

# HIV Clinical Providers' Awareness, Attitudes, and Willingness to Support Patient Outreach Efforts for HIV Cure-Directed Research in Philadelphia, United States

Steven Meanley,<sup>1,✉</sup> William B. Carter,<sup>2,✉</sup> William R. Short,<sup>3</sup> David S. Metzger,<sup>4</sup> Amy Onorato,<sup>4</sup> Luis J. Montaner,<sup>5,✉</sup> and Karine Dubé<sup>6,✉</sup>; on behalf of the BEAT-HIV Community Advisory Board and the BEAT-HIV Community Engagement Group

<sup>1</sup>Department of Family and Community Health, University of Pennsylvania School of Nursing, Philadelphia, Pennsylvania, USA, <sup>2</sup>BEAT-HIV Community Advisory Board, Philadelphia, Pennsylvania, USA, <sup>3</sup>Department of Infectious Diseases, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania, USA, <sup>4</sup>Department of Psychiatry, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania, USA, <sup>5</sup>The Wistar Institute, Philadelphia, Pennsylvania, USA, and <sup>6</sup>Division of Infectious Diseases and Global Public Health, University of California San Diego School of Medicine, San Diego, California, USA

**Background.** Ethical patient outreach is critical for engaging patients with HIV in HIV cure-directed research. We sought to examine HIV clinical providers' awareness of current HIV cure-directed research strategies investigated through the Martin Delaney Collaboratories (MDC) and providers' attitudes toward patient outreach for HIV cure-directed research and to identify opportunities for clinical provider education on MDC research strategies.

**Methods.** We conducted a 1-time, cross-sectional, web-based survey with 64 HIV clinical providers (physicians, physician assistants, and nurses) in Philadelphia. A descriptive analysis was generated to determine clinical providers' awareness of MDC research strategies and attitudes toward patient outreach. Bivariate analyses were conducted to evaluate differences in awareness and attitudes by provider characteristics.

**Results.** Most providers were aware of MDC strategies, and nearly three-fourths of providers reported familiarity with 1 of the 2 Philadelphia MDC research programs. Providers overwhelmingly endorsed the need for clinicians to assist with patient outreach for HIV cure-directed research and were willing to recommend patients to participate. Enthusiasm for patient outreach waned if a study required a patient to undergo analytic treatment interruptions (ATIs). Providers identified preferred resources for receiving HIV cure-directed research updates, including webinars with continuing education credit and conferences.

**Conclusions.** Our study's findings advocate for added investment toward developing resources that better engage clinical providers about HIV cure-directed research updates and ongoing studies, including the importance of ATIs. As gatekeepers to patient participation on HIV cure-directed studies, added efforts to increase provider knowledge of specific HIV cure-directed research will advance patient education and ethical outreach.

**Keywords.** analytic treatment interruptions; clinical providers; HIV cure; patient outreach; patients with HIV.

Over 300 biomedical studies have been conducted with the aspirational goal of discovering a safe, effective, and scalable HIV cure worldwide, highlighting the prioritized global investment to eliminate HIV [1, 2]. In 2011, the US National Institutes of Health (NIH) launched the first iteration of the Martin Delaney Collaboratories (MDCs), an initiative aimed to

catalyze progress toward finding an HIV cure through research on strategies focused on eliminating HIV infection from the body or eliciting sustained control of HIV without antiretroviral treatment (ART). Now in its third iteration, there are 10 interdisciplinary and intersectoral MDCs across the United States representing a nearly US\$500 million investment into HIV cure-directed research through 2025 [2]. Basic and translational research is underway across the MDCs demonstrating accelerated progress toward an HIV cure.

HIV and health equity researchers have given significant attention to the processes and ethical considerations for supporting HIV cure-directed trial participants. A critical part of HIV cure-directed trial participation is the implementation of analytical treatment interruptions (ATIs) [3]. The purpose of implementing ATIs is to evaluate a study intervention's impact on viral rebound and control [4]. Though necessary for some HIV cure-directed strategies (eg, immune-based approaches), implementing ATIs imposes increased health risks to study participants and risks of HIV exposure to sex partners

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Correspondence: Steven Meanley, PhD, MPH, Department of Family and Community Health, University of Pennsylvania School of Nursing, 418 Curie Boulevard 231L, Philadelphia, PA 19146, USA (smeanley@nursing.upenn.edu).

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of trial participants [5]. It is essential that researchers of HIV cure-directed studies and clinical providers support people with HIV (PWH) as they navigate the possible physiological and psychosocial health impacts linked to their participation in HIV cure-directed trials. Opportunities for support may include discussions related to ATIs, trial participation-decisional balance (eg, patient-centered priorities over research priorities), and risk mitigation strategies (eg, partner protection packages) [5-9].

As HIV cure-directed research continues to progress toward increasing the number of clinical trials, there is increasing attention to the role of HIV clinical providers to support patient outreach. Clinical providers are key gatekeepers for community capacity-building efforts that aim to reach and engage populations of PWH. Given the requirements of lifelong treatment, clinical providers for PWH are tasked with developing trustworthy and supportive environments to maximize comprehensive care [10]. Positive patient-provider interactions are foundational to developing care-specific relationships with patients built on trust, especially among patients from historically excluded populations (eg, people of color, sexual and gender minority people, people who use drugs, and people from neighborhoods with a lower socioeconomic status). In a recent study of PWH in Philadelphia, roughly 86% of patients indicated that they would consider participating in an HIV cure-directed research trial and nearly 75% of these patients indicated HIV providers as their most trusted source for trial participation [11]. Taken together, the advancement of HIV cure-directed research hinges in part on clinical providers' willingness to facilitate and support PWH's participation.

