

**Screening and Prevention of Tuberculosis in HIV-Infected Patients:
Utilizing Nurses in Sub-Saharan Africa**

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Abstract

The concurrent HIV and Tuberculosis (TB) epidemics in sub-Saharan Africa are burdening already weak health systems. One proposed solution for this problem is task-shifting, or shifting the responsibility of HIV care and treatment from physicians to mid-level healthcare workers, such as nurses. Task-shifting has already been shown to be effective in nurse-driven HIV clinics in many African settings, and these programs should be scaled-up in order to serve more patients. To address the concurrent TB epidemic, these nurse-driven clinics should also incorporate the World Health Organization's *Guidelines for Intensified Tuberculosis Case-Finding and Isoniazid Preventive Therapy for People Living with HIV in Resource-Constrained Settings* into their practice. By utilizing protocols, diagnostic algorithms, and other clinical tools, nurse-driven HIV programs can successfully screen and prevent TB among adult and pediatric patients.

Table of Contents

Introduction.....4

Background.....5

Task-Shifting.....6

Incorporating TB Care into Nurse-Driven HIV Clinics.....10

Special Populations.....14

Implementation.....15

Conclusion.....17

References.....18

Appendix.....22

Introduction

Sub-Saharan Africa bears the largest burden of the HIV/AIDS epidemic and in 2009 was home to nearly 70% of all cases world-wide¹. Complicating the HIV epidemic in this region is tuberculosis (TB). An ancient ailment that was once thought to be disappearing, TB has resurged since the start of the HIV epidemic². As with HIV, sub-Saharan Africa bears one of the highest burdens of TB, and in 2009 claimed 30% of all cases³.

Critical healthcare worker shortages in sub-Saharan Africa complicate the delivery of effective HIV care and treatment⁴. Both the number and quality of healthcare workers are positively associated with health outcomes for HIV-infected patients⁵. Not surprisingly, in 2005 countries with the smallest health workforces had the poorest provision of treatment for HIV⁶. For more information on the healthcare shortages in sub-Saharan Africa, please see the Appendix.

One proposed solution for the shortage of healthcare workers (with subsequent implications for delivery of HIV care and treatment) is shifting the clinical responsibility for HIV management to mid-level healthcare workers, such as nurses. In some areas, nurses have already assumed the care and treatment of HIV-infected patients⁷⁻¹².

This report and proposal is prompted by the urgency of the coinciding HIV and TB epidemics and the recent release of the World Health Organization's *Guidelines for Intensified Tuberculosis Case-Finding and Isoniazid Preventive Therapy for People Living with HIV in Resource-Constrained Settings*¹³. In it, the feasibility of incorporating these guidelines into nurse-driven HIV care and treatment facilities in sub-Saharan Africa is discussed, and it proposes expansion of these programs.

Background

Acquired Immune Deficiency Syndrome (AIDS) was first described in 1981¹⁴, and by 1983, scientists had isolated the human immunodeficiency virus (HIV), the virus that leads to AIDS¹⁵⁻¹⁶. HIV is now recognized as a virus that is spread through blood, semen, vaginal fluid, and breast milk; it infects and weakens the immune system of its host, leading to the host's inability to fight infection. This weakened immune system allows the development of opportunistic infections – diseases that are otherwise uncommon, but attack when one's body cannot defend itself¹⁷. It is these opportunistic infections that lead to death among individuals who are infected with HIV. Now the vast majority of new and existing HIV infections occur in sub-Saharan Africa; sixty percent of the infections in this region are among heterosexual women¹.

Recent initiatives by the World Health Organization, national health programs, and non-governmental organizations, as well as increased funding by the Gates Foundation, the Global Fund to Fight AIDS, Tuberculosis, and Malaria, and the President's Emergency Plan For AIDS Relief (among others) have facilitated treatment scale-up in sub-Saharan Africa¹⁸. These efforts have led to a decrease in incident infections and AIDS-related deaths in recent years¹. In 33 highly-affected countries there was a 25% decrease in new infections from 2001 to 2009¹. In spite of this progress, there were still 2.6 million new infections around the world in 2009 and 33.3 million people living with HIV¹.

