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Authors

Ikeda, Daniel J
Basenero, Apollo
Murungu, Joseph
et al.

Publication Date

2019-12-01

DOI

10.1016/j.jctube.2019.100116

Peer reviewed
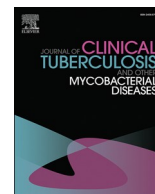
Contents lists available at ScienceDirect

J Clin Tuberc Other Mycobact Dis

journal homepage: www.elsevier.com/locate/jctube

Implementing quality improvement in tuberculosis programming: Lessons learned from the global HIV response

ABSTRACT

The quality of care and treatment for tuberculosis (TB) is a major barrier in global efforts to end TB as a global health emergency. Despite a growing recognition of the need to measure, assure, and improve quality of TB services, implementation of quality improvement (QI) activities remains limited. Applying principles of systems thinking, continuous measurement, and root cause analysis, QI represents a proven approach for identifying and addressing performance gaps in healthcare delivery, with demonstrated success in low- and middle-income settings in the areas of HIV/AIDS, maternal, newborn, and child health, and infection control, among others. Drawing from lessons learned in the development of QI programming as part of the global response to HIV, we review key enablers to implementation that may assist NTPs in turning aspirations of high-quality service delivery into action. Under the umbrella of a formal quality management (QM) program, NTPs' attention to planning and coordination, commitment to tracking key processes of care, investment in QI capacity building, and integration of TB QI activities within efforts to advance universal health coverage provide a framework to sustainably implement QI activities.

1. Introduction

Tuberculosis (TB) is a major public health threat, claiming the lives of 1.6 million worldwide in 2017. TB is preventable, treatable, and curable, yet decreases in TB incidence and mortality remain below targets advanced as part of WHO's End TB Strategy. Despite the wide availability of TB treatment, millions of people with TB receive care that is of consistently poor quality [1,2]. According to WHO's Framework on Integrated, People-Centered Health Services, high-quality healthcare is safe, effective, people-centered, timely, efficient, equitable, and integrated [3]. Endorsing a health systems approach to quality, the recent *Lancet Global Health* Commission on High Quality Health Systems in the SDG Era has furthered this framework by articulating the call for a "revolution" to support resilient, equitable and efficient health systems that serve people, are responsive to population health needs, and support ongoing learning and improvement [1]. A rapidly expanding body of work has documented the shortcomings of current TB care when assessed according to the ideals of high-quality health systems, emphasizing a crucial need to embed quality improvement (QI) concepts and methods in national disease control programs to achieve epidemic control targets [4,5].

While this imperative to measure, assure, and improve the quality of TB services is now well recognized, systematic attempts to integrate QI within TB service delivery and national TB programs (NTP) remain sparse [6]. At its core, QI seeks to optimize outcomes by applying systems thinking, routine measurement, and data-informed tests of change to routinely diagnose and improve shortcomings in processes of healthcare delivery [7]. Lessons learned through more than two decades of implementing QI programming as part of the global HIV response in low- and middle-income country (LMIC) settings offer NTPs a

framework within which to advance QI efforts that are effective and sustainable. Through the core functions of a formal quality management (QM) program—defined as the organizational infrastructure that enables routine measurement and QI activities [8,9]—NTPs in LMICs should seek to develop a public health approach to quality in which improvement is conceptualized as a continuous activity requiring dedication to centralized planning and coordination, attention to processes as well as inputs and outcomes, investment in capacity building and system strengthening, and linkage to broader quality initiatives.

2. Dedication to centralized planning and coordination

As part of early attempts to improve the quality of HIV care and treatment, national programs in LMICs witnessed the proliferation of QI initiatives spanning multiple implementing partners, methodologies, standards, and aims [10,11]. These initiatives were laudable for addressing recognized quality gaps. However, the simultaneous, loosely coordinated implementation of these initiatives created the need for national programs to address "the problem of many hands," a phenomenon in which the simultaneous implementation of multiple QI efforts can, paradoxically, produce suboptimal outcomes by dividing HCWs' attentions, placing inordinate strains on limited resources, and generating micro-level solutions for problems that require a macro-level response [12]. Accordingly, without central, Ministry-led coordination of these "many hands," well-meaning QI initiatives may yield disappointing results over time, thereby undermining the attractiveness of QI to policy makers, fomenting disillusionment among healthcare workers, and wasting already limited resources [1].

