

Educational Intervention Increased Referrals to Allopathic Care by Traditional Healers in Three High HIV-Prevalence Rural Districts in Mozambique

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Abstract

Introduction: Delayed uptake of clinical services impedes favorable clinical outcomes in Mozambique. Care is delayed among patients who initiate care with traditional healers; patients with conditions like human immunodeficiency virus (HIV) or tuberculosis are rarely referred to the health system in a timely fashion.

Methods: We conducted a pre-post educational intervention with traditional healers, assessing healer referral rates and HIV knowledge in three rural districts in Zambézia Province.

Results: The median monthly referral rate prior to the intervention was 0.25 patients (interquartile range [IQR]: 0–0.54) compared with a post-intervention rate of 0.34 patients (IQR: 0–0.71), a 35% increase ($p = 0.046$). A median HIV knowledge score of 67% (IQR: 59–78) was noted 4-months pre-intervention and a median score of 81% (IQR: 74–89) was recorded 2½ months post-intervention ($p < 0.001$). One hundred and eleven healers referred 127 adults, 36 pregnant women, and 188 children to health facilities. Referred patients were most likely to be diagnosed with bronchopneumonia (20% adults; 13% children) and/or malaria (15% adults; 37% children). Of 315 non-pregnant persons referred, 3.5% were tested for HIV and 2.5% were tested for tuberculosis.

Discussion: We engaged traditional healers with some success; referral rates were low, but increased post-intervention. Once seen in the clinics, patients were rarely tested for HIV or tuberculosis, though symptoms suggested screening was indicated. We found increased referral rates through an inexpensive intervention with traditional healers, a viable, cost-effective method of directing patients to health facilities. However, quality improvement within the clinics is necessary before a substantial impact can be expected.

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Introduction

Timely testing and engagement into care among those infected with human immunodeficiency virus (HIV), tuberculosis (TB), and malaria and infection remains a large public health challenge in sub-Saharan Africa [1–3]. Testing is essential to starting the cascade of medical and behavioural interventions designed to improve a patient's health and reduce their infectiousness [4–7]. For example, persons who test positive for HIV are counselled to reduce their sexual risk behaviours, often resulting in increased condom use [8]. Those successfully initiated on ART have lower viral loads [9,10], resulting in lower rates of transmission to their sexual partners [11–14], and if pregnant, are less likely to pass the virus to their infants [15,16]. Of course, early TB detection and

treatment reduces TB infectiousness [17] and improves patient outcomes [18]. An early malaria diagnosis typically leads to reduced morbidity and mortality [19,20]. Despite the availability of clinical services, slow uptake and/or delayed help seeking behaviour remains a barrier to improving patient outcomes for many diseases in low and middle income nations (LMICs) [21–26].

In sub-Saharan Africa people commonly seek initial health consultations from a traditional or religious healer [27–31]. Symptoms, perceived source of the illness, or failed treatment from traditional healers can all motivate a patient to seek clinical services [27,28]. People visit traditional healers due to social acceptability, perceived source of illness, confidence in healer treatment (and/or a lack of confidence in the health center), easy

access, low cost, as well as the perceived fit of a healer's explanation of illness with expectations of the local culture [32–35]. Physicians often openly disapprove of patients who first see a healer for treatment, often resulting in animosity between healers and clinicians, as well as between scolded patients and their clinicians [28,36,37].

Given the level of trust in the community and the absolute numbers of healers, the incorporation of traditional healers into the formal health system could help increase early diagnosis and therapy with prompt referrals [31,38–43]. Efforts to increase healer knowledge about specific diseases, improve relationships with allopathic practitioners, and reduce delays to allopathic care have been piloted with traditional healers in diverse countries, including Brazil, Uganda, Kenya, Ghana, Cameroon, Lesotho, Gambia, Nepal, and India [24,44–58]. While educational and motivational interventions designed to change healer behavior are common, formal assessment of their effect on patient referral or patient health outcomes is limited [46,50,57,59]. In Mozambique, both the Ministry of Health and traditional healers are enthusiastic about the creation of a formal partnership [37]. To this end, the Ministério da Saúde (MISAU; Mozambican Ministry of Health), along with several formal healer organizations in Zambézia province, and the Vanderbilt University affiliated non-governmental organization Friends in Global Health (FGH) collaborated to design a formal system for documenting healer referrals to the health facility and for providing feedback to healers regarding patient diagnoses.