A majority of studies aiming to gather insight into provider perspectives on HIV cure-directed research and patient outreach have largely been qualitative in study design and conducted outside the United States (eg, France and Ghana) [12, 13]. Prior studies highlight providers' pervasive optimism for an HIV cure; however, HIV clinical providers commonly expressed concerns about their patients' health risks associated with participating in trials requiring ATIs and challenges related to research creating challenges and interruptions in day-to-day clinical operations [12-18]. It is therefore critical to continue monitoring what HIV clinical providers know about current HIV cure-directed research and how they feel about supporting these efforts through patient outreach.

Guided by the Information, Motivation, and Behavioral Skills (IMB) model, we sought to survey clinical providers in Philadelphia (PA, USA). Philadelphia is home to 2 MDCs, the BEAT-HIV MDC (University of Pennsylvania/Wistar Institute), and the CRISPR for Cure (Temple University) [19, 20]. The primary objectives of our study were to:

1. describe clinical providers' awareness of HIV cure-directed research strategies currently being implemented through the MDC program;
2. describe clinical providers' attitudes and willingness to conduct outreach to PWH at their clinic for HIV cure-directed research and clinical trials; and
3. identify education opportunities to support clinical providers' awareness of current HIV cure-directed strategies and patient requirements for research participation and self-efficacy for patient outreach.

We hypothesized that providers who work in infectious disease clinics and environments that value research, who have specialized HIV training, who self-report greater research and patient outreach experience, and who have a lower level of burnout would exhibit more positive attitudes and willingness to conduct outreach with PWH for HIV cure-directed research. We also hypothesized that providers would express greater unwillingness to support patient outreach initiatives for HIV cure-directed research trials that required ATIs.

## METHODS

### Study Design and Participants

The current study is a co-led project between the BEAT-HIV Community Advisory Board (CAB), a diverse group of PWH and HIV advocates, and an interdisciplinary group of researchers in the BEAT-HIV Community Engagement Group (CEG) [21]. The data reflect HIV clinical providers' responses to a cross-sectional web-based survey, completed between July 2022 and March 2023. Clinical providers were eligible to participate if they were currently practicing or providing care. Clinical providers had to self-report being a physician (including internal medicine residents and infectious disease fellows), physician assistant, or registered nurse (RN) or nurse practitioner (NP) in Philadelphia. Providers were recruited across 6 health care systems, specifically 8 HIV infectious disease clinics and 1 community HIV clinic in Philadelphia County. Provider recruitment was conducted across multiple methods. The principal investigator conducted outreach by presenting the purpose of the web-based survey at virtual all-staff meetings at these HIV clinics. One study staff member conducted in-person recruitment in clinic breakrooms. Lastly, we leveraged connections of HIV clinic directors for in-house provider outreach. On average, clinical providers completed the web-based survey in <5 minutes. Virtual informed consent was obtained, and clinical providers did not receive compensation for their participation. Approval by the Institutional Review Board at the University of Pennsylvania was received for the conduct of this study.

### Measures

The web-survey was adapted and designed in alignment with the IMB model, which states that behaviors are a function of adequate information, individual motivation, and behavioral skills to enact the desired behavior. The IMB model was

deemed appropriate for the study given its prior application to improve service provision among clinical providers. With the exception of provider burnout [22], all survey items were newly generated for the current study. Survey items were co-developed and finalized iteratively through CAB meetings to maximize community relevance and minimize participation burden.

#### **Awareness of MDC HIV Cure-Directed Research Strategies.**

Providers were asked 2 questions on strategy awareness: (1) Broadly speaking, how familiar are you with the HIV cure research currently being conducted? (2) How familiar are you with the HIV cure-related research currently being conducted in Philadelphia? Both items were scored from 1 (not at all familiar) to 4 (very familiar). Both items were dichotomized into 0 (no familiarity) and 1 (any familiarity). Providers in the any familiarity category were provided with a follow-up question ascertaining the specific strategies with which they were familiar. The select-all-that-apply option included the 10 strategies listed in accordance with *The HIV Treatment Journal of TPAN*, accessible at <https://www.positivelyaware.com/articles/third-era-martin-delaney-collaboratories>.

**Attitudes and Motivations for Conducting Patient Outreach.** The web-based survey included 3 items addressing providers' attitudes and willingness, as a proxy for motivations, to conduct patient outreach for HIV cure-directed research: (1) How important is it for clinicians to assist with patient outreach for HIV cure research? (4-point Likert scale); (2) How likely would you be to recommend your patients with HIV to participate in HIV cure-directed research? (5-point Likert scale); (3) If participating in HIV cure-directed research required interruptions to a patient's treatment, how much would this affect your willingness to discuss HIV cure research with your patients with HIV? (5-point Likert scale).

**Provider Characteristics.** Regarding research experience, providers self-reported the number of years of formal research training they had received, the number of years of patient outreach they had, and the proportion of their current position (ie, time and effort) that is committed to conducting research activities. For self-efficacy, providers were asked, "How confident would you feel in having discussions to raise awareness of HIV cure research with patients living with HIV?" (1 = not at all confident, 4 = very confident). Providers were asked, based on their opinion, how much clinic operations leaders value research at their workplace (1 = none at all, 4 = a lot). Burnout was measured using the 1-item Maslach Burnout Inventory: "I enjoy my work" (1 = "I have no symptoms of burnout"; 5 = "I feel completely burned out and often wonder if I can go on"), which has been previously validated with physicians [22]. Lastly, providers self-reported their gender, race/ethnicity, position (ie, physician, physician assistant, RN,

or NP), whether they work at an infectious disease clinic, whether they are a primary care provider, and whether they have received specialized HIV training.

