Measuring the Outcomes of a Comprehensive HIV Care Course

Pilot Test at the Infectious Diseases Institute, Kampala, Uganda

Marcia R. Weaver, PhD, Cecilia Nakitto,† Gisela Schneider, MD, MPH,†*
Moses R. Kamya, MBchB, MMed, MPH,†‡ Andrew Kambugu,† Robinah Lukwago, Bpharm,†§
Allan Ronald, MD,‖ Keith McAdam, FRCP, FWACP,†¶#
*and Merle A. Sande, MD**††*

Objective: To evaluate the effects of the Infectious Diseases Institute's 4-week course for African doctors on comprehensive management of HIV including antiretroviral therapy on four outcomes: (1) clinical skills, (2) clinical activities, (3) monitoring of HIV patients, and (4) training activities

Design: Clinical exam at beginning and end of course and at follow-up 3 to 4 months later, and a cross-section telephone survey.

Methods: Forty-seven doctors attending the course (October 2004, November 2004, March 2005, and April 2005) agreed to participate. A 17-item Clinical Exam Checklist was used to assess clinical skills. A telephone survey was conducted 1 month after the course to collect data in four areas: clinical activities, monitoring of HIV patients, case studies on initiation of ART, and training activities.

Results: The course improved the clinical skills of doctors. Between the beginning and end of the course, their clinical skills improved significantly in 11 of 17 areas (n = 34). Between the end of the course and follow-up, their skills improved significantly in three areas (n = 14). The trainees were practicing HIV care and training. The telephone survey (n = 46) showed that 93% of trainees treated HIV patients, 35% provided training on HIV, and 47% monitored the weight of the last HIV patient treated (patient's weight was a clinical end point to measure health status). At follow-up, everyone provided training and trained an average of 20 people per month.

Key Words: HIV infections, highly active antiretroviral therapy, developing countries, sub-Saharan Africa, continuing medical education, clinical competence

(*J Acquir Immune Defic Syndr* 2006;43:293–303)

Training of health professionals is a focus of international efforts to improve the quality of care and to reduce the mortality of the 25.8 million people[1] who are infected with HIV in sub-Saharan Africa.[2–4] Effective ART training is essential to prevent the development of resistance among HIV isolates and to improve the quality of care for HIV-infected patients. In addition, the funding and, perhaps more importantly, the time that professionals spend away from their clinics during training are scarce resources.

Investment in training of health professionals is guided by only a handful of studies on HIV training programs in resource-limited settings.[5–9] Additional information is available on doctors' HIV knowledge and attitudes; for recent examples, please see Souville et al[10] and Ayaya et al.[11] Perhaps the most comprehensive information on the effectiveness of HIV training programs was provided by an evaluation of the United Nations Family Planning Association's HIV/AIDS-related interventions.[12,13] Effectiveness of training was handicapped by 6 factors:[12]

(1) Absence of task analysis
(2) Poor trainee selection and high turnover once trained
(3) Curricula and modules that were rarely custom-made and not based on needs assessments
(4) Lack of training materials
(5) Absence of pretest and post-training evaluation
(6) Insufficient supervision and follow-up training

A review of randomized controlled trials of training interventions for physicians in Europe and North America showed that didactic methods, such as lectures and presentations, were not effective at changing physician practice.[14] Interactive methods, such as hands-on practice sessions, case discussion, and role-play, were effective at changing physician practice and in some cases the health outcomes of patients.

Received for publication May 18, 2006; accepted August 14, 2006.
From the *Department of Health Services and International Training and Education Center on HIV, (I-TECH), University of Washington, Seattle, WA; †Infectious Diseases Institute, Makerere University, Uganda; ‡Department of Medicine, Makerere University, Uganda; §Institute of Public Health, Makerere University, Uganda; ‖Department of Internal Medicine, University of Manitoba, Winnepeg, Canada; ¶Pratt Medical Group, Tufts–New England Medical Center, Boston, MA; #Department of Clinical Tropical Medicine, London School of Hygiene and Tropical Medicine, London, England; **Department of Medicine, University of Washington, Seattle, WA; and ††Academic Alliance Foundation, Arlington, VA.
This research was supported by funding from the Puget Sound Partners for Global Health.
Reprints: Marcia R. Weaver, PhD, Department of Health Services and International Training and Education Center on HIV (I-TECH), University of Washington, 901 Boren, Suite 1100, Seattle, WA 98104 (e-mail: mweaver@u.washington.edu).

The AIDS Education and Training Centers in the United States emphasize interactive methods and clinical training such as consultation.[15]

Didactic training methods predominate in much of sub-Saharan Africa, with notable exceptions such as the Infectious Diseases Institute (IDI) at Makerere University in Kampala, Uganda, and recent clinical mentoring initiatives in some African countries.[16,17] From 2002 to 2005, the IDI offered a 4-week course on comprehensive management of HIV including ART to 25 doctors, 6 times a year. Beginning in 2006, the HIV training program for doctors changed to a 3-week Core course with additional 1-week modules.[18] The 6 modules are Advanced Clinical Care and ART; ART Program Management; HIV Care for Children and Preventing Maternal-to-Child Transmission; HIV Prevention in Health Care Settings; Research in HIV Care; and Training of Trainers. All courses feature interactive training methods, such as case presentations and clinical rounds. The IDI also offers 1- and 2-week courses on HIV care including ART for other health professionals.

Both the comprehensive management of HIV course and Core course were designed as leadership courses for African doctors with the idea that the alumni would provide leadership in their national ART programs in the near future. Many medical training programs have elements of leadership training; see, for example, the competencies that were endorsed by the Accreditation Council for Graduate Medical Education in the US.[19] The IDI courses focus on clinical leadership with the objectives of improving the clinical skills of the trainees and preparing them to share their knowledge and skills with colleagues and patients in their home hospital or clinic.

As a leadership course, the IDI course is independent of the Ugandan ART program. At the same time, the national ART program in Uganda and ART programs in other African countries are central to the success of the IDI course. The IDI course does not include funding for an intervention package to immediately apply clinical and training skills. Outcomes of the course depend on the emergence of other programs to support the alumni financially and professionally.