Methods

Study Locations

This study was conducted from February–September 2012, in 15 health facilities located in the districts of Morrumbala, Alto Molócuè, and Lugela in Zambézia Province, Mozambique (Figure 1). We were assisted by the organization for traditional healers, the *Associação dos Médicos Tradicionais de Moçambique* (AMETRAMO).

Participant Eligibility and Recruitment

Traditional healers were eligible to participate if they were an adult (≥ 18 years), lived and practiced traditional medicine in the catchment area (≤ 10 km) surrounding a target health facility (either the district level hospital or any of four small community-level health posts), a member of the AMETRAMO organization, and capable of providing informed consent. A convenience sample of healers was recruited from healers who were members of AMETRAMO in each region. Healers were informed about the study by one of two of us (CMA and JS) during monthly AMETRAMO meetings in January–February 2012. Healers were recruited if they met the eligibility requirements, were willing to use a referral form to identify their referrals to the health facility, and agreed to participate in a health training session for three days at the midpoint of the study. Healers who were interested learning more about the study met with study personnel in a private room following the meeting. Once the healer agreed to participate, they completed the consent form and the baseline interviewer-

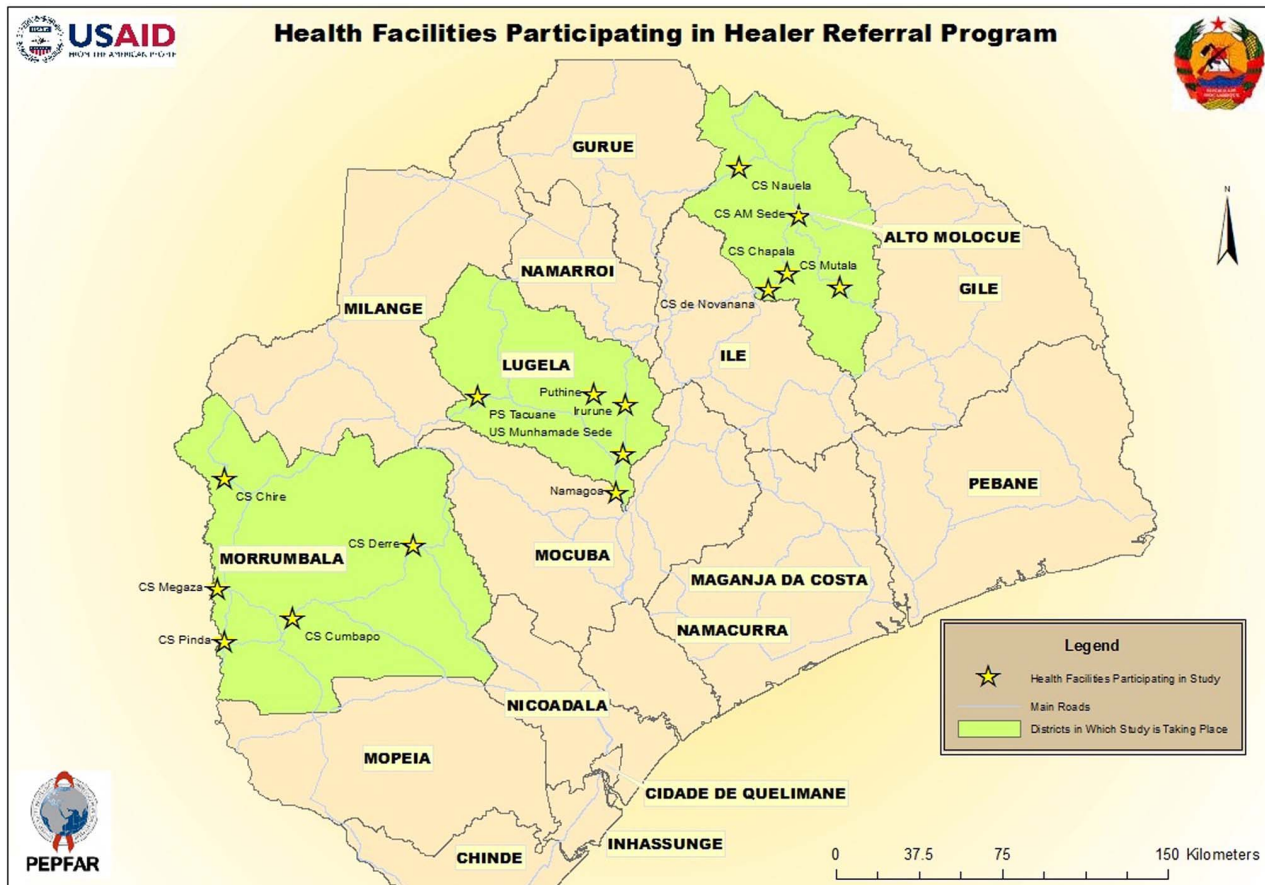


Figure 1. Map study districts in Zambézia Province (Friends in Global Health SCIP project supported by MISAU and USAID).
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administered knowledge questionnaire. Healers were enrolled on a “first come, first enrolled” basis until we recruited an average of 37 participants in each district until sample size requirements were met. The questionnaire took approximately 30–60 minutes to complete; no financial incentive was provided. The same tool was administered a second time to the same participants in September 2012. Study data were collected and managed using REDCap™ electronic data management software [60].

Intervention

Following the completion of the first questionnaire, healers were provided a two hour training session on how to use a new referral form designed to track healer referrals to the health system (Figure 2). At this baseline data collection time period, healers were provided only minimal direction about whom to refer, but were instructed carefully how to use the pictorial form to document their referral. Each healer was given a packet of 120 forms (40 each for adults, pregnant women, and children) with instructions on how to secure additional forms from our collaborators in the communities. Healers were asked to refer patients to the health facility as they had in the past (either direct accompaniment or by providing the form to the patient directly and giving them instructions