Evaluation of the Efficiency of Patient Flow at Three HIV Clinics in Uganda

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Abstract

With dramatic increases in antiretroviral therapy (ART) provision, many clinics in sub-Saharan Africa are congested, but little attention has focused on the efficiency of clinics. Between April and June 2008, we conducted a time-and-motion study to assess patient flow at three HIV clinics in Uganda. Mulago HIV Clinic had 6,700 active patients, compared with 2,700 at Mbarara Municipal Council Clinic (MMC) and 2,800 at Reachout Mbuya (ROM). Mulago had six doctors and eight nurses; MMC had two doctors and two nurses, and ROM had two doctors and 12 nurses. Mulago and MMC used a doctor-led model, whereas ROM used a nurse-led model. Randomly selected patients were tracked, with data collected on time waiting and time spent with providers. Patients were categorized as new, preparing for ART, early ART, stable ART, or non-ART. Doctors indicated whether the patients they saw warranted their consultation. Data were collected on 689 patients (230 at Mulago, 229 at MMC, and 230 at ROM). Overall waiting time was longest at ROM (274 min; 209–346) and Mulago ISS (270 min; 230–336) compared with MMC (183 min; 148–233). Nurse-clinicians at ROM spent twice the time with patients compared with the doctors at Mulago. At Mulago, doctors indicated that 27% of the patients they reviewed did not need to see a doctor, compared with 45% at MMC. Task-shifting may not be efficient in terms of time. More-effective triage and longer visit intervals could improve patient flow and capacity for cost-effective scale-up.

Introduction

MORE THAN 4 MILLION adults and children were receiving antiretroviral therapy (ART) in low- and middle-income countries at the end of 2008, more than 1 million more people than at the end of 2007. This represents a 36% increase in 1 year, and a 10-fold increase in 5 years.¹ Nearly 3 million people were receiving ART in Sub-Saharan Africa by end of 2008 compared with about 2 million at the end of 2007.² This represents a regional increase of 39% in 1 year and a 30-fold increase since the end of 2003. This increased volume of patients has contributed to having HIV clinics that often are congested and struggling to meet the demand of high patient volume with limited infrastructure and human resources. Only 35% of people in need of ART are receiving treatment.

With programs striving for universal access and provider-initiated HIV testing and counseling (PITC) increasing in prominence,^{2–4} the demand for increased capacity to provide ART and HIV care will only increase and further burden already overloaded clinics.

Until recently, the focus of ART programs has been mainly on establishing clinics, securing enough drugs, and providing treatment to as many people as possible to save lives. Little attention has been given to the efficiency of clinic operations and how clinics can be managed more effectively to improve patient flow, quality of care, and cost-effectiveness of ART scale-up. Although long clinic visits and waiting times have become the norm at most large clinics throughout the region, few investigations have examined the flow of patients through a clinic and the sources of bottlenecks and potential

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avenues for improving operational efficiency. Maximizing clinic efficiency, while maintaining quality of care, will be essential for sustaining ART scale-up and progressing toward universal access to ART.

When examining clinic efficiency with regard to patient flow, a number of factors can influence efficiency and the emergence of bottlenecks in clinic operations. These factors include the volume of patients seen on a daily basis, the types of patients seen in terms of stage of care, clinic policies on frequency of patient visits, the types of providers who they should see, the size and composition of the providers, and the staffing model.^{5,6}

We conducted a time-and-motion study to evaluate the efficiency of patient flow in three HIV clinics in Uganda as part of a phased study aimed at improving efficiency and cost-effectiveness of HIV care and treatment. The aim of this study was to examine how patient flow and waiting times are associated with the numbers and types of patients seen, and the staffing model used by the clinic. This was intended to identify barriers to patient flow to inform the selection of modifications to improve clinic efficiency.

