

Healthcare providers' knowledge, readiness, prescribing behaviors, and perceived barriers regarding routine HIV testing and pre-exposure prophylaxis in DeLand, Florida

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Abstract

Objectives: Florida ranks highest in the United States among newly diagnosed HIV infections. This ranking reflects the need for investigation of healthcare providers' knowledge, readiness, prescribing behaviors, and perceived barriers to routine HIV testing and pre-exposure prophylaxis.

Methods: We adapted national questionnaires with questions co-developed with Florida Department of Health to form a 25-item instrument. Questionnaires were distributed to the population of eligible healthcare providers in DeLand, Florida.

Results: Results from an approximate 20% response rate that encompasses 12 providers demonstrate baseline findings to inform future studies. For example, 75% of respondents were aware of FL Administrative Code 64D-3.042 that pregnant women should receive HIV testing during first and third trimesters. However, 50% of respondents rarely or never offer tests to pregnant women according to practice guidelines. About 75% of respondents strongly agree or agree with willingness to prescribe pre-exposure prophylaxis to high-risk patients, yet 8.3% always or very often prescribe pre-exposure prophylaxis.

Conclusions: Results convey the importance of and need for greater collaboration between providers and the Florida Department of Health to enhance providers' knowledge, readiness, and, ultimately, behaviors regarding routine HIV testing and pre-exposure prophylaxis prescription.

Keywords

Routine HIV testing, PrEP, provider knowledge, prescribing behaviors, provider-perceived barriers

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Introduction

Florida ranks first within the United States among newly diagnosed human immunodeficiency virus (HIV) infections in 2015, the most recent year of nationally collected surveillance data, with 4864 new diagnoses—over a 6% increase from the prior year.¹ In this same year, approximately 56% of new diagnoses in Florida occurred among those ages 20–39 years, with the 25–29 age range seeing the greatest proportion (16.9%) of new diagnoses across all ages. Nearly three-quarters of new diagnoses within Florida in 2015 occurred among blacks and Hispanics (42.8% and 30.8%, respectively). Among males, the majority (77.7%) of new diagnoses occurred among men who have sex with men (MSM), followed by heterosexual contact (17.1%); while

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among females, 89.7% of new cases occurred through heterosexual contact followed by injection drug use (IDU) (10.1%).² Florida also ranks third in the nation, behind New York and California, among people living with HIV/AIDS (PLWH).¹ Its rankings necessitate implementation of effective current preventive measures,^{3–9} as well as investigation of new prevention strategies.

In consultation with collaborators at the Florida Department of Health in Volusia County (FDOH-Volusia), the challenge of implementing effective preventive strategies was highlighted as a pressing countywide concern. Volusia County is located in north-central Florida on the eastern side of the state between 2 of the 10 leading metropolitan statistical areas in the United States with the highest rates of newly diagnosed HIV infections in 2015.¹ HIV testing prevalence throughout Florida, including Volusia County, based on Florida Behavioral Risk Factor Surveillance System (BRFSS) data, has remained relatively unchanged and has decreased in some cases over the past decade or more.^{10,11} Moderately low and decreasing levels of HIV testing^{10–12} coupled with relatively high and increasing HIV incidence, undiagnosed infections, and PLWH^{10–13} within the county, which also aligns with certain state^{1,10–12,14,15} and national^{1,14,15} trends, call for more in-depth assessments of current practices within the county.

HIV screening

There are nearly 18,000 PLWH in Florida who are unaware that they are infected;¹⁵ nationwide estimates show that about one in eight PLWH is unaware of their infection.¹⁴ Across the United States, those who are unaware of their infection are responsible for almost one-third of new infections.⁹ According to national Youth Risk Behavior Surveillance (YRBS) and BRFSS estimates, only 22% of sexually active high school students and 33% of sexually active young adults ages 18–24 have ever been tested for HIV. However, there has been a significant decline among young adult females, no change among young adult males, and no change among high school students regardless of gender in HIV testing prevalence in recent years.¹⁶ Over the last 5 years of surveillance (2011–2015) in Volusia County, HIV infections among 13–19-year-olds have been increasing.¹⁰ However, consistent with certain state^{10,11} and national¹⁶ trends, testing prevalence, not only within this age group, has either declined or shown no change.¹¹

In 2006, the Centers for Disease Control and Prevention (CDC) revised recommendations for HIV testing in all clinical public and private healthcare settings, including hospital emergency departments, urgent care centers, primary care offices, and other clinics.¹⁷ The revision includes an *opt-out* HIV screening recommendation, meaning that patients ages 13–64 years in all healthcare settings are recommended routine HIV screening on informing them that screening will occur, unless patients specifically decline testing.¹⁷ Patients

considered at high risk for HIV infection are recommended for annual HIV screening,¹⁷ and all pregnant women should be tested for HIV during routine prenatal screenings, with repeated screening during third trimesters within areas containing higher HIV infection rates,¹⁷ such as seen in Florida, including Volusia County.

