

# Health-care worker engagement in HIV-related quality improvement in Dar es Salaam, Tanzania

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## Abstract

**Objective.** To assess health-care worker (HCW) awareness, interest and engagement in quality improvement (QI) in HIV care sites in Tanzania.

**Design.** Cross-sectional survey distributed in May 2009.

**Setting.** Sixteen urban HIV care sites in Dar es Salaam, Tanzania, 1 year after the introduction of a quality management program.

**Participants.** Two hundred seventy-nine HCWs (direct care, clinical support staff and management).

**Main Outcome Measures.** HCW perceptions of care delivered, rates of engagement, knowledge and interest in QI. HCW-identified barriers to and facilitators of the delivery of quality HIV care.

**Results.** Two hundred seventy-nine (73%) of 382 HCWs responded to the survey. Most (86%) felt able to meet clients' needs. HCW-identified facilitators of quality included: teamwork (88%), staff communication (79%), positive work environment (75%) and trainings (84%). Perceived barriers included: problems in patients' lives (73%) and too few staff or too high patient volumes (52%). Many HCWs knew about specific QI activities (52%) or had been asked for input on QI (63%), but fewer (40.5%) had participated in activities and only 20.1% were currently QI team members. Managers were more likely to report QI involvement than direct care or clinical support staff ( $P < 0.01$ ). No difference in QI involvement was seen based on patient load or site type.

**Conclusions.** HCWs can provide important insights into barriers and facilitators of providing quality care and can be effectively engaged in QI activities. HCW participation in efforts to improve services will ensure that HIV/AIDS quality of care is achieved and maintained as countries strive for universal antiretroviral access.

**Keywords:** quality improvement, health-care workers, health-care surveys

## Introduction

According to the World Health Organization (WHO), between 2005 and 2007, the number of people receiving antiretroviral (ARV) therapy almost doubled, with more than 2 million people in sub-Saharan Africa receiving treatment. The rapid increase in the number of people receiving ARV

therapy represents substantial progress toward the goal of universal access to care and treatment for HIV/AIDS. However, as the number of patients grows, there is an increasing need to ensure that quality care is delivered to maximize the effectiveness of HIV care and prevent the development of treatment failure and drug resistance [1–3]. In the President's Emergency Plan for AIDS Relief

(PEPFAR) Reauthorization Act which was signed in 2008, a strong emphasis was placed on ensuring the delivery of quality HIV care [4].

The ability to measure and improve quality in HIV care in resource-limited settings has been limited by the demands of providing care [5–7]. The quality of care delivered in resource-limited settings reflects a combination of provider, site, patient and system factors. Some of the factors that have been found to negatively impact the quality of care provided include poor patient retention rates [3, 8], slow scale up of pediatric care [9], delays in ARV switches from first- to second-line therapy [1], poor coordination of clinical and laboratory services [10], inefficient client flow in the clinics [3, 11] and weak ARV therapy monitoring and evaluation systems [5, 7, 12, 13]. Identifying factors associated with the ability to deliver and improve the quality of care is a challenge in both resource-rich [14–16] and resource-constrained settings [3] and efforts are already underway to develop capacity at the sites to measure and improve the quality of care in resource-limited settings [17]. Currently, little is known about the attitudes of health-care workers (HCWs) in resource-limited settings regarding the quality of care they provide and their engagement in quality improvement (QI) in ARV therapy clinics in the context of scale-up and limited resources. Understanding providers' perceptions of the quality of care they are able to deliver, barriers and facilitators they encounter, and their interest and involvement in QI to address identified gaps is critical to understanding how to optimally engage staff in meeting the goals of effective quality care.

In this paper, we report the findings of an HCW survey exploring perceptions of quality of care, barriers and facilitators to providing such care, perceived knowledge, interest and engagement in QI activities in a group of PEPFAR-supported Care and Treatment Centers for HIV positive patients in Dar es Salaam, Tanzania, 1 year after the introduction of a quality management program. This information is important for program directors and clinical managers working to engage HCWs in work to improve quality of health care in Tanzania and other similar resource-limited settings.

