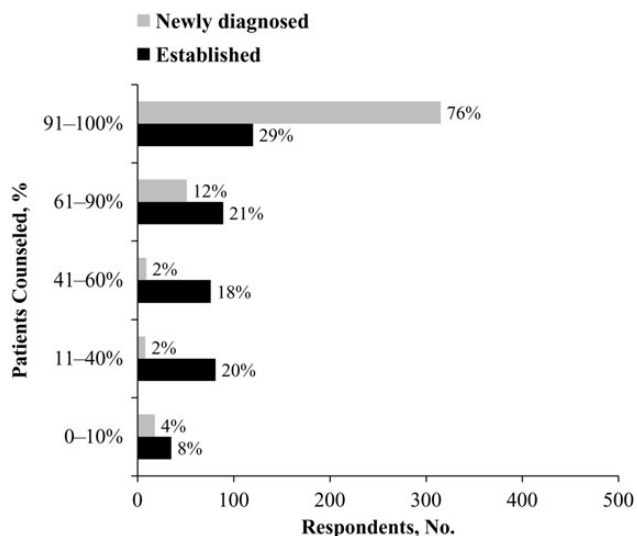


Figure 3. Practices of human immunodeficiency virus infection (HIV) specialists in delivering risk-reduction counseling to HIV-infected patients (n = 415). Respondents reported the percentages of patients with newly diagnosed or established HIV infection to whom they had delivered risk-reduction counseling in the prior month. They delivered counseling to a greater proportion of patients with newly diagnosed infection.

for those who do not report HIV transmission behaviors ($P < .001$) (Table 2). Clinicians who deferred ART were less likely than those who recommended early ART to perceive themselves as having a role in counseling HIV-infected patients about PrEP ($P = .002$), discussing PrEP with partners ($P = .01$), or prescribing PrEP ($P = .02$). Similarly, respondents who deferred ART were less likely to have counseled HIV-infected patients about PrEP or to offer visits for partners to discuss PrEP. However, clinicians who deferred ART were as likely to have prescribed PrEP as those who recommended early ART ($P = .41$). Respondents who deferred ART were less likely to indicate that PrEP should be offered to PWID ($P = .008$) or that they felt adequately prepared to prescribe PrEP to PWID ($P = .004$). Risk-reduction counseling practices did not differ between providers who deferred ART and clinicians who recommended early ART. A multivariable model that included geography, employment setting, years in practice, and volume of HIV-infected patients as independent variables did not demonstrate significant associations with recommending early ART (data not shown).

DISCUSSION

Infectious diseases physicians are uniquely positioned to decrease HIV transmission by providing early ART, PrEP, and other risk-reduction interventions to HIV-infected persons and their partners. In this national survey of infectious diseases physicians, 87% of HIV clinicians indicated that they routinely recommended early ART, as endorsed by US Department of Health and Human Service treatment guidelines [8]. A 2011 study of ART-prescribing clinicians in New York and Washington, DC, found that only 14% of respondents routinely prescribed ART at all CD4⁺ cell counts, though 75% would initiate ART earlier than otherwise indicated for patients in serodiscordant partnerships [12]. Because the 2011 study surveyed ART-prescribing clinicians from various professions (ie, not only infectious diseases physicians) and did not ask about initiation of ART at the time of diagnosis, the results from that study and our survey are not directly comparable. Nonetheless, our results do suggest that a substantial number of HIV-care providers have recently shifted their practices toward routine provision of early ART. Greater intentions to prescribe early ART could result from growing evidence supporting the transmission [2, 3] and personal health benefits of early ART [2, 18, 19] or guidelines recommending early ART [8].