To evaluate the IDI course, we collected data from four cohorts of doctors in 2004 and 2005, on 2 sets of outcomes: (1) clinical care and (2) training activities. For clinical care, we assessed their clinical skills and whether alumni were actively treating patients with HIV. For training activities, we assessed whether trainees were actively training colleagues and patients and the number of people trained per month.

METHODS

Training Program

In 2004 and 2005, the IDI course on comprehensive management of HIV including ART was 4 weeks long, with half of the time devoted to classroom sessions and half to clinical sessions. The course was taught by professors from the Faculty of Medicine at Makerere University and 2 visiting professors sponsored by the Infectious Disease Society of America. Table 1 summarizes the classroom sessions from the October 2004 course, which was representative of those offered during the pilot test. In addition to the sessions listed in Table 1, trainees attended case discussions almost every day, either at case conferences with IDI's adult infectious disease clinic staff, by presenting their own cases, or by discussing cases observed during the clinical sessions.

Clinical sessions were offered at the adult infectious disease clinic, pediatric infectious disease clinic, dermatology clinic, prevention of mother-to-child transmission (PMTCT) clinic, psychiatric clinic, oncology ward, and medical ward of Mulago Hospital. Clinical sessions were also offered at several outpatient care facilities, including the Development of Antiretroviral Therapy (DART) clinic, Hospice Uganda, Joint Clinical Research Center (JCRC), Makerere University/Johns Hopkins University Laboratory, Mildmay International, Mbuya Reach Out, Nsambya Home Care, and The AIDS Support Organization (TASO). Some of the clinical sessions focused on clinical manifestations of HIV that were specific to that facility such as the oncology ward at Mulago Hospital, while others focused on models of care that were practiced by the facility, such as Mbuya Reach Out. (The Core course now distinguishes between these 2 types of clinical sessions as "clinic attachments" and "clinic visits," respectively.)

Outcome Measures

Outcome data were collected from three sources: (1) clinical examination at the beginning and end of the course, (2) telephone survey of alumni 1 month after the course, and (3) follow-up sessions 3 to 4 months after the course.

Clinical Examination

The IDI introduced a clinical examination for doctors in the autumn of 2004 as both a clinical training activity and an evaluation activity. A visit at the IDI adult infectious disease clinic between a trainee and a patient was observed by an IDI faculty member. Four patients were recruited from the clinic and asked to return late in the day when the clinic was less busy. Each patient participated in 3 clinical examinations per day on 2 days and received a stipend to cover transportation and other expenses. The IDI faculty selected patients who represented specific conditions that were a focus of the course, such as hepatotoxicity from treatment with nevirapine. The faculty excluded patients who could not communicate during the visit, such as those with HIV-related dementia. The patients were the same for some trainees but not all cohorts. In most cases, the same faculty member observed both the pretest and posttest clinical examinations of a trainee.

The faculty assessed the trainees with a 17-item checklist. The Clinical Examination Checklist (see Appendix A) was designed by the Training Subcommittee of the Academic Alliance for AIDS Care and Prevention in Africa. The checklist was based on the "Five A's," which guide behavior change interventions in a primary care setting: (1) assess, (2) advise, (3) agree, (4) arrange, and (5) assist.[20] The checklist included five items on clinical care, 6 items on patient management, and 6 items on professionalism and interpersonal skills.

The faculty member assessed the trainee on each item with a 4-point scale, where 4 was "excellent - trainee demonstrates strength/skills," and 1 was "unsatisfactory - trainee did

TABLE 1. Classrooms Sessions of the IDI Course on Comprehensive Management of HIV, Including Antiretroviral Therapy

Field	Sessions
Epidemiology	HIV/AIDS impact in Africa
	Clinical epidemiology and applied biostatistics
	Natural history of HIV and HIV/AIDS classifications
Basic science	Immunology
	Molecular biology
	Pathogenesis
	Virology of HIV and clades
Clinical manifestations of HIV	Oral manifestations and candidiasis
	AIDS-related malignancies
	Gastrointestinal, hepatobiliary, and enteric pathogens
	Renal, cardiac, endocrine, and ophthalmic
	Dermatological manifestations
	Pulmonary manifestations and tuberculosis
	Hematological manifestations
	Adult neurological manifestations
Laboratory	Laboratory diagnosis of HIV infection
Management of opportunistic infections	Systemic bacterial infections
	Pneumocystis
	Cryptococcal meningitis
	Toxoplasma
	Septrin prophylaxis
Malaria	Malaria and HIV
Mental health	Mental health and HIV
Pediatric manifestations, care, and treatment	Clinical presentation and classification of HIV in children
	System bacterial infections in children
	Pediatric pulmonary manifestations and tuberculosis
	Use of ART in pediatrics
	Counseling in pediatrics and adolescents
Antiretroviral therapy	Introduction to and principles of ART
	Combination therapies and drug interactions
	ARV drugs and toxicities
	Immune reconstitution syndrome
	Implementation and monitoring of an ART program
	Clinical and laboratory monitoring of ART
	ARV drug resistance
	ARV drug adherence
	Use of ARV drugs in pregnancy
HIV prevention	Preventing mother-to-child transmission
	Preventing sexual transmission
	Syndromic approach to sexually transmitted diseases
	Legal issues, health rights, and stigma
	Vaccines for HIV infection
	Voluntary and routine counseling and testing
	Prevention in health-care settings
Research in HIV/AIDS	Overview of clinical trials and study design
	Ethical issues of research in resource-limited settings

not perform task completely and requires a lot of support." The narrow range and meaning of each score were intended to minimize differences in scores across faculty.

After the visit, the faculty member discussed observations with the trainee to clarify decisions made by the trainee and explored reasons for deviating from the checklist.