Tuberculosis is a communicable disease that is spread through particles in the air³. Over one in three people in the world are have latent TB, and only 5-10% of those who are not also HIV-infected will ever develop active TB³. TB is a concern for people with

HIV, as HIV enables quicker development of active disease³. In sub-Saharan Africa, where the HIV epidemic is rampant, TB rates are rising¹⁹. HIV is now the biggest risk factor for development of active TB²⁰. Up to 34% of all smear-positive cases of TB are directly attributable to HIV², and reduction of the TB epidemic in sub-Saharan Africa will depend on control of the HIV epidemic²¹.

In short, HIV accelerates the progression of TB, and TB accelerates the progression of HIV²², even when TB is treated²³. Further, TB is the most common opportunistic infection that affects HIV-infected individuals;²² unlike other infections, it can develop throughout the progression of HIV²⁴, even when a person's immune system is still relatively strong. TB is also the most common cause of death of HIV-infected individuals^{22,25}. Despite these sobering facts, there is evidence that treatment of TB in HIV-infected individuals can have a positive impact on CD4 count, one measure of HIV progression²⁶.

Task-Shifting

Critical shortages in human resources for health in sub-Saharan Africa complicate delivery of HIV prevention, screening, and treatment services. Worldwide, there is a shortage of 4.3 million health workers, including physicians, nurses, midwives, and ancillary workers⁵. Sub-Saharan Africa, which is home to 11% of the world's population, has only 3% of its health workforce⁵. These shortages are due to inadequate enrollment in nursing and medical schools, insufficient job opportunities for all cadres of health professionals, poor compensation, uneven urban-rural distribution of workers, and migration of skilled workers to developed or other developing countries²⁷⁻²⁸. Thirty-six

of the fifty-seven countries (63%) with healthcare worker shortages are in sub-Saharan Africa²⁹, and the magnitude of the HIV epidemic in this region puts additional pressure on a health workforce that is already stressed³⁰. The healthcare worker shortage in this region is considered a significant impediment to widespread expansion of HIV treatment³¹.

Task-shifting, or the delegation of certain clinical responsibilities from higher-trained cadres of health professionals to lower-trained cadres (e.g., doctors to nurses and nurses to nurse's aids or community health workers), is one proposed solution for the healthcare worker shortage. While task-shifting alone will not address all of the problems with health systems in sub-Saharan Africa, it should be considered part of a holistic approach to improving provision of HIV care and treatment.

In many resource-rich countries, task-shifting has long been used as an effective way to address shortages in service delivery³², particularly in the areas of primary care and management of chronic diseases³³. In sub-Saharan Africa, nurse-driven, stand-alone TB programs are an accepted and widely-used form of task-shifting³⁴⁻³⁶.

There are documented logistical, financial, and clinical advantages to task-shifting HIV care and treatment to nurses. Regarding logistical benefit of HIV clinics, authors have reported both lower wait times in nurse-driven HIV clinics⁷ and increases in program efficiency³⁷.

Financial benefits of task shifting affect both the clinics and health education systems. Task-shifting to nurses or other mid-level cadres of health workers can either reduce clinic costs or increase the number of patients seen for the same cost³⁸. A report from Uganda found that shifting HIV medication, or antiretroviral therapy (ART),

follow-up care to nurses and pharmacists could save the Ugandan Ministry of Health 0.5 to 11 million dollars each year³². The same article examined the cost of training new clinicians, and estimated that nurse education in east Africa costs \$730-\$2,500 per individual, compared to \$11,600 per new physician trained³². It is reasonable to assume other countries that shift HIV care and treatment to nurses would see similar savings, although perhaps to varying degrees.