Any effort to improve the quality of healthcare services should begin with a clearly articulated vision of what quality "means" within a

Table 1
Core components of a QM plan.

Component	Description
1. Quality statement	A brief mission statement that characterizes the aims of the QM program.
2. Quality program	A characterization of the programs' leadership, systems of accountability, membership, roles and responsibilities of technical working groups and oversight committee, and expectations for communicating program updates and activities.
3. Performance measurement system	A description of which performance measures will be tracked as part of the QM program, and how, when, and by whom they will be routinely collected and reported.
4. Setting improvement goals	A set of endpoints or conditions (e.g., treatment completion rats) around which the QM program will seek to prioritize and structure QI activities.
5. Stakeholder and patient participation	A description of how staff, providers, patients, communities, and other stakeholders will be involved in the QM program.
6. Evaluation	A plan for evaluating the performance of the QM program, including progress in meeting stated improvement goals, organizational effectiveness of current QM program committees, and robustness of existing QM plan.
7. Annual QI work plan	A detailed roadmap of implementation, which changes annually, that specifies improvement priorities and QI activities that will be advanced as part of the QM program's activities.

particular context and a common roadmap for bringing that vision to fruition in a coordinated fashion [13]. Early attempts to coordinate quality at national level included approaches, like HIVQUAL, that supported a core set of national indicators, development of a standardized national QI training curriculum and building QI coaching capacity. Further recognition of the need to situate facility-level QI activities within a cohesive policy framework led to the development of HIV QM plans in LMICs derived from lessons learned from HIV programs in the United States (Table 1) [14]. HIV QM Programs have developed and implemented these plans over the past decade that provide this organizational framework for ongoing support of quality. For example, in Zimbabwe, the National AIDS Program convened key stakeholders from local governments, donors, implementing partners, universities and civil society to develop its common plan and policy for quality that embraced QI and developed a plan for its spread throughout the country [15]. Through this participatory process, stakeholders agreed upon a common measurement framework, and developed a national approach to quality aimed at aligning diverse QI initiatives under a shared framework of accountability.

Namibia undertook a similar process through a technical working group on quality, led by its Quality Assurance Division [16]. With support from capacity-building initiatives like HEALTHQUAL (formerly HIVQUAL International) and the USAID Applying Sciences to Strengthen and Improve Systems (ASSIST) Project, similar plans have been developed in Uganda, Tanzania and Kenya [17–19]. Acknowledging the importance of planning and coordination in implementation of QI, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) adopted several indicators as part of its site- and national-level assessment tools that evaluate programs on the presence and stewardship of QM plans [20,21].

Like all policies, QM plans face the risk of collecting dust on a shelf rather than driving change as intended. These plans are important for imparting specifics to national programs' strategic visions of quality, but their implementation must be supported by structures, processes, and functions that establish accountability and empower local health systems to deliver care that is of consistently high quality [9]. In the context of TB, national programs can begin by developing QM plans that situate the generic calls for quality of care within their programs' strategic action plans by generating a step-by-step guide on how to translate available human and material resources into QI activities that target locally relevant performance gaps. To be successful, progress in implementation of these plans must be measured using time-bound goals and continuously monitored to adapt the plans as needed. Standardized tools such as the national organizational assessment may be useful to NTPs to assess the robustness of their QM plans [9]. Furthermore, lessons learned from the development and evaluation of QM plans in Zimbabwe and Namibia underscore the importance of having Ministry-led—rather than donor-driven—organizational support to oversee the development and administration of the QM program, and an inclusive approach to stakeholder engagement that solicits input and

buy-in from across the health sector to co-develop it and reinforce its implementation. Donor support of QM programs, through assessment tools and dedicated funding, are useful levers for stimulating initial action, but may fall short in achieving sustainability [11]. Without the organizational support of a QM program, political leadership from Ministries of Health, and commitment of national governments to allocate domestic funds, the visions articulated in QM plans or strategies are unlikely to be realized and sustained.