In 2013, the US Preventive Services Task Force (USPSTF) also recommended routine HIV testing for all patients ages 15–65, in addition to those of any age who are at greater risk.¹⁸ Yet, healthcare providers throughout Florida, including Volusia County, have the option for their practices to *opt-out* or *opt-in* (i.e. patients must specifically request screening) regarding HIV testing. Despite prior HIV testing recommendations that required written or oral consent, revised recommendations state that “*separate written consent for HIV testing should not be required; general consent for medical care should be considered sufficient to encompass consent for HIV testing.*”¹⁷ Effective 1 July 2015, Florida statutes removed the requirement for healthcare providers to obtain written informed consent from patients for HIV testing.¹⁹

Despite the aforementioned USPSTF national recommendations, studies show rates of providers performing routine HIV screening ranging from 20%²⁰ to 61%.²¹ Evidence suggests that healthcare provider-perceived barriers affect (routine) HIV testing^{20–30} and prescription of preventive treatment^{31–41} to individuals who may be at high risk for infection. Provider-perceived barriers can include any event, situation, service, attitude, belief, practice, and so on—relating to the provider and his or her practice, patients, or other factors—that healthcare providers identify as obstacles to HIV testing and/or preventive treatment.

Recent studies identify numerous provider-perceived barriers to routine testing. Provider-related barriers include time constraints;^{20–28,30} lack of knowledge, experience, or appropriate training regarding HIV testing;^{20,22–24,26–30} competing health priorities during patients’ visits;^{21–25,28} perception that patients have low-risk for infection;^{20,21,23–30} stigma surrounding HIV;^{23,24,27,30} discomfort approaching the topic due to cultural, ethnic, or language differences with patients;^{20,21,24,25,27,28} general discomfort about discussing the topic or disrupting the provider-patient relationship;^{20,21,23,25–28,30} and inconsistent beliefs with recommendations or general uncertainty regarding the value or cost-effectiveness of routine testing.^{23,26,28,30} Providers have also identified barriers they perceive are important to their patients, including patient refusal;^{21–23,25,28} lack of patient confidentiality;^{23,27,28} stigma associated with HIV, particularly in socially conservative communities²³ or rural settings;^{23,24} and lack of patient-friendly educational materials regarding HIV testing.²⁷ Provider-perceived barriers related to policies, clinical facilities, or processes include informed consent processes;^{20–22,24–26,28–30} pretest counseling requirements;^{20–22,25,26,28} lack of or inadequate reimbursement;^{21–25,28} cost^{20,26,27} or generally insufficient resources;³⁰ lack of staff interest/initiative;^{26–28} unavailability of rapid testing;^{21,25} and inadequate

processes for follow-up visits and linkage to appropriate care.^{20,25,26,28,30}

Pre-exposure prophylaxis for HIV prevention

In addition to routine HIV testing, recommendations for preventive care were introduced in 2014 to curb transmission.⁴² Pre-exposure prophylaxis (PrEP), a US Food and Drug Administration (FDA)-approved preventive treatment for HIV, has been shown to reduce risk of HIV infection.^{43–46} Truvada, a PrEP medication, was first approved by the FDA in 2004 for treatment of PLWH; however, it was also FDA-approved in 2012 as the first PrEP to prevent risk of infection among HIV-negative individuals.⁴⁷ Nearly 50,000 individuals in the United States have begun taking Truvada as a PrEP.⁴⁸ Though considering the potential long-term benefits to population health, PrEP prescription has been relatively low (e.g. one large social networking site found that only 3.1% of 9000 MSM surveyed in 2014 had used PrEP,³³ and another national study showed that only 1774 people had used PrEP between January 2011 and March 2013³⁴).

In one US study conducted in 2015, only 38% of 604 family planning providers could correctly define PrEP, with the same proportion who could state the efficacy of the drug in clinical trials.³⁵ An even larger US study surveyed physicians and nurse practitioners over time and found that PrEP awareness increased from 24% in 2009 to 66% by 2015, though only 22% had read CDC PrEP prescribing guidelines that same year.⁴⁹ Additional results showed that PrEP prescription by providers was extremely low, ranging from 1% in 2012, when PrEP was FDA-approved, to 7% by 2015.⁴⁹

There are many barriers that providers perceive to affect their prescription of PrEP to patients. Lack of knowledge, training, or experience regarding PrEP,^{35,37,40} discomfort talking with patients about PrEP,^{32,33} and believing that PrEP should be primary care's responsibility^{31,32,40} are some barriers related to providers' experience. Providers perceive barriers to prescribing PrEP that focus on drug efficacy and effects to patients, including efficacy of PrEP in practice;^{31,32,37–39} potential toxicity to otherwise healthy individuals;^{31–33,39} potential future drug resistance;^{31,32,37,39–41} and side effects,^{37,40} more generally. There are also time constraints;^{31,36,39,40} difficulty implementing PrEP in practice, including logistic concerns;^{31,32,36,37,41} and limited drug availability concerns for infected individuals³⁷ that prevent providers from prescribing PrEP. Providers perceive barriers related to patient risk, including the perception that patients are not at high risk^{31,32,40} as well as concern over the potential increase in patients' risky behaviors.^{32,33,37,39–41} Finally, cost-related issues are a barrier for providers to prescribe PrEP, including costs to patients^{31–33,36,37,39,40} and cost-effectiveness or concerns that funds could be better spent on other prevention strategies.^{31,32,38,39}