#### **Data Analyses**

Given that providers were recruited in Philadelphia, we evaluated whether they were aware of any MDC research strategies overall and any MDC research strategies in Philadelphia (BEAT-HIV and CRISPR for Cure). We conducted Fisher exact tests of association to evaluate statistically significant differences in awareness by gender, race/ethnicity, employment position (eg, physician, physician assistant, NP, or RN), whether they work in an infectious disease clinic (yes/no), whether they are a primary care provider (yes/no), and if they have received specialized training in HIV (yes/no). We also performed non-parametric tests to evaluate mean differences in provider characteristics between individuals who were familiar with MDC HIV cure-directed research strategies and those without any familiarity. As the study was not statistically powered to conduct multiple linear regressions, we performed nonparametric bivariate tests (eg, Mann-Whitney, Kruskal-Wallis) on the 3 attitudes and motivation questions with years of research experience, years of patient outreach experience, committed research time in current position, patient outreach self-efficacy, perceptions of how much research is valued at their workplace, and provider burnout. We also performed Spearman's correlation tests to examine the associations that these 3 ordinal items had with other continuous and ordinal-measured provider characteristics. Lastly, we describe providers' preferred education modalities for learning about HIV cure-directed research.

## **RESULTS**

#### **Provider Characteristics**

Providers (Table 1) were majority non-Hispanic, non-Middle Eastern White, cisgender female, and physicians. Most providers had held their positions for at least 1 year (81.3%), were employed at an infectious disease clinic (57.8%), provided primary care (60.9%), and had specialized HIV training (73.4%). On average, providers had >4 years of research training, >9 years of patient outreach experience, and >20% of their position was committed to conducting research. Providers reported moderate levels of self-efficacy to have discussions with PWH to raise awareness of HIV cure-directed research (median [IQR, range], 2.00 [1.25–3, 1–4]), moderate levels of perceived value for research at their workplace (median [IQR, range], 3 [3–4, 1–5]), and low levels of occupational burnout (median [IQR, range], 2 [2–3, 1–4]).

#### **Awareness of MDC HIV Cure-Directed Research Strategies**

A large majority (84.4%) of providers expressed any familiarity with MDC HIV cure-directed research strategies (Table 1). Among those who had any familiarity with the MDC (Figure 1), the strategies with which providers were most

**Table 1. Awareness of HIV Cure-directed Strategies by Provider Characteristics, n = 64 HIV Clinical Providers**

Provider Characteristics	Any MDC Research Strategy				Any Philadelphia MDC Strategy		
	Full Sample n = 64	Any n = 54 (84.4%)	None n = 10 (15.6%)	P	Any n = 47 (74.6%)	None n = 17 (25.4%)	P
	No. (%)	No. (%)	No. (%)		No. (%)	No. (%)	
Gender	...	...	...	NS <sup>a</sup>	...	...	NS <sup>a</sup>
Cisgender male	26 (40.6)	23 (88.5)	3 (11.5)		19 (73.1)	7 (26.9)	
Cisgender female	37 (57.8)	30 (81.1)	7 (18.9)		27 (73.0)	10 (27.0)	
Nonbinary	1 (1.6)	1 (100.0)	-		1 (100.0)	-	
Race/ethnicity	...	...	...	NS <sup>b</sup>	...	...	NS <sup>b</sup>
NH, NME White	44 (68.8)	38 (86.4)	6 (13.6)		35 (79.5)	9 (20.5)	
White, Hispanic	3 (4.7)	3 (100.0)	0 (0.0)		1 (33.3)	2 (66.7)	
White, Middle Eastern	4 (6.3)	4 (100.0)	0 (0.0)		3 (75.0)	1 (25.0)	
Black or African American	4 (6.3)	3 (75.0)	1 (25.0)		3 (75.0)	1 (25.0)	
Asian	8 (12.5)	6 (75.0)	2 (25.0)		5 (62.5)	3 (37.5)	
Other	1 (1.6)	0 (0.0)	1 (100.0)		0 (0.0)	1 (100.0)	
Position	...	...	...	NS	...	...	NS
Physicians (+residents & fellows)	53 (82.8)	45 (84.9)	8 (15.1)		39 (73.6)	14 (26.4)	
Physician assistant	4 (6.3)	3 (75.0)	1 (25.0)		2 (50.0)	2 (50.0)	
Nurse practitioner or RN	7 (10.9)	6 (85.7)	1 (14.3)		6 (85.7)	1 (14.3)	
Employed at infectious disease clinic, no	27 (42.2)	20 (74.1)	7 (25.9)	NS	15 (55.6)	12 (44.4)	**
Employed at infectious disease clinic, yes	37 (57.8)	34 (91.9)	3 (8.1)		32 (86.5)	5 (13.5)	
Primary care provider	...	...	...	NS	...	...	NS
No	25 (39.1)	23 (92.0)	2 (8.0)		21 (84.0)	4 (16.0)	
Yes	39 (60.9)	31 (79.5)	8 (20.5)		26 (66.7)	13 (33.3)	
HIV specialized training	...	...	...	*	...	...	***
No	17 (26.6)	11 (64.7)	6 (35.3)		7 (41.2)	10 (58.8)	
Yes	47 (73.4)	43 (91.5)	4 (8.5)		40 (85.1)	7 (14.9)	
	Median (IQR)	Median (IQR)	Median (IQR)	P	Median (IQR)	Median (IQR)	P
Research training, y	2.00 (1.00–5.00)	2.00 (1.00–5.00)	3.50 (0.00–6.25)	NS	2.00 (1.00–5.00)	2.00 (0.50–5.50)	NS
Patient outreach experience, y	4.00 (0.00–15.00)	4.00 (0.00–15.00)	2.50 (0.00–11.25)	NS	5.00 (1.00–17.00)	0.00 (0.00–8.50)	NS
Research % effort	5.00 (0.00–25.00)	5.00 (0.00–25.00)	5.00 (0.00–18.00)	NS	5.00 (2.75–63.75)	5.00 (0.00–12.50)	**
Outreach self-efficacy	2.00 (1.25–3.00)	2.00 (2.00–3.00)	2.50 (1.75–3.00)	NS	2.00 (1.00–2.00)	3.00 (2.00–4.00)	*
Perceived value of research at workplace	3.00 (3.00–4.00)	3.00 (3.00–4.00)	3.50 (3.00–4.00)	NS	3.00 (3.00–4.00)	3.00 (2.00–4.00)	NS
Occupational burnout	2.00 (2.00–3.00)	2.00 (2.00–3.00)	2.00 (1.75–2.25)	NS	2.00 (2.00–3.00)	2.00 (2.00–3.00)	NS

