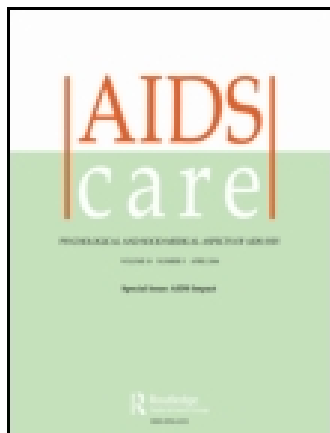


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### Patterns of care in two HIV continuity clinics in Uganda, Africa: a time-motion study

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## Patterns of care in two HIV continuity clinics in Uganda, Africa: a time-motion study

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The study objectives were to identify opportunities to improve the quality of care in resource-limited settings by examining the workflow and patient activities at two large outpatient HIV clinics in Uganda. Using time motion study techniques, we collected detailed data on all activities of patients and clinicians in two government-sponsored HIV clinics in Uganda. Processes measured included amount of time clinicians (physicians, nurse practitioners and clinical officers) spend in clinic, the daily patient census and patient visit-length. We also recorded the time spent on various activities by providers and patients. We found that the mean time in clinic per workday at Masaka was 5.5 hours and at Mbarara 4.9 hours, with about 60% of this time spent in direct and indirect care of patients at both sites. Workday start-times varied by two hours in Masaka and one-and-a half hours in Mbarara and end-times by five and three hours respectively. One-hundred-and-nineteen patients (SD 34) visited Masaka each day and 107 (SD 45) visited Mbarara. The mean duration of the patient visit was 77 minutes at Masaka and 196 minutes at Mbarara, with 66% and 62% of the time spent at respective sites waiting for care. We conclude that clinicians in resource-poor settings spend limited amounts of time at the clinic site, with a large portion of the clinic-time taken up by tasks that do not require specialized patient-care skills. This study demonstrates that opportunities exist to improve clinic productivity and visit experience for patients, and provides a baseline for designing and evaluating the impact of process improvement interventions.

**Keywords:** health personnel; HIV; Africa; time and motion studies; outpatient clinic

### Introduction

Insufficient personnel is a barrier to scaling-up antiretroviral treatment (ART) for HIV-positive patients in resource-poor settings (Kumar, 2007; Narabsimhan et al., 2004). Kober and Van Damme (2004) state that workforce inadequacy is “the single most serious obstacle for national treatment plans”. With increasing availability of ART, more patients are seeking care in outpatient facilities but governments and local institutions in developing countries with substantial prevalence of HIV are unable to increase their workforce at a pace sufficient to meet the growing demand. Hiring and training additional HIV-care providers will take time and funding; in the meantime, only by increasing the efficiency of existing clinics can these countries meet the needs of their citizens suffering from HIV.

Improving efficiency requires a detailed, fundamental understanding of how these clinics work and mapping the process of care is an important step towards this goal (Barach & Johnson, 2006). Workflow studies can: guide decisions on how to distribute

staff and responsibilities; provide information about the work-culture; inform recommendations for change; serve as a basis for evaluating the effect of new programs or technologies introduced into the clinic; and highlight the experience of patients during a clinical visit. We assessed the workflow in two government-funded HIV-clinics in Uganda – a country that, despite having a critical shortage of health-care personnel (US Agency for International Development, Bureau for Africa, Office of Sustainable Development, 2003), has made impressive strides in fighting HIV (Slutkin et al., 2006). Our aims were to: better understand the clinic organization; enumerate the task-burden for providers; and get a sense of how patients spend their time during the clinic visit.

### Methods

#### Setting and participants

We conducted the study between November 2006 and February 2007 in two HIV clinics in Uganda: one affiliated with Mbarara University of Science and

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Table 1. Characteristics of Masaka and Mbarara clinics.

Clinic characteristics	Masaka	Mbarara
Primary affiliation(s)	MRRH <sup>a</sup> and Uganda CARES <sup>b</sup>	MUST <sup>c</sup>
Location type	Resource-poor urban setting	Resource-poor urban setting
Documentation of patient visits	Free-text hand-written notes	Paper-based encounter forms with coded answers
Registered HIV-positive patients	5,100	11,000
Patients of ARVs <sup>d</sup>	2,500	3,100
Average daily patient census	119 (SD 34; range 71–197)	107 (SD 45; range 62–172)
Number of full-time physicians	3	4
Number of full-time COs <sup>e</sup>	1	0
Number of full-time clinical NPs <sup>f</sup>	2	0

<sup>a</sup> MRRH – Masaka Regional Referral Hospital

<sup>b</sup> Uganda CARES – This is a partnership between Uganda Ministry of Health and the US-based AIDS Healthcare Foundation.