We found that HIV clinicians believed they should take an active role in implementing PrEP, as recommended by CDC guidelines [10]. Many respondents perceived that they should counsel HIV-infected patients about PrEP, discuss PrEP with their partners, and prescribe PrEP. Because only 59% of the study sample had actually counseled HIV-infected patients about PrEP, and only 1 in 3 respondents had prescribed PrEP to partners, clinicians may still be missing opportunities to provide PrEP. However, in a survey of EID members conducted in 2013, only 9% of

Table 2. Significantly Different Survey Responses Between Clinicians Who Typically Recommended Early Antiretroviral Treatment (ART) and Those Who Deferred ART

Survey Item	Respondents by Timing of ART Initiation for Typical HIV-Infected Patient, No. (%) ^a			P Value ^c
	Defer ART (n = 52)	Early ART (n = 359)	Total (n = 411 ^b)	
Reasons to defer initiation of ART for patients with CD4⁺ cell counts >500/μL (n = 402)				
Patient unsure about readiness	51 (98.1)	339 (94.4)	390 (94.9)	.50
Untreated depression or psychiatric illness	30 (57.7)	157 (43.7)	187 (45.5)	.06
Abuse of alcohol or recreational drugs	40 (76.9)	231 (64.4)	271 (65.9)	.07
Limited financial support for ART/HIV care	33 (63.5)	167 (46.5)	200 (48.7)	.02
Comorbid conditions that increase risk of ART toxic effects	24 (46.2)	101 (28.1)	125 (30.4)	.008
No HIV transmission behaviors	12 (23.1)	8 (2.2)	20 (4.9)	<.001
Recommends PrEP for serodiscordant couples				
When HIV-infected partner defers ART and is viremic	39 (75.0)	288 (80.2)	327 (79.6)	.38
When HIV-infected partner has suboptimal adherence and intermittent viremia	36 (69.2)	274 (76.3)	310 (75.4)	.27
When HIV-infected partner has an undetectable viral load during ART	17 (32.7)	130 (36.2)	147 (35.7)	.62
Would not recommend PrEP	5 (9.6)	22 (6.1)	27 (6.6)	.36
Not sure	10 (19.2)	53 (14.8)	63 (15.3)	.40
Perceived clinical role with serodiscordant couples (n = 397)				
Counsel about PrEP	38 (73.1)	318 (88.6)	356 (86.6)	.002
Offer visit to discuss PrEP with HIV-uninfected partner	29 (55.8)	260 (72.4)	289 (70.3)	.01
Prescribe PrEP	28 (53.9)	251 (69.9)	279 (67.9)	.02
No role	8 (15.4)	21 (5.9)	29 (7.1)	.01
Experiences with serodiscordant couples (n = 307)				
Counseled about PrEP	21 (40.4)	223 (62.1)	244 (59.4)	.003
Offer visit to discuss PrEP with HIV-uninfected partner	14 (26.9)	154 (42.9)	168 (40.9)	.03
Prescribed PrEP	14 (26.9)	117 (32.6)	131 (31.9)	.41
None of the above	5 (9.6)	37 (10.3)	42 (10.2)	.88
Typical approach to conception in serodiscordant couples^d				
Sperm processing and assisted reproduction	16 (30.8)	50 (13.9)	66 (16.1)	.002
PrEP during periods of noncondom intercourse	10 (19.2)	89 (24.8)	99 (24.1)	.38
Noncondom intercourse without PrEP	6 (11.5)	70 (19.5)	76 (18.5)	.19
None of the above	5 (9.6)	20 (5.6)	25 (6.1)	.23
Unsure	15 (28.9)	130 (36.2)	145 (35.3)	.30
Belief about what PWID should be offered (n = 387)				
Sterile syringes	38 (73.1)	289 (80.5)	327 (79.6)	.21
Opiate substitution therapy	35 (67.3)	244 (68.0)	279 (67.9)	.92
PrEP (if HIV uninfected)	13 (25.0)	159 (44.3)	172 (41.9)	.008
None of the above	11 (21.2)	40 (11.1)	51 (12.4)	.04
Feels adequately prepared to provide PWID (n = 199)				
Sterile syringes	5 (9.6)	34 (9.5)	39 (9.5)	.97
Opiate substitution therapy	5 (9.6)	22 (6.1)	27 (6.6)	.34
PrEP (if HIV uninfected)	5 (9.6)	101 (28.1)	106 (25.8)	.004
None of the above	9 (17.3)	61 (17.0)	70 (17.0)	.95
Provided HIV risk-reduction counseling (n = 396)				
To >90% of patients with newly diagnosed infection	35 (67.3)	276 (76.9)	311 (75.7)	.31
To >90% of patients with established infection	16 (30.8)	103 (28.7)	119 (29.0)	.66

Bold values represent P values <.05.