Abbreviations: MDC, Martin Delaney Collaboratories; NH, Non-Hispanic; NME, Non-Middle Eastern; NS, statistically nonsignificant.

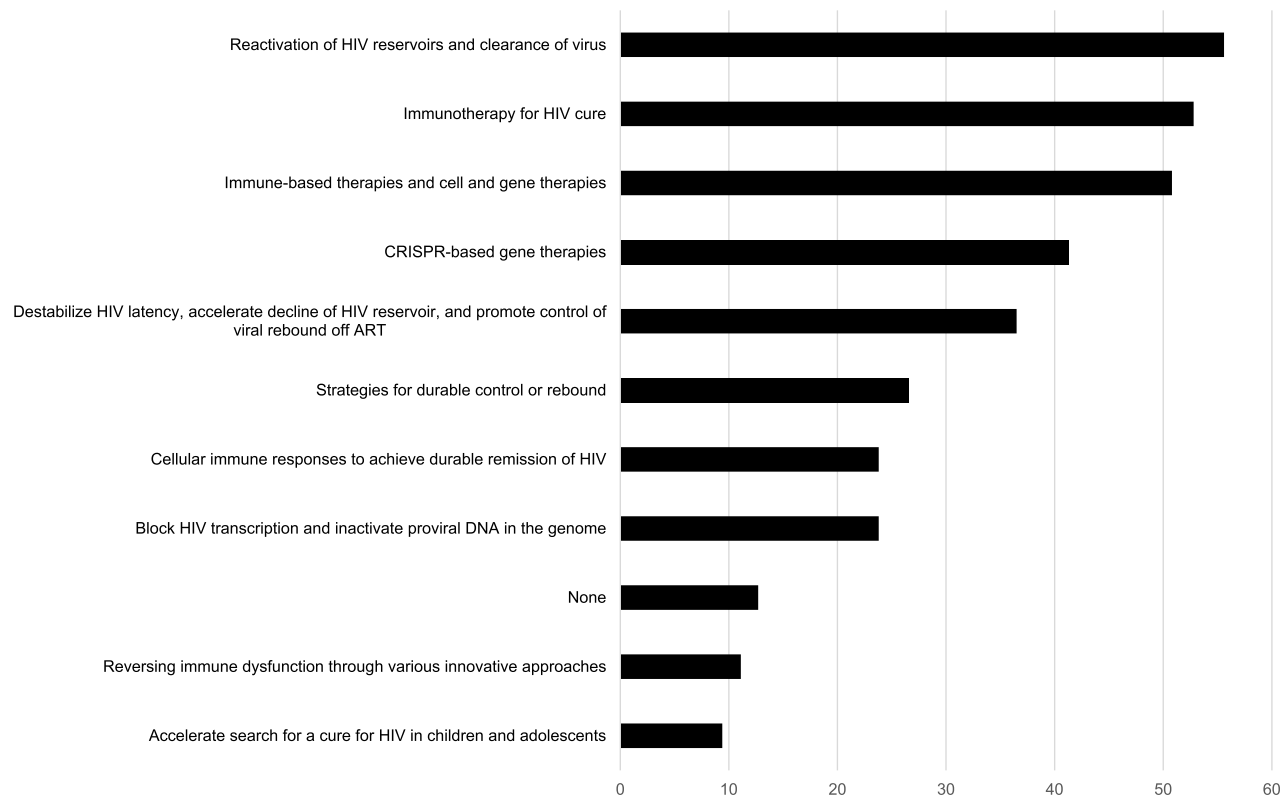
\*P &lt; .05; \*\*P &lt; .01; \*\*\*P &lt; .001.

<sup>a</sup>Differences evaluated between cisgender male and cisgender female due to small sample sizes.<sup>b</sup>Differences evaluated between NH, NME White compared with all other categories due to small cell sizes.

commonly aware (>50% of providers) were reactivation of HIV reservoirs and clearance of virus, immunotherapy for HIV cure, and immune-based therapies and cell and gene therapies, respectively [23–25]. The least known strategies (~10% of providers) were reversing immune dysfunction through various innovative approaches and accelerating the search for HIV in children and adolescents [26–28]. Bivariate tests indicated that providers who had received specialized HIV training were more aware of any MDC HIV cure-directed research strategy than providers who had not received specialized HIV training (91.5% vs 64.7%). Of those who had heard of the MDC, just over 10% reported not being familiar with any specific HIV cure-directed research strategy.