<sup>c</sup> MUST – Mbarara University of Science and Technology.

<sup>d</sup> ARV – Anti-retroviral (HIV) medication.

<sup>e</sup> COs – Clinical officers.

<sup>f</sup> NPs – Nurse practitioners working as clinicians.

Technology and the other with Masaka Regional Referral Hospital (Table 1). In Masaka, Nurse Practitioners (NPs) generally saw patients with minor complaints, while the Clinical Officer (CO) and physicians saw the remaining patients. In Mbarara, physicians saw all patients.

For this study we observed patients and clinicians. All established HIV-positive adult patients presenting for routine follow-up care and all clinicians (physicians, CO and NPs) scheduled to work full-day shifts were eligible for observation.

### Data collection

We programmed a list of provider tasks and patient activities into Personal Digital Assistant (PDA) devices using the HandBase 3<sup>®</sup> software (DDH Software, Inc., Wellington, Florida) (See Appendix-Tables 5 and 6). Using time-motion study methods we employed previously in the US (Overhage et al., 2001) and at a clinic in rural Kenya (Rotich et al., 2003), trained observers with PDAs recorded the activities of clinicians and patients by choosing from the pre-established list. For each recorded activity, the PDA automatically assigned a beginning and an end time. Clinicians were observed for three full workdays following a non-random schedule and depending on their availability, whereas patients were observed for the full clinic visit on a random schedule. At the end of each observation day, the data were transferred to a Microsoft Access<sup>®</sup> database (Microsoft Corp, Redman, Washington). Data managers at each clinic recorded the total number of patient visits for the day.

### Data analysis

The data were analyzed separately for the Mbarara and Masaka clinics using SAS<sup>®</sup> (version 9.1, SAS Institute, Cary, North Carolina). The duration of an activity was calculated as the difference between its start and end time.

### Clinicians

We computed the mean length of provider workday, the variability between the start- and end-times of these workdays, the mean number of patients seen during each workday and the mean time spent in each major task category. In addition, we computed the mean amount of time spent by providers in direct and indirect care during each patient encounter at the two clinics as almost all our patient encounters had these tasks recorded. Direct care included talking to, listening to, counselling, examining or performing a procedure on patient. Indirect care included reading from or writing to a patient's chart or encounter form, prescribing medications or discussing care with other staff.

### Patients

The unit of analysis for patients was the clinic visit, which we recorded from the time the patient was registered for the day's visit to the time he or she left the clinic. We excluded from analysis all wait times before formal clinic registration because some patients presented several hours before the clinic's doors opened due to there being no appointment scheduling system at either site. We computed the mean number of patients who visited each clinic per

day and the mean length of each visit. We did not control the analyses for provider because: (1) each patient was seen by multiple providers and (2) we did not keep patient nor provider identifiers in order to assure patient and provider anonymity.

## Results

### Clinicians

All providers working as full-time clinicians during the study period participated in the study. Clinicians observed included four physicians from Mbarara and three from Masaka, one CO from Masaka and two NPs from Masaka. We excluded two observation days for Mbarara physicians and one for the Masaka NPs as they did not represent the complete day at the clinic. More than 140 hours of provider activities were observed.

The mean time spent in clinic for Masaka providers was 5.5 hours (range 2.5–7.5) and for Mbarara providers 4.9 hours (range 3.8–6.5). The providers at Masaka started their clinic days between 8:56 am and 10:57 am and those at Mbarara between 8:15 am and 9:53 am. The end-time for the provider clinic days at Masaka varied between 12:32 pm and 5:21 pm and in Mbarara between 12:27 pm and 3:35 pm.

Masaka providers cared for a mean of 26.4 patients (range 16–48; 3–8 patients per hour) each day while Mbarara providers saw a mean of 29 patients (range 19–41; 4–7 patients per hour) ( $p = 0.41$ ). For Masaka, the number of patients seen per day by the NPs (mean 26; range 17–48) was not very

different from the number seen by the physicians (mean 28; range 18–36) or CO (mean 22; range 16–27).

Table 2 shows the provider activities as a percentage of the workday at the two clinics. Direct and indirect patient care accounted for only 60% of the providers' workday at each clinic. Masaka providers, as a group, spent relatively more time on administrative activities (15 versus 6.5%). For the Masaka providers, the percentage of the workday spent in most activity categories were roughly equivalent between the different providers, with the exception of NPs spending relatively less time on administrative activities and more time waiting. We found that the providers in Masaka spent a larger amount of time per patient in both Direct Patient Care and in Indirect Patient Care compared to the providers in Mbarara (Table 3).