Assessment in Volusia County, Florida

Among stakeholders in Volusia County, Florida—including collaborators at the FDOH-Volusia and academic public health researchers, interest focuses on assessing healthcare providers' knowledge, perceptions, readiness, prescribing behaviors, and potential barriers of HIV testing and PrEP, particularly as nearly three-quarters of new HIV diagnoses among Volusia residents in 2017 occurred at county health department locations (29.27%), followed by hospitals (21.96%), healthcare providers' offices (18.3%), and infectious disease specialists' locations (3.66%).⁵⁰ While more is known throughout the eastern side of the county, where the health department is located, there is a need to assess and address potential barriers that may exist in the western side of the county—in DeLand, which also serves as the county seat. Therefore, identifying and addressing barriers affecting providers' practice of routine HIV screening and preventive treatment to high-risk patients is key to implementing change. Through this population-based assessment of DeLand healthcare providers, baseline information can be identified regarding the current status within the community. This, in turn, can guide leaders at the FDOH-Volusia, in collaboration with community partners, to begin addressing important findings from the assessment, such as areas for greater provider training or development of more effective strategies for facilitating increased routine HIV screening and PrEP prescription.

Methods

The population of licensed healthcare providers practicing in DeLand, between January and March of 2017, within infectious diseases, family/general practices, obstetrician/gynecologist (OB/GYN) practices, university healthcare services, the hospital emergency department, and urgent care centers was assessed. A provider list containing contact information across 33 practices/locations was created through online searches and a current provider directory,^{51,52} by which authors cross-checked provider details.

A 25-item questionnaire was developed by adapting items from instruments of related previous studies,^{23,25,35,49} with additional questions created in collaboration with FDOH-Volusia co-authors based on gaps in information within the county. Questions pertained to provider knowledge, perceptions, readiness, prescribing behaviors, and barriers regarding HIV testing and PrEP. Provider demographic and background characteristics were also collected. The questionnaire was vetted through FDOH-Volusia co-authors for feedback and edits, in addition to further FDOH-Volusia staff focused on HIV/AIDS (see Acknowledgments), and was tested by investigators for completion length and readability. Investigators estimated an approximate 5-minute completion time. The final questionnaire was formatted

Table 1. Top panel: Provider eligibility and/or reasons for ineligibility for study participation identified during initial recruitment calls. Bottom panel: Provider preferences for informed consent and questionnaire delivery among eligible providers.

Provider eligibility and/or reason for ineligibility	Count (N)	Percentage among contacted providers (%)
Eligible Providers	62	75.61
Ineligible Providers*	20	24.39
Total Providers Contacted	82	100
*Reasons for Ineligibility		
Moved/Not in DeLand	15	18.29
Non-eligible practice (dermatology only)	1	1.22
Retired	2	2.44
Phone Disconnected/No Address	2	2.44
Preferred method for questionnaire delivery among eligible providers	Count (N)	Percentage among contacted (vs eligible) providers (%)
Mailed (Postal)	32	39.02 (51.61)
E-mailed	26	31.71 (41.94)
Faxed ^a	6 ^a	7.32 ^a (9.68 ^a)
Not Interested (did not send questionnaire)	4	4.88 (6.45)
Total Eligible Providers	62	75.61 (100)

^aThose faxed had initially been mailed (postal), but office managers indicated in follow-up calls that they had not received informed consents and questionnaires (or that providers misplaced them) and would like to receive them by fax. These are not included in the total count, as they were already counted with those via postal mail.

both as a hard copy that would be mailed (postal and e-mail) or faxed and via an online format using a SurveyMonkey link.

Ethics statement

The study was approved by the Stetson University Institutional Review Board in December 2016 to begin in January 2017.

Survey administration/data collection

Scripts were developed for all interactions related to the study. Initial calls were made in late January 2017 to introduce the study, confirm the number of licensed healthcare providers at each practice/location, and, as a convenience to providers, inquire as to which questionnaire format/delivery method providers prefer (i.e. online via SurveyMonkey, fax, or a mailed hard copy). Based on preferences, informed consents and questionnaires were e-mailed or mailed with return self-addressed stamped envelopes included to facilitate participation.

Investigators conducted multiple participation reminder calls/e-mails to all providers' offices between early February and mid-March 2017. During final follow-up calls/e-mails, office managers were reminded of the mid-March participation deadline. For those offices that could not be reached after numerous calls/e-mails, in-person visits to providers' offices were conducted. Data collection was completed on March 17. Responses were kept confidential and de-identified.

Data analysis

Data collected from online questionnaires were exported to a spreadsheet, and all hard copy questionnaire responses were recorded therein, and cross-checked, by investigators for data entry accuracy. SPSS was used to perform descriptive statistical analyses of providers' demographics, knowledge, perceptions, readiness, prescribing behaviors, and barriers of HIV testing and PrEP.