Telephone Survey

A telephone survey was conducted by the AIDS Treatment Information Center (ATIC). ATIC is a "warm line" for clinicians where pharmacists respond to queries about ART and other aspects of HIV/AIDS care and prevention using a toll-free call center, as well as fax and Internet

resources.[21] The term "warm line" means that a call center is open during business hours (eg, weekdays from 8 AM to 5 PM), as opposed to a "hot line" that is open 24 hours a day. Doctors in Uganda generally had better access to cell phones than to land lines or e-mail. An ATIC pharmacist (R. Lukwago) interviewed 46 of 47 alumni by telephone using a structured questionnaire that included the following 4 topics: (1) clinical activities, (2) training activities, (3) monitoring the last HIV patient treated (trainee practice), and (4) brief case studies on the criteria for initiation ART.

Follow-Up Sessions

A subset of Ugandan alumni who practiced outside of Kampala were invited to a 1½ day session at the IDI 3 to 4 months after the course. Nine alumni from the November 2004 cohort were invited to an April 2005 session, and 7 alumni from the March 2005 cohort were invited to a June 2005 session. A clinical examination was conducted during the follow-up session, and alumni were asked about the training they conducted after completing the IDI program. The follow-up session also included case presentations and interactive sessions on recent advances in HIV care.

Sample

Four cohorts of IDI trainees were invited to participate in the evaluation: (1) October 2004, (2) November 2004, (3) March 2005, and (4) April 2005. The telephone survey was limited to alumni who worked in Uganda, because of the cost of intercountry calls in Africa and the analysis focused on that subset of trainees. The clinical examination sample does not include the October 2004 cohort; October was the first time that the clinical examination checklist was used, and it was substantially revised for subsequent cohorts.

Table 2 summarizes the sample size, enrollment rate, and response rate of the total sample and each cohort for the clinical examination, telephone survey, and follow-up sessions. For the clinical examination, 35 of the 54 trainees who worked in Uganda from the last 3 cohorts agreed to participate, for an enrollment rate of 65%. The 32 complete cases made a response rate of 91%; one observation was missing from the November 2004 follow-up session, the March 2005 pretest, and the March 2005 posttest. For the telephone survey, 47 of the 71 trainees who worked in Uganda in all 4 cohorts agreed to participate, for an enrollment rate of 66%. One observation was missing from the October 2004 cohort, for a response rate of 98%. For the follow-up session, clinical examination data were available for 14 out of 16 alumni, for a response rate of 88%. Missing data on 2 cases from the November 2004 follow-up session and March 2005 cohort were noted above.

Analysis

Descriptive statistics on the clinical examination checklist and telephone survey were analyzed with SPSS-PC. χ^2 tests were performed to compare percentages, and paired sample t tests were performed to compare means.

Human Subjects

All trainees were recruited to participate in the evaluation with an informed consent process. The evaluation was approved by the University of Washington's Division of

TABLE 2. Enrollment Rate and Response Rate of IDI Trainees by Cohort

	October '04	November '04	March '05	April '05	Total
Trainees					
Work in Uganda	17	15	18	21	71
Work outside Uganda	8	10	7	4	29
Total	25	25	25	25	100
Number enrolled					
Work in Uganda	12	13	14	8	47
Enrollment rate					
Clinical examination	—	87%	78%	38%	65%
Telephone survey	71%	87%	78%	38%	66%
Clinical examination					
Pretest	—	13	13	8	34
Posttest	—	13	13	8	34
Complete cases	—	12	12	8	32
Response rate	—	92%	86%	100%	91%
Follow-up session					
Attendance	—	9	7	—	16
Complete cases	—	8	6		14
Response rate	—	89%	86%		88%
Telephone survey	11	13	14	8	46
Response rate	92%	100%	100%	100%	98%

Human Subjects and the Makerere University Faculty of Medicine's Research and Ethics Commitee.

RESULTS

Clinical Activity

Descriptive statistics on the alumni's clinical activity during the month after the course are reported in Table 3. Twenty six percent of the alumni worked in referral hospitals and 35% worked in district hospitals. The subsample who attended the follow-up session represented a higher percentage of doctors who worked in district hospitals when compared to the entire telephone survey sample.

Ninety-three percent of the alumni treated HIV patients during the previous month, and among those who treated HIV patients, they treated an average of 48 patients per week. Hospitals and clinics generally set aside 1 day per week for HIV clinics, so 48 would be the number of HIV patients they saw on a typical HIV-clinic day. Thirty-three percent of the alumni initiated patients on ART, and those who provided this service initiated an average of 7 patients per week. Seventy-two percent of the alumni monitored patients on ART, and those who provided this service monitored an average of 20 patients per week, or 42% of their HIV patient load. These descriptive statistics are similar to those reported for the subsamples in columns 2 and 3 of Table 3.

As shown in Figure 1, a higher percentage of the March and April 2005 alumni reported that they initiated patients on ART than the October and November 2004 alumni, but the difference was not statistically significant. Fifty percent of the 2005 alumni and 21% of the 2004 alumni initiated patients on ART (P = 0.197). Similarly, 82% of the 2005 alumni monitored patients on ART compared to 62% of the 2004 alumni (P = 0.124).

Clinical Examination Data

Two comparisons of the clinical examination data were made to test the effect of the IDI course on the trainees' clinical capacity: (1) pretest scores from the beginning of the 1-month program were compared to the posttest scores at the end, and (2) posttest scores were compared to the follow-up scores of trainees who attended the follow-up session.

Table 4 presents the pretest and posttest results for the three cohorts of trainees with clinical examination data. On the pretest, the three areas with the highest scores were "perform assessment," "appropriate procedures," and "non-verbal communication with the patient." The mean score for four of the items was 3.0 or below and included drug treatment, management plan, development of follow-up plan, and documentation.

In the comparison of pretest and posttest scores, the trainees showed significant improvement on 11 of the 17 areas. The three areas with the highest scores were "establish rapport," "professionalism," and "appropriate procedures." The mean score was 3.26 or higher for all of the areas.

The trainees who attended the follow-up session were a subsample of all trainees. The comparison between the posttest and follow-up scores could be biased if the subsample was generally more skilled than other trainees because the analysis would reflect differences between the samples rather than improvement in skills. To control for the sample differences, comparisons between the posttest scores and the follow-up session scores were conducted with only the subsample who attended the follow-up session (Table 5).