Methods

Study setting

Between April and June 2008, we conducted a time-and-motion study at three HIV clinics: Reachout Mbuya (ROM), Mulago HIV clinic, and Mbarara Municipality clinic (MMC). The clinics differ in the number of patients registered, the number and mix of providers, as well as other clinic procedures and policies that are reflected in the model of care they use to provide treatment. Mulago HIV clinic provides care to about 250–300 patients per day, compared with 100–150 at Mbarara and ROM. At the time this study was conducted, Mulago had registered 8,500 patients, compared with 4,200 at MMC and 3,100 at ROM. However, the number of active patients (seen at least once in 3 months) was 6,700 at Mulago, 2,700 at MMC, and 2,800 at ROM. Mulago had six doctors, one clinical officer, and eight nurses; MMC had two doctors, one clinical officer, and two nurses, whereas ROM had two doctors, one clinical officer, and 12 nurses. Mulago and MMC are doctor-led facility-based clinics, whereas ROM is a nurse-led

clinic with a prominent community component, including home visits to monitor adherence and provide care and treatment for patients who are too ill to come to the health facility (Table 1). Mulago and MMC employ pharmacy technicians to dispense drugs, whereas nurses dispense drugs at ROM. Mulago and MMC conduct limited home visits only for ART patients who have missed appointments and are unavailable by telephone. ROM employs persons living with HIV/AIDS (PHAs) to perform some of the clinic activities, including home visits, patient-retention activities, support, and monitoring of adherence. ROM services are restricted to individuals coming from one Parish in Kampala, whereas Mulago ISS and MMC are located at the National and Regional referral hospitals, respectively, and serve patients from many districts. All clinics prepare patients for ART initiation for 2 to 3 weeks. The preparation includes review of baseline CD4 counts, three counselling sessions, and presentation of treatment buddies. The characteristics of the clinics are summarized in Table 1. In terms of clinic flow, typically, a patient in the three clinics starts with the records person, followed by triage, clinician (nurse, clinical officer, or doctor), and then laboratory and/or counsellor, depending on the need, and finally, the pharmacy.

Patient selection

To determine whether a patient's stage of care influences waiting times and clinic efficiency, we categorized the patients as: new patients (in the clinic for the first time), new ART (within 6 months of ART initiation), stable ART (more than 6 months taking ART), stable non-ART (not taking ART and stable medical condition) and patients undergoing preparation for ART. Patients from each category of stage of care were randomly selected from the list of patients who attended the clinic on the days of data collection. At Mulago ISS, every tenth patient was selected right from the start of the clinic, whereas at MMC, every fifth patient, and at ROM, every seventh patient was selected. Selection of patients was done in three batches: between 8.00 and 10.00 AM, targeting patients who arrive before the clinic opens; between 10.00 and 12.00, and between 12.00 and 3.00 (Mulago and MMC stop registering patients at 3.00, whereas ROM stops registering

TABLE 1. CHARACTERISTICS OF THE HIV CLINICS AND CLINIC PROCEDURES

	<i>Mulago ISS</i>	<i>Mbarara Municipality Clinic</i>	<i>Reach Out Mbuya Clinic</i>
Total clients	8,500	4,200	3,100
Clients on ART	3,500	1346	1800
New clients/wk	80	32	10–15
New ART clients/wk	45	26	20
Clients seen/day	250–300	100	100–150
Percentage female	65%	60%	77%
Baseline mean CD4	152 per mm ³	398 per mm ³	102 per mm ³
Medical doctors	6	2	2
Clinical officers	1	1	1
Nurses	8	1	12
Support staff	8	2	6
CD4 machine	Yes	Yes	No
HIV testing	Yes	Yes	Yes
Visit schedule	Monthly	Monthly	Monthly
No. of years clinic has been operational	4 yr	3.5 yr	8 yr

TABLE 2. CATEGORY OF PATIENTS TRACKED BY CLINIC

	<i>Mulago HIV Clinic</i> n = 230	<i>Mbarara Municipality</i> n = 229	<i>Reach out Mbuya</i> n = 230	<i>Total</i> n = 689
Patient Category				
New patients	30 (13.0)	12 (5.2)	26 (11.3)	68 (10.0)
Stable non-ART	69 (30.0)	76 (33.2)	62 (27.0)	207 (30.0)
ART preparation	41 (17.8)	33 (14.4)	16 (7.0)	90 (13.1)
Early ART (<6 mo)	43 (18.7)	35 (15.3)	42 (18.3)	120 (17.4)
Stable ART (>6 mo)	47 (20.4)	73 (31.9)	84 (36.5)	204 (29.6)
Total	230	229	230	689

patients at 12.00, except for emergencies). All selected individuals were classified into the appropriate stage of care based on a review of their charts. Deliberate selection of underrepresented groups was conducted to ensure adequate representation of each patient category.