### Patients

During the study period, a mean of 119 patients (SD 34; range 71–197) visited Masaka each clinic day, while 107 patients (SD 45; range 62–172) visited Mbarara. We made full-visit observations for 89 patients at Mbarara and 95 at Masaka, for a total of 420 hours of patient observations. The mean visit length for patients at Masaka was 77 minutes and at Mbarara 196 minutes, with most of the time spent waiting – 51 minutes (66%) at Masaka and 122 minutes (62%) at Mbarara (Table 4). The mean time spent with the clinician during the visit was 7.5 minutes (median 6.30) in Masaka and 8.2 minutes (median 6.10) in Mbarara.

Table 2. Provider activities (% of workday) at Masaka and Mbarara clinics.

	Masaka providers				Mbarara physicians
	NP	CO	MD	NP+CO+MD <sup>a</sup>	
Indirect patient care <sup>b</sup>	31.3	27.1	32.4	31.2	33.9
Direct patient care <sup>c</sup>	26.2	33.3	27.4	28.2	25.1
Personal <sup>d</sup>	20.9	15.7	17.9	18.1	16.0
Administrative <sup>e</sup>	8.2	17.8	16.8	15.0	6.5
Waiting <sup>f</sup>	7.0	1.4	3.0	3.6	1.4
Miscellaneous <sup>g</sup>	6.5	4.8	2.6	3.8	17.0

<sup>a</sup> Percent of workday spent on various activities by Masaka providers taken as a group. NP = Nurse practitioner, CO = Clinical officer and MD = Physician.

<sup>b</sup> Indirect patient care: these tasks include reading or writing on patient's chart or encounter form, prescribing medications, discussing patient's care on the phone or with other providers.

<sup>c</sup> Direct patient care: these tasks include talking to or counseling patient(s) and examining or doing a procedure on patient.

<sup>d</sup> Personal: these tasks include provider's personal activities e.g. breaks, conversations, email and reading.

<sup>e</sup> Administrative: these tasks include all non-patient-centered work activities like filing of records and other staff interactions.

<sup>f</sup> Waiting: these tasks include waiting for patients, records or other staff.

<sup>g</sup> Miscellaneous: examples include 'provider leaving facility' or 'walking within facility'. Also includes activities not in our other categories.

Table 3. Mean minutes per patient-encounter spent by providers on direct and indirect patient care at Masaka and Mbarara clinics.

	Minutes per patient encounter (median)	
	Masaka <sup>a</sup>	Mbarara
Indirect patient care	3.83 (3.18)	3.41 (2.93)
Direct patient care	3.41 (2.68)	2.51 (1.90)

<sup>a</sup> This includes combined data for all Masaka Providers, i.e. NPs, CO and Physicians.

## Discussion

This study draws attention to the small amount of time available to clinicians in resource-limited settings to perform their clinical duties. Providers only spent about five hours (out of an eight-hour workday) in the clinic. Analysing provider activities outside the clinic during scheduled work hours should inform ways of increasing their clinical time. While in clinic, almost 40% of providers' time was spent on tasks not directly related to patient care, such as administrative, personal and miscellaneous tasks. Given the critical shortage of highly trained clinicians in these settings, approaches are needed to ensure that clinicians spend the most time in patient-care tasks for which they are uniquely qualified.

Understanding patient activities can help in deciding which interventions will have the greatest impact in improving patient flow and patients' clinic experience. We observe that patients spend the largest part of their clinic visit waiting for care and that reducing the waiting times could help to decrease congestion in the clinic and potentially increase patient satisfaction. The waiting times also offer a great opportunity for educating patients on the many

Table 4. Mean minutes per visit spent by patients on various activities at the Masaka and Mbarara clinics during a routine follow-up clinic visit.

Patient activity	Mean minutes per visit (median)	
	Masaka	Mbarara
Waiting	51.2 (42.98)	121.9 (122.67)
Waiting for other staff	22.8 (11.17)	53.4 (44.82)
Waiting for PCP	24.1 (18.60)	48.0 (41.55)
Waiting for pharmacist	16.3 (14.52)	24.5 (22.10)
Time with other staff	11.0 (4.98)	42.7 (27.42)
Miscellaneous	5.8 (3.45)	22.8 (16.33)
Time with clinicians	7.5 (6.30)	8.2 (6.10)
Time with pharmacy	2.6 (1.85)	1.7 (1.37)

aspects of HIV through counselling and group educational programs.