TABLE 3. Clinical and Training Activities of Alumni 1 Month After IDI Course

	Ugandan Sample	Ugandans With Clinical Examination Data	Ugandans Who Attended Follow-Up Session
Clinical activities			
Type of facility where alumni worked			
Referral hospital	26%	31%	21%
District hospital	35%	38%	64%
Clinic	15%	12%	7%
Other clinical	15%	12%	7%
Research	6%	6%	—
Do you currently treat patients with HIV?	93%	100%	100%
Mean number of patients treated per week	81	128	132
Conditional mean number of HIV patients treated per week	48	49	46
Do you initiate patients on ART?	33%	31%	36%
Conditional mean number of patients who initiate per week among alumni who initiate patients on ART	7	9	9
Do you monitor patients on ART?	72%	69%	71%
Conditional mean number of patients monitored per week among alumni who monitor ART	20	22	17
Training activities			
Conducted training since the IDI course	35%	34%	36%
Mean number of people who attended trainings	8	15	12
Attended an ART training before the IDI course	46%	25%	43%
Sample size	46	32	14

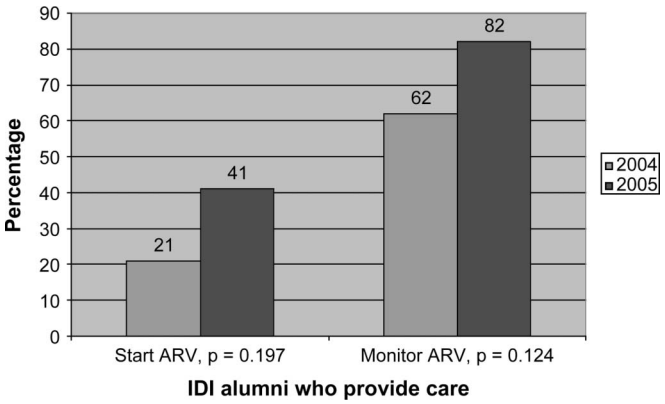

FIGURE 1. Comparison of ARV care provided by 2004 versus 2005 alumni.

In Table 5, the difference between the pretest and posttest scores was significant for 5 of the 17 areas, but the smaller sample size had less power to detect significant differences. The difference between the posttest score and follow-up score was significant for 3 areas: "patient advice," "development of a follow-up plan," and listen to patient. For 2 of the areas—"World Health Organization staging" and "nonverbal communication"—listed in Table 5, the mean score for the follow-up session was 3.93, which means that 13 of the 14 alumni earned an "excellent" score. For two additional areas—"professionalism" and "listen to patient"—the mean score for the follow-up session was 3.84, which means that 12 of the 14 alumni earned an "excellent" score.

TABLE 4. Comparison of Clinical Examination Scores: Ugandan Sample

	Pretest Mean	Posttest Mean	Pretest vs. Posttest Statistic*
Perform assessment	3.5	3.72	0.147
Patient history	3.22	3.66	**0.006**
Physical examination	3.25	3.69	**0.003**
Likely diagnosis	3.28	3.66	**0.003**
WHO staging	3.23	3.53	0.293
Appropriate laboratory tests	3.33	3.41	0.911
Appropriate procedures	3.46	3.77	0.054
Drug treatment	3.00	3.47	**0.014**
Patient advice	3.13	3.47	**0.026**
Management plan	2.97	3.37	**0.016**
Development of follow-up plan	2.70	3.26	**0.001**
Establish rapport	3.39	3.88	**0.001**
Professionalism	3.41	3.81	**0.001**
Listen to patient	3.25	3.69	**<0.001**
Non-verbal communication	3.50	3.72	0.074
Documentation	3.00	3.54	0.165
Time management	3.22	3.60	**0.008**
Sample size	32	32	

*When the pretest and posttest means are significantly different, the test statistic is shown in bold.

Monitoring the Last HIV Patient Treated

The telephone survey included a series of questions about the last HIV patient treated to assess the alumni's practice of monitoring HIV patients. The results are reported in Table 6.

Several of the questions were about the patient's background to provide a context for the monitoring questions. For example, questions about sex, age, and pregnancy status were necessary to understand whether or not a doctor should monitor the patient's use of contraceptives. Among the women of childbearing age who were not pregnant, 28% of the alumni did not know whether or not the patient was using contraceptives.

We selected the patient's weight as a clinical end point to measure the patient's health status. Change in an HIV patient's weight is an important clinical sign of disease progression.[22] HIV wasting syndrome was associated with reduced survival among HIV patients in South Africa,[23] and recent evidence shows that it occurs in patients on antiretroviral therapy.[24] As shown in Table 6, 53% of the alumni did not know whether or not their patient's weight had changed since the last visit. For some alumni, it was the first visit of the patient who was the subject of the interview, so the doctor had no record of the patient's weight for a comparison. Even without a record, the alumni should be encouraged to ask the patient about changes in his/her weight in the last month. Four percent of the alumni did not know whether or not the patient had an appetite.

Brief Case Studies on the Criteria for Initiation ART

The telephone survey included two brief case studies on initiation of ART based on the Ugandan national guidelines:[25]

(1) According to the Ugandan ART guidelines, is a 2-year-old, HIV-positive orphan who lives with his/her aunt a candidate for starting ART? He/she is asymptomatic and has no CD4 count.

(2) According to the Ugandan ART guidelines, is a 2-year-old, HIV-positive orphan who lives with a healthy grandparent a candidate for starting ART? He/she has pediatric Stage II disease and no CD4 count.

Three possible responses were read to the alumni: (1) yes, (2) no, and (3) need more information.

Forty-two percent of the 46 alumni who responded to the telephone survey answered case study 1 correctly, and 13% answered case study 2 correctly. The correct answer to case study 1 was "need more information" because the aunt's ability to help with adherence to treatment and the child's polymerase chain reaction (PCR) were not known. The correct answer to case study 2 was "yes" because the healthy grandparent can help with adherence and a CD-4 (T-cell) count or PCR is not necessary for children with pediatric Stage II disease.