Other recent reports have described the clinical outcomes from nurse-driven HIV clinics in sub-Saharan Africa. Benefits of using nurses to run these clinics include increased access to counseling and testing^{7,37} and improved coverage of care, leading to improved population-level outcomes³⁹. Nurse-driven HIV programs report shorter patient wait times³⁷ and reduced loss to follow-up,^{8,37} compared to hospital based, physician-driven programs. By replacing physicians with nurses, physicians are able to focus more on non-HIV tasks^{27,37} such as management of complex medical or surgical cases and supervision of other health workers. One study estimates that this re-designation of responsibilities could allow for a 4.1-14.8% increase in physician time for other tasks³².

Studies report that nurses are able to provide high-quality clinical care for HIV-infected individuals that is comparable to that of physicians^{7-11,31,37}. Specifically, nurses have demonstrated that they are able to effectively assess HIV-infected patients, perform clinical staging³¹, adhere to treatment guidelines for ART provision^{9-10,31}, manage opportunistic infections, oversee drug supply, and supervise ancillary staff⁷. Patients seen in nurse-driven programs have been shown to have rates of immunological recovery

and viral suppression⁷, viral failure, toxicity failure⁸, and time-to-death outcomes^{8,10} comparable to those seen in physician-run centers.

Task-shifting to nurses for HIV management does have limitations and should not be considered a simple solution that requires merely handing nurses additional responsibilities. Task-shifting requires an investment in nursing - in nurse education, on-the-job trainings, and continuing education opportunities. There are noted discrepancies between nursing schools in different regions, which can affect the capacity of some nurses to provide adequate HIV care³¹. Effective task-shifting requires initial in-depth training (both didactic and practical) to reduce errors^{7,9-10,23,27}. Continuing education should be provided, in the form of targeted training to address deficiencies⁹⁻¹⁰. Nurses who manage the care of HIV-infected patients should be provided with standardized protocols⁴⁰, checklists, diagnostic algorithms, and flowcharts for ART initiation to facilitate high-quality care⁹⁻¹⁰. Finally, ongoing supervision is an important component of task-shifting to monitor care^{7,10-12,41}.

There is concern, as well, for the acceptability of nurse-driven HIV programs by patients. This can depend on cultural and societal factors, as well as the age, experience, and training of the nurses⁴². Effective, attentive care may be one way to address this concern. There is also concern for co-worker acceptability as nurses assume more responsibility for HIV care and treatment³⁷. Clearly defined clinical roles are essential to preventing or addressing this tension²⁸. One study found that while shifting roles caused initial discomfort for other healthcare workers, with time this tension subsided⁷.

In order for task-shifting to serve as an effective component of HIV management, other health system components must also be bolstered. First, nursing schools need to be

expanded and improved, as there is a significant nursing shortage in sub-Saharan Africa (although not nearly as dire as the physician shortage)⁵. As nurses assume more responsibility for assessment, diagnostics and prescription, traditional nursing roles (such as phlebotomy, administrative tasks, and support group management) must also be shifted to aids, community health workers, or expert-patients¹¹. This must be periodically re-evaluated to assure that nurses are not over-burdened by their new responsibilities. As one study that examined the workload of community health workers in an HIV clinic noted, there was a decline in quality of care with the addition of extra tasks⁴³.

In summary, task-shifting for HIV programs appears to be working already in many parts of sub-Saharan Africa, particularly those that incorporate the strategies for success that are described above. By bolstering nurse education and providing initial and follow-up training and supervision, programs are already seeing that this is an effective approach to HIV care and treatment. These programs should be expanded in sub-Saharan Africa and should also incorporate the new World Health Organization recommendations for adult and adolescent TB screening and prevention into the care provided by nurses. These guidelines and justification for their use in nurse-driven HIV clinics are detailed below.

Incorporating TB Care into Nurse-Driven HIV Clinics

There is a recognized need to improve identification and management of TB in all HIV clinics in sub-Saharan Africa^{2,9,44}. Nurses have demonstrated their capacity to properly recognize TB in HIV-infected patients³¹, and one nurse-driven HIV clinic in South Africa has begun successfully providing TB screening and diagnosis⁷. The

WHO's recently published guidelines provide a comprehensive set of recommendations for identification of TB in HIV-infected adults, adolescents, and children¹³. Detailed below is each adult and adolescent recommendation and support for its use in nurse-driven programs.