Results

Upon calls to the aforementioned 33 licensed providers' offices/locations in DeLand, the population was determined to be 82 healthcare providers. However, 20 providers were ineligible (e.g. retired, no longer practicing in DeLand), resulting in an eligible population size of 62 providers meeting inclusion criteria (Table 1). The majority preferred informed consents and questionnaires to be delivered via postal mail (N=32; 51.6%), followed by e-mail with a link to the online questionnaire (N=26; 41.9%), and four providers (6.5%) responded with no interest and preferred not to receive the questionnaire. Among the population of 62 eligible providers, 12 responses were received resulting in a nearly 20% response rate.

Provider demographics and clinical background

Table 2 presents providers' demographic characteristics and general clinical background. Of the 12 respondents, 66.7%

Table 2. Providers' demographic characteristics and general clinical background (n = 12).

Demographic/clinical background factors	Frequency (n)	Percentage (%)
Age (years)		
31–40	4	33.3
41–50	2	16.7
51–60	1	8.3
61–70	3	25.0
71 and over	2	16.7
Sex		
Male	8	66.7
Female	4	33.3
Race/Ethnicity		
American Indian, Alaska Native, or Native Hawaiian	0	0.0
Asian or Pacific Islander	2	16.7
Hispanic/Latino	1	8.3
Non-Hispanic Black/African American	1	8.3
Non-Hispanic White	7	58.3
Other	1	8.3
Years in Practice		
Less than 5	1	8.3
5–9	1	8.3
10–14	2	16.7
15–19	2	16.7
20–24	1	8.3
25 or more	5	41.7
Clinic Affiliation		
Primary Care/General Practice/Family Medicine	5	41.7
Obstetrician/Gynecologist (OB/GYN)	2	16.7
Hospital	1	8.3
Urgent Care	2	16.7
Other	2	16.7
Average Number of Patients Seen Daily		
1–4	0	0.0
5–9	0	0.0
10–19	4	33.3
20–29	5	41.7
30–39	1	8.3
40 or more	2	16.7
Clinical Specialty		
Infectious Disease Consultant	2	16.7
Family/General Practitioner	5	41.7
OB/GYN	2	16.7
Internist	1	8.3
Physician Assistant	1	8.3
Missing	1	8.3

were male and 58.3% self-identified as non-Hispanic white. Exactly half of participants reported being between 31 and 50 years old. Half had practiced medicine for at least 20 years, and all respondents reported seeing an average of at least 10 patients daily. The largest response from any clinic affiliation occurred among primary care/general practice/family medicine (41.7%), aligning with the proportion of providers reporting a clinical specialty of a family/general practitioner. Two providers (16.67%) were from OB/GYN practices; two providers (16.67%) were from urgent care clinics; another two providers (16.67%) self-identified as infectious disease consultants; and another provider (8.3%) was affiliated with an “other” clinic.

Providers' knowledge regarding certain aspects of HIV testing and PrEP clinical practice guidelines

Table 3 summarizes providers' reported knowledge of certain aspects surrounding HIV testing and the CDC's 2014 PrEP clinical practice guidelines.⁴² All providers correctly identified primary behaviors defining “high-risk” patients for HIV infection. Seventy-five percent reported awareness of Florida Administrative Code 64D-3.042, which mandates providers to offer pregnant women HIV testing during first and third trimesters. Of the 25% (i.e. three providers) unaware of the Florida statute, two self-identified with a primary care clinic affiliation; however, one of these indicated not treating pregnant women. One provider affiliated with an “other” clinic did not respond.

Two-thirds of providers correctly defined PrEP. Among the remaining one-third of providers incorrectly defining PrEP, two providers each gave two responses, one of whom provided one correct and one incorrect response, resulting in an unclear assessment of PrEP knowledge and was included among those incorrectly defining PrEP. Just over half of providers (58.3%) reported having read the CDC's 2014 PrEP clinical practice guidelines, and only 41.7% of providers correctly identified PrEP prescribing recommendations focused on high-risk patient populations (i.e. the 2014 CDC clinical practice guidelines state that all adults at high risk for contracting HIV should be prescribed PrEP).⁴² Among those who read the guidelines, 57.1% correctly defined PrEP and correctly identified PrEP prescribing recommendations. Of the nearly 43% (i.e. three providers) remaining who read the guidelines: one primary care provider incorrectly defined PrEP and incorrectly identified prescribing recommendations; one provider with an “other” clinic affiliation incorrectly defined PrEP and did not provide a response for identifying prescribing recommendations; and one OB/GYN correctly identified prescribing recommendations, though it was unclear whether the provider could correctly define PrEP (i.e. this was the aforementioned participant who

Table 3. Providers' knowledge regarding HIV testing and PrEP clinical practice guidelines (n = 12).