The study was approved by Makerere University School of Medicine Ethics Committee and Uganda National Council for Science and Technology.

Data collection

We used time-and-motion methods to evaluate patient flow and efficiency of clinic operations. This method is often used in operations research to examine the internal operations and efficiencies of clinics and other healthcare settings.^{7–9} The study involved tracking of patients from the time of arrival at the clinic to exit, on a single clinic visit, and documentation of all activities, including services provided, types of providers seen, and time spent at each point of services. The time waiting to see the provider as well as the time spent with the provider was documented. The arrival time at the clinic was self-reported, documented by patients on arrival at the clinic. Because patients arrive very early and the clinics serve patients by order of arrival, each patient records the time of arrival as the patient arrives at the clinic. The providers leave a pen and paper or book in the patient waiting area for this purpose.

A semistructured tool was placed in the patient files for completion by providers at each point of care. To reduce the data-collection demands on providers, a very simple one-page tool was used. Each provider was required to complete a maximum of four areas: provider category, activity or service provided to the patient, start time and end time of the activity, and whether the patient needed to see a doctor. With the exception of the start and end time, the rest of the questions were coded, and providers ticked the relevant codes. We estimate that this process took about 1–2 min to complete. A research assistant who was present at each clinic selected the patients to be tracked, completed the section for the patient category on the data-collection tool, and placed the tool in the patient chart. The tools were withdrawn from the patient chart after the patient saw the final provider at that visit (for the majority, this was after the pharmacy).

Data analysis

Descriptive statistics were used to calculate and describe the overall waiting time for patients at the three clinics, the time waiting for providers and time spent with providers. We

also estimated the number of providers seen by patients and the proportion of patients who the clinicians thought required review by doctors.

Results

Overall, 689 patients were tracked through all service points at the three clinics; 230 from Mulago ISS, 229 from MMC, and 230 from ROM. The breakdown of the participants in terms of stage of care is listed in Table 2. The proportions of each category of patient were roughly equivalent across the three sites, and the largest proportion of patients tracked was stable non-ART and stable ART patients, each comprising about 30%.

Arrival time

Each of the study clinics opened at 8:00 AM, and this was the overall median arrival time at each site. However, the range of arrival times varied greatly. A significant proportion of patients (40%, 275) arrived before the clinics opened, including 5% (32) who arrived before 6:00 AM. The majority of the patients, 75% (517), arrived between 7:00 AM and 12:00 PM. It is important to note that none of the clinics issue the patients specific clinic appointment times; patients are told only to come to the clinic on a specific day, irrespective of the time of day.

Waiting time

The overall stay in the clinic was longest at ROM (274 min; IQR, 209–346) and Mulago ISS (270 min; IQR, 230–336) compared with MMC (183 min; IQR, 148–233). Across all the clinics, the overall median waiting time did not differ greatly by patient category, ranging from 228 min (IQR, 178–312) for non-ART patients to 270 min (IQR, 206–321) for new patients. However, within-site differences were notable. At Mulago ISS, the waiting time for patients undergoing preparation for ART and the new patients was much higher at 310 (IQR, 260–332) and 301 (IQR, 258–373), respectively (about 30–40 min above the average of 270 min). Similarly, the waiting time for early ART patients at MMC was also much higher than the average (31 min longer than the average of 183 min). At ROM, new patients waited 55 min longer than the average of 248 min (Table 3).

Overall, not much variation was noted in the total waiting time by time of arrival. However, when examining arrival time within each site, significant patterns were apparent. The difference in waiting time for patients in Mulago and MMC who arrived before 8.00 (before the clinic opened) and those