## Methods

### Study goal and setting

This study was part of a research project designed to examine patient, provider and site factors associated with the quality of HIV care provided in an urban resource-limited setting. The study was conducted at 16 HIV Care and Treatment Clinics located in public health-care facilities and supported by the Muhimbili University of Health and Allied Sciences, Dar es Salaam City Council and the Harvard School of Public Health (MDH) PEPFAR program. The MDH PEPFAR program was established in 2004 and provides infrastructure, laboratory and technical support to Care and Treatment Centers in the Dar es Salaam region. Over

75 000 HIV-infected patients have been enrolled at the time of these analyses, and over 47 000 have been initiated on ARV therapy. In 2008, an HIV quality management program was initiated to support quality management education, performance measurements and QI at the MDH PEPFAR-supported Care and Treatment Centers.

### HCW survey

The content of the HCW survey was developed from a review of the literature, investigators' experience of barriers and facilitators associated with delivery of quality care and HCW engagement in QI, and surveys which had been used by one of the investigators [15; Hirschhorn, personal correspondence]. The initial survey was translated into Swahili and we conducted two focus group discussions of physicians, clinical officers and nurses from two of the Care and Treatment Centers to help refine the areas of focus and terminology used. The groups were also used to identify additional factors associated with the ability to provide quality care. The final survey incorporated suggestions made during the focus group discussions and included questions on HCW socio-demographics, HIV-related training and duration of employment at the clinic, HCW knowledge, involvement and interest in QI activities, perceived barriers to and facilitators of delivery of quality care and suggestions for system changes to improve the quality of care. Other areas covered by the survey included self-rated capacity to provide quality care and HCW perceptions of patient satisfaction with quality of care at the clinics.

### Study population

HCWs were grouped into three categories based on their main focus of activities: direct care providers (physicians, clinical officers, nurses [including nurse counselors], pharmacists and pharmacy technicians), clinic support staff (clinic attendants, medical records clerks, phlebotomists and laboratory technicians) and management (site supervisors, site managers, coordinators and data supervisors). HCWs were categorized according to their current position at the sites, rather than background or training. All health-care providers from these categories who were 18 years or older and working at one of the 16 sites were eligible to participate in this study. The survey was voluntary, self-administered and anonymous and was distributed to all eligible HCWs between 2 and 18 May 2009.

### Data analysis

Descriptive statistics were calculated for socio-demographic characteristics and survey responses.  $\chi^2$  tests for categorical measures were conducted to examine differences in responses between direct care providers, clinical support staff and management staff with Bonferroni's correction used to adjust for multiple comparisons. Missing values were coded in the analyses as 'no' for measures of interest in QI, where

the absence of a response was also interpreted as not being interested.

Hierarchical linear models for continuous outcomes and generalized estimating equations for categorical outcomes were conducted in order to identify respondent and site factors associated with perceptions of quality and patient satisfaction, QI involvement and perceived managerial interest in QI, while controlling for clustering at the site level. Independent variables included respondent factors such as age, sex and position (direct care providers and clinical support staff versus management); and site factors including site type (district hospital versus health center) and patient load (defined as number of active patients at the site from April to June 2009 per the total full-time equivalents [FTEs] for doctors, nurses and pharmacists).

A thematic analysis was performed on open-ended questions regarding suggestions for QI and potential training topics. Initial coding was based on themes identified in the literature and those which emerged through the focus group discussions. The codes were then systematically applied to the data set in an indexing exercise, with modification based on responses. The data were then re-coded and tabulated by a second researcher who was not involved in the initial coding.

Data were double-entered into a custom ACCESS database. Statistical analyses were conducted using SAS 9.1 (Cary, NC, USA). For all analysis, statistical significance was defined at the  $P < 0.05$  level.

The study protocol was reviewed and approved by the Institutional Review Boards at Harvard School of Public Health, Harvard Medical School, Muhimbili University of Health and Allied Sciences in Tanzania and the National Institute of Medical Research, Tanzania.