Beyond familiarity with MDC programs in general, lower awareness was present for the specific clinical strategies being

pursued by the 2 MDCs in Philadelphia (Table 1), with >40% of providers aware of the CRISPR-based gene clinical therapies strategy (CRISPR for Cure MDC) and just over 25% familiar with clinical strategies for durable control or rebound (BEAT-HIV MDC). Providers employed at an infectious disease clinic and providers who had specialized HIV training had more awareness of MDC HIV cure-directed research strategies in Philadelphia than their counterparts, respectively. Providers who were familiar with any Philadelphia MDC HIV cure-directed clinical strategy had more committed time to conducting research (27.5% vs 7.5%) and less patient outreach self-efficacy (median [IQR], 2 [1–2] vs 3.00 [2–4]) compared with providers who had no familiarity with any local activity on a specific HIV cure-directed clinical research strategy under development.



**Figure 1.** Familiarity (%) with MDC HIV cure-directed research strategies among providers with any HIV cure research familiarity,  $n = 54$  (Philadelphia, PA, USA: 2022–2023). Abbreviations: ART, antiretroviral therapy; MDC, Martin Delaney Collaboratories.

### Attitudes and Motivation for Patient Outreach for HIV Cure-Directed Research

Providers rated patient outreach for HIV cure research (Table 2) with high importance for clinicians (mean [SD], 3.45 [0.69]). Mann-Whitney and Kruskal-Wallis tests yielded no statistically significant differences in patient outreach importance ratings by providers' demographic or employment characteristics.

Providers rated themselves as highly likely to recommend patients to participate in HIV cure-directed research (mean [SD], 4.31 [0.73]). We observed a statistically significant positive correlation between research training experience in years and likelihood of recommending PWH to participate in HIV cure-directed research ( $\rho = 0.31$ ;  $P < .05$ ). There was a statistically significant inverse correlation between patient outreach self-efficacy and likelihood of recommending PWH to participate in HIV cure-directed research ( $\rho = -0.27$ ;  $P < .001$ ). No other statistically significant differences in willingness were observed by demographic or employment characteristics.

Over 50% (51.6%) of providers indicated they would be somewhat or much less willing to discuss HIV cure-directed research with their patients if participation required an ATI. There was a positive correlation between patient outreach experience in years and increased willingness to discuss HIV

cure-directed research with PWH ( $\rho = 0.14$ ;  $P < .05$ ). No other statistically significant differences in increased willingness were observed by demographic or employment characteristics.

### Preferred Provider Education Tools for HIV Cure-Directed Research

Providers expressed diverse preferences for education resources that offer up-to-date information on HIV cure-directed research (Figure 2). Over 50% of providers endorsed webinars with continuing education credit, peer-reviewed academic journal articles, HIV conferences, email summary updates, and in-clinic information sessions. Less than half of providers endorsed a preference for HIV cure websites and information sessions held within HIV service organizations.

## DISCUSSION

Our study complements prior US and international studies that explored clinical providers' attitudes and willingness to conduct patient outreach for HIV cure-directed trials. Irrespective of provider characteristics, we observed an endorsement of high importance for clinicians to assist with patient outreach for HIV cure-directed research. Additionally, providers expressed high levels of willingness to recommend their patients with HIV to participate in HIV cure-directed research, which aligned with prior qualitative studies and with



**Table 2. Motivations for Patient Outreach by Provider Characteristics (Philadelphia, PA, USA: 2022–2023)**

Provider Characteristics	How Important Is It for Clinicians to Assist With Patient Outreach for HIV Cure Research?		How Likely Would You Be to Recommend Your Patients With HIV to Participate in HIV Cure Research?		If Participating in HIV Cure–Related Research Required Interruptions to a Patient’s Treatment, How Much Would This Affect Your Willingness to Discuss HIV Cure Research With Your Patients With HIV?	
	Median (IQR)	<i>P</i>	Median (IQR)	<i>P</i>	Median (IQR)	<i>P</i>
Gender	...	NS <sup>a</sup>	...	NS <sup>a</sup>	...	NS <sup>a</sup>
Cisgender male	3.00 (3.00–4.00)		4.00 (4.00–5.00)	...	3.00 (2.00–3.00)	
Cisgender female	4.00 (3.00–4.00)		4.00 (4.00–5.00)	...	2.00 (2.00–3.00)	
Nonbinary	**		**	...	**	
Race/ethnicity	...	NS <sup>b</sup>	...	NS <sup>b</sup>	...	NS <sup>b</sup>
NH, NME White	4.00 (3.00–4.00)		4.00 (4.00–5.00)	...	3.00 (2.00–3.00)	
White, Hispanic	4.00 (4.00–4.00)		5.00 (4.00–5.00)	...	3.00 (2.00–3.00)	
White, Middle Eastern	3.50 (3.00–4.00)		4.50 (2.50–5.00)	...	2.00 (2.00–2.75)	
Black or African American	3.00 (2.25–3.00)		4.00 (4.00–4.00)	...	2.00 (1.25–2.75)	
Asian	4.00 (3.00–4.00)		4.50 (3.25–5.00)	...	2.00 (2.00–2.00)	
Other	**		**	...	**	
Position	...	NS	...	NS	...	NS
Physicians (+residents & fellows)	4.00 (3.00–4.00)		4.00 (4.00–5.00)	...	2.00 (2.00–3.00)	
Physician assistant	3.00 (1.50–3.75)		3.50 (3.00–4.75)	...	2.50 (1.25–3.00)	
Nurse practitioner or RN	4.00 (3.00–4.00)		5.00 (4.00–5.00)	...	3.00 (2.00–4.00)	
Employed at infectious disease clinic	...	NS	...	NS	...	NS
No	4.00 (3.00–4.00)		4.00 (4.00–5.00)	...	2.00 (2.00–3.00)	
Yes	4.00 (3.00–4.00)		5.00 (4.00–5.00)	...	3.00 (2.00–3.00)	
Primary care provider	...	NS	...	NS	...	NS
No	4.00 (3.00–4.00)		5.00 (4.00–5.00)	...	3.00 (2.00–3.00)	
Yes	3.00 (3.00–4.00)		4.00 (4.00–5.00)	...	2.00 (2.00–3.00)	
HIV specialized training	...	NS	...	NS	...	NS
No	4.00 (3.00–4.00)		4.00 (4.00–5.00)	...	2.00 (2.00–3.00)	
Yes	4.00 (3.00–4.00)		4.00 (4.00–5.00)	...	2.00 (2.00–3.00)	
	<i>ρ</i>	<i>P</i>	<i>ρ</i>	<i>P</i>	<i>ρ</i>	<i>P</i>
Research training, y	0.17	NS	0.31	*	0.04	NS
Patient outreach experience, y	0.18	NS	0.43	***	0.14	*
Research % effort	−0.03	NS	0.10	NS	0.03	NS
Outreach self-efficacy	−0.06	NS	−0.27	*	0.10	NS
Perceived value of research at workplace	0.11	NS	0.20	NS	0.09	NS
Occupational burnout	−0.10	NS	−0.21	NS	−0.10	NS