Abbreviations: ART, antiretroviral treatment; HIV, human immunodeficiency virus infection; PrEP, preexposure prophylaxis; PWID, persons who inject drugs.

^a Percentages represent number of affirmative responses for each response item divided by the total number of study participants responding to the question about recommending early vs deferred ART (n = 411).

^b Totals <411 are indicated in Survey Item column.

^c Determined with χ^2 or Fisher exact test (for small cell sizes).

^d Includes an HIV-infected man with an undetectable viral load during ART and an HIV-uninfected female.

respondents had prescribed PrEP [13]. Therefore, our results suggest that rates of PrEP provision by infectious diseases physicians may have increased since the dissemination of CDC guidelines in May 2014.

Nearly all providers indicated reasons they would defer ART, with lack of patient readiness and uncontrolled substance abuse as frequently cited barriers, consistent with prior surveys of clinicians [12,20]. Providers therefore seem hesitant to prescribe ART to patients with high CD4⁺ cell counts when they anticipate suboptimal adherence. For these patients, clinicians may believe that early ART still carries potential risks (eg, promoting antiretroviral drug resistance) that need to be weighed against its known benefits. Many providers also believed that patient preferences should play a central role in whether or not patients initiate ART. These findings suggest a need for interventions to help providers communicate the benefits of early ART in a manner that is most likely to motivate ambivalent patients to initiate ART without delay. Our findings also suggest that providing HIV-infected patients with access to substance abuse treatment and mental health services could increase the likelihood that their providers would recommend early ART, in addition to the personal health benefits. Informing clinicians that many patients with psychosocial stressors can achieve virologic suppression with simplified ART regimens and adequate adherence support [21,22] could also enhance provision of early ART to these patients.

A potential barrier to implementing PrEP has been uncertainty about which providers should prescribe PrEP, including HIV specialists (who may encounter few HIV-uninfected patients), primary care providers (who generally have limited experience prescribing antiretroviral medications), or others [23]. Our finding that a majority of HIV clinicians perceived aspects of PrEP provision to be part of their clinical role suggests that networks of HIV specialists could be important partners in efforts to implement PrEP on a national scale. Promoting the visibility of HIV specialists who are “early adopters” of PrEP provision should also be prioritized, because these clinicians could act as trusted networks of local experts for less-experienced colleagues. Similar to other medical innovations [24,25], widespread diffusion of PrEP into care settings could hinge on local transfer of skills from early adopters to the general community of practitioners [26].

Respondents who routinely deferred ART were less likely to perceive themselves as having a role in PrEP provision than those who recommended early ART. Thus some providers may be “late adopters” of early ART and PrEP. Practitioner concerns about these strategies seem to be multifactorial, because providers who deferred ART were more likely than other respondents to cite financial constraints, potential toxic effects of medications, and absence of HIV transmission behaviors as reasons to defer ART, and they were less likely to feel prepared to offer PrEP for PWID. Interventions for late adopters may therefore need to address structural barriers to accessing ART where such barriers exist, provide information about the safety

and benefits of early ART and PrEP, and offer training and support to enhance clinicians’ readiness to prescribe PrEP.

Respondents generally supported offering preventive interventions to PWID, but few clinicians felt sufficiently prepared to provide these. Notably, many providers (up to 51%) did not answer questions about preparedness to deliver interventions to PWID. Missing responses to these questions were likely nonrandom, because most participants responded to adjacent questions about offering interventions to PWID. We interpreted these missing data as additional evidence that clinicians felt unprepared to provide interventions to PWID, consistent with prior surveys [15]. Our study did not collect data to ascertain whether providers would prefer additional training to provide interventions to PWID themselves or whether they would prefer referring patients to specialized programs. However, because outcomes of substance abuse treatment are improved when opiate-substitution therapy is provided in HIV clinics instead of opioid-treatment programs [27], infectious diseases physicians should be offered training, support, and encouragement to deliver interventions to PWID. These physicians may also encounter PWID for reasons unrelated to HIV, including bacterial infections associated with injecting practices and, increasingly, hepatitis C treatment [28,29], so training HIV clinicians to provide comprehensive preventive care to PWID could benefit these patients.

