The HIV Workforce in New York State: Does Patient Volume Correlate with Quality?

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(See the Editorial Commentary by Gallant on pages 1878–9.)

Background. Knowledge of care practices among clinicians who annually treat <20 human immunodeficiency virus (HIV)–positive patients with antiretroviral therapy (ART) is insufficient, despite their number, which is likely to increase given shifting healthcare policies. We analyze the practices, distribution and quality of care provided by low-volume prescribers (LVPs) based on available data sources in New York State.

Methods. We communicated with 1278 (66%) of the LVPs identified through a statewide claims database to determine the circumstances under which they prescribed ART in federal fiscal year 2009. We reviewed patient records from 84 LVPs who prescribed ART routinely and compared their performance with that of experienced clinicians practicing in established HIV programs.

Results. Of the surveyed LVPs, 368 (29%) provided routine ambulatory care for 2323 persons living with HIV/AIDS, and 910 LVPs cited other reasons for prescribing ART. Although the majority of LVPs (73%) practiced in New York City, patients living upstate were more likely to be cared for by a LVP (odds ratio, 1.7; 95% confidence interval, 1.4–1.9). Scores for basic HIV performance measures, including viral suppression, were significantly higher in established HIV programs than for providers who wrote prescriptions for <20 persons living with HIV/AIDS ($P < .01$). We estimate that 33% of New York State clinicians who provide ambulatory HIV care are LVPs.

Conclusions. Our findings suggest that the quality of care associated with providers who prescribe ART for <20 patients is lower than that provided by more experienced providers. Access to experienced providers as defined by patient volume is an important determinant of delivering high-quality care and should guide HIV workforce policy decisions.

Keywords. HIV; quality care; antiretroviral therapy; patient volume; workforce.

Determining minimum patient volume thresholds for qualification as an human immunodeficiency virus (HIV) care "expert" or "specialist" continues to challenge policy makers [1–6]. Historically, providing routine ambulatory care for an annual volume of ≥20 HIV-positive patients has served as a primary marker of HIV-care expertise in New York State (NYS) [7, 8]. However, that figure has long been promulgated with limited evidence and may have become an inaccurate measure, given changes in HIV care and treatment.

The complexities of antiretroviral therapy (ART) demand criteria that identify clinicians with sufficient expertise to provide high-quality, long-term HIV care. Historically, organizations including the HIV Medicine Association, New York State Department of Health AIDS Institute (NYSDOH AI), and the American Academy of HIV Medicine (AAHIVM)—none of which are official subspecialty boards—offered criteria to identify expert HIV-care providers and, in turn, served as reference points for patients, healthcare providers, and policy makers. Consensus about whether a certain patient volume

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signifies quality does not exist; the AAHIVM uses a guideline of 20 patients in 48 months [7], and the HIV Medicine Association specifies 25 patients in 36 months [9].

In the last 15 years, new classes of antiretroviral medications, the evolution of drug resistance, and the impact of HIV on comorbid conditions have transformed the practice of HIV care, which includes comprehensive primary care as well as continued monitoring of ART. A reexamination of the relationship between patient volume and the quality of HIV care focusing on the achievement of patient outcomes would inform workforce policy decisions and strategies within the changing landscape of HIV care.

In 2008, the NYSDOH AI convened an expert panel of HIV clinicians and public health officials to address the multifaceted issues associated with the definition of expert HIV treatment, including a reconsideration of the annual 20-patient threshold for "expert" HIV-treatment provider designation [8]. The panel expressed concern that a strict volume requirement fails to consider comanagement and team-based models of care, which could offer necessary expertise to produce expected clinical outcomes in the absence of high-volume practitioners. Among recommendations concerning the association of patient volume with the quality of care provided to persons living with HIV/AIDS (PLWHA), the panel recommended that the NYSDOH AI analyze existing administrative data to assess the quality of care provided by low-volume prescribers (LVPs) [8].