Knowledge assessment	Frequency (n)	Percentage (%)
Awareness of FL Administrative Code 64D-3.042 (offering pregnant women HIV testing during first and third trimesters)		
Yes	9	75.0
No	2	16.7
Missing	1	8.3
Knowledge of high-risk patient identifiers		
Unprotected sex	0	0.0
Diagnosis of another sexually transmitted infection (e.g. gonorrhea, chlamydia, syphilis)	0	0.0
Injection drug use	0	0.0
HIV + partner	0	0.0
All the above	12	100.0
What is pre-exposure prophylaxis (PrEP)?		
A preventive medicine, taken daily, for HIV negative adults who are at high risk of exposure to the virus	8	66.7
A preventive medicine taken within 72 hours of exposure to HIV	2	16.7
A medicine for HIV positive adults who have had the virus for some time	0	0.0
None of the above	0	0.0
I have never heard of PrEP	0	0.0
Multiple responses ^a	2 ^a	16.7 ^a
Have you read CDC's 2014 PrEP clinical practice guidelines?		
Yes	7	58.3
No	5	41.7
Which are included within the CDC's 2014 clinical practice guidelines?		
Providers have discretion as to who may be prescribed PrEP	0	0.0
PrEP should only be prescribed to adults with HIV + partners	0	0.0
PrEP should be prescribed to all adults at high risk for contracting HIV	5	41.7
There are no specific guidelines regarding the administration of PrEP	0	0.0
I do not recall	0	0.0
I have not read the guidelines	5	41.7
Missing	1	8.3
Multiple responses ^b	1 ^b	8.3 ^b

^aTwo providers selected multiple responses: one provider selected "A preventive medicine, taken daily, for HIV negative adults who are at high risk of exposure to the virus" and "A preventive medicine taken within 72 hours of exposure to HIV"; the other provider selected "None of the above" and "I have never heard of PrEP."

^bOne provider selected two responses: "Providers have discretion as to who may be prescribed PrEP" and "PrEP should only be prescribed to adults with HIV + partners."

provided both a correct and incorrect response, so it was counted as an incorrect response).

Providers' willingness/readiness regarding PrEP

All providers reported willingness to discuss PrEP with high-risk patients. Half of them reported strongly agree and half reported agree (Table 4). However, fewer providers (75%) reported willingness to actually prescribe PrEP to high-risk patients. About 33.3% reported strongly agree and 41.7% reported agree. One-quarter of providers were undecided. All providers who were undecided about their

willingness to prescribe PrEP were in primary care practicing for less than 15 years.

Providers' practices regarding HIV testing and PrEP prescription

Table 5 summarizes results regarding providers' HIV testing and PrEP prescription behaviors. Only half of providers reported always or very often asking adult patients about their sexual activity. Among the half of providers who sometimes or rarely ask about patients' sexual activity, two-thirds have a clinic affiliation/specialty in family/general practice. Two-thirds of providers reported always or very

Table 4. Providers' willingness/readiness regarding pre-exposure prophylaxis (PrEP) (n = 12).

Provider willingness/readiness	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Provider willingness to discuss PrEP with high-risk patients	6 (50.0%)	6 (50.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Provider willingness to prescribe PrEP to high-risk patients	4 (33.3%)	5 (41.7%)	3 (25%)	0 (0.0%)	0 (0.0%)

Table 5. Behaviors/practices regarding providers' HIV testing and pre-exposure prophylaxis (PrEP) prescription (n = 12).

Behavior/practice	Always	Very often	Sometimes	Rarely	Never
Ask adults about their sexual activity	3 (25.0%)	3 (25.0%)	5 (41.7%)	1 (8.3%)	0 (0.0%)
Offer HIV test to sexually active adults who have not previously been tested for HIV	4 (33.3%)	4 (33.3%)	1 (8.3%)	2 (16.7%)	1 ^a (8.3%)
Offer HIV test to adults seeking treatment for another sexually transmitted infection	9 (75.0%)	1 (8.3%)	1 (8.3%)	0 (0.0%)	1 ^a (8.3%)
Offer HIV test to pregnant women	5 (41.7%)	1 (8.3%)	0 (0.0%)	3 (25.0%)	3 ^b (25.0%)
Offer HIV test to men who have sex with men	5 (41.7%)	1 (8.3%)	3 (25.0%)	0 (0.0%)	3 ^c (25.0%)
Offer HIV test to adults starting tuberculosis treatment	8 (66.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 ^d (33.3%)
Discuss PrEP with high-risk patients	2 (16.7%)	4 (33.3%)	0 (0.0%)	2 (16.7%)	4 (33.3%)
Prescribe PrEP to high-risk patients	1 (8.3%)	0 (0.0%)	3 (25.0%)	1 (8.3%)	7 (58.3%)
Refer high-risk patients to an HIV (or infectious disease) specialist after a positive test result	8 (66.7%)	2 (16.7%)	1 (8.3%)	1 (8.3%)	0 (0.0%)

^aThis primary care provider stated that clinic policy is to refer patients to the Florida Department of Health-Volusia County (FDOH-Volusia) for HIV testing.

^bAll three providers were in primary care. Two of them stated they do not see/treat pregnant women, while the third stated that clinic policy is to refer patients to the FDOH-Volusia for HIV testing.

