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International Journal for Quality in Health Care, 2017, 29(5), 654–661
doi: 10.1093/intqhc/mzx083
Advance Access Publication Date: 9 August 2017
Article

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The patient-centered medical home: a reality for HIV care in Nigeria

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Editorial Decision 23 June 2017; Accepted 28 July 2017

Abstract

Objective: HIV care delivery in resource-limited settings (RLS) may serve as a paradigm for chronic disease care, but comprehensive measurement frameworks are lacking. Our objective was to adapt the patient-centered medical home (PCMH) framework for use in RLS, and evaluate the performance of HIV treatment programs within this framework.
Design and setting: Cross-sectional survey administered within the AIDS Prevention Initiative in Nigeria (APIN) network.
Participants: Medical directors at APIN clinics.
Main outcome measures: We adapted the 2011 US National Committee on Quality Assurance's PCMH standard to develop a survey measuring five domains of HIV care: (i) enhancing access and continuity, (ii) identifying and managing patient populations, (iii) planning and managing care, (iv) promoting self-care and support and (v) measuring and improving performance.
Results: Thirty-three of 36 clinics completed the survey. Most were public (73%) and urban/semi-urban (64%); 52% had >500 patients in care. On a 0–100 scale, clinics scored highest in self-care and support, 91% (63–100%); managing patient populations, 80% (72–81%) and improving performance, 72% (44–78%). Clinics scored lowest with the most variability in planning/managing care, 65% (22–89%), and access and continuity, 61% (33–80%). Average score across all domains was 72% (58–81%).
Conclusions: Our findings suggest that the modified PCMH tool is feasible, and likely has sufficient performance variation to discriminate among clinics. Consistent with extant literature, clinics showed greatest room for improvement on access and continuity, supporting the tool's face validity. The modified PCMH tool may provide a powerful framework for evaluating chronic HIV care in RLS.

Key words: patient-centered medical home, HIV, resource-limited settings

Introduction

In an unprecedented response to the global HIV crisis, the UN and donor agencies in partnership with country governments and advocacy groups worldwide have launched a massive scale-up of HIV care and treatment services [1]. This partnership has achieved substantial impact, including a reduction in new HIV infections and AIDS-related deaths [1]. Nonetheless, much still needs to be done to consolidate these gains and to maximize the quality of the services that have been established. Nigeria is the most populous country in Africa, and has the second largest population living with HIV in the world [1, 2]. Data describing the continuum of HIV care in Nigeria and other resource-limited settings (RLS) highlight many areas needing improvement. In Sub-Saharan Africa, HIV remains under-diagnosed, and nearly half of those infected are unaware of their disease status. Sixty percent of eligible patients lack access to treatment, and many patients present late to care or not at all [3]. At least 30% interrupt care, and another 25–30% do not remain in care over time [4, 5].

With the historic success of the global HIV response, efforts initially focused on the acute crisis are now moving towards ensuring availability and sustainability of effective programs in RLS. However, few comprehensive frameworks exist to evaluate HIV care delivery systems along the care continuum, including effective HIV testing and diagnosis, linkage to chronic care, initiation of life-saving antiretroviral therapy (ART), and durable virologic suppression [6]. Nonetheless, the US President's Emergency Plan for AIDS Relief (PEPFAR) and other global donors have encouraged recipient governments to incorporate HIV care into broader efforts to improve health and development [7, 8]. With this focus, the infrastructure created for HIV care may extend beyond HIV alone, by providing a model that can be applied to the management of other chronic diseases. Indeed, WHO has called for a 25% reduction in premature mortality from non-communicable diseases globally by 2025—most of this burden is in low- and middle-income countries [9]. In this context, the need for a reliable framework to assess quality of care for chronic medical conditions, including HIV care, is great [6, 10].