Ensuring that all providers who routinely manage care for HIV-positive patients have the required competencies and capabilities to provide high-quality care is a critical and timely component for achieving population-wide viral load suppression. The current analysis seeks to inform the discourse among policy makers, educators, clinicians, and public health professionals by examining the quality, distribution, and contexts of clinical practice among clinicians who prescribe ART and provide routine ambulatory care for <20 HIV-positive patients per year, hereafter referred to as *LVPs*. To our knowledge, this is the first study to examine the relationship between patient volume and viral load suppression within a large state or public health jurisdiction.

METHODS

Data Source

Because of the lack of an existing database to address workforce questions, we used several sources of administrative data to better understand the distribution and characteristics of LVPs. To identify these providers, we used prescription drug claims from the NYS Medicaid and AIDS Drug Assistance Program (ADAP). We then interviewed clinicians to establish a cohort that provided routine ambulatory care to ≤20 PLWHA and studied the performance of a representative sample of these providers through chart review.

Identification of LVP Using Pharmacy Claims

The first step involved identification of clinicians who had written ART prescriptions for <20 unique patients in federal fiscal year (FFY) 2009. We queried claims data from the NYS Medicaid and ADAP ART prescription databases, which contain prescription information for approximately 68% of PLWHA in NYS [10]. We removed all duplicate provider data, using each clinician's unique national provider identifier and name, excluding 865 clinicians who had written ART prescriptions for a single unique patient in FFY 2009, because they were presumed to have written prescriptions when covering for others and were not likely to regularly prescribe ART. The subsequent group for analysis included 1937 clinicians who had written ART prescriptions for 2–19 HIV-positive patients and were classified as LVPs. This process of identifying LVPs is presented in Figure 1.

Provider Interview

To determine reasons for prescribing ART, we attempted to contact 1937 LVPs by phone, e-mail, or fax. We gathered contact information from the databases and online searches, using both names and national provider identifiers. We were able to establish initial communication with 1611 prescribers. Of these, 1278 (79.1%) responded and answered the specific questions listed in Figure 1.

We gathered self-reported caseload information to ensure that LVPs did not prescribe for more patients than reported in the Medicaid or ADAP databases. Provider self-report and the NYS Physician Profile Database [11] was used to classify each provider by specialty and location.

From these 1278 providers, we collected additional data including (1) self-reported caseload in FFY 2009; (2) reasons for prescribing ART; (3) self-identification as an HIV specialist; and (4) any provision of care to PLWHA who would not appear in Medicaid or ADAP databases because they were uninsured or were beneficiaries of Medicare, private insurers, or the Veterans Administration. (Table 1) This 10-month follow-up process was completed in May 2012.

Of the providers surveyed, 368 (29%) confirmed that they provided routine ambulatory care for <20 PLWHA in FFY 2009 and were subsequently designated as LVPs. Of the 910 not designated as LVPs, 260 provided care for ≥20 HIV-positive patients, and 650 prescribers did not routinely provide HIV care. Reasons for writing prescriptions included covering gaps in care (45%), providing inpatient care (20%), and use of ART for hepatitis B treatment (13%) or for post-exposure prophylaxis (8%). Twenty-three clinicians (4%) claimed inappropriate attribution of prescribing within the databases. Twelve had prescribed ART only while providing consultation (2%), while others did so as residents or fellows (1%). Six providers (1%) wrote prescriptions for HIV-positive mothers and their newborns. 17% (111) were unable to recall reasons or noted issues such as stolen prescription pads.