^cTwo providers were OB/GYNs who do not see male patients, while the third stated that clinic policy is to refer patients to the FDOH-Volusia for HIV testing.

^dThree providers were in primary care, two of whom stated that they do not see tuberculosis patients (or have "not seen any for a long time"), while the other stated that clinic policy is to refer patients to the FDOH-Volusia for HIV testing. Finally, one provider was an OB/GYN.

often offering HIV tests to sexually active adults who had not been previously tested for HIV, while the remaining one-third reported sometimes, rarely, or never doing so. Of this one-third, all providers were either affiliated with or gave a clinical specialty in primary care/general practice; however, one of them stated that clinic policy is to refer all patients to the FDOH-Volusia for HIV testing. Just over 83% of providers reported always or very often offering HIV tests to adults seeking treatment for another sexually transmitted infection (STI). One respondent (8.3%) reported never offering testing to such patients, though again, this was the respondent who indicated that clinic policy refers all patients to the FDOH-Volusia. One more provider selected sometimes and was affiliated with a primary care clinic. Just over 83% of providers always or very often refer high-risk patients to an HIV (or infectious disease) specialist after a positive test result.

Fifty percent of providers reported offering HIV tests to pregnant women (41.7% always and 8.3% very often). Among the 50% never, rarely, or sometimes doing so, half stated that they do not see/treat pregnant women, one-third were affiliated with primary care yet rarely offer pregnant women HIV

testing, and one provider (16.7%) stated clinic policy to refer patients to the FDOH-Volusia.

Among the 10 providers who see male patients (i.e. those who were *not* OB/GYNs), 60% reported always or very often offering HIV tests to MSM, while one such provider reported never doing so—again, according to clinic policy for referrals to the FDOH-Volusia, and 30% responded sometimes—all of whom practice in primary care.

Eight providers (66.7%) reported always offering HIV tests to adults starting tuberculosis (TB) treatment. One-third reported never doing so: three of the four providers were in primary care and either reported not treating TB patients (or not doing so for a long time) or stating clinic policy to refer patients to the FDOH-Volusia. One provider is an OB/GYN, thus implying not treating TB patients.

Regarding PrEP, 50% of providers reported always or very often discussing PrEP with high-risk patients. Two-thirds of the remaining half reported never discussing PrEP with high-risk patients, with three of the four affiliated with primary care and one with an OB/GYN practice. One of these primary care providers indicated that there were "no suitable patients." The remaining one-third reported rarely

discussing PrEP with high-risk patients, and both of these providers' affiliations are in primary care. Only one provider (8.3%) reported always prescribing PrEP to high-risk patients, and three providers (25.0%) reported sometimes doing so. Yet, over half (58.3%) reported never prescribing PrEP to high-risk patients, and an additional provider (8.3%) reported rarely doing so. Among these two-thirds who never or rarely prescribe PrEP, 75% (six providers) are affiliated with primary care clinics, one with an urgent care center, and one with an OB/GYN practice.

Of providers who reported reading the 2014 CDC PrEP guidelines, only one provider reported always prescribing PrEP. The remaining such providers reported sometimes (42.9%) or never (42.9%) prescribing PrEP.

Provider-perceived barriers to asking patients about sexual activity and HIV testing behaviors

One-third of providers identified barriers to asking about patients' sexual activity and offering HIV testing to high-risk patients. These were barriers attributed to sometimes, rarely, or never responses to the first six provider behaviors/practices listed in Table 5. Barriers that all four respondents identified were providers' perception that most patients are at low risk for HIV and other health priorities for patients during visits.

While every barrier (see Supplemental Table I) listed in these closed-response questionnaire items (with the exception of an open-ended response for "other") was identified at least as a low priority by at least one of the four respondents, several barriers were selected as high priorities among at least one of these providers, including providers' perception of patients as low-risk and patients generally not having high-risk behaviors; patient reluctance/refusal; and provider perception that HIV is not a major issue in the community. Five additional providers gave open-ended responses: three providers indicated that they selected never or rarely for offering pregnant women an HIV test because they do not have/see/treat pregnant women (these providers were in primary care); one OB/GYN noted only caring for women to explain the never responses for offering HIV tests to MSM and TB patients; and one provider in an "other" clinic affiliation stated that their clinic policy is to refer patients to the health department for any HIV testing, though this provider also responded to only sometimes asking patients about sexual activity. Another provider who rarely asks patients about their sexual activity did not identify any barriers for so doing. All other providers listed barriers to their reasons for sometimes, rarely, or never responses.

Provider-perceived barriers to PrEP willingness/readiness and prescription

One-third of providers identified perceived barriers to their willingness/readiness to discuss or prescribe PrEP and their

actual discussion and prescription of PrEP (see Supplemental Table II). Similar to barriers identified for HIV testing, the most commonly selected barrier regarding PrEP was providers' perception that patients generally do not have high-risk behaviors.