## Results

### Participant and site characteristics

The survey was distributed to 382 HCWs, of whom 279 (73.0%) returned the survey. Respondents included 215 (77.1%) direct care providers, 31 (11.1%) clinical support staff and 22 (7.9%) management (Table 1). Most respondents were female ( $n = 216$ , 77.4%) and had been working at MDH for a mean of 2.3 years. The mean age of respondents was 38.0 years. The mean number of patients seen per direct care provider per day varied across cadre, with pharmacists seeing the highest number of patients (119 patients), doctors seeing 44 patients and nurses seeing 36 patients per day. There was no significant difference in response rate between doctors, nurses, pharmacists and phlebotomists (data not shown).

Study sites included three district hospitals (18.8%) and 13 health centers or dispensaries (81.3%). Health centers and dispensaries were analyzed together, as both have similar staff compositions and patient loads. Eight (50.0%) of the sites were categorized as small (less than 300 patients seen per month), whereas three (18.8%) were medium-sized

**Table 1** Survey respondents' demographics and site characteristics

Characteristic	Number (%)
Position ( $n = 279$ ) <sup>a</sup>	
Direct care providers	215 (77)
Doctor	48 (17)
Nurse <sup>b</sup>	130 (47)
Pharmacists <sup>c</sup>	37 (13)
Clinical support staff	31 (11)
Phlebotomist	25 (9)
Lab technicians	3 (1)
Clinic attendants/medical records clerks	3 (1)
Management <sup>d</sup>	22 (8)
Female	216 (77)
Mean age (SD)	38.0 (8.3)
Mean years working at MDH (range 2–5+)	2.3 (1.7)
Number of patients seen per day, by cadre	Mean (SD)
Doctor	44.4 (20.3)
Nurse	36.0 (30.5)
Pharmacist	118.9 (66.8)
Phlebotomist	84.4 (84.8)
Type of site ( $n = 16$ )	Number (%)
District hospital	3 (18.7)
Health center/dispensary	13 (81.3)
Size of site	Number (%)
Small (<300 patients seen per month)	8 (50)
Medium (300–1000 patients seen per month)	3 (18.7)
Large (1000+ patients seen per month)	5 (31.3)
Patient Load (active patients per month/ FTE)	Mean
Doctors	547
Nurses	269
Pharmacists <sup>e</sup>	1042
Mean percentage of HIV+ patients on ART at clinic	62.0%

ART, anti-retroviral treatment; MDH, Muhimbili University of Health and Allied Sciences, Dar es Salaam City Council, Harvard School of Public Health; FTE, full-time equivalent. <sup>a</sup>HCWs grouped based on main role at the sites. <sup>b</sup>Includes nurses and nurse counselors. <sup>c</sup>Includes pharmacy technicians. <sup>d</sup>Includes site supervisors, site managers, coordinators and data supervisors. <sup>e</sup>Only for the 12 sites with pharmacists. Percents may not add up to 100% due to rounding.

(300–1000 patients) and five (31.3%) were categorized as large (greater than 1000 patients seen per month; Table 1). Across all sites, the ratios of total active patients from April to June 2009 per FTE of direct care cadres were 547:1 for doctors, 269:1 for nurses and 1042:1 for pharmacists. Using  $\chi^2$  tests, clinic rates (>80 versus <80%) of returned surveys were not significantly associated with the HCW responses to the questions ( $P > 0.05$ ) and so were not included in the multivariate models (data not shown).

## Perceptions of quality of care delivered and patient satisfaction

More than two-thirds (67.9%) of respondents rated the quality of clinical services provided as excellent (24.5%) or very good (43.4%; Table 2). Over three-quarters (78.5%) of HCWs strongly agreed or agreed that patients were satisfied with care at their site. In multivariate models, male respondents (adjusted odds ratio [AOR] 1.78, 95% confidence interval [CI] 1.05–3.03,  $P = 0.03$ ) and respondents working in a health center or dispensary (AOR 1.95, 95% CI 1.35–2.81,  $P < 0.001$ ) were more likely to report higher quality of care (Table 3). Working in a health center or dispensary was associated with greater perceived patient satisfaction (AOR 6.57, 95% CI 2.38–18.10,  $P < 0.001$ ). HCW category, age and patient load were not associated with either higher ratings of quality of care delivered or perceived patient satisfaction with care.