Our study provides a baseline for evaluating the effect of new technologies and programs introduced in each clinic. Both Masaka and Mbarara clinics will be part of a demonstration project assessing the feasibility of an electronic record (EMR) system that includes a scheduling function used effectively by the network of Kenyan clinics that helped to develop this EMR system (Siika et al., 2005). We intend to analyze the impact of these systems on the clinic work-flow and the patient experience using the same time-motion techniques.

Several limitations in this study deserve mention: (1) observing the providers and patients may have changed their behavior (the Hawthorne effect); (2) the observations for the clinicians were not randomly selected and the number of providers and clinics studied was small, thus limiting the generalizability of the results; (3) the small number of clinicians observed also makes it difficult to gauge the impact of NPs and CO who have a potentially important role in resource-limited settings (Dovlo, 2004); and (4) our study does not account for seasonal changes in patient volume and it would be beneficial to look at the quality of care, in addition to time-use, at these clinics.

## Conclusion

This study demonstrates that even in settings with limited personnel, opportunities exist to improve productivity and visit quality. Greater efficiency in HIV-clinics means more patients seen and, hence, more lives saved and suffering relieved. The study also provides a baseline for the evaluation of interventions to improve productivity and efficiency.

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#### Appendix 1: Tasks and analysis grouping for clinical officer, physicians and nurse practitioners.

Task	Analysis groups
Computer: email	Personal
Computer: other work activities	Administrative
Exam: pelvic exam	Direct patient care
Exam: regular physical exam	Direct patient care
Filing: putting documents in record	Administrative
Filing: putting records away	Administrative
Looking/waiting: not sure	Waiting
Looking/waiting: other work related	Waiting
Looking/waiting: patient	Waiting
Looking/waiting: patient records	Waiting
Looking/waiting: personal	Personal
Looking/waiting: provider or staff	Waiting
Miscellaneous: cannot find entry	Miscellaneous
Miscellaneous: eating/drinking/idle	Personal
Miscellaneous: observer personal hygiene	Miscellaneous
Miscellaneous: on break	Personal
Miscellaneous: work related	Miscellaneous
Phone: not sure	Miscellaneous
Phone: other work activities	Administrative
Phone: personal	Personal
Reading: medical reference	Indirect patient care
Reading: non-medical	Miscellaneous
Reading: patient chart	Indirect patient care
Reading: schedule	Administrative
Talking: not sure	Miscellaneous
Talking: patient/family	Direct patient care
Talking: personal	Personal
Talking: to provider or staff	Administrative
Walking inside or outside	Miscellaneous
Writing: chart notes	Indirect patient care
Writing: on encounter form	Indirect patient care
Writing: orders or prescription	Indirect patient care
Writing: other work related	Administrative

**Appendix 2: Activities and analysis groups for patients.**

Activity	Analysis Groups
Getting: seen by triage nurse	Time with other provider
Getting: another procedure	Time with physician
Getting: ART medication	Time with pharmacy
Getting: care by clinician	Time with clinician
Getting: examined by clinician	Time with doctor
Getting: group counseling	Time with other provider
Getting: health peer education	Time with other provider
Getting: individual counseling	Time with other provider
Getting: laboratory study	Time with other provider
Getting: non-ART meds	Time with pharmacy
Getting: service at records	Time with registration
Getting: specialized-patient event	Time with other provider
Looking for: hospital facility	Miscellaneous
Looking for: not sure	Miscellaneous
Looking for: personal	Miscellaneous
Looking for: provider/staff	Miscellaneous
Miscellaneous: can't find entry	Miscellaneous
Miscellaneous: observer personal hygiene	Miscellaneous
Miscellaneous: patient personal	Miscellaneous
Miscellaneous: personal	Miscellaneous
Phone: not sure	Miscellaneous
Phone: personal	Miscellaneous
Talking: not sure	Miscellaneous
Talking: other medical staff	Time with other provider
Talking: with clinician	Time with clinician
Waiting: ARV pharmacy	Waiting for pharmacy
Waiting: for counseling	Waiting for other provider
Waiting: for clinician	Waiting for clinician
Waiting: laboratory	Waiting for other provider
Waiting: not sure	Waiting for other provider
Waiting: nurse dispenser	Waiting for pharmacy
Waiting: other care related	Waiting for other provider
Waiting: personal	Miscellaneous
Waiting: records	Waiting for registration
Waiting: room 5	Waiting for other provider
Waiting: skin clinic	Waiting for other provider
Walking: inside	Miscellaneous
Walking: outside	Miscellaneous
Writing/reading: other medical documents	Time with other provider
Writing: personal	Miscellaneous