Of the nearly all (11 of 12 providers, or 91.7%) who selected sometimes, rarely, or never regarding discussion and prescription practices about PrEP with patients, only 4 (36.4%) identified barriers relating to their practices. An additional three providers indicated "other" barriers: one primary care provider never prescribes PrEP due to referring such patients to an infectious disease specialist; one urgent care general practitioner rarely sees high-risk patients, thus rarely prescribes PrEP; and one provider in an "other" clinic affiliation justifies rarely discussing PrEP and never prescribing PrEP because the clinic is "not a PCP clinic" and "does not do follow-up" (this provider also indicated a response of undecided regarding willingness to prescribe PrEP). There were four (36.4%) remaining providers who did not provide reasons for only sometimes, rarely, or never discussing or prescribing PrEP to patients.

High-priority barriers, some of which are identical to those regarding barriers to HIV testing, include provider perception that patients generally do not have high-risk behaviors; other health priorities for patients; lack of training in how to offer PrEP; and providers' perception that PrEP prescription is not their job and that someone else is doing it. Additional barriers were identified as moderate and low priorities (see Supplemental Table II).

Of the two additional providers—both in primary care—who indicated they were undecided in their willingness to prescribe PrEP to high-risk patients, one usually refers such patients to an infectious disease specialist while the other identified 21 barriers with low, moderate, and high priorities, with the high priority barrier that it's not the provider's job and someone else is doing it.

Discussion

Although guidance is clear and has been in place since 2006, regarding HIV testing,^{17–19} and since 2014 regarding PrEP prescription recommendations,⁴² this study demonstrates in DeLand, Florida similar results as those seen throughout other studies across the nation.^{53,54} For example, three-quarters of providers were aware of the Florida statute requiring HIV testing of pregnant women during their first and third trimesters. Of the remaining quarter, only one provider mentioned not treating pregnant women. Among all providers aware of the code who treat pregnant women, 57.1% reported always offering pregnant women HIV testing. We are *still* seeing this disconnect between provider knowledge/awareness and prescribing behaviors, even for straightforward state-mandated practices such as HIV testing of pregnant women. Similar to other studies, competing priorities during visits^{21–25,28,53} and providers' perceptions that patients

are at low risk for infection or do not engage in high-risk behaviors^{20,21,23–30} were the most common barriers to DeLand providers ordering HIV testing. A systematic review published in 2017 shows that routine testing of pregnant women is not only cost-effective but also cost-saving.⁵⁵

This study yields relatively low awareness of PrEP clinical practice guidelines compared to a prior study among HIV healthcare providers,⁴¹ though higher than a more recent study among primary care clinicians,⁴⁹ reflecting a more comparable population. Regarding prescribing willingness and behavior, results are similar to a 2015 study of primary care clinicians in which 7% reported having prescribed PrEP, with variability in willingness to prescribe PrEP depending on the risk population, ranging from 34% to 79%.⁴⁹ This disparity may be occurring due to providers generally not asking patients about their sexual activity or other high-risk behaviors. Another possible explanation is response bias—for example, providers know that they *should be* discussing and prescribing PrEP to high-risk patients according to practice guidelines, so they indicated that they were *willing* to do so, when additional factors impact compliance in practice.

The most identified barriers to discussing and prescribing PrEP with high-risk patients in this study were also seen in similar prior studies as common barriers. Barriers relating to providers' perceptions about their patients include providers' perception that patients do not have high-risk behaviors and most patients have low-risk for infection;^{31,32,40} other health priorities for patients; patient reluctance/refusal; and patient concern for confidentiality. Barriers surrounding providers' perceptions of PrEP and HIV more generally include lack of training regarding PrEP,^{35,37,40} such as how to offer PrEP and providers' perception of no place to refer patients for PrEP; providers' perception that prescribing PrEP is not their job and that someone else is doing it; and providers' perception that HIV is not a major issue in the community. Interestingly, recent prior studies that surveyed HIV/infectious disease providers indicated that prescribing PrEP is the primary care provider's responsibility.^{31,32,40}

Finally, with 24.4% of providers from the initial list considered ineligible, this in turn reduced the anticipated population size and indicates a need for a more accurate and current provider database within DeLand or Volusia County more generally. This finding raises concern not only for assessing population reliability and validity but also for patients seeking healthcare services (e.g. HIV prevention) within the community. Provider contact information should be current and accurate within resources that are accessed by providers and patients, as too many attempts at contacting providers with invalid contact information could affect patients' efforts for seeking preventive information and care.

This study has limitations. The relatively low response rate of 19.35%, after numerous follow-up calls, e-mails, faxes, and visits to providers' offices, may at least be partially attributed to providers' reluctance to participate in the assessment. Non-responders may differ from providers who

participated regarding their knowledge, perceptions, readiness, and prescribing practices. During follow-up calls, e-mails, and visits, some providers voluntarily gave reasons for not participating. A common reason provided was time constraints. A representative of one provider's office mentioned that the assessment was occurring during a policy renewal period, perhaps contributing to a low response rate throughout the community. One possible explanation for providers' reluctance to participate could also be the sensitivity of the topic. If providers are not current in their knowledge and/or compliance of offering HIV tests and PrEP prescriptions according to the CDC's clinical practice guidelines, then providers may feel less inclined to participate. One location declining to participate containing a very large number of providers indicated that their policy was not to provide any HIV testing or PrEP. Clearly there is a need for further research on identifying and/or developing strategies for building effective partnerships among health departments, hospitals, universities, clinics, and healthcare providers, more generally, in an effort for enhancing information sharing and ultimately impacting HIV-related health outcomes in communities.