Training Activities

Alumni were asked about their training activities as part of the telephone survey 1 month after the course and during the follow-up session 3 to 4 months after the course. As shown in Table 3, only 35% of the trainees were engaged in training 1 month after the course. As shown in Figure 2, however,

TABLE 5. Comparison of Clinical Examination Scores: Ugandans Who Attended Follow-Up Session

	Pretest Mean	Posttest Mean	Pretest vs. Posttest Statistic	Follow-Up Session Mean	Posttest vs. Follow-Up Session Test Statistic*
Perform assessment	3.43	3.71	0.263	3.75	0.876
Patient history	3.14	3.5	0.174	3.75	0.236
Physical examination	3	3.5	**0.029**	3.58	0.534
Likely diagnosis	3.07	3.57	**0.003**	3.79	0.272
WHO staging	3.21	3.23	1.000	3.93	0.056
Appropriate laboratory tests	3.31	3.15	0.504	3.3	0.426
Appropriate procedures	3.45	3.75	0.146	3.64	0.568
Drug treatment	3.07	3.43	0.292	3.69	0.264
Patient advice	3.14	3.15	0.721	3.79	**0.001**
Management plan	2.93	3.21	0.218	3.36	0.435
Development of follow-up plan	2.79	3.08	0.339	3.57	**0.026**
Establish rapport	3.31	3.79	**0.008**	3.71	0.671
Professionalism	3.36	3.64	0.104	3.86	0.082
Listen to patient	3.14	3.57	**0.028**	3.86	**0.040**
Non-verbal communication	3.36	3.64	0.165	3.93	0.104
Documentation	2.88	3.4	1.000	3.5	0.182
Time management	2.93	3.64	**0.006**	3.43	0.272
Sample size	14	14		14	

*When the pretest and posttest means are significantly different, the test statistic is shown in bold.

a significantly higher percentage of the March and April 2005 alumni (50%) reported conducting a training session than the October and November 2004 alumni (21%) ($P = 0.037$). The mean number of people trained was not significantly different between the 2005 (8) and 2004 (9) alumni.

During the follow-up sessions, when alumni were asked about training activities, every one of the 16 alumni had conducted one or more training sessions. The mean number of people trained by the November 2004 alumni was 82 during the 4 months after the course, and the mean trained by the March 2005 alumni was 57 during the 3 months after the course, or an average of 20 people per month. At this rate, for every person trained, 100 people would benefit within 5 months after the course.

Note that training activities of the subsample of alumni who attended the follow-up session appeared to be representative of the other trainees. As shown in Table 3, 36% of the subsample who attended the follow-up session conducted a training session 1 month after the course, compared to 35% of the full sample. During the same time period, 50% of the March 2005 alumni who attended the follow-up session and 25% of the November 2004 alumni who attended the follow-up session conducted a training session, which is comparable to the results for the 2005 and 2004 trainees in Figure 2.

DISCUSSION

The effects of the IDI's comprehensive HIV course were demonstrated by four outcomes: (1) clinical activities, (2) clinical skills, (3) monitoring of HIV patients, and (4) training activities. Considering clinical activities, 93% of the IDI alumni (n = 46) were treating patients with HIV 1 month after the course. This outcome compares favorably to an evaluation of a 6-week WHO training program on HIV in which 75% of the doctors were treating patients with HIV 2 to 5 years after the course.[8] In the context of Uganda in recent years, it is likely that IDI alumni were treating patients with HIV before the course, and the success reflected on the quality of the process by which trainees were selected. In other contexts, collecting information on clinical activities before and after the course could be used to distinguish between 2 aspects of training: (1) the quality of the selection process, and (2) the course's effect on recruiting physicians to treat HIV patients.

Measures of ARV care and training activities showed that the 2004 alumni were less active in ARV care and training than the 2005 alumni 1 month after the course. Among the subsample who attended the follow-up session, the 2004 alumni were training as actively as the 2005 alumni 3 to 4 months after the course. Given that the training activities of the subsample who attended the follow-up session was representative of the full sample, the difference between the 1-month and 3- to 4-month follow-up was attributable to the schedule for rolling out the Ugandan ART program. In 2005, the national ART program was extended from district hospitals to higher-level health centers (health center IV), which included funding to train the staff at the health center IVs.[26] During the follow-up sessions, both the 2004 and 2005 alumni reported planning and implementing the district-level training programs.

A leadership course falls between training programs that have been the focus of much of the literature on evaluation of training outcomes. In economics literature, education and training programs have focused on individuals, while outcomes have been measured primarily by increases in employment and earnings that accrued to an individual over his/her lifetime.[27–29] In the global health literature, training has focused on a specific type of care and was often part of

TABLE 6. Description of Care of Last HIV Patient Treated by Alumni 1 Month After the IDI Course

	Ugandan Sample	Ugandans With Clinical Examination Data	Ugandans Who Attended Follow-Up Session
When last patient was treated			
Today	38%	34%	29%
Yesterday	16%	16%	21%
>1 day ago	11%	16%	14%
Other	36%	34%	36%
Sex, percentage female	60%	62%	79%
Mean age of patients, in years	30	30	30
Purpose of visit			
Initiate ART	4%	3%	0%
Monitor ART	20%	9%	7%
Initial visit for specific compliant	47%	56%	71%
Follow-up visit for specific complaint	18%	16%	14%
Other	9%	12%	7%
Has the patient's CD4 count been done?			
Yes	53%	44%	36%
No	44%	53%	64%
Don't know	2%	3%	0%
Patient has started ART, percentage "yes"	49%	44%	50%
Is patient the female of childbearing age who is pregnant, percentage "yes"	0%	0%	0%
Does the female patient of childbearing age have access to contraceptive services?			
Yes	50%	55%	70%
No	21%	17	20
Don't know	29%	28	10
Number of women of childbearing age	24	18	11
Has the patient's weight increased, decreased, or stayed the same since the last visit?			
Increased	42	34	36
Decreased or stayed the same	4	6	7
Don't know	53	59	58
Does the patient have an appetite?			
Yes	69	66	64
No	27	31	29
Don't know	4	3	7
Sample size	45	32	14

an intervention package that included supervision, supplies, and drugs. For examples, please see Gilson et al[30] and Sweat et al.[31] Outcomes were measured primarily by improvement in the quality of care with the expectation that improvements would be observed immediately after the intervention and persist for 6 to 12 months.