TABLE 3. OVERALL WAITING TIME (IN MINUTES) BY CLIENT CATEGORY AND CLINIC

<i>Client category</i>	<i>Mulago median (IQR)</i>	<i>MMC median (IQR)</i>	<i>ROM median (IQR)</i>	<i>Total median (IQR)</i>
Non ART	248 (210–259)	174 (161–223)	264 (197–365)	204 (168–270)
Under prep for ART	310 (267–460)	207 (175–363)	166 (166–166)	295 (207–372)
Early ART (<6 mo)	257 (247–280)	175 (148–283)	347 (221–534)	259 (191–331)
Stable ART (>6 mo)	263 (236–306)	178 (145–214)	279 (234–313)	228 (169–297)
New	284 (250–345)	195 (162–296)	306 (277–338)	281 (249–329)
Total	268 (247–315)	180 (159–229)	291 (228–353)	253 (183–311)

who arrived after 8.00 was not big. However, at ROM, patients who arrived before 8.00 waited 30 min longer than those who arrived after 8.00. At Mulago, the median waiting time for patients who came before 8.00 was 268 min (247–315) compared with 276 min (221–377) for those who came after 8.00. At MMC, the median waiting time for patients who came before 8.00 was 180 min (159–229) compared with 189 min (136–234) for those who came after 8.00. At ROM, the median waiting time for patients who came before 8.00 was 291 min (228–353) compared with 262 min (205–339) for those who came after 8.00. The patients who arrived at the clinics after 12.00 waited least. At Mulago, patients who arrived after 12.00 waited 58 min less than the average of 270 min. At ROM, patients who arrived after 12.00 waited 79 min less than the average of 274 min, whereas at MMC, they waited 133 min less than the average of 183 min.

In the overall sample, patients waited longest to see the medical officers (45 min) and the counselors (52 min). However, at ROM, the waiting time was longest for the clinical officers (82 min), and at MMC, for nurses (42 min). A very long waiting time was required to see the records person at Mulago ISS compared with that at the other sites; the records person registers patients and also retrieves their charts from the storage room. At the time of conducting this study, the registration at all the three clinics was manual. The overall waiting times at MMC were much lower for records person, doctor, counsellor, and clinical officer.

The overall median number of minutes spent with providers during the clinic visit was 65 min (IQR, 35–100), representing 26% of the overall duration of the visit. At MMC, which had the shortest waiting times, the time spent with providers was 46% of the clinic visit time, compared with 30% at ROM and 15% at Mulago ISS. At ROM, which uses a nurse-driven model of care, the clinical officers, nurse clinicians, and

nurse dispensers spent more than thrice the time with the patients compared with their counterparts at Mulago (Table 4). Similarly, the clinical officer at MMC spent about twice the time with the patients compared with their counterparts at Mulago ISS and ROM. ROM has an adherence support desk that does not exist at MMC and Mulago ISS; at Mulago and MMC adherence support is integrated into the counsellor visit. Waiting time at the adherence desk was 51 min, and time spent with provider at the desk was only 5 min.

Efficiency of triage/Need to see a doctor

At Mulago ISS, 72% (113) of the patients were seen by doctors compared with 8% (18) at ROM and 55% (125) at MMC. Within each site, the new patients had the highest proportion of patients seen by doctors: 91% and 83% at Mulago ISS and MMC, respectively, and 15% at ROM. Among the other four patient categories, some slight variation was found, but generally a relatively equivalent proportion was seen by a doctor or medical officer (Table 5). At MMC, the medical officers indicated that 45% of the patients they saw did not require a doctor, compared with 27% at Mulago ISS. At ROM, where patients are generally seen by a nurse or clinical officer unless their condition warrants being seen by a doctor, clinicians (nurses and clinical officers) indicated that 213/230 (92%) of the patients they saw did not require attention from a doctor.

Number of providers seen

Typically, a patient will see about four providers at each visit, including a records person, a triage nurse, a clinician, and a dispenser. New patients and patients undergoing preparation for ART see more providers because they also have blood draws for CD4 testing and receive counseling.