3. Attention to processes of care

Like early applications of QM methodologies to healthcare, preliminary attempts by national programs to address quality in the setting of HIV care focused largely on a quality assurance (QA) approach of standards-based inspection and supervision. The earliest assessments of programmatic performance in LMIC settings relied exclusively on findings of population-level analyses in which "success" was approximated according to inputs, "coverage," and outcomes alone [22]. To be sure, these analyses were useful for developing accountability for resource allocation and estimating the gap between disease burden and the national program's corresponding response, but they were too infrequent and insufficiently granular to drive action and system-wide learning. Importantly, the narrow selection of inputs and outcomes neglected the key importance of assessing the cascade of processes, such as testing, diagnosis, and treatment initiation, that mediate the translation of inputs (e.g., life-saving antiretroviral therapy) into outcomes (e.g., viral suppression, long-term survival and declining disease burden) [23].

Growing recognition of the central importance of examining healthcare processes in assessments of quality spawned the intensive efforts of national HIV programs to identify, measure, and improve these processes in individual facilities. Following the lead of Thailand [24], in 2007 Namibia joined Uganda and Mozambique to become one of the first LMICs to systematically address these processes as part of its national HIV QM program. After 10 consecutive rounds of measurement, by 2013 these efforts had yielded marked improvements in 10 of the program's 11 quality indicators (Table 2) [25]. In Haiti, commitment to performance measurement led to the evolution of a centralized, comprehensive electronic platform, *Système Intégré de Gestion d'Healthqual d'Haiti* (SIGHH), for monitoring HIV QI programming (Fig. 1), which fused the country's pioneering electronic medical record, *iSanté*, and its monitoring and evaluation system [26]. SIGHH has allowed the national HIV program to automatically capture patient-level data, produce real-time quality reports linked to quality program organizational assessments and geographically target its response to low-performing sites or high-burden areas. Moreover, SIGHH tracks key enablers of QI implementation, such as QI coaching and ongoing QI projects, providing national program staff with further detail on site-level progress. As of 2019, data are transmitted to SIGHH from all facilities that provide HIV care in Haiti.

Table 2
HIVQUAL measures – Namibia.

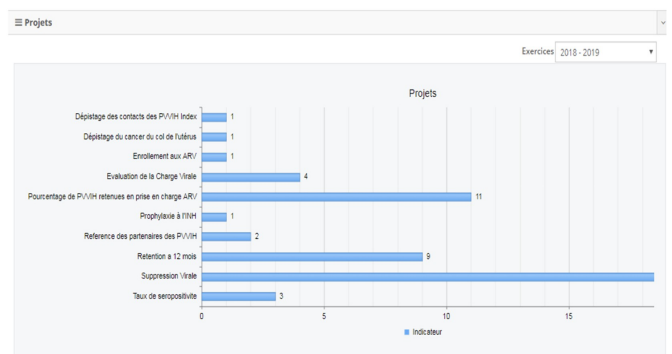| Indicator	Definition
1. Clinic visits and retention	Percentage of patients on ART with a clinical visit during the last 3 months
2. Pre-ART monitoring	The proportion of Pre-ART patients with CD4 monitoring completed in the past 6 months.
3. Viral load monitoring on ART	The proportion of patients with a viral load test completed in the past 6 months.
4. New ART initiation	The proportion of eligible patients who were initiated on ART within the past 6 months.
5. TB screening	The proportion of patients with documented TB screening result at each clinic visit within the past 6 months.
6. Isoniazid prophylactic therapy	Proportion of eligible patients currently on isoniazid prophylactic therapy during the past 6 months.
7. Cotrimoxazole prophylactic therapy	Proportion of patients with CD4 $\leq$ 250 or WHO clinical stages 3 or 4 prescribed cotrimoxazole prophylactic therapy during the past six months.
8. ART adherence assessment	Proportion of patients who received an adherence assessment at each of their clinic visits during the past 6 months.
9. Nutritional assessment	Proportion of patients who were administered a nutrition assessment during their last clinic visit
10. Alcohol screening	Proportion of patients screened for alcohol use in the last 6 months.
11. Family planning assessment	Proportion of patients aged 15–49 who were assessed for their family planning status.
12. STI screening	Proportion of patients aged 15–49 years screened for genital ulcers and urethral/vaginal discharge in the past 6 months.
13. Cervical cancer screening	Proportion of female patients older than 15 years who had a documented cervical cancer screening result not older than 15 months.