The appropriate time to evaluate a leadership course is debatable and may fall sometime in between the timing of the evaluations stated in the economics and global health literature. An early evaluation after a course and before a national program is implemented may understate the course's effects. Several observations beginning 1 to 3 months after a course and continuing on a quarterly or semiannual basis for 2 to 5 years may provide the most accurate data on outcomes. To measure the effect on the alumni's professional life, it may also be helpful to collect data on employment and earnings in addition to their clinical and training activities over this time period.

As for clinical skills, the trainees' skills improved between the beginning and end of the IDI course as measured by the Clinical Examination Checklist. Among the subsample of alumni who attended the follow-up session, their clinical skills continued to improve for 3 or 4 months after the course. These additional improvements may reflect that knowledge continued to be assimilated and skills continued to be developed after the course, or they may reflect the effects of additional training or decision-support interventions by other programs. The three areas in which there was significant improvement could have required more experience with patients to develop: "patient advice," "development of a follow-up plan," and "listen to patient." These results support the recommendation to collect outcome data over a longer period of time and to control for additional training after the IDI course.

The clinical examination measured changes in clinical skills and served as a skill-building activity, but concerns have been raised about the reliability of ratings across observers

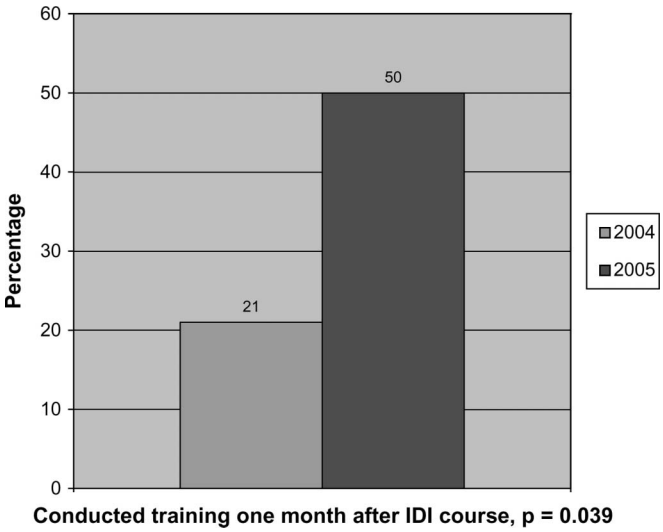

FIGURE 2. Comparison of training by 2004 versus 2005 alumni.

when clinical examinations were used to evaluate residents in the United States.[32,33] Some researchers consider unannounced (or blinded) standardized patient encounters to be the "gold standard" for measuring the quality of clinical care.[34] Unblinded standardized patient encounters have been used to evaluate an HIV clinical skills training for second-year residents in internal medicine[35] and an HIV risk-assessment and counseling workshop for medical students in the United States.[36] We sought to improve the accuracy of the ratings in two ways: (1) the clinical examination checklist provided a structured form for reporting observations, and (2) clinical skills were assessed by the IDI faculty. In research in the United States, structured forms provided more accurate ratings than open-ended questions, and faculty ratings were more accurate than ratings by doctors in community hospitals.[32,33] It may be possible to improve consistency across faculty by recruiting three or four IDI faculty members to perform the clinical examinations for all cohorts of trainees. The Clinical Examination Checklist can also be used to mentor trainees and alumni in their home clinics or hospitals.

Considering the monitoring of HIV patients, data from the telephone survey showed room for improvement in monitoring contraceptive use among female patients and changes in weight among all patients. In addition, the alumni's lack of knowledge of the Ugandan guidelines for initiation of ART for children underscored the need to exploit the opportunities created by prevention of mother-to-child transmission programs to initiate early interventions for HIV-exposed and HIV-infected children.[37]

The data on monitoring HIV patients were based on self-reports about the last HIV patient treated. Self-reports on practice could potentially be less accurate than observation of clinical skills by faculty. A questionnaire on the last patient treated, however, was used to evaluate the effect of the French recommendations for non-occupational post-exposure prophylaxis.[38] Self-report on clinical practices may serve as a measure of best practices rather than actual practice; some doctors who reported that they knew about a change in the patients' weight may not have actually known, but doctors who reported that they did not know were unlikely to actually know. The last-patient-treated method warrants further research on its validity given that follow-up data on alumni were much less expensive to collect from telephone surveys than from clinical examinations.

Two limitations of the pilot test were noted above: (1) inter-rater reliability across faculty who observed the clinical examinations and (2) accuracy of the self-reported practice of monitoring the last HIV patient treated. In addition to these limitations, the sample size was small, especially the subsample who attended the follow-up session. The subsample size was not large enough to detect significant differences between the pretest and posttest results that were evident in the Uganda sample and may have missed significant differences between the posttest and follow-up session. The IDI continues to conduct the clinical examination at the beginning and end of the Core course, so data from a larger sample will be available for analysis in the future. On the basis of pilot test results, the IDI plans to conduct a quarterly telephone survey with a sample of alumni, which will provide a more complete picture of clinical and training activities over the course of the national ART program in Uganda.

A final limitation is that clinical activities and skills did not necessarily represent actual clinical practice. Recent research in Tanzania showed that neither direct observation of one consultation nor vignettes, which in their research were similar to unblinded standardized patients, represented actual practice in a resource-limited setting.[39] Data on actual clinical practice would be challenging to collect because a leadership course that is independent of national ART programs could not rely on regular reporting on the quality of HIV care. If those data were available from a national ART program, they would represent facility performance rather than individual practice. For specialized evaluations of a leadership course, the best source of information on actual practice may be a series of blinded standardized patients with some visits to the trainees' home facility before the course and some after. For routine evaluations, the clinical examinations and telephone survey are a sustainable source of information on clinical activities and skills.