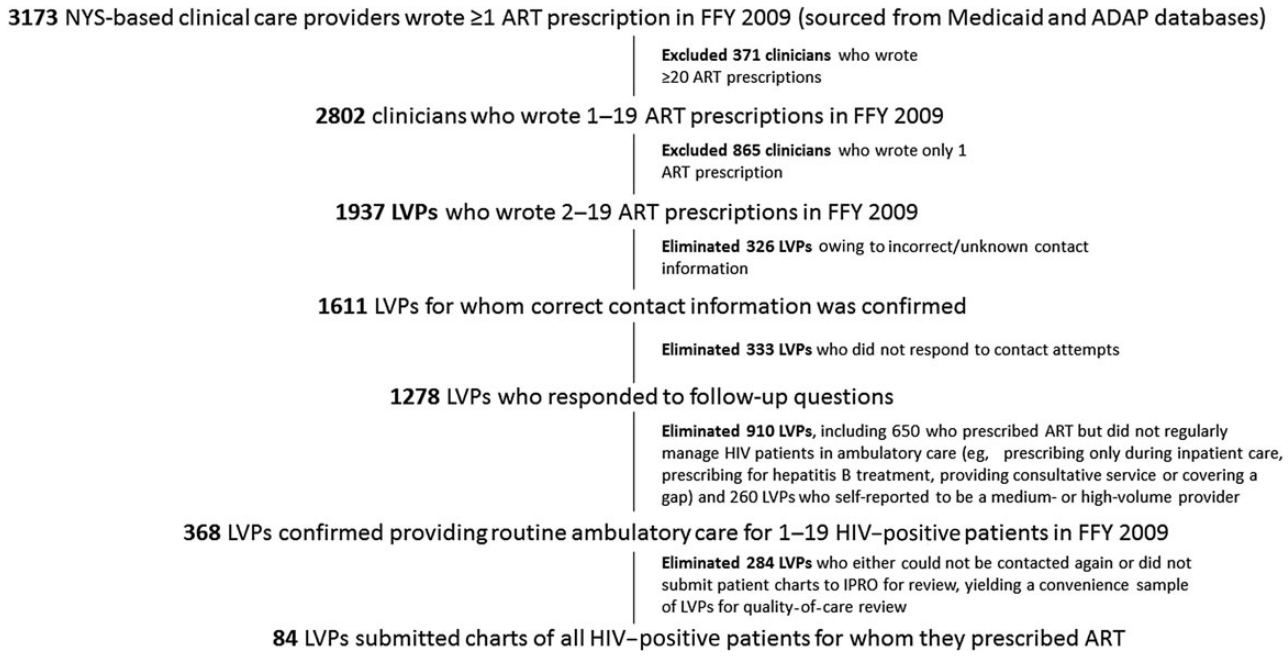

Figure 1. Process for identification of low-volume prescribers (LVPs) in New York State (NYS). Abbreviations: ADAP, AIDS Drug Assistance Program; ART, antiretroviral therapy; FFY, federal fiscal year; HIV, human immunodeficiency virus.

Performance Measurement via Chart Review

We sought to obtain charts from 368 LVPs. We found that 65 providers had moved or retired. The remaining 303 were asked to provide the medical record of each patient for whom they had prescribed ART. Eighty-four providers (27.7% of 303) submitted a total of 320 records. After submission, 27 patients (8.4%) were deemed ineligible because they did not meet the eligibility criteria of 2 HIV medical visits or were only seen in an inpatient setting (Figure 1).

All patient record reviews used established HIV performance measures to assess quality of HIV care. The performance indicators used in this analysis reflect US Department of Health and Human Services clinical guidelines at the time of data collection [12]. The same performance measures were used as indicators of clinical performance for both sampled LVPs and the statewide cohort of established providers. Mental health screening entailed comprehensive assessments of depression, anxiety, and posttraumatic stress disorder as well as cognitive function, domestic violence, sleeping habits, and appetite.

The performance scores generated from the LVP sample were compared with mean scores from a statewide cohort of experienced providers, who were evaluated on the same performance metrics. Reviews from experienced providers were conducted according to methods developed in 2002, using established procedures standardized for chart abstraction, formal training on the methods, internal validation, attestation of the results by the facility medical director, and external review by NYSDOH staff. These data were randomly sampled from 186 established HIV programs as part of the NYSDOH HIV Quality of Care Program [13]. Practitioners in these programs are required to meet the volume criterion of ≥20 patients or be supervised by an experienced provider meeting the criterion [14]. Data from the randomly selected records are submitted electronically each year to the NYSDOH by participating programs. For the chart review and statewide data submission, eligibility was limited to patients with 2 medical visits during the calendar year.