Like HIV, delivery of high-quality care for TB can be conceptualized according to a cascade of key processes that directly translate into achieving epidemic control [27]. Lessons learned from implementation of HIV QI programming in countries like Namibia and Haiti underscore the importance of building robust measurement platforms that track facility-level performance in these key clinical processes. To stimulate action among providers, performance measurement data must be continuously collected, sufficiently local, and conceptualized as the basis for improvement rather than fodder for blame [28]. While many TB programs collect these data elements as part of routine service delivery and program monitoring [29], the purpose and method of collection for each data point may vary, creating a data ecosystem that is fragmentary and ill-suited for use in improvement. Consolidation of these data sources into a centralized system with defined indicators offer NTPs a common rubric with which to evaluate performance and develop evidence-informed policy responses. While some processes are, and ought to be, commonly measured across settings (e.g., receipt of drug susceptibility testing), decisions to track others may be informed by local policies and priorities. HIVQUAL-Namibia's decision to track screening for food insecurity, for example, underscores the utility of selecting measures that reflect both internationally defined standards of treatment and locally relevant priorities and social determinants of health.

Clinical outcomes

QI projects

Organizational QM capacity

QI coaching

Fig. 1. SIGHH dashboards – Haiti
In Haiti, SIGHH dashboards are used to track the site-level progress of QI implementation according to several factors, including clinical outcomes (a), QI projects (b), organizational QM capacity (c), and QI coaching visits (d) [60]. Progress is monitored centrally and further coaching and support is tailored to low-performing sites. The juxtaposition of the different components also allows a retrospective evaluation of the role coaching played in advancing implementation of QI activities and quality programs, and whether a cascading effect on performance was achieved.

4. Investment in capacity building and system strengthening

The global response to HIV, like TB, has relied heavily on disease-specific, donor-driven initiatives which have often valued short-term achievements in key indicators over attention to long-term capacity-building [10]. PEPFAR, in particular, has been enormously successful in stemming the tide of new infections and preventing associated morbidity and mortality [30], but evidence supporting its benefit in strengthening underlying health systems to address other population health concerns remains mixed [31,32]. As an emergent phenomenon, high-quality healthcare service delivery requires a foundation that enables vigilance, enforcement of clearly defined policies, procedures, roles, and expectations, and development of a well-prepared facility, district, and national cadres who don't simply "know" QI concepts and methods. Crucially, these cadres must be able to continuously and dynamically support QI implementation and system-wide learning to respond to evolving patient, clinical, and population health priorities in their facilities and communities [33].

The availability of an adequate, capable, and compassionate health workforce pervades any discussion of sustainable delivery of high-quality healthcare in LMICs [1], and is of particular concern in countries transitioning away from donor financing [34]. Appreciation of the challenge of sustainability in a climate of declining donor funding led many programs to pivot toward pursuit of long-term capacity-building and health systems strengthening that include quality management as part of continuing efforts to reach epidemic control targets. With this formal coordination and support, HIV programs began to embed QI capacity within national and sub-national health systems. In Vietnam, a provincial coaching model was implemented in which existing cadres from the Provincial Peoples' AIDS Committees were capacitated by the National AIDS Program to provide mentorship to facilities in QI implementation as part of routine supervisory activities. For example, in Son La Province, QI activities were successfully spread to 7 of the province's 9 HIV clinics and improving the quality of HIV care in a majority of core indicators [35]. In Ho Chi Minh City, all district health centers were coached to implement improvement activities. With the guidance of national and provincial HIV quality technical working groups, the model has been adopted as a strategy to sustainably decentralize QI implementation and expertise with limited need for additional staffing. In Namibia, the national program has developed a comprehensive framework for QI capacity building, which specifies standards, curricula, and evaluation of QI trainings for healthcare workers, trainers, improvement coaches, and consumers both within and beyond the HIV program.