## Facilitators and barriers to providing quality care

**Facilitators.** HCWs identified a number of factors which facilitated provision of quality care (Table 2). These included teamwork among staff (88.2%), communication between staff members (79.2%), a positive work environment (75.3%) and availability of resources at the clinic (67%). The program had initiated a system of dividing the clinic day into two overlapping sessions (split shifts) to better distribute patient load and improve workflow. Patients were also given appointments during a specific time block to help reduce patient wait time and increase clinic efficiency. These interventions were cited by 74.9% of respondents as facilitators of quality care. Trainings were also viewed as important facilitators to providing quality care, including training received by the respondent (83.9%) and the training of clinical staff at the site (70.6%). Access to training at the sites was very high, with 93% of respondents having received some specialized training since joining an MDH-supported site (data not shown).

**Barriers.** Overall, the majority of respondents with patient contact reported being able to meet their clients' needs (85.5%). However, some barriers to providing quality care were identified (Table 2). The most common barrier identified by 72.7% of respondents was 'problems in patients' lives', such as lack of transportation to the clinic or inadequate nutrition. Clinic-related barriers were the next most common, with 52% of HCWs noting work overload (too few staff or too high patient volumes). Forty-five percent also considered the limited resources available to meet the non-medical needs of patients (e.g. food or transportation vouchers) a significant barrier.

Suggestions for improvement in quality of care centered on strengthening human resources by providing additional trainings, increasing the number of HCWs and providing financial and non-financial incentives for staff (data not shown). Other areas for improvement focused on the clinic environment and health systems, including increasing space and clinic resources.

**Table 2** HCW respondents ratings of clinical services provided, ability to meet patient needs, perceptions of patient's satisfaction, and barriers and facilitators to providing quality care

	N (%)
Providers rating of the clinical services at MDH ( $n = 274$ )	
Excellent	67 (24.5)
Very good	119 (43.4)
Good	81 (29.5)
Fair/poor	7 (2.6)
Felt able to meet their clients' needs ( $n = 249$ ) <sup>a</sup>	213 (85.5)
Agreement that patients were satisfied with quality of care at their site ( $n = 274$ )	
Strongly agree	53 (19.3)
Agree	162 (59.1)
Neither agree or disagree	51 (18.6)
Disagree	8 (2.9)
Strongly disagree	0 (0)
Major facilitators at the site to providing the best care possible ( $n = 279$ ); all options listed below	
Staff work together as a team	244 (88.2)
Training I have received	234 (83.9)
Communication between staff	221 (79.2)
Clinic environment	210 (75.3)
Split shift <sup>b</sup>	209 (74.9)
Training of other staff	197 (70.6)
Resources at the clinic	188 (67.4)
Other	21 (7.5)
Major barriers at the site to providing the best care possible ( $n = 278$ ); all options listed below	
Problems in patients' lives	203 (72.7)
Work overload (# of staff, # of patients seen per day)	144 (52)
MDH inability to meet non-medical needs of patients (e.g. by providing food, transport)	126 (45.2)
Training of staff	106 (38.0)
Complexity of care	75 (26.9)
Clinic flow	67 (24.0)
Communication between providers and patients	40 (14.3)
The clinic staff do not work together as a team	9 (3.2)
Other	25 (9.0)

MDH, Muhimbili University of Health and Allied Sciences, Dar es Salaam City Council, Harvard School of Public Health. <sup>a</sup>HCWs with no direct patient contact were excluded. <sup>b</sup>Split shift: as a quality improvement strategy, the clinic day was divided into two overlapping sessions (shifts) to better distribute patient load and improve workflow.

## Awareness, interest and activity in QI

The majority of HCWs (97.6%) felt that the clinic management was very (55.6%) or somewhat (42.0%) interested in



**Table 3** Multivariate models of HCW perception of quality of care, patient satisfaction and involvement in QI activities at the site