Abbreviations: IQR, interquartile range; NH, Non-Hispanic; NME, Non-Middle Eastern; NS, nonsignificant.

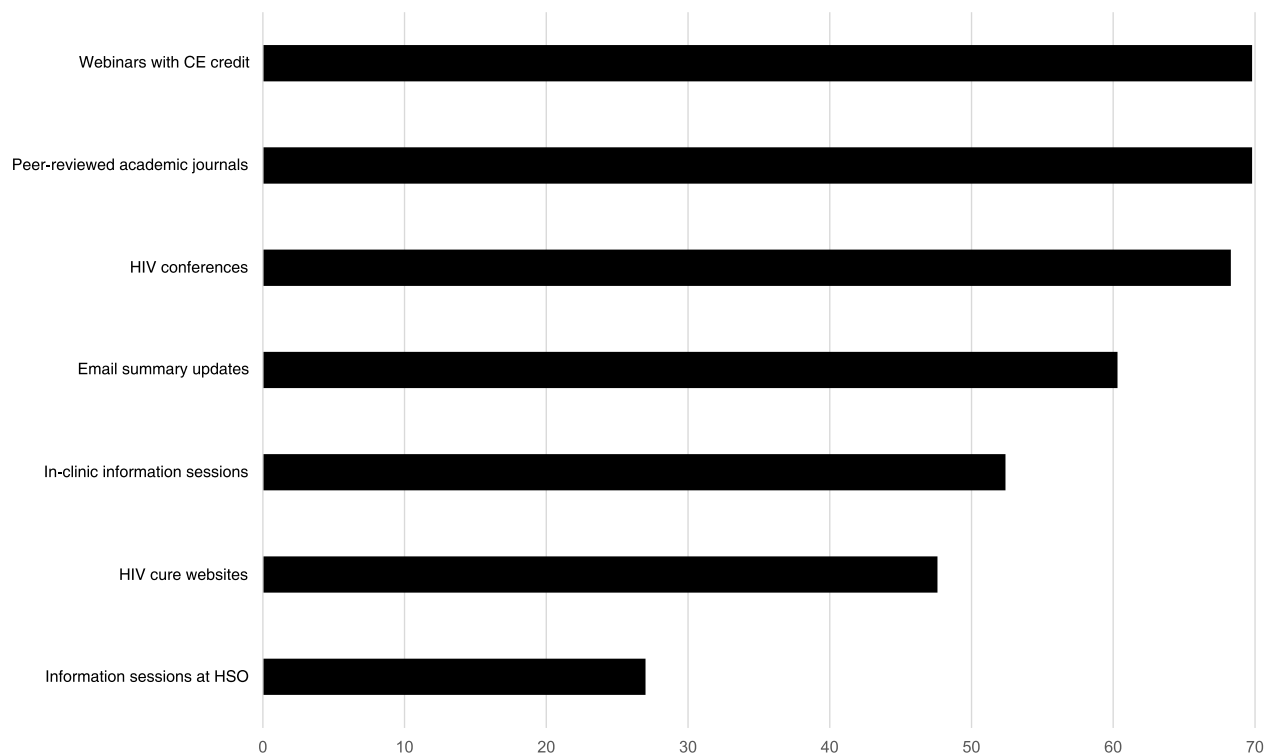
\**P* < .05; \*\*omitted due to *n* = 1.<sup>a</sup>Differences evaluated between cisgender male and cisgender female due to small sample sizes.<sup>b</sup>Differences evaluated between NH, NME White compared with all other categories due to small cell sizes.

studies of patient populations [12–18]. Yet, there remains hesitancy to participate in patient outreach given challenges related to ATIs. As hypothesized, willingness to recommend patients for HIV cure–directed research was positively correlated with providers’ number of years of research training and number of years of patient outreach.

The inverse correlation between patient outreach self-efficacy and willingness to recommend patients was an unexpected finding. This finding suggests that there may be other conditions or prior histories with conducting patient outreach, such as complex study coordination, a dislike for outreach activities, or patient histories with adverse events stemming from

research participation, that may affect providers’ willingness to refer patients. As expected, we found that providers who had more experience conducting patient outreach reported greater willingness to discuss HIV cure–directed research requiring ATIs with patients. Future mixed-methods studies should evaluate and explore factors that shape willingness to support HIV cure–directed research studies that require ATIs through patient outreach (eg, perceptions of patient characteristics, perceptions of the complexity of study protocols, level of psychosocial support offered to patients).