With the availability of highly active ART, HIV care delivery programs became even more expansive, incorporating the comprehensive care, treatment, and prevention of HIV [11]. This evolution occurred concurrently with an important shift in the dialog about health care in the U.S., as the healthcare system was sharply criticized for delivering increasingly fragmented and depersonalized care [11, 12]. Critics emphasized the importance of integrating both evidence-based and patient-centered medicine to improve healthcare quality [12]. Indeed, in the early 2000 s, the Institute of Medicine published a landmark report entitled *Crossing the Quality Chasm*, which sparked a nationwide effort to reform healthcare delivery systems, placing patients at the center, of coordinated, high-quality services across the health system [13]. Models for the delivery of comprehensive HIV care developed organically in this context, with tremendous advocacy for and sensitivity to the complex multidisciplinary social, biological, and environmental needs of patients living with HIV [11, 14]. HIV care delivery in many RLS has been modeled after such effective systems in resource-rich environments, and have introduced important elements of patient-centered care in settings where this ideal has not often been integrated into routine health care [15, 16]

For many with chronic disease, the patient-centered medical home (PCMH) was heralded as a bridge across the *quality chasm*, and an important framework for health care that promotes partnerships between patients, their families, and clinicians. [17]. PCMH models focus on whole-person care coordinated across all elements of the healthcare system. The PMCH model was introduced in the United States in 1967 by the American Academy of Pediatrics and was initially designed for special-needs children [17]. As the U.S. healthcare system responded to the IOM's call for action, this model was modified and adapted by the American Academy of Family Physicians and American College of Physicians to transform the delivery of adult primary care [17]. The National Center for Quality Assurance articulated the goals of this framework into 6 measureable standards (enhancing access and continuity, identifying and managing patient populations, planning and managing care, providing self-care support, tracking and coordinating care, and measuring and improving performance) by which to evaluate primary care programs [18].

Early evidence suggests that care delivery that meets the highest PCMH standards may improve quality and reduce costs of care for certain chronic conditions [19, 20]. Other models of integrated, patient-centered, care have shown important impact on promoting behavior change for multi-morbid patients [21]. As such, both the National HIV/AIDS Strategy and the Patient Protection and Affordable Care Act in the US have included the PCMH as a valued strategy for accomplishing key goals of improving quality of care and containing costs [22]. The PCMH model may also provide a reliable measurement framework for the evaluation of comprehensive and cost-effective HIV care delivery in RLS, the goal of which is to efficiently diagnosis and treat people living with HIV to maximize virologic control, and minimize HIV-related morbidity and mortality [23]. Our purpose was to assess the feasibility of the PCMH framework for use in Nigeria and evaluate the performance of HIV treatment programs in Nigeria according to this standard.

Methods

Study design and setting

We conducted a cross-sectional survey of medical directors of comprehensive HIV treatment centers of the AIDS Prevention Initiative in Nigeria (APIN) (Fig. 1). APIN administers a network of HIV treatment centers in Nigeria established in collaboration with the Harvard T. H. Chan School of Public Health (HSPH) in 2000. APIN became a local NGO in 2007 and gradually took over program management from HSPH [24]. At the time of the study, APIN coordinated 36 diverse clinic sites providing care and treatment to over 100,000 people living with HIV/AIDS in 9 of Nigeria's 36

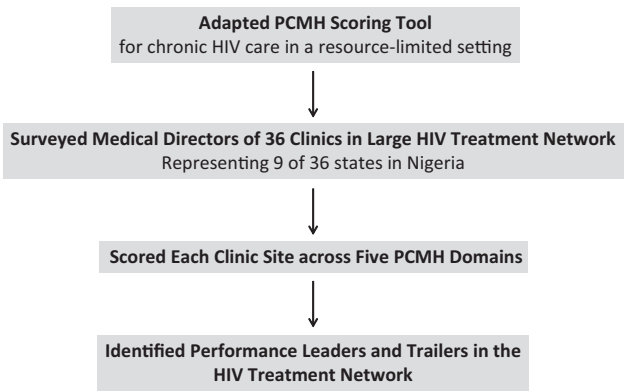

Figure 1 Schematic of study design.

states. These sites follow streamlined clinical protocols in compliance with National Nigerian ART guidelines [25].

Data collection

We administered a structured health service questionnaire to medical directors at all APIN sites incorporating five key domains of the PCMH: (i) enhancing access and continuity of care, (ii) identifying and managing populations, (iii) planning and managing care, (iv) promoting self-care and support and (v) measuring and improving performance. Standard clinical encounter forms and clinic protocols were reviewed to assess comprehensiveness of documented demographic and clinical information and routine clinical practice on education and prevention activities.