Recommendation One: *Adults and adolescents living with HIV should be screened for TB with a clinical algorithm and those who do not report any one of the symptoms of current cough, fever, weight loss or night sweats are unlikely to have active TB and should be offered IPT [isoniazid preventive therapy].*

Recommendation Two: *Adults and adolescents living with HIV and screened with a clinical algorithm for TB, and who report any one of the symptoms of current cough, fever, weight loss or night sweats may have active TB and should be evaluated for TB and other diseases.*

Source: World Health Organization, 2011. *Guidelines for intensified tuberculosis case-finding and isoniazid preventive therapy for people living with HIV in resource-constrained settings.*

These first recommendations specifically advise the use of clinical algorithms in screening and preventing TB. Several studies have reported that nurses are able to manage HIV care effectively by utilizing clinical algorithms⁹⁻¹⁰. Using the same technique for intensified TB case finding would be easily incorporated in nurse-driven HIV clinics. Additionally, nurses have already been shown to accurately identify TB in HIV-infected patients³¹ and will thus be able to properly identify patients with or without the symptoms outlined in these recommendations.

Adult and adolescent dosing of IPT is standardized and thus much more simple than initiation and management of ART, which nurses have demonstrated the capacity to administer^{7,9,31}. This straightforward component of these guidelines would be quite feasible in nurse-driven clinics. Nurses managing HIV care and treatment have also proven that they are able to identify and manage other opportunistic infections⁷, so

evaluating patients for “other diseases”, as Recommendation Two states, would be manageable. The compatibility of these recommendations with existing standards of nursing practice favors their successful implementation.

Recommendation Three: *Adults and adolescents living with HIV who have an unknown or positive TST [tuberculin skin test] status and are unlikely to have active TB should receive at least six months of IPT as part of a comprehensive package of HIV care. IPT should be given to such individuals irrespective of the degree of immunosuppression, and also to those on ART, those who have previously been treated for TB and pregnant women.*

Recommendation Four: *Adults and adolescents living with HIV who have an unknown or positive TST status and who are unlikely to have active TB should receive at least 36 months of IPT. IPT should be given to such individuals irrespective of the degree of immunosuppression, and also to those on ART, those who have previously been treated for TB and pregnant women.*

Source: World Health Organization, 2011. *Guidelines for intensified tuberculosis case-finding and isoniazid preventive therapy for people living with HIV in resource-constrained settings.*

Nursing practice already includes the initiation and interpretation of TST; if tests are available, nurses managing HIV care and treatment can easily provide this service. As discussed above, IPT for adults and adolescents is not complex – it requires no weight-based dosing and no clinical judgment to determine who should receive it. As the recommendation outlines, all patients qualify, regardless of history or clinical condition, and high-technology laboratory testing is not needed to exclude those with different levels of immunosuppression. Recommendation Four allows for longer use of IPT in HIV-infected persons, which may provide further benefit. As nurse-driven HIV programs have similar or better rates of loss-to-follow-up compared to physician-driven programs^{8,37}, incorporating lengthy patient requirements like extended therapy is not

unreasonable. Nurses managing HIV care and treatment should be able to readily incorporate these recommendations into their practice, as they are based on existing nursing tasks.

Recommendation Five: *TST is not a requirement for initiating IPT in people living with HIV.*

Recommendation Six: *People living with HIV who have a positive TST benefit more from IPT; TST can be used where feasible to identify such individuals.*

Source: World Health Organization, 2011. *Guidelines for intensified tuberculosis case-finding and isoniazid preventive therapy for people living with HIV in resource-constrained settings.*

There are simply not enough HIV clinics in many sub-Saharan African countries, and inaccessibility due to long travel times is a known barrier to receiving care⁴⁵. As TST requires two visits, a TST-positive approach to TB case-finding is impractical in traditional physician-driven, hospital-based HIV clinics, many of which exist only in urban settings. Nurse-driven clinics can be implemented in rural areas and thus be located very near their patients. As such, providing TST is feasible, but as the recommendation states, is not necessary for initiation of IPT. Therefore, nurses working in any setting with HIV-infected patients can easily implement IPT without TST.

