An International Perspective: Institutionalizing Quality Improvement through Data Utilization at a Multicountry, Multiclinic Level

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OBJECTIVES

After reading this chapter, the reader shall be able to:

- Explain the use case of quality improvement for HIV care in resource-constrained countries, covering the life cycle from paper- and electronic-based data collection through the calculation of indicators to the interpretation of values at the patient and population levels.
- Describe the impact of this process on the implementation of care delivery and outcomes evaluation.
- Evaluate the implications for training.
- Compare the results of several use cases of continuous quality improvement for HIV care.

ABSTRACT

Continuous quality improvement is just as important in developing countries as in the United States. And like the United States, data systems are the foundation for understanding and providing quality services. As part of the AIDS Relief Consortium's efforts to build HIV treatment and care services, we review best practices and lessons learned from working in eight African and two Caribbean nations.
INTRODUCTION

In any setting, the effective delivery of quality Human Immunodeficiency Virus (HIV) care and treatment is a complex undertaking. Infrastructure and knowledge gaps, while major challenges in resource limited settings, do not negate the need for and achievability of quality care and treatment for people living with HIV/Acquired Immunodeficiency Syndrome (AIDS). As such, the backbone component of medical capacity building is assessing care and helping to devise and implement continuous quality improvement programs at the clinic level. Working to assure and improve the quality of medical care provided through continuous quality improvement (CQI) not only is crucial for the growth of global HIV programs but also impacts patients’ health and lives. In this chapter we explain the training, technology, and clinic practices needed to institutionalize quality improvement. While HIV medical care is the focus of this chapter, the lessons learned from this effort also can apply to the treatment and prevention of other diseases.

Improving the quality of health care cannot be fully complete without accurate and reliable medical information (AbouZahr and Boerma, 2005; Aiga et al., 2008; Chan et al., 2010; Nash et al., 2009). As many countries report their progress toward achieving the United Nations (UN) Millennium Development Goals, the need for high-quality data has never been greater (Millennium Development Goals, 2011; Rugg et al., 2009). In spite of dwindling funds for public health activities, exceedingly more programs rely on the accuracy of data to determine future funding opportunities. Assuring the quality and usability of health information systems remains a challenge. It is against this backdrop that the President’s Emergency Plan for AIDS Relief (PEPFAR) has had a significant impact on expanding the use of data through providing access to HIV care and treatment to millions of people in resource-limited settings. The expansion of data use through data collection and electronic medical records (EMRs) propels resource-limited countries’ abilities well beyond what previously could be done.

As HIV treatment decentralizes to more rural health facilities and satellites with infrastructure limitations and as patients remain on antiretroviral (ART) treatment for longer periods of time, it becomes imperative to assess treatment outcomes to ensure that quality health outcomes are not compromised by the overwhelming demand to continue to scale. The University of Maryland’s Institute of Human Virology (UMSOM/IHV) has been privileged to work as an implementing partner with PEPFAR as part of the
AIDSRelief Consortium. This consortium is composed of Catholic Relief Services (CRS), which served as the lead partner; Futures, which supported the strategic information of the programs; Catholic Medical Mission Board (CMMB), which supported the prevention of mother-to-child transmission programs and Interchurch Medical Assistance World Wide (IMA); and UMSOM/IHV, which served as the clinical mentorship arm of the consortium and provided continued medical and care delivery support to local partners and implemented continuous quality improvement interventions through the Outcomes and Evaluation (O&E) component. By the time transition of PEPFAR occurred, 276 health facilities and hospitals within eight countries in Africa (Uganda, Kenya, Tanzania, Ethiopia, Rwanda, Zambia, Nigeria, and South Africa) and two countries in the Caribbean (Haiti and Guyana) were supported. The programs were located in rural settings, semiurban settings, and urban locales with over 400,000 patients on ART and more than 800,000 patients who have received care. Our facilities were diverse in their settings, culture, and people. All programs were licensed by their respective governments and were recognized providers of care and support for people living with HIV/AIDS. In 7 of the 10 AIDSRelief countries where viral loads for program evaluation were conducted, median time on treatment was 16 months, and the average viral suppression proportion (which is the gold standard for treatment success) among a 10% random sample of all patients initiated on therapy was 88.2%, a rate comparable to or even better than those seen in industrialized countries. Our success in supporting these countries stemmed from being able to identify a benchmark and develop a general framework on which to build.

THE AIDSRELIEF HIV CARE DELIVERY MODEL

The AIDSRelief Model of Care (Figure 7.1) is built on a foundation of health systems strengthening. An effective health system will depend on the strength of each facility, its network, and its links with the public health sector and the community. With an emphasis on health systems strengthening as the foundation, our medical, strategic information, and site management program components continually worked in conjunction with each other. Additionally, the care delivery model emphasized adherence as a vital therapeutic intervention. Intensive treatment preparation, patient-specific care, and treatment plans with community-based treatment services including
home-based follow-up during the initiation and continuation of antiretroviral treatment were key components to sustained successful outcomes. Many of these activities required specific indicators that could be measured and evaluated to improve continued care within the community. Clinical indicators such as baseline cluster of differentiation 4 (CD4) cell count, CD4 cell count overtime, identification of opportunistic infections, drug toxicities, and side effects served to provide clinicians an important background in making informed decisions for their patients. Social indicators and determinants of health included disclosure, defining catchment areas for treatment as well as training and supporting community members. All of these areas served as a part of the health system, which supported HIV care and delivery within a community and ultimately the entire country. Initially this information was captured through the use of patient management forms. However, a need was identified early on in the program for electronic capture of these large data sets to use the data effectively. The transition to electronic forms allowed for easy access to both patient and facility population data and emphasized data use for clinical management of patients and program management.