We excluded one PCMH domain, tracking and coordinating care. The NCQA scoring framework relied heavily upon electronic means of tracking and coordinating care, and the infrastructure in many RLS makes this standard unachievable. However, as the NCQA framework does have some redundancy across domains, we measured essential elements of tracking and coordinating care within the context of the other five domains described above (including follow-up of test results, coordination and completion of referrals, and documentation of care transitions). In the planning process, we recognized that the patient/family experience was *not* systematically assessed during routine care. We made the decision to remove this from the scoring framework for this study, since there would be no variability in this measure. The scoring framework does, however, incorporate the core elements of the Primary Care Model (highlighting linkage to care through first contact, coordination of services, continuity of care, and comprehensive services) [18, 26]. In addition, we also included questions about practice type, provider types, and scope of HIV and non-HIV-related medical and support services provided. Medical directors had the option of completing paper or web-based questionnaires (administered via Lime Survey); they were instructed to complete them using their best estimates, key information from program staff, and other objective data. Missing, incomplete and inconsistent responses were identified and reviewed by the Senior Advisor of community programs at APIN with respondents to ensure clarity of results.

Modified PCMH framework

We adapted the 2011 National Committee on Quality Assurance's PCMH standard for HIV care in RLS [18]. We reviewed each question for its relevance to HIV care in RLS and provided substitutes where necessary. Items that relied solely on electronic data platforms were removed given the environment. The original tool had 125 questions and 81 points. The adapted tool had 106 questions and 52 points (Table 1). We revised the scoring method for this adapted framework, assigning points to each of the PCMH domains measured. Clinics earned a maximum of 15 points for access and continuity of care, 8 points for identifying and managing patient populations, 9 points for evidence-based care, 5 points for self-care and community resource promotion and 4 points for performance improvement.

Data analysis

We summarized the range of scores and variability across each of the five measured domains within the APIN network (to identify

Table 1 Original and modified PCMH scoring tools

PCMH domain	Original scoring tool			Modified scoring tool			Notes
	Score	Features assessed	Number of questions	Score	Features assessed	Number of questions	
Enhance Access & Continuity	20	7	34	15	7	29	■ 1 feature removed (electronic access to clinic) ■ 1 feature added (linkage to HIV care) ■ 2 questions modified [21] ■ 5 questions added (ensuring access to care for high-risk patients, efficient ART access for eligible patients, completion of referrals and documented transitions) ■ 6 questions removed (providing phone and electronic medical advice, patient/family selection of care teams)
Plan & Manage Care	17	5	24	9	4	14	■ 1 feature removed (electronic prescribing) ■ 4 questions removed (written care plans and clinical summaries, OTC med documentation) ■ 2 questions modified (to include high-risk HIV populations, and antiretroviral adherence assessment)
Measure & Improve Performance	19	6	23	9	6	21	■ 2 questions removed (measure patient/family experience) ■ 1 question modified (drug stock out frequency)
Identify & Manage Patient Populations	16	4	34	11	4	33	■ 4 questions removed (demographic patient information) ■ 3 questions added (TB symptom screening, food insecurity, poverty assessment) ■ 1 question modified
Provide Self-Care Support & Care	9	2	10	8	2	9	■ 1 question removed (EHR use to ID education resources) ■ 3 questions modified (HIV-specific prevention and education activities, support group services and community-based outreach services)
Total	81	24	125	52	23	106	

This table summarizes key components of the PCMH scoring tool and changes in the modified scoring tool. The modified PCMH scoring tool assesses five domains. Each domain reflects several important components of that domain which are measured by specific questions that are assigned points to arrive at the total score. EHR, electronic health record.