Although some providers identified barriers to HIV testing of high-risk patients and PrEP discussion and prescription with patients, further investigation is needed, perhaps by conducting focus groups or individual interviews with providers. Though no statistical tests were performed in this baseline assessment due to the small sample, results may suggest a potential discordance in provider knowledge and behaviors regarding HIV testing and PrEP treatment. Naturally, a study on a larger population would need to be conducted to test this hypothesis.

Conclusion

This study brings attention to the types of issues that *all* providers, particularly in smaller cities/communities which comprise the majority of the state and nation, should be considering with respect to HIV testing and PrEP prescription. First, routine HIV testing, and more in particular PrEP prescription, by healthcare providers among the study population appears to be driven mainly by preferences and specific practice-based policies guided by healthcare providers, rather than by national guidelines. Second, study results indicate the need for greater collaboration between FDOH-Volusia and local providers to improve provider practices surrounding HIV prevention that ultimately can impact patients' health outcomes. This low level of collaboration, which is reflected at the national level regarding lack of engagement among local health departments and hospitals,⁵⁶ may be contributing to the aforementioned discrepancy of guidelines about routine HIV testing and more so regarding provision of PrEP. More provider training could be implemented by the FDOH-Volusia—that is, by local and state health departments, more generally—in an effort to prevent new HIV infections.

Training and community dialogue sessions are ongoing; however, it is challenging for providers to join these dialogues. Since time constraints play a major factor, perhaps *lunch and learns* could be offered onsite at providers' practices for continuing education. Providing healthcare agencies outside the FDOH-Volusia with information and opportunity to communicate and dialogue with one another can improve Florida residents' access to HIV testing and PrEP. While offering routine HIV testing may increase diagnosis numbers initially, coupling this with increased prescription of PrEP should lead to an overall decrease in new infections. This strategy could also translate into cost-savings, though a robust health economic cost-effectiveness analysis would need to be conducted. In one recent study focused on MSM populations, PrEP and test-and-treat strategies were hugely cost-effective leading to the largest declines in HIV incidence compared to other alternative preventive measures.⁵⁷ According to recent CDC prediction models under current national testing and treatment rates, implementing the use of PrEP within high-risk populations in the United States is estimated to reduce new HIV infections by over 48,000 by 2020.⁵⁸ This projection increases to over 185,000 new HIV infections prevented in the United States—a 70% reduction—through a combination strategy of expanding testing, PrEP usage, and treatment.⁵⁸

It is important to assess the nature of the provision of PrEP at the local level to better design steps to address misalignments with guidelines. Some misalignments may be due to lack of knowledge among providers, while others may be due to lack of engagement—potentially by both healthcare providers and local health departments. Either way, the compounded consequence is suffered by the (un)treated population. Health departments partnering with healthcare providers to inform them about existing programs designed to support high-risk individuals and communities would not only be beneficial to the DeLand area, and throughout Volusia County, but also throughout similar populations/communities throughout Florida—and the United States, more generally. For example, the Ryan White Program provides a comprehensive system of preventive and primary care that includes essential support services for both insured and uninsured persons with HIV or at high risk of HIV.⁵⁹ Part C of the Program funds local community-based organizations to support outpatient intervention services, including HIV testing, and ambulatory care.⁵⁹

For smaller communities, which represent a large part of the population both throughout Florida and across the United States, population-based assessments, such as this study, are feasible and informative. They provide a clearer picture of the local idiosyncrasies that may be obstacles to implementation of national guidelines. This assessment offers the Department of Health a dual picture of lack of engagement and misguided healthcare provider perceptions and policies. Optimal change comes from assessment, and

there are no one-size-fits-all solutions. This manuscript provides a necessary step to foster greater involvement and engagement between healthcare providers and local health departments, and it provides an example of how local health departments can assess providers' knowledge, attitudes, readiness, practices, and barriers regarding both routine HIV testing and PrEP prescription—as well as work together to address areas of concern that may be identified through such an assessment. Through the formation of partnerships within and across healthcare organizations at the community level that are focused on addressing barriers of and providing access to services regarding HIV prevention, a positive health outcome and reduction in new HIV infections could result. Prescribing HIV tests and PrEP to patients who meet CDC guidelines could reduce incidence of new HIV infections. Furthermore, results of this study will help inform the FDOH of areas that need additional educational efforts among providers surrounding HIV testing and PrEP, thus benefiting the community of healthcare providers, which will in turn benefit residents of similar communities where HIV rates are among the highest in the nation.

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Informed consent

A written informed consent document was distributed to all providers, indicating that their completion and submission of the questionnaire was, indeed, providing their informed consent for participation in the study.

Supplemental material

Supplemental material for this article is available online.

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