CONCLUSION

The IDI course clearly improved the clinical skills of the doctors who completed it. The alumni were practicing HIV care and training. It would be possible to improve their capacity for treating HIV-infected children and their practice for monitoring HIV patients in the future.

ACKNOWLEDGMENTS

The authors thank the members of the Training Subcommittee of the Academic Alliance for AIDS Care and Prevention in Africa who designed the Clinical Examination Checklist: Drs. Harriet Mayanja and Edward Mbidde of Makerere University in Uganda, Robert Colebunders of the Institute of Tropical Medicine in Antwerp, and Michael Scheld of the University of Virginia, and Dr. Moses Kamya and Ms. Cecelia Nakitto. We are grateful to Drs. Joshua Baalwa,

Sabrina Bakeera-Kitaka, Grace Ndeezi, and William Worodria and to Ms. Sylvia Ntege of Makerere University, who helped with the follow-up training sessions. We acknowledge Dr. David Serwadda and Ms. Edith Bagambe of Makerere University and Drs. Ceppie Merry and Peter Coakley of Trinity College, University of Dublin in Ireland, for their guidance and management of the AIDS Treatment Information Center. Finally, we are grateful to Drs. Winston Cavert of the University of Minnesota, Gabrielle O'Malley of I-TECH, and Brant Viner of the Boston Medical Center for advice on measuring the outcomes of clinical training, two anonymous reviews for comments on the manuscript, and Bobbi Nodell of I-TECH for editing the manuscript.

REFERENCES

1. UNAIDS and WHO. AIDS Epidemic Update. Geneva: UNAIDS, 2005. Available at: http://www.unaids.org/epi/2005/doc/EPIupdate2005_pdf_en/epi-update2005_en.pdf. Accessed April 15, 2006.
2. United States Office of the Global AIDS Coordinator. Action Today, a Foundation for Tomorrow: The President's Emergency Plan for AIDS Relief Second Annual Report to Congress. Available at: http://www.state.gov/s/gac/rl/c14960.htm. Accessed April 30, 2006.
3. United States Office of the Global AIDS Coordinator. Engendering Bold Leadership: The President's Emergency Plan for AIDS Relief First Annual Report to Congress. Available at: http://www.state.gov/s/gac/rl/c14960.htm. Accessed April 30, 2006.
4. World Health Organization. Human capacity-building plan for scaling up HIV/AIDS treatment. Available at: http://www.who.int/3by5/publications/documents/capacity_building/en/index.html. Accessed April 30, 2006.
5. Misra A, Garg S, Singh MM, et al. Effectiveness of training on the knowledge of HIV/AIDS among doctors in Delhi. *J Commun Dis*. 2002; 34:149–153.
6. Buskin SE, Lin L, Houyuan Y, et al. HIV/AIDS knowledge and attitudes in Chinese medical professionals and students before and after an informational lecture on HIV/AIDS. *J Public Health Manag Pract*. 2002; 8:38–43.
7. Zell SC. An evaluation of teaching methods utilized during an HIV miniresidency course for Thai physicians. *AIDS Educ Prev.* 1997;9:70–82.
8. Stiernborg M. Impact evaluation of an international training course on HIV/AIDS. *AIDS Care*. 1996;8:311–319.
9. Sherr L, Christie G, Sher R, et al. Evaluation of the effectiveness of AIDS training and information courses. *S Afr Med J.* 1989;76:358–362.
10. Souville M, Msellati P, Carrieri M-P, Brou H, Tape G, Dakouri G, Vidal L, and the Cote D'Ivoire HIV Drug Access Initiative Socio-Behavioural Evaluation Group. Physicians' knowledge and attitudes toward HIV care in the context of the UNAIDS/Ministry of Health Drug Access Initiative in Cote d'Ivoire. *AIDS*. 2003;17(Suppl 3):S79–S86.
11. Ayaya SO, Sitienei J, Odero W, et al. Knowledge, attitudes and practices of private medical practitioners on tuberculosis among HIV/AIDS patients in Eldoret, Kenya. *East Afr Med J*. 2003;80:83–90.
12. United Nations Population Fund, Office of Oversight and Evaluation. *UNFPA Support to HIV/AIDS-Related Interventions*. Evaluation Report, no date; 16:25–30.
13. United Nations Population Fund, Office of Oversight and Evaluation. *UNFPA Support to HIV/AIDS-Related Interventions*, Part II: HIV/AIDS-Related Training. Evaluation Findings, 1999;12:1–3. Available at: http://www.unfpa.org/monitoring/pdf/n-issue12.pdf. Accessed April 30, 2006.
14. Davis D, O'Brien MAT, Freemantle M, et al. Impact of formal continuing medical education: do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes. *JAMA*. 1999;282:867–874.
15. U. S. Department of Health and Human Services, Health Resources and Services Administration. HIV/AIDS Bureau. Programs: The AIDS Education and Training Centers (AETC). Available at: http://hab.hrsa.gov/programs/factsheets/aetc.htm. Accessed April 30, 2006.
16. International Training and Education Center on HIV (I-TECH). Clinical Mentoring Initiative. Available at: http://www.go2itech.org/itech?page=co-20-02. Accessed May 18, 2006.
17. Wester CW, Bussmann H, Avalos A, et al. Establishment of a public antiretroviral treatment clinic for adults in urban Botswana: lessons learned. *Clin Infect Dis*. 2005;40:1041–1044.
18. More information on the Infectious Diseases Institute is available at: http://www.idi-makerere.ac.ug. Accessed May 12, 2006.
19. Accreditation Council for Graduate Medical Education. Outcomes Project. Available at: www.acgme.org/Outcome. Accessed July 23, 2006.
20. Whitlock EP, Orleans CT, Pender N, et al. Evaluating primary care behavioral counseling interventions. *Am J Prev Med*. 2002;22: 267–284.
21. More information on AID Treatment Information Center is available at: http://www.aticafrica.org. Accessed July 20, 2006.
22. Wheeler DA, Gibert CL, Launer CA, et al, and the Terry Beirn Community Programs for Clinical Research on AID. Weight loss as a predictor of survival and disease progression in HIV infection. *J Acquir Immune Defic Syndr Hum Retrovirol*. 1998;18:80–85.
23. Post FA, Motasim B, Wood R, et al. AIDS in Africa—survival according to AIDS-defining illness. *S Afr Med J.* 2001;91:583–586.
24. Wanke CA, Silva M, Knox TA, et al. Weight loss and wasting remain common complications in individuals infected with human immunodeficiency virus in the era of highly active antiretroviral therapy. *Clin Infect Dis*. 2000;31:803–805.
25. Katabira ET, Kamya MR (eds). *Antiretroviral Treatment and Care Guidelines for Adults and Children*. Kampala, Uganda: Ministry of Health, Republic of Uganda, 2003.
26. Amolo Okero F, Aceng E, Madraa E, et al. Scaling up antiretroviral therapy: experience in Uganda. In: *Perspectives and Practice in Antiretroviral Treatment*. Geneva: World Health Organization; 2003. Available at: http://www.who.int/hiv/amds/case3.pdf. Accessed April 30, 2006.
27. Heckman JJ, Hotz VJ, Dabos M. Do we need experimental data to evaluate the impact of manpower training on earnings? *Eval Rev.* 1987;11: 397–427.
28. LaLonde R, Maynard R. How precise are evaluations of employment and training programs: Evidence from a field experiment. *Eval Rev.* 1987;11: 428–451.
29. Becker GS. *Human Capital*. New York: National Bureau of Economic Research; 1975.
30. Gilson L, Mkanje R, Grosskurth H, et al. Cost-effectiveness of improved treatment services for sexually transmitted diseases in preventing HIV-1 infection in Mwanza Region, Tanzania. *Lancet*. 1997;350:1805–1809.
31. Sweat M, Gregorich S, Sangiwa G, et al. Cost-effectiveness of voluntary HIV-1 counselling and testing in reducing sexual transmission of HIV-2 in Kenya and Tanzania. *Lancet*. 2000;356:113–121.
32. Noel GL, Herbers JE, Caplo MP, et al. How well do internal medicine faculty members evaluate the clinical skills of residents? *Ann Intern Med*. 1992;117:757–765.
33. Herbers JE, Noel GL, Cooper GS, et al. How accurate are faculty evaluations of clinical competence? *J Gen Intern Med*. 1989;4:202–208.
34. Luck J, Peabody JW. Using standardized patients to measure physicians' practice: validation study using audio recordings. *BMJ.* 2002;325: 679–683.
35. Dieckhaus KD, Vontell S, Pfeiffer C, et al. The use of standardized patient encounters for evaluation of a clinical education program on the development of HIV/AIDS-related clinical skills. *Journal of HIV/AIDS and Social Services*. 2005;4:9–29.
36. Haist SA Jr, Griffith IC, Hoellein AR, et al. Improving students' sexual history inquiry and HIV counseling with an interactive workshop using standardized patients. *J Gen Intern Med*. 2004;19:549–553.
37. African Network for the Care of Children Affected by AID (ANECCA). In: Tindyebwa D, Kayita J, Musoke P, et al, eds. *Handbook on Paediatric AIDS in Africa*. Kampala, Uganda: Regional Center for Quality in Health Care; 2004. Available at: http://www.rcqhc.org/modules.php?op=modload&name=UpDownload&file=index&req=viewdownload&cid=4. Accessed April 30, 2006.
38. Laporte A, Jourdan N, Bouvet E, et al. Post-exposure prophylaxis after non-occupational HIV exposure: impact of recommendations on physicians' experiences and attitudes. *AIDS*. 2002;16:397–405.
39. Leonard KL, Masatu MC. The use of direct clinical observation and vignettes for health services quality evaluation in developing countries. *Soc Sci Med*. 2005;61:1944–1951.