TABLE 4. TIME WAITING FOR AND TIME SPENT WITH PROVIDERS (IN MINUTES) AT THE THREE CLINICS

<i>Provider category</i>	<i>Mulago HIV Clinic Median time (IQR)</i>		<i>Mbarara Municipality Median time (IQR)</i>		<i>Reach out Mbuya Median time (IQR)</i>	
	<i>Time to see provider (IQR)</i>	<i>Time with provider (IQR)</i>	<i>Time to see provider (IQR)</i>	<i>Time with provider (IQR)</i>	<i>Time to see provider (IQR)</i>	<i>Time with provider (IQR)</i>
Records (file retrieval)	57.00 (26.0–95.0)	10.00 (3.0–15.0)	5.00 (0.0–25.0)	8.00 (3.0–18.0)	18.00 (0.0–65.0)	15.00 (8.0–30.0)
Doctor	71.00 (30.0–125.0)	7.00 (5.0–10.0)	24.00 (9.0–50.0)	10.00 (6.0–26.0)	69.00 (1–114.0)	20.00 (11.0–30.0)
Counselor	72.00 (42.0–139.0)	13.00 (10.0–20.0)	15.00 (7.0–34.0)	60.00 (34.0–96.0)	26.00 (3.0–49.0)	35.0 (25.0–80)
Nurse	35.00 (15.0–77.0)	3.00 (1.0–10.0)	42.00 (8.0–50.0)	4.0 (3.0–4.5)	56.00 (16.0–97.0)	18.50 (10.0–30.0)
Clinical officer	42.00 (9.0–91.0)	9.00 (4.0–12.0)	12.00 (7.0–25.0)	30.00 (10.0–40.0)	82.00 (26.0–165)	15.00 (9.0–29.0)
Lab technician	5.00 (2.0–12.0)	3.00 (2.0–4.5)	5.0 (2.0–9.0)	5.00 (3.0–8.0)	15.00 (8.5–67.5)	8.50 (6.5–10.5)
Pharmacy technician	4.00 (0.0–7.0)	6.00 (6.0–9.0)	4.00 (1.0–10.0)	4.00 (2.0–6.0)	45.00 (6.0–121.0)	16.50 (11.0–23.0)

TABLE 5. PROPORTION OF PATIENTS SEEN BY MEDICAL DOCTORS BY PATIENT CATEGORY

	<i>Mulago</i> n = 154	<i>MMC</i> n = 229	<i>ROM</i> n = 230	<i>Total</i> n = 613
<i>Patient category</i>				
New patients	21 (91.0)	10 (83.3)	4 (15.4)	35 (57.8)
Stable non-ART	32 (72.7)	45 (59.2)	5 (8.1)	82 (45.0)
ART preparation	21 (77.8)	14 (42.4)	1 (6.3)	36 (47.4)
Early ART (<6 mo)	19 (67.9)	23 (65.7)	1 (2.4)	43 (41.0)
Stable ART (>6 mo)	20 (62.5)	33 (45.8)	7 (8.1)	60 (31.4)

Overall, 68% of the patients saw three to four providers before exiting from the clinic, whereas 32% saw five or more providers. Among the new ART patients at Mulago ISS, 77% saw five or more providers, compared with 39% for patients undergoing preparation for ART and an even smaller proportion of early ART (26%), stable ART (28%), and non-ART patients (16%).

Discussion

We identified heavy congestion with a long waiting time at all the three clinics. Other studies in sub-Saharan Africa have identified a long waiting time as a challenge that could affect patient satisfaction and retention.^{5,6} The patient load may be one of factors leading to a long waiting time; MMC, with 2,700 active patients, had about half the waiting time as did Mulago, which had 6,700 active patients. However, ROM, which had 2,800 active patients, had similarly long waiting time as to that of Mulago. This may be related to the types of providers who saw the patients; ROM used a nurse-led model, whereas Mulago and MMC used a doctor-led model. The nurse clinicians spent about twice the time with patients than did the doctors at Mulago ISS, whereas the clinical officers at MMC spent thrice the time with patients than did the doctors at MMC and at Mulago. Overall, 15% of the total visit time for patients was spent with providers at Mulago compared with 30% at ROM and 46% at MMC. This may be due to less confidence in conducting clinical activities by nurses and clinical officers and diminishes the effect of using nurse-clinicians and clinical officers on time efficiency. It may be necessary to conduct a critical examination of the processes and challenges faced by nurses and clinical officers in decision making and to provide more support, including simplified treatment algorithms to reduce the consultation time without compromising the quality of care.¹⁰