Statistical Analyses

We estimated the number of LVPs in NYS and the number of PLWHA that they care for using methods described in the Supplementary Digital Content. We used χ^2 tests of independence to compare the quality of care provided by LVPs and performance of physicians who saw ≥20 patients. Odds ratios were computed to quantify the magnitude of the associations between patient volume and the quality-of-care indicators. To address concerns about bias in our data, we examined the sampling distributions of patient volume, geographic distribution, and specialist type using the Kolmogorov–Smirnov test.

To examine the geographic distribution of LVPs, we classified the zip code within which each provider practiced as rural or urban based on the rural-urban commuting area codes, which account for the close proximity between urbanized areas and many outlying communities [15–17]. We used R software

Table 1. Characteristics of Identified Low-Volume Prescribers

Characteristic	LVPs, No.	
	Contacted (n = 368)	Chart Review Sample (n = 84)
Education		
MD/DO	348	80
Nurse practitioner	15	3
Physician assistant	5	1
Location		
New York City	270	62
Rest of state	98	22
Locale		
Urbanized[a]	353	80
Nonurbanized	15	4
HIV caseload (Medicaid and ADAP database)		
2–5	301	64
6–10	42	15
11–19	25	5
HIV caseload (verified by self-report)		
2–5	234	44
6–10	74	20
11–19	60	20

Abbreviations: ADAP, AIDS Drug Assistance Program; HIV, human immunodeficiency virus; LVP, low-volume prescribers.

[a] Urbanized areas included zip codes where the majority of residents commuted to a densely populated city with ≥50 000 persons [16, 17].

Table 2. Distribution of Specialties Among Low-Volume Prescribers

Specialty	Low-Volume Prescribers, No. (%)
Internal medicine	151 (41.0)
Family medicine	114 (31.0)
Infectious diseases	25 (6.8)
Pediatrics	22 (6.0)
Obstetrics-gynecology	7 (1.9)
Geriatric medicine	6 (1.6)
Pediatric infectious diseases	3 (0.8)
Other	
Other specialty	20 (5.4)
Nurse practitioner	15 (4.1)
Physician assistant	5 (1.4)

(version 2.15.2; R Foundation for Statistical Computing) for all analyses.

RESULTS

We identified 368 LVPs who confirmed prescribing ART for 2–19 unique patients. In total, the cohort provided routine ambulatory care to 2323 PLWHA. The characteristics of this group are described fully in Table 1. This group of LVPs prescribed ART for a mean of 4.3 patients (interquartile range [IQR], 2–5). The most common specialties among LVPs were internal medicine (41%), family medicine (31%), and infectious diseases (6.8%) (Table 2).

Of the 368 confirmed LVPs, 209 (57%) volunteered additional details about their practices. Twenty-seven reported participating in comanagement of HIV-positive patients, and 51 reported prescribing for reasons other than routine ART management and to cover gaps in care. Only 4 identified themselves as HIV specialists. Other respondents recounted specific care practices, including being a women's health HIV or pulmonology HIV specialist and managing short-term care for patients with newly diagnosed HIV infection before referring them to a dedicated HIV-care provider.

Of the confirmed LVPs, 270 (73%) practiced in the New York City metropolitan area. However, patients living outside New York City were more likely to be cared for by an LVP (odds ratio, 1.7; 95% confidence interval, 1.4–1.9). Only 15 (4%) practiced in nonurbanized areas.

With χ^2 tests of independence, LVPs demonstrated lower scores for all quality-of-care indicators. Results of this analysis appear in Table 3. Notably, viral load suppression rates were lower among patients cared for by LVPs than among those patients cared for by experienced providers (56% vs 77%; $P < .01$). Patients cared for by LVPs were less likely to have viral load measured every 4–6 months than were those cared for by experienced HIV clinicians ($P < .01$). In addition, patients cared for by LVPs were less likely to have regular clinical visits, CD4 cell count measurements, or mental health and syphilis screenings (all $P < .01$). LVPs were not observed to be more or less likely than higher-volume prescribers to prescribe *Pneumocystis jiroveci* pneumonia prophylaxis for at-risk patients ($P = .79$), but the small sample size (n = 26) prevents inference on this estimate.