Recommendation Seven: *Providing IPT to people living with HIV does not increase the risk of developing isoniazid (INH)-resistant TB. Therefore, concerns regarding the development of INH resistance should not be a barrier to providing IPT.*

Source: World Health Organization, 2011. *Guidelines for intensified tuberculosis case-finding and isoniazid preventive therapy for people living with HIV in resource-constrained settings.*

Drug-resistant TB is a real problem and a valid concern. Despite this, the WHO recommendations acknowledge that prevention with isoniazid is still appropriate. There may be considerable needs for healthcare worker education on this topic, including nurses. As stated before, nurses can easily incorporate near-universal IPT prescription into HIV care and management programs, and this recommendation simplifies TB prevention, making it an ideal area of care for task-shifting.

Special Populations

The management of adult HIV care and ART provision are fairly straight forward and therefore lend themselves to protocols and clinical algorithms. This also makes this treatment ideal for task-shifting. However, as adults develop more advanced disease, their care becomes more challenging. Similarly, HIV-infected children have complex disease even initially, as their weak immune systems cannot stave off the opportunistic infections and there is less evidence to guide their care. Adults with advanced disease and children are special populations that, while challenging, are still good candidates for nurse-based HIV care. These populations are discussed further below.

As HIV progresses in adult patients, and as adults develop resistance to first-line ART, their care becomes complicated. Patients are often managed on a case-by-case basis, with less dependence on a treatment protocol. Health systems in sub-Saharan African settings are starting to navigate the management of patients with advanced and

complex HIV, and care of these patients is currently managed by physicians. However, as nurses gain experience in managing HIV, their programs should start to assume more responsibility for these complex patients. Many of the recommendations that are outlined above for nurse-driven clinics (particularly continuing education, supervision and ongoing quality control) must be considered as nurses adopt this extra responsibility.

Children with HIV, even those without advanced disease, require careful monitoring and refined clinical judgment to navigate treatment. Pediatric HIV progresses more quickly than in adults, and this progression has been found to be even more rapid in sub-Saharan African settings due to poor nutrition and higher exposure to opportunistic infections⁴⁶. One study, conducted in Rwanda, found that nurses were capable of managing care for HIV-infected pediatric patients¹¹, but there is little other evidence regarding the use of task-shifting for the management of HIV-infected children. However, nurses have demonstrated that they are capable of providing excellent adult care, and have adopted responsibility for this care in health systems that often offer very little support, which suggests they also may be capable of providing care for HIV-infected children. Further, as nurses adopt the care of HIV-infected adults, a disparity in available care will appear, as adults find themselves with more options for treatment and children do not. Anticipating this disparity, and utilizing the available resources (such as nursing) to address it are crucial.

Implementation

In order for countries to fully implement a shift from physician-based HIV care and treatment to nursing-based care, different aspects of their healthcare systems will

have to be addressed. As is illustrated in the Appendix, many countries in sub-Saharan Africa have nursing shortages in addition to physician shortages. These shortages will need to be addressed through increased capacity and enrollment at nursing schools, as well as improved didactic and clinical training on management of HIV, before nurses can assume responsibility for HIV care and treatment.

Some countries in this region are home to nurses who have been adequately trained but who are unable to find employment due to lack of available jobs⁴⁷. Increased governmental investment in nurse-driven programs will lead to the creation of more jobs for local nurses who are ready to assume this responsibility.

Another important consideration for the transition from physician- to nurse-driven HIV care and treatment is reimbursement. As nurses who take on the added responsibility of managing HIV-infected patients, they will have to be compensated accordingly. While this would be an added expenditure by already struggling health systems, it is an investment that will have high return as more HIV-infected patients are treated, and can thus contribute to the country's economy. Further, compensating nurses adequately for this work will be less expensive than hiring extra physicians to do the same work, making it a cost-effective alternative.