Variable	Class	AOR (95% confidence interval)			
		Clinical services provided rated as 'Excellent' ( <i>n</i> = 251)	Provider 'Strongly Agrees' that patients were satisfied with the quality of care ( <i>n</i> = 251)	Involvement in QI (yes) ( <i>n</i> = 255)	Management is very interested in QI (yes) ( <i>n</i> = 237)
Age (per year)		0.99 (0.97, 1.02)	0.99 (0.96, 1.03)	0.97 (0.95, 1.00)	1.01 (0.98, 1.04)
Sex	Male	1.78 (1.05, 3.03)*	1.22 (0.64, 2.33)	0.72 (0.46, 1.11)	1.67 (0.59, 4.72)
	Female	Ref.	Ref.	Ref.	Ref.
Position	Direct/clinical support staff	0.71 (0.30, 1.72)	1.11 (0.41, 2.99)	0.22 (0.08, 0.64)**	0.33 (0.12, 0.90)*
	Management	Ref.	Ref.	Ref.	Ref.
Site type	HC/dispensary	1.95 (1.35, 2.81)***	6.57 (2.38, 18.10)***	0.97 (0.49, 1.92)	0.98 (0.69, 1.38)
	District hospital	Ref.	Ref.	Ref.	Ref.

HC, health center; AOR, adjusted odds ratio. Patient load (number of active patients seen per quarter/full-time equivalent) was not a significant predictor for any of the outcomes. \* $P < 0.05$ . \*\* $P < 0.01$ . \*\*\* $P < 0.001$ .

QI related to HIV care and in hearing staff ideas for QI (91.1%; Table 4). Most HCWs (90.3%) also reported at least some training in measuring and improving quality of patient care, with 35.1% reporting a lot of training. Involvement of staff was relatively high; over one-half (52.0%) of staff knew about activities at their site to improve care or had been asked for their input on QI activities (62.7%). However, more formal engagement was lower; fewer HCWs (40.5%) reported being directly involved with QI activities and only 20.1% were currently a member of a formal QI team.

In univariate analyses, statistically significant differences in involvement in QI activities were found between HCWs in different categories (Table 5). Compared with direct care or clinical support staff, management reported higher formal engagement in QI activities ( $P = 0.008$ ), being asked more frequently for input in QI activities ( $P = 0.02$ ), and having more awareness about activities focused on improving care ( $P = 0.03$ ). Compared with direct care and clinical support staff, management also reported higher management interest in QI ( $P = 0.02$ ) and more activity by management in soliciting staff ideas ( $P = 0.007$ ). There was no statistically significant difference between groups in membership in formal QI teams or perception of staff working as a team to improve quality. In a multivariate model adjusting for site factors and HCW demographics, direct care and clinical support staff remained significantly less likely than management to report formal involvement in QI activities at the sites (AOR 0.22, 95% CI 0.08–0.64,  $P = 0.005$ ) and high management interest in QI (AOR 0.33, 95% CI 0.12–0.90,  $P = 0.031$ ).

## Discussion

As countries strive to achieve the goal of universal HIV care and treatment, measuring and improving quality must play a

**Table 4** HCW knowledge and involvement in QI activities (*n* = 279)

Positive HCW response to the following questions	<i>N</i> (%)
Do you know about specific activities around improving care in HIV at this clinic?	145 (52.0)
Have you been involved in activities which look at quality of care and work to improve problems at your site?	113 (40.5)
Have you been asked for your input in how to improve care or solve problems in care?	175 (62.7)
Do staff members work together to improve quality?	260 (93.2)
How interested is management in QI? ( <i>n</i> = 257)	
Very	143 (55.6)
Somewhat	108 (42.0)
Not interested	6 (2.33)
How interested is management in hearing staff ideas for QI? ( <i>n</i> = 257)	
Very interested	115 (44.8)
Somewhat interested	119 (46.3)
Not interested	23 (8.9)
How much education do you have in measuring/improving quality? ( <i>n</i> = 265)	
A lot	98 (35.1)
Some	154 (55.2)
None <sup>a</sup>	27 (9.7)
Are you interested in being member of QI team? ( <i>n</i> = 258)	
Yes	191 (68.5)
No <sup>a</sup>	32 (11.4)
Already member	56 (20.1)

<sup>a</sup>Includes missing values.