Our findings indicate high levels of awareness of HIV cure–directed research strategies in MDCs overall and in local MDCs



**Figure 2.** Preferred education resources (% endorsed) for up-to-date information on HIV cure-directed research, n = 64 providers (Philadelphia, PA, USA: 2022–2023). Abbreviations: CE, continuing education; HSO, HIV service organization.

among clinical providers of PWH in Philadelphia. However, the same clinicians report lower levels of patient outreach, highlighting a missed opportunity to offer greater exposure to innovative and timely research in the HIV medical field. Relatedly, we found that providers with any awareness of Philadelphia MDCs reported, on average, a greater proportion of work hours dedicated to research commitments compared with those with no awareness. One interesting finding is that providers with any awareness of Philadelphia MDCs reported, on average, less experience with patient outreach than providers with no awareness. These findings suggest that provider outreach for HIV cure-directed research should be conducted more intentionally and with comprehensive informational resources about up-to-date cure-focused research and future patient opportunities. This finding may also be confounded based on providers' alternative and specific interests in HIV research (eg, primary or secondary prevention).

Despite working in Philadelphia clinics, the most well-known cure-directed research strategies were reactivation of HIV reservoirs and clearance of virus, immunotherapy for HIV cure, and immune-based therapies and cell and gene therapies. It is possible that providers were most familiar with these strategies given that they have been tested longer (eg, have been tested across multiple MDC iterations). Awareness of HIV cure-directed research strategies that align with the MDC

may also be underestimated or skewed toward affiliation of clinics where providers completed surveys. Additionally, providers' awareness of specific strategies may be connected to providers' research networks and interests not captured by the current survey.

An important contribution of our study was our ability to identify opportunities for additional provider education on HIV cure-directed research for Philadelphia-area clinical providers. Over half of providers endorsed using educational resources including webinars with continuing education credit, peer-reviewed academic journal publications, HIV conferences, email summary updates, and in-clinic information sessions. Similar to qualitative findings among HIV clinical providers in the Northwest United States [18], our study suggests that educating providers about HIV cure-directed research should not be a one-size-fits-all approach and that HIV cure-directed researchers should diversify educational resources. Providing multiple avenues for education on HIV cure-directed research will maximize opportunities to raise targeted awareness of current strategies and trials enrolling human participants. Furthermore, these platforms can be leveraged to address important topics (eg, the necessity of implementing ATIs), support skill building and self-efficacy with patient outreach, minimize coordination complexities that serve as barriers to linking PWH to HIV cure-directed research, and ensure a

comprehensive understanding of ethical practices (eg, partner protections and psychosocial support and monitoring) for PWH who elect to participate in HIV cure-directed trials [5, 29–31]. This will be critical given that PWH who are interested in research participation frequently make final decisions in collaboration with their clinical providers [32]; therefore, having provider support will be essential.

Our study has several limitations. We employed a cross-sectional survey design given the interest in ascertaining a snapshot of clinical providers' awareness of HIV cure-directed research strategies within the MDC program and their attitudes and willingness toward conducting patient outreach. Statistically significant correlations do not support causal relationships. Additionally, we did not ask providers about their awareness of HIV cure-directed strategies being conducted outside of the MDC; therefore, we may be underestimating clinical provider awareness of HIV cure-directed research. Despite offering a foundation for understanding our primary hypotheses, our measures of provider characteristics offer a preliminary understanding of providers' capacity (eg, behavioral skills) and self-efficacy to conduct patient outreach with PWH. Future studies should identify and invest in effective strategies for supporting providers who are willing and motivated to conduct best-practice patient outreach for HIV cure-directed research.

Given the geographic focus and dependency of provider enrollment within an academic network of providers across Philadelphia, the generalizability of our findings may be limited. Though substantial effort was made to enroll diverse providers from several health systems and clinics, providers were not randomly selected, and our findings may only be generalizable to clinical providers connected to academic health systems. Overall, our study may underestimate clinical providers' attitudes toward HIV cure-directed research and patient outreach in alternative or resource-limited settings. Furthermore, our study did not delineate between NPs and RNs. Though our sample of nurses was small, the differences in scope of training and practice may have implications for attitudinal and motivational differences for patient outreach. We advocate for further investment into obtaining clinical providers' perspectives in broader settings, particularly in geographic regions where MDCs are located and to account for scope of work.

Despite the limitations of our study, our findings provide a supportive platform to better engage clinical providers of PWH in HIV cure-directed research. Ultimately, clinical providers, as gatekeepers to patient populations of PWH, need the knowledge and behavioral skills to assist interested patients in understanding the requirements and risks (including risk mitigation) of HIV cure-directed research participation. These tools will ensure clinical providers' capacity to maintain patient trust, maximize informed consent, and facilitate linkage to trial participation opportunities. Lastly, there is a critical

need to scale-up communication strategies and coordination activities between HIV cure-directed research implementers and clinical providers of PWH. Removing barriers and streamlining patient outreach to day-to-day clinical operations will support collaborative engagement between HIV cure researchers and clinical providers of PWH.

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**Data availability.** De-identified data are accessible upon request and permission from the primary author and the BEAT-HIV Community Advisory Board.