to visit the clinic). We followed up with healers to assess any difficulties with filling out the forms and with clinical sites to collect the referral forms once each month. Based on the number of incomplete referral forms collected at the health facilities in the first few months, two additional training sessions with healers were conducted in each district to improve completion. A binder for referral form collection was placed in the patient intake (or consult) room(s) at each clinic or hospital for the collection of referral forms. Physician, nurses, and medical technicians, were asked to file referral forms as they were collected at the hospital.

In June–July 2012, FGH implemented a primary health training course for healers in each study district capital. The training

course was designed to help healers identify patients with HIV, TB, malaria, malnutrition, mental illness, and diarrhea and provide information about the importance of early detection and referral for standard methods of treatment. Training in disease identification and in the use of referral forms was conducted bilingually (in Portuguese as well as in the relevant local languages of Elowme, Sena, or Manhaua). All training related costs, including travel and meals were covered by the project; however, no additional financial incentives were provided to the healers. Two and one half months after the intervention, we retested healer HIV knowledge through interviewer-administered knowledge questionnaires, identical to the baseline, in their home communities.

Measures

The questionnaire. The questionnaire that was administered twice, pre-training and post-training, to each healer collected information on demographics, Portuguese proficiency, general knowledge about HIV-related knowledge, tuberculosis, malaria, nutrition, and diarrhea, and using the previously validated HIV KQ-27 knowledge scale [61].

Referral forms. Referral forms were designed through collaboration with FGH personnel and the investigators, MISAU’s Instituto Nacional de Medicina Tradicional (National Institute of Traditional Medicine within the Ministry of Health), and the Zambézia branch of AMETRAMO. Referral forms include the date of patient referral, provide the name of the referring healer, and include information about the patient symptoms and diagnosis. These referral forms were collected from each health facility once per month throughout the study period.

Analysis

The monthly rate of patient referral for each healer is calculated as the number of patients referred prior to and after intervention divided by the duration in months of pre- and post-intervention.

Figure 2. Adult (A), Child (B), and Pregnant Woman (C) Referral Form.
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Table 1. Characteristics of 111 Traditional Healers from three rural districts in Zambézia Province, Mozambique, comparing those who referred to allopathic clinics with those who did not refer.