**Table 5** QI activities, by position

	Direct care ( <i>n</i> = 215)	Clinical support staff ( <i>n</i> = 31)	Management ( <i>n</i> = 22)	<i>P</i> -value
% knowledgeable about QI activities	50.7 <sup>†</sup>	41.9	77.3% <sup>‡</sup>	0.03
% involved in QI activities	39.5 <sup>†</sup>	35.5	72.7 <sup>‡</sup>	0.008
% of management very interested in QI	51.8	71.4	77.3 <sup>‡</sup>	0.02
% of management very interested in hearing QI ideas	43.7 <sup>†</sup>	33.3	76.2 <sup>‡</sup>	0.007
% asked for input on QI	63.3 <sup>†</sup>	48.4	86.4 <sup>‡</sup>	0.02
% believe staff works together on QI activities	94.4	90.3	90.9	0.45*
% with a lot of education in QI	35.4	41.9	27.3	0.55
% currently a member of QI team	17.7	19.4	36.4	0.11
% interested in being part of a QI team	85.3	92.0	92.9	0.67*

Direct care: doctors, nurses, pharmacists, pharmacy technicians. Clinical support care: clinic attendants, data clerks, phlebotomists, laboratory technicians. Management: site supervisors, site managers, coordinators, data supervisors. \*Fisher's exact test conducted due to small expected cell counts. <sup>†</sup>Statistically significant difference ( $P < 0.05$ ) when compared with clinical support staff, using the Bonferroni correction to adjust for multiple comparisons. <sup>‡</sup>Statistically significant difference ( $P < 0.05$ ) when compared with direct care providers, using the Bonferroni correction to adjust for multiple comparisons.

key role to ensure the efficacy and sustainability of care. Engaging HCWs in efforts to measure and improve the quality of care has been identified as a priority by national programs, donor agencies and programs intended to scale-up HIV care and treatment. In the context of HIV scale up in an urban setting, 1 year after the introduction of a quality management program, we found that there was evidence of considerable spread of awareness and engagement in QI and high provider ratings on the quality of care provided at MDH-supported sites.

Despite relatively high workloads, there were high levels of HCW-reported interest and awareness of QI-related activities. Some opportunities for strengthening HCW participation in QI were identified, with only 40.5 and 20.1% directly involved in QI activities and participating in formal QI teams, respectively. Additionally, there was less engagement of direct care and clinical support staff than management, with management significantly more likely to report the awareness of QI activities, involvement in QI activities, interest in QI and being asked for input on QI. These findings highlight the need to ensure engagement of multidisciplinary teams of HCWs in QI, including direct care and clinical support staff.

The MDH emphasis on addressing system-related factors which could compromise the quality of care was reflected in HCW-reported barriers and facilitators to quality of care. Although our findings overlap some of the barriers described in recent studies in both resource-limited and resource-rich contexts, there were some notable differences. Similar to studies in Malawi [2], Mali [6], Tanzania [7] and other resource-limited settings [18, 19], HCWs in our study reported inadequate human resources given the patient load. Other studies in resource-limited settings, however, have found that HCWs perceived inadequate financial compensation as a barrier to providing quality care, whereas very few HCWs suggestions in our study (data not shown) included financial incentives as a way to facilitate the quality of care [6, 20–23].

Site operations, in particular inefficient patient flow through the clinic, and inadequate site resources have also been recognized as potential barriers to quality of care in resource-limited settings [3]. Patient flow was not found to be a major obstacle in this study. The MDH-supported clinics had recognized long patient waiting times as a barrier to care in the year prior to the survey and had already implemented system redesign including appointment time blocks and extended hours. Although our study design does not allow us to show causality, we hypothesize that this redesign resulted in patient waiting times not being reported as a significant barrier at the time of the study. Further evaluation of the impact of these systems design changes is the focus of ongoing work.

Other factors such as lack of training, difficulties in communication between staff members and lack of teamwork which were identified as barriers in other studies were not reflected in our results. For example, a study on the quality of care in the prevention of mother-to-child transmission in Vietnam identified lack of training and support as a key barrier to providing quality care [24]. Reflecting the emphasis and high rates of training within the MDH program, training (both for themselves and of other staff members) was cited as an important facilitator to the delivery of quality HIV care in our study. Working relationships, including aspects such as teamwork and communication, have also been identified as significant provider and system factors associated with better quality of care and increased HCW motivation in resource-rich [25–28] and resource-limited contexts [29]. In a review of the literature, Manser [25] found that certain aspects of teamwork, such as the frequency of communication, strength of shared goals and the degree of mutual respect among care providers, were associated with higher quality of care. McKeon *et al.* [26] conclude that teamwork and communication skills can help mitigate threats to patient safety, which include incomplete patient data, worker fatigue, suboptimal staffing and inexperienced staff. Although these factors have been less extensively studied in resource-limited