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## References

1. Dubé K, Kanazawa J, Taylor J, et al. Ethics of HIV cure research: an unfinished agenda. *BMC Ethics* **2021**; 22:83.
2. Treatment Action Group. Research toward a cure trials. **2024**. Available at: <https://www.treatmentactiongroup.org/cure/trials/>. Accessed March 27, 2024.
3. Julg B, Ananworanich J, Barouch DH, et al. Recommendations for analytical antiretroviral treatment interruptions in HIV research trials—report of a consensus meeting. *Lancet HIV* **2019**; 6:e259–68.
4. Peluso MJ, Dee L, Campbell D, et al. A collaborative, multidisciplinary approach to HIV transmission risk mitigation during analytic treatment interruption. *J Virus Erad* **2020**; 6:34–7.
5. Dubé K, Morton T, Fox L, et al. A partner protection package for HIV cure-related trials involving analytical treatment interruptions. *Lancet Infect Dis* **2023**; 23:e418–30.
6. Dresser R. First-in-human HIV-remission studies: reducing and justifying risk. *J Med Ethics* **2017**; 43:78–81.
7. Dubé K, Campbell DM, Perry KE, et al. Reasons people living with HIV might prefer oral daily antiretroviral therapy, long-acting formulations, or future HIV remission options. *AIDS Res Hum Retroviruses* **2020**; 36:1054–8.
8. Dubé K, Eskaf S, Evans D, et al. The dose response: perceptions of people living with HIV in the United States on alternatives to oral daily antiretroviral therapy. *AIDS Res Hum Retroviruses* **2020**; 36:324–48.
9. Grossman CI, Ross AL, Auerbach JD, et al. Towards multidisciplinary HIV cure research: integrating social science with biomedical research. *Trends Microbiol* **2016**; 24:5–11.
10. Dawson-Rose C, Cuca YP, Weibel AR, et al. Building trust and relationships between patients and providers: an essential complement to health literacy in HIV care. *J Assoc Nurs AIDS Care* **2016**; 27:574–85.
11. White C, Freshwater W, Lefae M, et al. Awareness of HIV cure-directed research among HIV clinic patients in Philadelphia. Poster presented at: Conference on HIV Persistence During Therapy; December 10–13, 2019; Miami, FL, USA.
12. Ringel R, White C, Freshwater W, et al. Perceptions of HIV cure-directed research in HIV clinic patients in Philadelphia.



13. Lampitey H, Newcomb B, Bonney EY, et al. Healthcare provider perspectives on HIV cure research in Ghana. *AIDS Res Treatment* **2023**; 2023:8158439.
14. Préau M, Doumergue M, Protière C, et al. Acceptability of HIV cure-related trials: the challenges for physicians and people living with HIV (ANRS-APSEC). *AIDS Care* **2018**; 39:914–20.
15. Dubé K, Dee L, Evans D, et al. Perceptions of equipoise, risk-benefit ratios, and “otherwise healthy volunteers” in the context of early-phase HIV cure research in the United States: a qualitative inquiry. *J Empir Res Hum Res Ethics* **2018**; 13:3–17.
16. Protière C, Arnold M, Fiorentino M, et al. Differences in HIV cure clinical trial preferences of French people living with HIV and physicians in the ANRS-APSEC study: a discrete choice experiment. *J Int AIDS Soc* **2020**; 23:e25443.
17. Protière C, Fressard L, Mora M, et al. Characterization of physicians that might be reluctant to propose HIV cure-related clinical trials with treatment interruption to their patients? The ANRS-APSEC study. *Vaccines (Basel)* **2020**; 8:334.
18. Protière C, Spire B, Mora M, et al. Patterns of patient and healthcare provider viewpoints regarding participation in HIV cure-related clinical trials. Findings from a multicentre French survey using Q methodology (ANRS-APSEC). *PLoS One* **2017**; 12:e0187489.
19. Sylla L, Patel H, Louella M, et al. Community HIV clinicians’ perceptions about HIV cure-related research in the Northwestern United States. *HIV Res Clin Pract* **2022**; 23:61–75.
20. BEAT-HIV Delaney Collaboratory. 2024. Available at: <https://www.beat-hiv.org/>. Accessed March 27, 2024.
21. CRISPR for Cure: A Martin Delaney Collaboratory for HIV Cure. 2024. Available at: <https://crisprforcure.org/>. Accessed March 27, 2024.
22. Dubé K, Peterson B, Jones NL, et al. Community engagement group model in basic and biomedical research: lessons learned from the BEAT-HIV Delaney Collaboratory towards an HIV-1 cure. *Res Invol Engagem* **2023**; 9:39.
23. Rohland BM, Kruse GR, Rohrer JE. Validation of a single-item measure of burnout against the Maslach Burnout Inventory among physicians. *Stress Health* **2004**; 20:75–9.
24. HIV CARE Collaboratory of AIDS Researchers for Eradication. 2024. Available at: <https://delaneycare.org/>. Accessed March 27, 2024.
25. Delaney AIDS Research Enterprise (DARE). 2024. Available at: <https://www.daretofindacure.org/>. Accessed March 27, 2024.
26. I4C Immunotherapy for HIV Cure. 2024. Available at: <https://www.i4cacure.org/martin-delaney-collaboratory/>. Accessed March 27, 2024.
27. RID HIV Reversing Immune Dysfunction for HIV-1 Eradication. 2024. Available at: <https://www.ridhiv.org/>. Accessed March 27, 2024.
28. PAVE Pediatric Adolescent Virus Elimination. 2024. Available at: <https://www.pave-collaboratory.org/>. Accessed March 27, 2024.
29. Dubé K, Perez-Brumer A. Call for justice-informed HIV cure trials with ATIs. *Lancet HIV* **2024**; 11:e137–9.
30. Dubé K, Perez-Brumer A, Patel H, et al. This is actually a really unique moment in time: navigating long-acting HIV treatment and HIV cure research with analytical treatment interruptions—a qualitative interview study in the United States. *AIDS Res Hum Retroviruses* **2024**; 40:455–3.
31. Protière C, Fiorentino M, Sow A, et al. Where are the persons living with HIV who might refuse to participate in HIV cure-related clinical trials with treatment interruption? *AIDS* **2020**; 34:1095–9.
32. Protière C, Préau M, Carrieri P, et al. Importance of the patient-physician interaction in assessing acceptability of HIV cure trials. *HIV Med* **2018**; 19:e56–7.