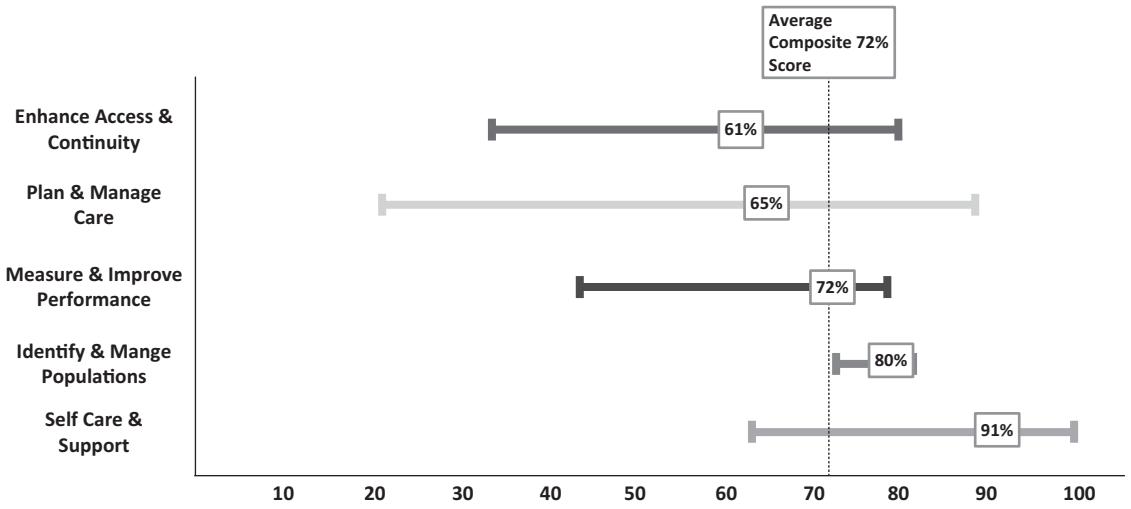

Figure 2 Average scores across five PCMH domains within the APIN network. This figure shows the average and range of individual clinic scores within the APIN network. Each colored bar represents one of five measured PCMH domains. Clinics scored highest on self-care and support activities. Clinics scored lowest in enhancing access and continuity, and had the most variability in scores in planning and managing evidence-based care. Average composite score across the five domains was 72%.

areas for improvement), determined how many clinical sites scored above average in at least one domain, and identified performance leaders (clinics with above average scores in all five domains) and performance trailers (clinics with below average scores in at least four domains) within the APIN network. The score for each domain was transformed to a scale of 0–100% (Fig. 2). We used linear regression to determine whether facility level characteristics (facility type, HIV prevalence within state, urban vs. rural location, and number of patients at clinical site) were associated with average score within the PCMH framework. We did not perform a priori power analyses given our fixed sample size and unknown distribution of scores. We conducted a secondary review of the health service questionnaires of performance leaders and trailers to identify salient structures and processes of care adopted by clinics performing at these extremes.

Results

Summary of participating comprehensive APIN clinic sites

Medical directors in 33 of APINs 36 (92%) comprehensive clinic sites completed the 50-item health service questionnaire. Most sites ($n = 24$; 73%) were in the public sector, followed by faith-based settings ($n = 8$; 24%) and private clinics ($n = 1$; 3%). Most were secondary health facilities ($n = 25$; 76%), which are typically general hospitals (GHs) coordinated by state governments, in contrast to tertiary facilities ($n = 8$; 24%), which are typically affiliated with university health centers. Most sites ($n = 29$; 88%) were located in states with medium HIV prevalence (2–6%). Only two sites (6%) were located in high prevalence (>6%) or low prevalence (<2%) states. Sixteen sites (49%) were located in urban centers, 12 (26%) were in rural and 5 (15%) in semi-urban communities. Additionally, 11 (33%) of the participating clinics had ≤500 patients in care, while 6 (17%) had >5000 patients in care (Table 2).

Most clinics ($n = 29$; 88%) were in outpatient facilities located on hospital grounds, and the majority ($n = 26$; 79%) reported offering both HIV and general medical services. Nonetheless, routine offering of non-HIV clinical services varied widely, from routine blood pressure (BP) monitoring in all sites ($n = 33$; 100%) to diabetes screening and pap smears in 74% ($n = 24$) and 10% ($n = 10$) of sites, respectively. Home visits were routinely offered at most APIN sites ($n = 29$; 88%); the indication for home visits included advanced HIV disease, other severe medical problems, transportation or financial issues, caretaker duties, defaulted from clinic, and pre-ART home assessment. Transportation assistance was offered by a minority of sites ($n = 13$; 39%) and included travel vouchers, program vehicle transportation, and funds raised by patients or staff for indigent patients. About half the sites ($n = 17$; 52%) offered food or nutritional supplementation to patients in need due to unemployment, low body mass index (BMI), pregnancy, and/or advanced HIV disease. Nearly all sites ($n = 30$; 91%) provided flexible ART dispensation, allowing patients to receive ART prescriptions in excess of the typical 30-day supply. According to APIN protocol, all sites that made this provision did so for patients who were stable on ART, but some sites additionally made this available to patients who lived far from clinic or whose jobs provided challenges to obtaining monthly ART. A few sites made these provisions for patients experiencing geopolitical crises ($n = 4$; 13%), and only one site provided longer ART prescriptions to students away at school taking exams. All sites encouraged disclosure to a treatment buddy, and all had systems in place to identify and contact patients who missed visits and defaulted from care (Table 3).