settings, the HCWs in Dar es Salaam also rated teamwork and communication very highly as facilitators for providing quality care. The HCW emphasis on the importance of training, site operations and working relationships on quality of care in the current study supports recent work that financial compensation alone is not enough to increase HCW motivation and ensure the quality of care [6, 18–22, 29–32].

The study has a number of limitations. Urban clinics and those supported through donor funds may have more access to resources and trained HCWs than rural sites or those solely supported by the public sector, which could affect the barriers to and facilitators of quality of care identified. The results for HIV care and treatment sites in an urban setting may not be generalizable to rural sites and primary care clinics where patient and HCW characteristics may differ significantly. Similarly, the salary support provided by MDH may account for the fact that non-financial barriers featured more prominently in our study than financial compensation, in contrast to other studies in resource-limited settings. However, although the financial support provided by MDH may obscure some of the commonly perceived barriers in other resource-limited settings, the study provides an important opportunity to understand and identify ways that programmatic support can successfully address potential challenges to quality of care.

Although other studies in resource-limited settings have identified provider stigma as a barrier to providing quality care [24, 33], this study did not include questions on stigma. The possibility that HCW stigma affects quality of care in urban clinics in Dar es Salaam must be explored further. Another possible limitation is the aggregation of a number of cadres into each of the three HCWs groups, due to the numbers of respondents in some cadres and the overlap of primary scope of activities (among HCWs in direct care, clinical support care and management categories). Individuals from the same cadre (e.g. nurses, doctors) may serve very different roles (e.g. direct clinical care, managerial) depending on the individual and the clinic. This may have obscured differences in cadre-specific perceived barriers and facilitators to quality of care. Additionally, HCW-reported barriers were not externally validated, and thus may only reflect perceptions of barriers rather than objective indicators of issues encountered in the clinics. However, our study sought to understand HCW perceptions of barriers, and the effects this may have on their motivation and subsequent delivery of quality care. Finally, HCW perceptions of patient satisfaction with quality may not reflect the actual attitudes of the patients. ‘The difference seen between the percent of health care workers who felt patients were satisfied with care provided (78.5%) and the percent of health care workers who felt they were providing “excellent” or “very good” quality of care (68%) may in part reflect differences in expectation of care’. Murray *et al.* [34] similarly note the difference between reported quality and satisfaction, with the former being more closely associated with objective service realities and the latter reflecting patient expectations and actual experiences with the care system. Understanding the relationship between patient-reported perceptions of the quality of care received with satisfaction and the technical quality of care actually provided as well as comparing these

measures with HCW perceptions of quality of care delivered is the focus of ongoing work.

In conclusion, we found that despite high workloads, the majority of HCWs were interested in participating in QI activities. However, although the majority had been asked for input into improving quality, only 40% had been involved in activities and even fewer were on QI teams. This highlights the need to increase opportunities for these HCWs to actively engage more formally in QI activities as ARV treatment is scaled up in resource-limited settings. In this context, HCWs can provide important insights into the facilitators of quality care and remaining barriers. Although the cross-sectional design does not allow us to determine causality, the high ratings of systems and low ratings of many barriers commonly found in ARV therapy clinic in sub-Saharan Africa may be due to the efforts of a program focused on supporting provision of quality care through addressing commonly reported barriers to quality including resources, physical infrastructure, patient flow and training needs. This possibility needs to be tested further, but is supported by the results of a study in Ethiopia evaluating HIV/AIDS clinical care quality which found that strengthening of systems, including regular monitoring and improvements in care processes and outcomes in addition to availability of adequate resources, was an important component in ensuring the quality of care [5]. The continuous engagement of HCWs in these type of QI efforts will help ensure that quality of care is achieved and maintained as countries strive to attain the goal of universal access to ARV therapy.

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