Finally, the cultural shift that will accompany this transition to nurse-driven care should be considered. Nurses will have to be accepted as primary care givers for patients with HIV by their colleagues in the healthcare system and the larger community. Tactics for ensuring a smooth transition among healthcare workers to nurse-driven HIV care are discussed earlier in this report. Supporting nurses in this role and promoting high-quality

care will facilitate a cultural shift at the community level to accepting nurses as they take on the responsibility of HIV care and treatment.

Conclusion

Nurse-driven HIV clinics in sub-Saharan Africa are recognized as viable options for addressing the HIV epidemic. The incorporation of TB screening and prevention, as outlined by the WHO's *Guidelines for Intensified Tuberculosis Case-Finding and Isoniazid Preventive Therapy for People Living With HIV in Resource-Constrained Settings*¹³, is feasible and highly promising in light of the concurrent epidemics and synergy between HIV and TB. By utilizing comprehensive training and supervision, as well as clinical algorithms and protocols, nurses can easily manage the care of HIV-infected adults and adolescents while also screening for and preventing TB.

Task-shifting alone will not address all of the barriers to HIV care and treatment in sub-Saharan Africa. Without efforts to recruit and retain healthcare workers, as well as those to improve or reinforce laboratory capacity, drug and supply availability, and infrastructure, health systems will remain unable to address the HIV epidemic. However, many studies have shown that nurses are competent to take on this responsibility and should be included in the global fight against HIV and TB.

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Appendix.

Table One. Sub-Saharan Africa Countries With the Fewest Human Resources for Health

Comparison Countries	# Physicians per 1,000 people (2005)*	# Nurses per 1,000 people (2005)*	HIV Incidence Rate (2009)**
France	3.37	7.24	<0.10
USA	2.56	9.37	<0.10
Argentina	3.01	0.80	<0.10
Thailand	0.37	2.82	<0.10
Sub-Saharan African Countries			
United Republic of Tanzania	0.02	0.37	0.45
Malawi	0.02	0.59	0.95
Sierra Leone	0.03	0.36	0.14
Mozambique	0.03	0.21	1.19
Niger	0.03	0.22	<0.10
Togo	0.04	0.43	0.27
Benin	0.04	0.84	0.10
Rwanda	0.05	0.42	0.18
Eritrea	0.05	0.58	<0.10
Lesotho	0.05	0.62	2.58
Burkina Faso	0.06	0.41	<0.10
Senegal	0.06	0.32	<0.10
Uganda	0.08	0.61	0.74
Mali	0.08	0.49	<0.10
Central African Republic	0.08	0.30	0.17

Table Two. Sub-Saharan African Countries With the Highest HIV Incidence

Comparison Countries	# Physicians per 1,000 people (2005)*	# Nurses per 1,000 people (2005)*	HIV Incidence Rate (2009)**
France	3.37	7.24	<0.10
USA	2.56	9.37	<0.10
Argentina	3.01	0.80	<0.10
Thailand	0.37	2.82	<0.10
Sub-Saharan African Countries			
Swaziland	0.16	6.30	2.66
Lesotho	0.05	0.62	2.58
Botswana	0.40	2.65	1.56
South Africa	0.77	4.08	1.49
Mozambique	0.03	0.21	1.19
Zambia	0.12	1.74	1.17
Malawi	0.02	0.59	0.95
Zimbabwe	0.16	0.72	0.84
Uganda	0.08	0.61	0.74
Cameroon	0.19	1.60	0.53
Kenya	0.14	1.14	0.53
United Republic of Tanzania	0.02	0.37	0.45
Namibia	0.30	3.06	0.43
Gabon	0.29	5.16	0.43
Togo	0.04	0.43	0.27

*World Health Organization. *Working together for health: the World Health Report 2006.*

**UNAIDS. *Global Report, 2010.*