Average scores across five PCMH domains within the APIN network

Among the five domains assessed in the final scoring template, clinics scored highest in promoting self-care and support, 91% (range: 63–100%); followed by identifying and managing populations, 80% (range: 72–81%); measuring and improving performance, 72% (range 44–78%); and planning and managing care, 65% (range 22–89%). Clinics scored lowest on enhancing access and continuity, 61% (range: 33–80%). The greatest variability in scores was in planning and managing evidence-based care (range: 22–89%), while the least variability was in identifying and

Table 2 Characteristics of participating APIN comprehensive clinics in a study of the PCMH framework in Nigeria

Sector		Level of care		State HIV prevalence*		Location		# Patients in care	
	n (%)		*n* (%)		*n* (%)		*n* (%)		*n* (%)
Public	24 (73)	Secondary	25 (76)	High (>6%)	2 (6)	Rural	12 (36)	≤500	11 (33)
Private	1 (3)	Tertiary	8 (24)	Medium (2–6%)	29 (88)	Semi-urban	5 (15)	501–1 000	7 (21)
Faith based	8 (24)			Low (<2%)	2 (6)	Urban	16 (49)	1 001–5000	6 (17)
								>5000	6 (17)
								Missing/unknown	4 (12)

managing patient populations (range 72–81%). The average composite score across the five domains was 72% (Fig. 1). In univariate analysis, no clinic-level variables (level of care, HIV prevalence within state, urban vs. rural location or number of patients in care) were significantly associated with average composite score.

Highest and lowest performing clinic sites

Five (15%) clinics were identified as performance leaders, scoring above average in all five domains. Conversely, four (12%) clinics were identified as performance trailers scoring below average in at least four of five measured domains. Among the four performance trailers, only one clinic scored below average in all five domains, and the remaining three scored below average in four of five domains (Fig. 3).

Discussion

We introduced the PCMH framework, commonly used in resource-rich environments, to assess comprehensive HIV treatment programs in an RLS. The 33 clinics assessed in the APIN network performed well according to this standard, with a composite average score of 72% across the five measured domains. In addition to providing a global performance assessment, the PCMH framework allowed for identification of highest and lowest performing clinic sites within the network. Accordingly, 15% of clinics scored above average in all domains, highlighting an opportunity to share best practices from these clinics across the treatment network. On the other hand, 12% scored below average across at least four of five PCMH domains, providing areas of focus for quality improvement efforts at the facility level.

The clinics scored highest (91%) on the domain measuring 'promoting self-care and support' activities. The relatively high score in this domain provides some face validity for the use of the modified PCMH scoring tool, since all APIN clinics have prioritized investment in this area due to the requirement for high medication adherence for effective HIV care. The activities measured by this domain facilitate patient outcomes through focus on adherence counseling, peer support, outreach activities in the home and local community, and secondary prevention efforts. Adherence to ART is essential to maintain the clinical, immunologic and mortality benefits of ART [27]. However, suboptimal adherence remains a challenge for many patients with chronic diseases, including HIV [1, 27]. Consequently, most guidelines, including the World Health Organization (WHO) HIV treatment guidelines, call for routine adherence assessment along with a variety of program-level interventions to optimize adherence [28]. As with many programs in RLS, APIN sites provide group and individual adherence counseling for all patients initiating ART, and highlight adherence within their secondary prevention program. APIN sites invest in a variety of staff to support adherence activities, including adherence counselors, social workers, and home-based care teams. Adherence messages are solidified by routine health and wellness presentations provided by the nursing staff to patients waiting to be seen by their providers. Some interventions adopted universally by APIN program sites to optimize adherence include referral to peer support groups and community outreach programs, as well as use of treatment supporters. Some programs ($n = 6$; 18%) included home visits for patients at high risk for poor adherence prior to ART initiation. The variety of programs offered by APIN sites underscores the value placed on investing in patient adherence.