| | No referrals (n = 27) | Any referral(s) (n = 84) | All (n = 111) | P-value ^b |
|---|--------------------------|-----------------------------|------------------|----------------------|
| District, n (%) | | | | 0.35 |
| Alto Molócuè | 11 (41%) | 22 (26%) | 33 (30%) | |
| Lugela | 9 (33%) | 33 (39%) | 42 (38%) | |
| Morrumbala | 7 (26%) | 29 (35%) | 36 (32%) | |
| Age, Median (Interquartile range) ^a | 50 (48–61) | 52 (45–61) | 51 (46–61) | 0.36 |
| Missing, n (%) | 1 (4%) | 5 (6%) | 6 (5%) | |
| Speaks Portuguese, n (%) | | | | 0.95 |
| No | 12 (44%) | 33 (42%) | 45 (42%) | |
| A little | 6 (22%) | 20 (25%) | 26 (25%) | |
| Yes | 9 (33%) | 26 (33%) | 35 (33%) | |
| Sex, n (%) | | | | 0.32 |
| Female | 8 (30%) | 34 (43%) | 42 (40%) | |
| Male | 19 (70%) | 45 (57%) | 64 (60%) | |
| Distance (time) ^a | 40 (5–60) | 33 (24–60) | 35 (18–60) | 0.58 |
| Missing, n (%) | 14 (52%) | 38 (45%) | 52 (47%) | |
| Distance (km) ^a | 2 (1–4) | 2 (1–5) | 2 (1–5) | 0.87 |
| Missing, n(%) | 14 (52%) | 47 (56%) | 61 (55%) | |
| Education in years ^a | 1 (0–3) | 1 (0–4) | 1 (0–3) | 0.98 |
| Pre-Intervention HIV Knowledge Score ^a | 63 (56–71) | 70 (63–78) | 67 (59–78) | 0.032 |
| Post-Intervention HIV Knowledge Score ^a | 81 (74–88) | 81 (73–90) | 81 (74–89) | 0.56 |
| Missing, n(%) | 5 (19%) | 16 (19%) | 21 (19%) | |
| Mean difference in Pre- and Post-Intervention HIV Knowledge Scores ^a | 15 (3–21) | 10 (0–19) | 11 (1–19) | 0.29 |
| Missing, n(%) | 5 (19%) | 16 (19%) | 21 (19%) | |

^aContinuous data are summarized as median (interquartile range).

^bTo compare the distribution of study characteristics for healers with any referral, we employ chi-square tests. Similarly, we use a Wilcoxon rank sum test for continuous variables by any referral.

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We compared pre- and post-monthly rate of referral using a paired Wilcoxon rank sum test. To estimate which healer characteristics were associated with better uptake of referral practices we used multivariable linear regression. The model included age, education, sex, district, Portuguese speaking ability, and post-intervention HIV score. We describe those healers with no referrals to those with ≥ 1 referrals during the study intervention. To compare the distribution of healer characteristics by any referral, we employ chi-square and Wilcoxon rank sum tests. From referral forms, we describe patient location, symptoms, clinical diagnosis, and HIV status by referral pre- and post-intervention. R-software 2.15.1 (www.r-project.org) was used for data analyses. The study was reviewed and approved after iterations by the Vanderbilt Institutional Review Board and the Comité Nacional de Bioética a Saúde in Mozambique. All participants provided written consent to participate in the study; this procedure was approved by both ethics committees.

Results

We enrolled 111 healers in the study. We presented the study to 188 traditional healers at 15 AMETRAMO meetings. Interest was indicated from 147 (78.2%), of whom 111 were enrolled in the study. All of the 147 healers who spoke with a study coordinator agreed to participate; we had to turn away 36 potential

participants after the study was filled. Healers had a median age of 51 years (IQR: 46–61), 60% were men, and had obtained a median of one year of formal education (IQR: 0–4). Healers reported a low level of oral Portuguese proficiency: 33% were fluent, 25% spoke some Portuguese, and 42% had no Portuguese speaking ability. Seventy-six percent of the healers in the study had referred a patient to the health facility in the past, with no statistically significant differences in overall referral frequencies among healers in different communities (Table 1).

During the study period, healers referred 351 persons –127 adults, 36 pregnant women, and 188 children – to the health facility for treatment. Among adults referred, the most common symptoms were (more than one symptom could be named): fever (37%), cough (24%), and diarrhea (13%) (Table 2). Pediatric patients were referred for fever (42%), cough (15%), and convulsions (9%) (Table 3), while pregnant women were referred for delivery (37%) and prenatal care (24%) (data not shown). In addition to information about the symptoms that may have spurred healers to refer, we also gathered data about patient diagnoses by the allopathic clinicians. Referred adults and children were most likely to have bronchopneumonia (20% of adults; 13% of children) and malaria (15% of adults; 37% of children) diagnosed syndromically. Excluding pregnant women who are nearly all tested on an opt-out basis, only 11 of 315 (3.5%) referred

Table 2. Summary of adult referrals from 52 of 111 Traditional Healers from three rural districts in Zambézia Province, Mozambique, comparing referrals occurring Pre- and Post-Intervention.