Guidelines recommend routine provision of risk-reduction counseling to HIV-infected patients, but respondents reported substantially lower rates of counseling for established patients than for new patients, similar to prior findings [14,30]. Identifying barriers to routine risk-reduction counseling by busy clinicians should be a priority, because studies have demonstrated ongoing sexual risk behaviors and incident sexually transmitted infections among some HIV-infected patients engaged in care [31]. Frequent risk-reduction counseling may be particularly important among subpopulations in which HIV transmission is potentiated by syndemic sexually transmitted infections [32,33].

This study has limitations. We recruited a convenience sample from EIN, a voluntary network of physicians within the Infectious Diseases Society of America, so the opinions and experiences of respondents may not be generalizable to all HIV-care clinicians or physicians who are not HIV-care providers. It is possible those who responded recognized the role of ART in HIV prevention as normative, hence were willing to invest time to complete the survey, compared with colleagues who did not think the issues were important (who reasonably would be more likely to be late adopters). Reported and actual prescribing practices could differ given recall bias, so objective assessments of clinician practices could provide more accurate data. Because the survey introduction summarized guideline recommendations for early ART and PrEP, social desirability bias could have influenced physicians to report practices consistent with these recommendations. Respondents completed surveys 4 months after publication of CDC guidelines regarding

PrEP, and provider behaviors may change gradually [34], so additional studies will be necessary to ensure up-to-date assessments of prescribing patterns.

The findings of this study suggest that most infectious diseases providers who are HIV specialists in the United States generally recommend early ART and that many also perceive a role for themselves in providing PrEP to partners of their HIV-infected patients. However, only 1 in 3 clinicians has prescribed PrEP to partners, many do not feel prepared to deliver protective interventions to PWID, and clinicians report infrequent delivery of risk-reduction counseling to HIV-infected patients. Because national networks of infectious diseases physicians could have a strong influence on uptake of early ART for HIV-infected persons, use of PrEP by their partners, and delivery of interventions for PWID, investing in interventions to optimize practices among frontline infectious diseases specialists could have an appreciable impact on the HIV epidemic.

Supplementary Data

Supplementary materials are available at <http://cid.oxfordjournals.org>. Consisting of data provided by the author to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the author, so questions or comments should be addressed to the author.