APIN clinical sites also scored highly (80%) on 'identifying and managing populations.' Many of the processes measured in this domain were routinized across the APIN network through the use of standard data collection forms guiding patient assessment, both at clinic entry and at follow-up. These forms help to operationalize several practices, including comprehensive health assessment (HIV diagnosis, opportunistic infection including tuberculosis (TB) diagnosis, ART, and other chronic medical issues). The standardization of these processes and uniformly high score on this domain across the network highlights the value of minimizing variability of important care processes, and provides additional face validity for the modified PCMH framework. Clinics in the APIN network screen patients for TB at each clinical encounter—an important practice given that TB is a major cause of morbidity and mortality among people living with HIV in Nigeria and other parts of sub-Saharan Africa [29]. In fact, about a third of all HIV-related deaths worldwide are attributable to TB [29]. While these practices were consistent across clinics, other important screening and management practices varied widely. At the time of assessment, only 12 of 33 (36%) clinics offered mental health services, and 17 of 33 (52%) offered food or micronutrient supplementation. Both untreated depression and food insecurity have been identified as barriers to effective adherence to HIV care and ART [30, 31]. Depression is the most common neuropsychiatric complication in people living with HIV, but remains under-diagnosed and undertreated [32]. Many patients face the challenge of prioritizing medical treatment in the face of competing subsistence needs, and nutritional support is acknowledged as a critical component of HIV care in food-insecure settings [30]. This suggests that integration of routine screening for depression and food insecurity along with focused intervention for high-risk patients could improve HIV-specific outcomes.

Continuous quality improvement has been adopted as a tool to improve patient outcomes for many health conditions, including HIV [33]. While these techniques have seen widespread use in resource-rich environments, they have been used less in resource-limited environments [6, 10]. The PCMH framework recognizes the importance of continuous quality improvement by including a domain highlighting its principles [20]. The APIN network has codified performance measurement and quality-improvement efforts into routine practice coordinated centrally by its strategic information group, and facilitated