Although some notable work has been accomplished to apply QI concepts and methods to TB care [36–42], these efforts have remained limited in scale and with minimal attention paid to capacity building for ongoing QI implementation, leaving their sustainability beyond the few facilities or districts in which they are implemented an open question. Experiences from HIV QI implementation in settings with workforce shortages and frequent staff rotations point to the importance of developing models, curricula, and standards whose scalability is planned from the outset, and whose intended targets for QI capacity building span facility, district, and national cadres, as well as the public and private sectors [43]. Mentorship and coaching can speed site-level implementation of QI, but their implementation remains a challenge in LMICs, in part due to a lack of consistent QI coaching standards. QI coaching certification standards, such as those implemented in Haiti and Zimbabwe, can assist in overcoming this barrier (Table 3) [44]. In addition to standards and curricula, large-scale improvement initiatives, such as collaboratives, can be useful in developing capacity of participating national-, district- and facility-level teams to implement QI and generating a package of scalable improvement interventions [45–50]. Ministry-led collaboratives to address HIV care processes and outcomes, build platforms for peer learning and exchange, and complement other QI capacity building efforts that have

been implemented with notable success in Kenya, Namibia, Zimbabwe, and Malawi. These initiatives should be considered as part of TB programs' capacity-building "toolkit," especially in high-burden areas, to accelerate improvements and achieve results.

Beyond capacity building of healthcare workers, establishing consumers as active players in system-wide QI efforts represents an essential, albeit underutilized approach to build demand for high-quality health services. In Namibia, a QI curriculum for consumers, which was piloted across 6 sites in 2016, is currently being scaled as part of broader national activities aimed at promoting people-centered care delivery, including revisions of patient charters and curricula on consumer rights [51]. Other approaches for involving consumers in QI efforts, such as experience-based co-design, patient feedback systems, consumer advisory committees, and community-based monitoring programs have been used with considerable success in resource-rich settings, but have, to date, seen disappointing uptake in LMICs [1]. Systematic incorporation of these approaches into QI capacity-building agendas remains an aspiration in HIV and TB QI programming in LMICs, and warrants further attention and development [52,53]. Finally, given the damaging effects of stigma on the success of both HIV and TB control [54], urgent work is needed to leverage continuous measurement, patient involvement and QI methods to address its root causes and act to mitigate their effects, particularly in healthcare settings [55].

5. Linkage to broader quality initiatives

HIV QM programs, like other disease-specific quality programs, are typically discrete and siloed initiatives within Ministries of Health. When these programs were developed, national quality programs in LMICs were often non-existent or small outposts of QA initiatives. As national quality programs have evolved, the separation of disease-specific quality initiatives, often fueled by categorical funding requirements, has resulted in parallel systems of measurement and capacity-building that can result in confusing messages for providers and subnational units about priorities. Moreover, the jurisdiction of these disease-specific programs is often limited to quasi-independent clinics housed within larger healthcare facilities. The quality of services for people living with HIV presenting to care at other service units within these institutions, medical clinics, and those external to the public sector (private, military and prison clinics) often remains unaddressed and characterized by substandard care.

These concerns have prompted the call for integration of QM programs within a broader national health system quality framework [13]. Under the expanding push for universal health coverage, primary care providers will assume the mantle for diagnosis and primary care of people with HIV and TB, among other conditions. Some promising early examples of collaboration and alignment have been observed in several countries. In Zimbabwe, the HIV QI training curricula and coaching model has been adopted by the maternal, newborn and child health (MNCH) and malaria programs through capacity-building of provincial and district health management teams that provide support to health facilities in their jurisdictions [56]. In Thailand, the Hospital Accreditation Program [57] has developed a disease-specific certification program for HIV that includes HIV-specific measures and QM programs. In Lao People's Democratic Republic, measures to assess patient experience and stigma and discrimination in HIV clinics are endorsed under "Five Goods, One Satisfaction," the national policy on healthcare quality [58], and in Vietnam, HIV measures have been integrated into the national health sector reporting system. In some countries, conversely, HIV programs and platforms have been used to address other diseases. In Namibia, indicators to measure the quality of care for non-communicable diseases (NCD) and TB have been integrated into large-scale HIV quality initiatives, and in Haiti, *iSanté* has evolved to capture measures for NCDs, MNCH, and TB which are gradually being adopted in primary care clinics. Notably, 63TB surveillance indicators are

Table 3
Basic competencies for QI coaches.