| | Pre-intervention referrals (n = 69) | Post-intervention referrals (n = 58) | Both pre-/post-intervention referrals (n = 127) |
|---|--|---|--|
| District, n(%) | | | |
| Alto Molócuè | 21 (30%) | 11 (19%) | 32 (25%) |
| Lugela | 36 (52%) | 28 (48%) | 64 (50%) |
| Morrumbala | 12 (17%) | 19 (33%) | 31 (24%) |
| Symptoms with referral, n(%) ^a | | | |
| Diarrhea | 10 (14%) | 7 (12%) | 17 (13%) |
| Fever | 25 (36%) | 22 (38%) | 47 (37%) |
| Spots on Tongue | 1 (1%) | 2 (3%) | 3 (2%) |
| Discharge from genitals | 9 (13%) | 6 (10%) | 15 (12%) |
| Cough (possible tuberculosis) | 15 (22%) | 15 (26%) | 30 (24%) |
| Emaciation | 3 (4%) | 4 (7%) | 7 (6%) |
| Body sores | 4 (6%) | 5 (9%) | 9 (7%) |
| Spots on genitals | 3 (4%) | 5 (9%) | 8 (6%) |
| Other problems | 0 (0%) | 2 (3%) | 2 (2%) |
| Diagnosis at clinic, n(%) ^a | | | |
| Bronchopulmonary pneumonia | 12 (17%) | 13 (22%) | 25 (20%) |
| Malaria | 12 (17%) | 7 (12%) | 19 (15%) |
| Gastrointestinal problem | 4 (6%) | 2 (3%) | 6 (5%) |
| Sexually transmitted infection | 5 (7%) | 3 (5%) | 8 (6%) |
| HIV infection | 2 (3%) | 2 (3%) | 4 (3%) |
| Tuberculosis | 5 (7%) | 2 (3%) | 7 (6%) |
| Emergency | 1 (1%) | 2 (3%) | 3 (2%) |
| Other ^b | 18 (26%) | 15 (26%) | 33 (26%) |

^aPercentages may sum to more than 100% given multiple conditions.

^be.g. skin infection, broken bone, vertigo, snake bite.

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adults and children were tested for HIV, with 6 of 11 (54%) testing positive. Again excluding pregnant women, eight patients (2.5%) were tested for TB, with 3 of 8 (38%) testing positive.

HIV knowledge (measured 4 months pre-intervention and 2.5 months post-intervention) increased significantly. Healers had a median pre-intervention HIV knowledge score of 67% (IQR: 59–78) and a median post-intervention score of 81% (IQR: 74–89; $p < 0.001$). Overall, healers improved their scores on 26 of the 27 questions. Key areas where knowledge increased included: (1) a blood test for HIV exists (77% pre vs. 98% post); (2) antiretroviral therapy (ART) can improve the health of people living with HIV (65% vs. 89%); and (3) healers cannot provide herbal or spells to protect patients from HIV (59% vs. 81%). Misunderstandings about transmission via mosquitoes (43% vs. 63%), utensils (59% vs. 79%), or coughing/sneezing (58% vs. 76%) were resolved in the minds of more healers post-intervention. The only question in which healers had lower knowledge post-intervention highlighted the belief that eating healthy foods could protect a person from getting HIV (60% vs. 54%).

The number of referrals increased significantly post-intervention. The median monthly referral rate prior to the intervention was 0.25 patients (IQR: 0–0.54) compared with a post-intervention rate of 0.34 patients (IQR: 0–0.71; $p = 0.046$); this amounts to a 35% increase overall. In multivariable linear regression, no

associations were noted among healers who had increasing uptake of referral practices, including improved HIV knowledge ($p = 0.50$), Portuguese speaking ability ($p = 0.63$), or age of healer ($p = 0.66$). In fact, model fit was very poor ($R^2 = 0.055$), suggesting that healer characteristics included in the model poorly predicted the change in referral rate (Table 4).

Referral forms were generally filled out well by traditional healers, accuracy appeared to improve over time. Only 19 (5%) of forms were missing the name of the traditional healer, 38 (11%) were missing the date of referral, and 351 (100%) referral forms included data about the nature of the patient symptoms (either by circling pictures depicting symptoms or writing additional information on the forms). Clinical data were included with less regularity, with 22% of the forms lacking a diagnosis.