The LVPs who submitted charts prescribed ART for a mean of 4.5 patients (IQR, 2–5). An analysis of potential sample bias indicated that these providers did not differ significantly from the 219 LVPs who did not submit charts. The 2 groups were similar in medical specialty, geography, and patient volume (all comparisons, $P > .20$).

DISCUSSION

We estimate that 33% of all NYS HIV ambulatory care providers care for <20 patients and that these LVPs ultimately care for 3381 patients statewide annually. We demonstrate that clinicians who prescribe ART for ≥20 patients perform better on established NYS quality-of-care indicators than those who prescribe for <20, corroborating previous findings that prescribers who treat high volumes of patients are be more likely to provide quality care.

Although attention has been given to the role of LVPs and to the relationship between provider experience and health

Table 3. Comparison of Low-Volume Prescribers and New York State Human Immunodeficiency Virus Providers by Quality-of-Care Metrics

Performance Indicator	Providers, No. Meeting Performance Indicator/Total No. (%)		OR (95% CI)[a]	*P* Value[b]
	LVPs	NYS Quality of Care Program Participants		
Clinical visits every 4 mo	147/293 (50)	8569/10 404 (82)	0.22 (.17–.54)	<.001
Viral load measurement				
Every 4 mo	117/293 (40)	6535/10 401 (62)	0.39 (.31–.55)	<.001
Every 6 mo	128/293 (44)	9362/10 401 (90)	0.09 (.07–.42)	<.001
CD4 cell count every 6 mo	61/293 (21)	9436/10 401 (90)	0.03 (.02–.04)	<.001
Viral load suppression (<400 copies/μL)	129/231 (56)	6844/8890 (77)	0.38 (.29–.64)	<.001
Mental health screening	80/293 (27)	4984/10 404 (48)	0.40 (.31–.53)	<.001
Syphilis screening	93/293 (32)	8350/10 404 (80)	0.11 (.09–.14)	<.001
PCP prophylaxis	20/26 (77)	1125/1506 (75)	1.12 (.45–2.83)	.79

Abbreviations: CI, confidence interval; LVPs, low-volume prescribers; NYS, New York State; OR, odds ratio; PCP, *Pneumocystis jiroveci* pneumonia.

[a] NYS Quality of Care Program Participants used as reference group.

[b] The threshold for significance was .05, as determined with χ^2 test without Yates correction.

outcomes [1–5, 18–20], the present study, to our knowledge, is the first within a large state or public health jurisdiction. The association between patient volume and suboptimal outcomes has been well documented among PLWHA [4, 21, 22]. One study in the early-ART era observed that physicians in Ryan White programs with <20 HIV-positive patients had fewer eligible patients receiving highly active ART than those with higher volumes [5]. However, in these settings providers are likely to have access to experienced clinicians and case managers. Another study examined the relative effect of patient volume, years of HIV experience, and specialty on viral load outcomes in PLWHA who started ART between 1996 and 2006 [23]. This analysis of providers in a private healthcare system found an independent association between patient volume and viral load outcomes among ART-naive patients, irrespective of how long the provider had been treating patients with HIV infection. More recently, the relationship between patient volume and viral load outcomes was observed in physicians treating a cohort of Canadian drug users [24]. We augment this evidence by examining both a diverse mix of statewide low-income patients covered by Medicaid and ADAP and prescribers not affiliated with established HIV programs.

We found that the majority of LVPs practiced in primary care settings and were not infectious diseases specialists or self-identified as HIV specialists; 72% of them practiced internal or family medicine, and 5% were nurse practitioners or physician assistants. Of the 209 providers who detailed their practice circumstances, only 4 (2%) self-identified as HIV specialists.