Competency	Description
1. Knowledge of QI theory	Through completion of a formal national curriculum or internationally recognize QI training program, demonstrates knowledge of Qi theories and methods.
2. Experience as a coach	Demonstrates experience mentoring at least one facility QI team through documented completion of a QI project and organizational assessment with recommendations.
3. Understanding of patient involvement in quality	Exhibits an understanding of how to involve patients in QI activities, including methods for recruitment of patients for QI teams, approaches for including patients in priority setting, and evaluation of facilities' support for patient involvement.
4. Ability to use national program data reporting tools	Demonstrates competence in using national program data reporting tools to analyze and report performance measurement data, and provide support to facilities in data-driven QI decision making.
5. Reporting	Shows an ability to maintain a thorough record of coaching activities—Including tested interventions, implementation barriers, and improvement recommendations—for review by the national program.

available in *iSanté*, of which 24 are used for routine NTP reporting.

NTPs face the same challenges that dedicated HIV QM programs have encountered with respect to their role in the broader national health sector quality program. Too often, systems for measuring the quality of TB services are applied only within established TB clinics, an approach that may neglect patients presenting to general hospitals and health centers that lack requisite diagnostic and treatment capacity [59]. With the experience gained from nearly two decades of HIV QM initiatives that have spanned HIV prevention, testing, care and treatment, TB programs can avoid the pitfalls of separate programs by careful planning and coordination with their respective national quality programs. Practically speaking, the coordination and integration of these programs needs to strike a critical balance between the unified measurement platforms and QI methodologies with the preservation of disease-specific quality measures and expertise in clinical management. Resources can be leveraged by sharing QI training, capacity-building methods, and reporting systems. Shared measurement platforms can eliminate duplicate reporting systems for providers and facilitate inclusion of TB-specific metrics on national quality dashboards. Representation of clinical TB experts on national and subnational quality technical working groups will foster bidirectional sharing of knowledge and harmonization of policies and practices. Finally, the unification of coaching at district level will avoid duplication of activities and promote efficient use of resources. This alignment will also benefit providers and patients by assuring consistency of information and methods guiding the application of standards of care.

6. Conclusion

The quality of TB care in LMICs remains inadequate, with major shortcomings in detection, diagnosis, treatment, and recurrence-free survival. NTPs wield the mandate of addressing and improving quality across all sectors and for all affected populations, yet often have oversight over only dedicated TB clinics. To effectively tackle the substantial gaps throughout the cascade of TB care—and realize the potential role that QI plays to close them—NTPs need to apply careful planning, measurement, robust process improvement and capacity building across the entire health sector. Although HIV programs have reaped the benefits of donor largesse, the sustainability of their quality initiatives remains in peril as donor funding for associated staff and activities dwindles. NTPs now face the challenge of leveraging resources to support QI activities through effective coordination and commitment to capacity building, and the harnessing of existing measurement platforms and district health management teams. In doing so, they may realize long-term benefit and sustainability, especially as they seek to balance the growth of integrated primary care models and universal health coverage with the preservation of clinical expertise in TB. The burden of inaction is great. Aims to reduce TB deaths by 95% and incidence by 90% within the next 15 years demand the rapid implementation of strong, coordinated quality programs to achieve these ambitious improvements in population health. Lessons learned from the

successes and failures of HIV programs in addressing quality offer a starting point from which NTB programs must leap.

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Daniel J. Ikeda[a], Apollo Basenero[b], Joseph Murungu[c],
Margareth Jasmin[a], Maureen Inimah[d], Bruce D. Agins[a,e,*]

[a] *HEALTHQUAL, Division of Global Epidemiology, Institute for Global Health Sciences, University of California, San Francisco, San Francisco, CA, USA*

[b] *Ministry of Health and Social Services, Windhoek, Namibia*

[c] *HEALTHQUAL, Institute for Global Health Sciences, University of California, San Francisco, Harare, Zimbabwe*

[d] *National AIDS and STI Control Program, Nairobi, Kenya*

[e] *Institute for Implementation Science in Public Health, City University of New York, New York, NY, USA*

E-mail address: bruce.agins@ucsf.edu (B.D. Agins).

* Corresponding author at: Institute for Global Health Sciences, University of California, San Francisco, Mission Hall, Box 1224, 550 16th Street, Third Floor, USA