APPENDIX A
INFECTIOUS DISEASES INSTITUTE HIV/AIDS TRAINING PROGRAM
CLINICAL EXAMINATION CHECKLIST

Study Code Number: .../.../.../ Date: .../.../.../ Examiner: .....

Please summarise the trainee's knowledge/skills using the codes below
4-Excellent (Trainee demonstrates strength/skills in this area)
3-Good (Trainee demonstrates some ability/skills in this area)
2-Marginally satisfactory (Trainee demonstrates very limited strength/skills and needs additional support in this area)
1-Unsatisfactory (No skills at all/does not perform the task(s) completely. Trainee requires a lot of support in this area)
X-Not applicable

I. Clinical Skills

Component	Comment	Code
Performs thorough assessment appropriate for patient's reason for visit (knowledge of current complaint)		
Patient history (medical, social/family) is relevant to current complaint(s), focused and thorough		
Conducts relevant physical examination accurately and thoroughly in line with presenting complaint, symptoms and history		
Accuracy of most likely diagnosis and differential diagnosis		
Accuracy of WHO staging of patient's illness		
Orders or recommends appropriate laboratory tests in light of presenting complaint, cost, availability, etc.		
Performs all procedures competently and safely, with regard to patient comfort and anxiety		

II. Patient Management Skills

Component	Comment	Code
Recommends appropriate drug treatment in line with diagnosis		
Gives appropriate and focused patient advice		
Involves patient appropriately in the development of a focused management plan		
Develops appropriate follow up plan		

III. Professional/Interpersonal Skills

Component	Comment	Code
Establishes appropriate rapport with patient		
Demonstrates an attitude of professionalism and confidence, including treating patients with empathy, dignity and respect		
Listens to patient and identifies any other concerns they may have		
Verbal communication skills		
Non-verbal communication eg, eye contact, facial expressions		
Written documentation is accurate, thorough, logical and concise		
Performs all tasks or procedures in a timely manner		