Table 3 Range of services provided by 33 APIN comprehensive clinics

Variable	*n* (%)	Variable	*n* (%)
Clinic location (*n* = 33)		**Home visit (*n* = 33)**	
Outpatient on hospital grounds	29 (88)	Home visits offered	
Outpatient and Inpatient on hospital grounds	3 (9)	Indications for home visits (*n* = 29):	29 (88)
Outpatient clinic within research institute	1 (3)	Advanced HIV	24 (83)
		Severe medical problems	22 (76)
		Transportation	15 (52)
		Cared for by ill or elderly	22 (76)
		Lost to follow-up	28 (96)
		Pre-ART home assessment	6 (21)
		Indigent patients	2 (7)
Services offered (*n* = 33)		**Home visit services provided (*n* = 33)**	
HIV services only	7 (21)	Counseling	28 (96)
HIV and general medicine services	26 (79)	Coordinate referrals	26 (90)
		General care	24 (83)
		Medicine delivery	15 (52)
		Blood draws	3 (10)
TB services (*n* = 33)		**Hours of operation (*n* = 33)**	
TB screening offered	32 (97)	Open on holidays	22 (67)
TB treatment offered onsite	31 (94)		
TB visits coordinated with HIV clinic visits (*n* = 31)	27 (87)		
Non-HIV services offered (*n* = 33)		**Food/nutritional supplementation (*n* = 33)**	
BP screening	33 (100)	*Food parcels* provided:	17 (52)
BP management	28 (85)	To unemployed (*n* = 17)	16 (94)
Pap smear	10 (30)	To low BMI (*n* = 17)	13 (76)
STI screening/management	28 (85)	To pregnant (*n* = 17)	12 (71)
Family planning	29 (88)	To children (*n* = 17)	10 (59)
Diabetes screening	24 (73)	To advanced HIV (*n* = 17)	13 (76)
Diabetes management	26 (79)	To all PLWHIV (*n* = 17)	1 (6)
Cholesterol screening/management	18 (55)	To exposed infants (*n* = 17)	1 (6)
Mental health services	18 (55)		
Flexible ART dispensation		**Food/nutritional supplementation (*n* = 33)**	
>30 day supply dispensed to (*n* = 33):		*Nutritional supplements* provided to (*n* = 33):	23 (70)
Stable on ART (*n* = 30)	30 (91)	Unemployed (*n* = 23)	13 (56)
Far travel (*n* = 30)	30 (100)	Low BMI (*n* = 23)	15 (65)
Job (*n* = 30)	30 (100)	Pregnant (*n* = 23)	2 (9)
War zones/sectarian crisis/refuge (*n* = 30)	23 (77)	Exposed infants (*n* = 23)	1 (4)
Students taking exams (*n* = 30)	4 (13)	Transportation services provided via (*n* = 33):	13 (39)
Offsite ART dispensation offered (*n* = 33):	1 (3)	Voucher (*n* = 13)	7 (54)
Local primary healthcare facility (*n* = 5)	5 (15)	Program vehicle (*n* = 13)	4 (31)
GH near a cohort of patients (*n* = 5)	3 (60)	Indigent fund (*n* = 13)	5 (38)
Decentralization sites (*n* = 5)	1 (20)	After clinic visit (*n* = 13)	1 (8)
Treatment buddy encouraged (*n* = 33)	33 (100)	**Support groups offered (*n* = 33)**	33 (100)
LTFU tracking system (*n* = 33)	33 (100)	**Electronic medical record utilized (*n* = 33)**	28 (84)
Phone call or SMS to patient	32 (97)	Accessible to clinical providers	23 (70)
Phone call or SMS to patient contact	29 (88)	Regular reports given to providers	28 (85)
Home visit to patient	33 (100)	Data used to inform quality improvement	27 (82)
Support group members/other PLWHA	5 (15)		
Confidentiality measures adopted (*n* = 33)	29 (88)	**Average number of required pre-ART counseling visits**	1.9 (SD 1.0)
Follow-up pre-ART patients		**Fast tracking ART initiation (*n* = 33)**	
Baseline CD4 350–500 (*n* = 33)		Advanced HIV	27 (81)
Every 6 months	9 (27)	Pregnant women (in labor)	3 (9)
Every 3 months	20 (61)	Exposed Infants	1 (3)
Other	4 (12)	HBV, HCV, HSV co-infected	2 (6)
Baseline CD4 > 500 (*n* = 33)		AIDS-defining illness/OI	2 (6)
Every 6 months	22 (67)	TB	2 (6)
Every 3 months	9 (27)		
Other	2 (6)		

STI: Sexually transmitted infections; LTFU: Loss to follow-up; SMS: Short message service; PLWHA: People living with HIV/AIDS; SD: Standard deviation.

by use of a robust electronic health record. APIN has been an early adopter in this regard, applying quality-improvement techniques to HIV care in a resource-limited environment. Nonetheless, APIN sites had an average score on this domain. While all sites measured performance, not all clinic directors reported having access to reports of their performance, or using the information from these reports to

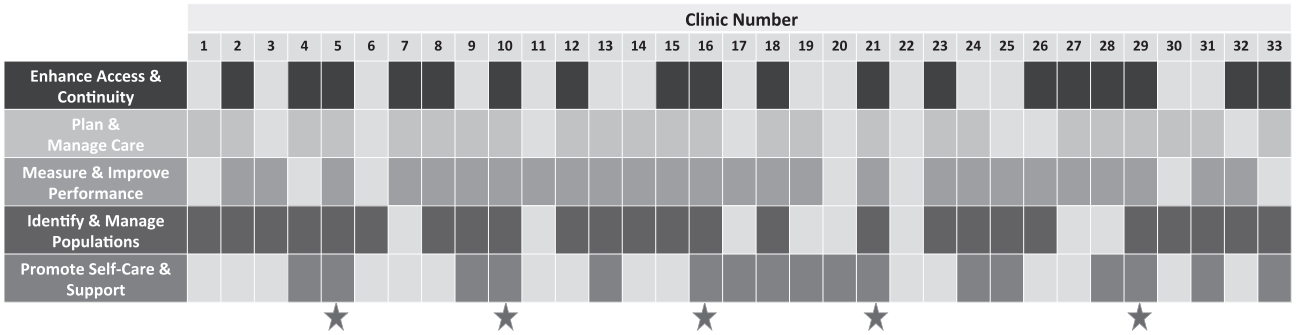

Figure 3 Dashboard of highest and lowest performing clinic sites. This figure is a dashboard summarizing APIN's highest and lowest performing sites within each PCMH domain. Thirty-two of 33 clinics scored higher than APIN's average domain score (colored rectangles) in at least 1 PCMH domain. Five of 33 (15%) clinics were performance leaders (scoring above average in all 5 domains. Four of 33 clinics (12%) were performance trailers; only 1 clinic scored below average in all 5 domains, other 3 clinics scored below average in 4 out of 5 domains. ★ Performance leader.