Discussion

Our educational intervention resulted in a 35% increase in healer referral rates, though the monthly frequencies of referral remained low. Fever, cough, and diarrhea were the most common symptoms among referred patients in both the pre- and post-intervention period. Similarly, the reasons for referring pregnant women were unchanged pre- and post-intervention; women were referred equally for prenatal care services or delivery, with a smaller number referred for treatment of vaginal bleeding. That

Table 3. Summary of child referrals from 64 of the 111 Traditional Healers from three rural districts in Zambézia Province, Mozambique, comparing referrals occurring Pre- and Post-Intervention.

| | Pre-intervention referrals (n = 93) | Post-intervention referrals (n = 95) | Both pre-/post-intervention referrals (n = 188) |
|---------------------------------------|--|---|--|
| District, n (%) | | | |
| Alto Molócuè | 33 (35%) | 26 (27%) | 59 (31%) |
| Lugela | 33 (35%) | 31 (33%) | 64 (34%) |
| Morrumbala | 27 (29%) | 38 (40%) | 65 (35%) |
| Symptoms/Referral, n (%) ^a | | | |
| Diarrhea | 10 (11%) | 7 (7%) | 17 (9%) |
| Fever | 42 (45%) | 37 (39%) | 79 (42%) |
| “Flaccid paralysis” | 6 (6%) | 4 (4%) | 10 (5%) |
| Measles | 1 (1%) | 5 (5%) | 6 (3%) |
| Cough associated with TB | 17 (18%) | 12 (13%) | 29 (15%) |
| Cholera | 8 (9%) | 5 (5%) | 13 (7%) |
| Convulsions | 8 (9%) | 10 (11%) | 18 (10%) |
| Anemia | 7 (8%) | 3 (3%) | 10 (5%) |
| Other problems | 7 (8%) | 14 (15%) | 21 (11%) |
| Diagnosis, n (%) ^a | | | |
| Bronchopulmonary pneumonia | 8 (9%) | 16 (17%) | 24 (13%) |
| Malaria | 37 (40%) | 32 (34%) | 69 (37%) |
| Gastrointestinal disorder | 11 (12%) | 10 (11%) | 21 (11%) |
| Schistosomiasis | 4 (4%) | 6 (6%) | 10 (5%) |
| HIV infection | 1 (1%) | 0 (0%) | 1 (1%) |
| Respiratory disorder | 0 (0%) | 2 (2%) | 2 (1%) |
| Vaccination | 1 (1%) | 0 (0%) | 1 (1%) |
| Anemia | 1 (1%) | 0 (0%) | 1 (1%) |
| Other ^b | 8 (9%) | 22 (23%) | 30 (16%) |

^aPercentages may sum to more than 100% given multiple conditions.

^be.g. leprosy, ear infection, oral thrush.

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low-cost engagement of traditional healers can foster such referrals is encouraging.

We were surprised, however, that under 5% of referred patients were tested for HIV and/or TB. Based on the high rates of HIV and TB in these districts, [62] coupled with the large number of patients referred for cough, emaciation, fever, white spittle, and/or skin lesions, we expected a large number of patients to be tested for both infections. The failure to routinely test patients for HIV at all 15 clinics suggests a systemic problem that needs to be addressed and may explain why patients are continuing to be first tested only after they suffer symptoms of advanced HIV disease [63]. There were several stock outs of HIV testing kits during our study (CMA and JS, personal observations); nonetheless, clinicians were frank with us that routine testing has not become integrated into clinical practice.

As with other studies measuring HIV knowledge change in traditional healers after an educational training [29,48,52,54,59,64] we found a sustained increase in HIV knowledge among healers. While the three-day educational intervention was associated with increasing HIV knowledge by 14%, it is interesting to note that we failed to detect an association between this increase and change in referral practices. This is similar to the finding from a South African study [59]. We do not

yet know, then, what motivated some healers to increase their referrals. We hypothesize that increased contact with healers (by our team and with the health facilities) created a greater feeling of community and inclusiveness by healers. We believe this relationship building helped to decrease feelings of hostility between the healers and the clinic health care providers. In follow-up with both healers and clinicians, we found that some continued to collaborate in ways we originally had not envisioned. For example, clinicians in Morrumbala established monthly meetings with healers to discuss referred patients. In Lugela, traditional healers came to the district hospital to follow up on their patients and to ensure clinicians were keeping their referral forms. We are now documenting these new activities and the impact of increased contact between the system and healers on healer attitudes and behavior.