The concentration of LVPs was highest in New York City; 73% of surveyed LVPs practice there. This finding contradicts the assumption made by some policy makers that low-volume HIV providers predominantly practice in rural areas where the number of PLWHA is lower and access to HIV care is limited. However, patients residing upstate were more likely to be cared for by LVPs (odds ratio, 1.7; 95% confidence interval, 1.6–1.8), suggesting the need to expand access to experienced providers in these areas. Consultation and coaching through distance telecommunications technology to build capacity for care in rural and low-prevalence communities has proved effective [25] and could be useful for delivering effective treatment of PLWHA in the absence of additional providers.

Although LVPs often lack expertise treating HIV, innovative strategies may improve their ability to deliver optimal HIV care. Care models that involve a multidisciplinary team of nurses, pharmacists, case managers, and social workers have been shown effective in improving ART adherence [26, 27]. In addition, comanagement may improve outcomes by allowing LVPs to treat complex patients and those with multiple comorbid conditions in consultation with experienced providers, whether within their own health system or with outside consultants via telemedicine [25, 28]. Only 13% of surveyed providers (27 of 209) participated in comanagement, which would have probably improved the performance of LVPs who provide ongoing care to PLWHA and prescribe ART when more experienced providers are inaccessible.

Our study had limitations. It did not consider longevity of experience as a determinant of quality care, which has been demonstrated elsewhere [23]. Providers who participate in comanagement with more experienced providers probably have an enhanced capacity to provide high-quality care, as do LVPs who frequently refer patients to ancillary services, such as those supported by the Ryan White HIV/AIDS program. We were also unable to examine whether continuing medical education improved the capacity of LVPs to provide high-quality care.

The performance scores associated with LVPs may also reflect characteristics of the patients for whom they provide care. This information was not gathered during chart review. Without this information, we could not perform case-mix analysis, which would be useful for future research. In our study, chart reviews were performed only for patients who had visited their provider in each 6-month period of the year. Because retention in care is a strong confounder, this eligibility criterion limited the likelihood of biased estimates or an uneven distribution of patients who might pose greater challenges for continuity of care.

LVPs who honored requests for charts may have provided better care than those who did not return charts, inflating the aggregate scores of sampled LVPs and obscuring even larger discrepancies in clinical performance. We were unable to include clinicians from the Veterans Affairs system or providers who accept private insurance exclusively. Contacting study participants also posed significant challenges. Incomplete or incorrect clinician contact information was common. However, the absence of significant differences in geographic distribution, clinical specialty, and patient volume among contacted and uncontacted prescribers suggests an absence of sampling bias.

Our study highlights the need to monitor data and trends within the HIV workforce. Routine collection of relevant information is not undertaken. The secondary use of large administrative databases presented specific limitation to study authors. Whereas Medicaid and ADAP drug claims were useful to establish the initial list of ART prescribers, provider interviews were time intensive and necessary to determine patient volume. Ideally, each jurisdiction would have a database that captured provider characteristics and patient volume to identify populations and geographic areas with unmet workforce needs.

Ongoing research is needed to examine strategies to guarantee a capable provider workforce for delivering effective care to HIV-positive patients over time and identify best practices. Investigation of the quality of care provided through team-based management and comanagement between low-volume and experienced providers would offer additional insights to our understanding of HIV workforce strategies [26–28]. With the eventual retirement of providers who have delivered HIV care since the beginning of the epidemic, unfilled positions within infectious diseases fellowship programs, and perceived lack of young providers expressing interest in HIV care [25], the urgency of developing workforce policies to assure high-quality care must be addressed by policy makers and educators in the health professions. Our results suggest that these approaches will need to consider how sufficient experience in the use of ART can be acquired to achieve maximal viral suppression rates among PLWHA, which, in turn, will reduce onward transmission. As these new strategies are designed and put into practice, implementation research should be conducted to determine which models and interventions are most successful to build capacity for HIV care in the changing healthcare environment and assure that the best possible care is provided to PLWHA.

Supplementary Data

Supplementary materials are available at *Clinical Infectious Diseases* online (http://cid.oxfordjournals.org). Supplementary materials consist of data provided by the author that are published to benefit the reader. The posted materials are not copyedited. The contents of all supplementary data are the sole responsibility of the authors. Questions or messages regarding errors should be addressed to the author.

Notes

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

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