adapt and improve care processes at the point of care delivery. This finding may reflect an opportunity to empower the clinics themselves, and not just central leadership, to be more actively engaged in the quality-improvement process. Indeed, this is an important tenet of quality-improvement theory [10].

APIN sites scored lowest and showed the greatest variability in 'enhancing access and continuity of care.' Abundant data on the HIV care continuum underscore the gap between optimal outcomes for HIV testing and diagnosis, linkage to care, initiation of ART, and retention in care, and the real world performance of those [1, 3]. In sub-Saharan Africa, the WHO estimates that only 51% of people living with HIV are aware of their status, only 32% of those living with HIV are receiving ART, and only 24% of people living with HIV have a suppressed viral load [3, 34, 35]. Even among those who successfully initiate care, 20–30% are not consistently retained in care over time [1, 35–38]. Given the many challenges that the global community has encountered in efforts to improve access to and continuity of care, it is not surprising that the APIN network has also faced these challenges. Nonetheless, the variability in practice and performance may provide insight into clinic-based practices and interventions that could enhance access and continuity. For example, all responding sites reported using a tracking system to determine whether patients missed visits and defaulted from care, and many also provided ART on more liberalized schedules (>30 day supply) to minimize the burden of pharmacy visits required to adhere to ART. On the other hand, few sites offered ART pick-up at remote sites closer to patient homes, and few offered assistance with transportation to clinic (through vouchers, program vehicles, etc.) for patients in need. Novel patient, clinic, and health-system level interventions will likely be required to substantially impact this domain.

Patient preferences have rarely been incorporated into care delivery systems in Nigeria and other RLS, despite the importance of this information for improving patient outcomes [14, 39, 40]. Patient-informed measures were therefore not included in this version of the modified PCMH framework. Due to the protean complications of untreated HIV disease, and clear social and behavioral drivers influencing care, effective HIV care delivery has necessitated a comprehensive and multidisciplinary approach [11, 15]. This approach to HIV care, first modeled in resource-rich environments, has begun to influence the culture of care delivery in RLS in the wake of the global AIDS response [15]. In this context, health systems that have historically focused on tasks for acute management have now been reconceived to focus on the chronic care of HIV patients. Unlike in resource-rich environments, this transformation has not occurred on the heels of a movement emphasizing patient-centered health care. Nonetheless, future iterations of this work should include and evaluate the patient and family experience, and patient-informed outcomes.

Our study has several limitations. First, the survey responses were self-reported. While we did review responses for consistency and completeness, we did not formally validate the responses, and thus could not account for potential sources of bias (including recall and social desirability bias). Second, even though study sites were geographically diverse, they are not representative of all HIV care programs throughout Nigeria. While not within the scope of this analysis, we were unable to assess the association between specific PCMH domains or composite scores and patient-level outcomes or cost of care. In addition, we may have been underpowered to detect relationships between composite scores and clinic-level characteristics. Future versions of the modified PCMH tool should incorporate important patient experience measures.

In the new global climate for HIV programs, characterized by flat or decreasing funding, evaluating core elements of comprehensive HIV care is essential [41]. The PCMH model has provided a framework for assessment of HIV programs in resource-rich environments [19, 20]. This analysis establishes that the modified PCMH tool may be a valuable framework for assessing service delivery for HIV care in Nigeria, and other RLS. Future work should determine whether the modified PCMH scoring framework is associated with clinical and patient-reported outcomes.

Funding

This work was supported by the National Institute of Allergy and Infectious Diseases of the National Institutes of Health [grant numbers K23 AI106406, AI058736, and P30AI060354]. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. This study was also supported in part by cooperative agreement from the Centers for Disease Control and Prevention [grant number 5U2GPS001058], the Harvard Medical School Office for Diversity, Inclusion and Community Partnership, and the Massachusetts General Hospital Executive Committee on Research.

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