The acceptability of our novel referral form and healers ability to fill out the form accurately surpassed our expectations, with 100% completion rates for the “symptom” section, 95% for the date of referral, and 89% for their own names. Patient and healer names were sometimes reversed (healer name where the patient name should be written and vice versa) suggesting some confusion and difficulty in reading the Portuguese forms. In the future, we will consider adding pictures to this section to improve compre-

Table 4. Multivariable model effects for change in referrals pre- to post-intervention from 84 Traditional Healers who referred at least one person from three rural districts in Zambézia Province, Mozambique by Healer characteristics and post-intervention HIV knowledge.

| | Estimate (95% CI) | P-value |
|---|----------------------|---------|
| Age (per 10 years) | 0.022 (−0.11, 0.16) | 0.75 |
| Education (per 1 year) | 0.034 (−0.043, 0.11) | 0.39 |
| Female | 0.002 (−0.34, 0.35) | 0.99 |
| District | | 0.27 |
| Lugela (ref) | 0 | |
| Alto Molócuè | −0.20 (−0.61, 0.21) | |
| Morrumbala | 0.16 (−0.25, 0.57) | |
| Portuguese speaking ability | | 0.63 |
| None (ref) | 0 | |
| A little | −0.064 (−0.49, 0.37) | |
| Fluent | −0.21 (−0.66, 0.23) | |
| Post-intervention HIV knowledge (per 15 points) | 0.11 (−0.13, 0.34) | 0.37 |

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hension. The clinical diagnosis section was only completed 78% of the time. We did not provide clinicians any incentive to complete the form and believe that the improvement of the absolute numbers of referrals and quality of the referral form represent future implementation science challenges.

Study strengths included the highly acceptable use of referral forms among healers living in three rural districts, and generalizability of healer referrals for rural catchment areas varying in size and distance from hospitals or health posts in all three districts (data not shown). This suggests the acceptability of the referral forms and the scalability of the project in a variety of rural settings if deployed elsewhere in Mozambique. The high rate of form completion from healers suggested that pictorial forms (Figure 2) can be used even when healers have low rates of literacy. The study also highlighted several challenges. Healers complained that clinicians did not always file the referral form presented by the patient, throwing some in the garbage. This was supported by our discovery of several diagnosis sections (the lower section of the referral forms filled out by the clinician) that had been returned to healers without their matching symptom section filed at the clinic. Clinic personnel with whom we spoke suggested that the nurses on duty during the evenings and weekends were less likely to file the forms, although we cannot confirm this. Study weaknesses include

the convenience sample recruited in a pre-post design employed to make this study feasible. The pre-post study design does not control for calendar effect. The use of a convenience sample of healers' further limits our conclusions as self-selection of healers interested in participating may better uptake the intervention. The possibility that some forms were not saved would mean that the study would undercount healer referrals; however, cross-checking the duplicate healer records with those at the health facilities, we estimate the number of discarded referral forms to be <10%. Because we lacked information on the patients who were referred by healers but did not go to the clinic and those patients who were seen by healers and not referred to clinic, we cannot assess the actual rate of referral and the effectiveness of healer referral, but only the rate of successful linkage. A further limitation of this study is future sustainability in the context of an under-capacitated Ministry of Health; despite purposeful efforts not to monetize healer involvement, any referral system would be limited by their ability to engage healers and clinicians, and to ensure appropriate distribution of referral forms.

This study demonstrates the feasibility of implementing a referral system with healers in Mozambique. Our ability to increase referral rates through an inexpensive intervention suggests a formal relationship with traditional healers may be a viable, cost-effective method of directing patients suffering from acute or chronic illness to the health facility. Whether electronic mechanisms of referral, such as mobile phone short messaging systems, might be deployed is unknown in this rural setting. The possibility of engaging healers in additional clinical tasks, including community-based HIV testing is a possibility, but would require additional support from the Ministry of Health. Given the large number of healers living in rural and remote areas with limited access to formal health services, traditional healers can be pivotal in the recognition and initiation of referral for timely testing for illness such as HIV and TB, assuming clinicians can be persuaded to implement more routine testing. Our study suggests that with minimal cost, healers and clinicians can collaborate to improve patient care.

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Author Contributions

Conceived and designed the experiments: CMA JS MB SHV FG. Performed the experiments: JS CMA DA. Analyzed the data: CMA MB SHV. Contributed reagents/materials/analysis tools: CMA FG JS. Wrote the paper: CMA JS MB DA SHV FG.

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