The waiting time was longest for doctors and counselors, indicating that streamlining doctor and counselor activities could have a major impact on the efficiency of clinic flow. Task shifting and further reducing the proportion of patients seen by doctors and counselors is one such intervention. Task shifting would reduce the waiting time for doctors and also free their time to see patients with complications. O'Brien et al.¹¹ developed a simulation-based model to quantify the impact of task-shifting on physician demand. Over the course of the 30-month pilot that included 1,076 patients, a total of 1,131 h was expended by prescribing nurses, saving 906 h of physician time.¹¹ Another study in a high-volume doctor-led clinic in Uganda showed a reduction in the waiting time from 157 h (22–426 h) in 2005 to 124 h (15–314 h) in 2007 despite an

increase in the number of patients from 250 to 400 per day after starting nurse visits and pharmacy-only refills.¹² This may appear to contradict the observation of a long waiting time at the nurse-led clinic in our study. The critical issue may be the proportions and types of patients seen by lower-level providers during task shifting. Whereas at ROM, virtually all the patients (92%) were seen by nurse-clinicians, the Infectious Disease Institute task-shifting retained a doctor-led model with 12 doctors and 10 nurses.

The number of providers seen by a patient on each visit may also be a major bottleneck. On average, patients in all the three clinics saw three to four providers on each visit, whereas a significant proportion of the new patients and those undergoing preparation for ART initiation saw more than five providers. Reducing the number of providers seen by patients on a given day could reduce the waiting time. For example, a patient who is clinically stable and adherent to treatment could come in just to get drug refills rather than go through clinicians and counselors.

These data also show other bottlenecks that may contribute to a long waiting time. The arrival time for patients was skewed, with more than two thirds of the patients arriving before 9.00 AM. This scenario presents challenges in staff allocation because the staffs are overwhelmed in the mornings but fairly redundant in the afternoons. All three clinics give appointments to the patients by date and do not indicate the actual time of the appointment. Redistributing the appointments and arrival times evenly throughout the day may reduce congestion and waiting time for the patients. However, discussions with providers indicated that patients do not adhere well to appointments and tend to come in early, even when they have been given afternoon appointments. Further, at Mulago ISS, patients spent up to 1 h at the records and file retrieval, which points to the need to improve the record management and file-retrieval systems. Options for improving efficiency at this level include computerizing the registry to ease retrieval of charts or, better still, having a complete electronic record-management system, depending on availability of resources. Another option would be increasing the number of people at the records and file-retrieval levels; these could be well-trained PHAs rather than nurses or other more highly trained providers. Other programs have piloted innovative interventions to address human-resource challenges, including using peer health workers who are persons living with HIV, with support from higher-trained providers.^{13,14}

Other than the new patients, there seemed to be no specialization, as almost equal proportions of all categories of patients were seen by doctors and clinical officers or nurses. It is very unlikely that all categories of patients have the same clinical needs; the doctors at MMC and Mulago thought a significant proportion of the patients they saw did not need to be reviewed by doctors. Conversely, a very small proportion of nurse-clinicians and clinical officers at ROM indicated that the patients they saw needed to be reviewed by a doctor, which points to more-efficient triage at ROM.

Increasing the interval of clinic visits for stable ART and non-ART patients at all three clinics may also reduce the daily patient load. Wagner et al.⁵ used mathematical modeling to show that reducing ART preparation sessions by two would reduce the number of daily clients in this patient category by half, and increasing visit intervals from 1 to 2 months would reduce the daily visits for this patient category by more than

half. Van Damme et al.¹⁵ also demonstrated a reduction in the doctor time needed per patient by between 14% and 33%, after a reduction in number of visits per patient and shorter consultation times. Stable patients receiving ART could have longer visit intervals without compromising the quality of their care. A prospective study of more than 90 centers in Europe showed that patients who have responded well to ART have a low chance of experiencing treatment failure in the next 3–6 months and could reasonably extend visit intervals to 6 months.¹⁶

Improving the efficiency at triage is a critical area that must be addressed because any modification that is introduced to the clinics (e.g., nurse visits) will succeed only if the patients are quickly directed to the right provider. Also, improvement in the efficiency of clinic operations is a continuous process, as new challenges will always emerge. To ensure continuous improvement, it may be necessary to train providers and managers in quality-improvement techniques.¹⁷

These findings highlight a major but often overlooked challenge to the further scale-up of HIV care and treatment in resource-limited settings. The scale-up of HIV services should be coupled with a critical analysis and adoption of policies and procedures that can maximize clinic efficiency and increase the capacity of the clinics to accommodate more patients, while maintaining the quality of care.

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