Notes

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References

- Prejean J, Song R, Hernandez A, et al. Estimated HIV incidence in the United States, 2006–2009. *PLoS One* **2011**; 6:e17502.
- Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med* **2011**; 365:493–505.
- Rodger A, Bruun T, Cambiano V, et al. HIV transmission risk through condomless sex if HIV⁺ partner on suppressive ART: PARTNER study [abstract 153LB]. In: Conference on Retroviruses and Opportunistic Infections (CROI). Boston, MA, 3–6 March 2014.
- 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**; 363:2587–99.
- 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.
- Thigpen MC, Kebaabetswe PM, Paxton LA, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. *N Engl J Med* **2012**; 367:423–34.
- 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.
- Department of Health and Human Services. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Available at: <http://aidsinfo.nih.gov/contentfiles/lvguidelines/adultandadolescentgl.pdf>. Accessed 21 March 2015.
- 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.
- 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 21 March, 2015.
- Project Workgroup for the 2014 Recommendations for HIV Prevention with Adults and Adolescents with HIV in the United States. Recommendations for HIV prevention with adults and adolescents with HIV in the United States, 2014. Available at: <http://stacks.cdc.gov/view/cdc/26062>. Accessed 21 March 2015.
- Kurth AE, Mayer K, Beauchamp G, et al. Clinician practices and attitudes regarding early antiretroviral therapy in the United States. *J Acquir Immune Defic Syndr* **2012**; 61:e65–9.
- Karris MY, Beekmann SE, Mehta SR, Anderson CM, Polgreen PM. 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.
- Metsch LR, Pereyra M, del Rio C, et al. Delivery of HIV prevention counseling by physicians at HIV medical care settings in 4 US cities. *Am J Public Health* **2004**; 94:1186–92.
- Cunningham CO, Kunins HV, Roose RJ, Elam RT, Sohler NL. Barriers to obtaining waivers to prescribe buprenorphine for opioid addiction treatment among HIV physicians. *J Gen Intern Med* **2007**; 22:1325–9.
- Pillai SK, Beekmann SE, Santibanez S, Polgreen PM. The Infectious Diseases Society of America emerging infections network: bridging the gap between clinical infectious diseases and public health. *Clin Infect Dis* **2014**; 58:991–6.
- Lane MA, Marshall J, Beekmann SE, et al. Outpatient parenteral antimicrobial therapy practices among adult infectious disease physicians. *Infect Control Hosp Epidemiol* **2014**; 35:839–44.
- Kitahata MM, Gange SJ, Abraham AG, et al. Effect of early versus deferred antiretroviral therapy for HIV on survival. *N Engl J Med* **2009**; 360:1815–26.
- INSIGHT START Study Group. Initiation of antiretroviral therapy in early asymptomatic HIV infection. *N Engl J Med* **2015**; 373:795–807.
- Beer L, Valverde EE, Raiford JL, Weiser J, White BL, Skarbinski J. Clinician perspectives on delaying initiation of antiretroviral therapy for clinically eligible HIV-infected patients. *J Int Assoc Provid AIDS Care* **2015**; 14:245–54.
- Bangsberg DR, Ragland K, Monk A, Deeks SG. A single tablet regimen is associated with higher adherence and viral suppression than multiple tablet regimens in HIV+ homeless and marginally housed people. *AIDS* **2010**; 24:2835–40.
- Malta M, Magnanini MM, Strathdee SA, Bastos FI. Adherence to antiretroviral therapy among HIV-infected drug users: a meta-analysis. *AIDS Behav* **2010**; 14:731–47.
- Krakower D, Ware N, Mitty JA, Maloney K, Mayer KH. HIV providers' perceived barriers and facilitators to implementing pre-exposure prophylaxis in care settings: a qualitative study. *AIDS Behav* **2014**; 18:1712–21.
- Berwick DM. Disseminating innovations in health care. *JAMA* **2003**; 289:1969–75.
- Yuan CT, Nembhard IM, Stern AF, Brush JE Jr, Krumholz HM, Bradley EH. Blueprint for the dissemination of evidence-based practices in health care. *Issue Brief (Commonw Fund)* **2010**; 86:1–16.
- Dearing JW, Norton WE, Larson RS. Next steps in designing for diffusion of pre-exposure prophylaxis: demonstration projects. *Am J Prev Med* **2013**; 44(1 suppl 2): S156–60.
- Lucas GM, Chaudhry A, Hsu J, et al. Clinic-based treatment of opioid-dependent HIV-infected patients versus referral to an opioid treatment program: A randomized trial. *Ann Intern Med* **2010**; 152:704–11.
- Ward JW, Valdiserri RO, Koh HK. Hepatitis C virus prevention, care, and treatment: from policy to practice. *Clin Infect Dis* **2012**; 55(suppl 1):S58–63.
- McGovern BH. Hepatitis C virus and the infectious disease physician: a perfect match [editorial commentary]. *Clin Infect Dis* **2012**; 55:414–7.
- Blair JM, Fagan JL, Frazier EL, et al. Behavioral and clinical characteristics of persons receiving medical care for HIV infection—Medical Monitoring Project, United States, 2009. *MMWR Surveill Summ* **2014**; 63(suppl 5):1–22.
- Mayer KH, Bush T, Henry K, et al. Ongoing sexually transmitted disease acquisition and risk-taking behavior among US HIV-infected patients in primary care: implications for prevention interventions. *Sex Transm Dis* **2012**; 39:1–7.
- Burchell AN, Allen VG, Moravan V, et al. Patterns of syphilis testing in a large cohort of HIV patients in Ontario, Canada, 2000–2009. *BMC Infect Dis* **2013**; 13:246.
- Notes from the field: repeat syphilis infection and HIV coinfection among men who have sex with men—Baltimore, Maryland, 2010–2011. *MMWR Morb Mortal Wkly Rep* **2013**; 62:649–50.
- Cocohoba J, Wang QJ, Cox C, et al. Consistency of initial antiretroviral therapy with HIV treatment guidelines in a US cohort of HIV-infected women. *J Acquir Immune Defic Syndr* **2008**; 47:377–83.