OUTCOMES AND EVALUATION

As clinical mentors, the UMSOM/IHV staff and faculty initiated components of the program that would support implementation of a care delivery model and focus on continuity of care through the collection,
analysis, and use of data. The O&E component of our technical support helped to accomplish this by first identifying a set of simple indicators that would ultimately lead to the development of patient management forms. We subsequently supported the use of continuous quality improvement activities to ensure a successful continuity of care for patients within an initially burdened health system. The remainder of this chapter will describe the comprehensive work of the O&E component of our technical support and how this has led to increased use of data and ultimately improved patient level outcomes.

**Data Collection**

*State of Data and Information Gathering Prior to PEPFAR*

With its introduction, PEPFAR was able to provide access to antiretroviral treatment to health facilities in very rural areas. Although several countries had access to the Global Fund and other donors, there had never been an HIV program measured at the scale of PEPFAR. Prior to PEPFAR many rural health facilities were providing palliative care and helping people living with HIV/AIDS die with dignity. Data were collected in a register format that was more conducive to tracking acute illnesses rather than chronic disease management. Longitudinal patient medical records were nonexistent, and medical records, if they existed, contained only basic registration and demographic information rather than medical information. Continuity of patient care was a challenge for clinicians and medical professionals alike. There was a need to document patient medical information that could be useful to patient outcomes, especially in the wake of increased access to antiretroviral treatment.

*Development of Indicators*

We were committed to making sure that people living with HIV/AIDS enrolled in our programs have improved clinical outcomes leading to improved quality of life. To measure this we developed and integrated indicators that measured patient and family quality of life, virologic and immunologic response to treatment, adherence levels, and quality of the program into monitoring and evaluation systems. Several countries treating HIV through the Global Fund and through other funding mechanisms had already identified monitoring indicators for their programs. Yet some critical indicators were still missing that we felt should be
included in the national set of indicators. A comprehensive team of clinicians, nurses, laboratory technicians, and community-based staff gathered to discuss the addition of indicators that could enable the health facility staff to make informed decisions for their patients and ultimately improve the delivery of care.

**Development of Patient Management Tools**

Many of the health facilities in which we worked would use thick ledgers to write down patients’ names and information (Figure 7.2). The ledgers would change monthly and be stored in shelves and would no longer be useful for data or clinical purposes. The development of longitudinal patient management tools provided health facilities an easier and safer way to document their patients’ information without risking a breach in confidentiality or privacy. Most important, the forms were longitudinal and could be used for the same patient every time they returned to the clinic for an appointment. Building off the clinical indicators and PEPFAR reporting requirements, a group of clinicians, monitoring and evaluation staff (Futures), and site managers (CRS) worked together to develop the AIDSRelief longitudinal medical records. These patient management tools were composed of the following forms: Enrollment, Initial Evaluation, Laboratory, Adult Pharmacy, Pediatric Pharmacy, Non-ART (antiretroviral treatment) Follow-Up, ART Follow-Up, Home Visit, Adherence Counseling Check-List, Contact

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**FIGURE 7.2**

Picture of health ledgers.
and Care Tracking, and Patient Profile (summary sheet). A key component to the development of these forms was establishing the minimum data set. It was the critical information necessary to ensure quality patient outcomes and to adequately report to the Ministry of Health, the hospital administrators or hospital board, and the funding agencies.

There was a need for a significant culture shift at facilities to implement these patient management tools. The facilities went from acute monitoring of illnesses to monitoring of chronic disease. We were asking the facilities to collect significantly more data and to track patients throughout the facility. To facilitate this process, AIDSRelief sent multidisciplinary teams to facilitate workflow diagramming, to develop new processes, and to identify human resource gaps. AIDSRelief provided training across the facility on the patient management tools and integrated feedback from facilities to improve the tools on a routine basis. This cultural shift was facilitated by dynamic hospital administrators, clinicians, nurses, and monitoring and evaluation (M&E) staff who wanted to see an improvement in the quality of care and patient outcomes. The focus was placed squarely on reviewing clinical and program indicators, and this was enabled by the collection of quality data. IHV and Futures provided on-site technical assistance and training to collect and analyze data regularly and to improve data quality and analyses. This mechanism successfully supported the continuity of care within all participating health facilities.

**Information Collected**

The information collected on each patient was based on the minimal data set and contained critical variables for clinical management and program reporting. In resource-constrained settings, facilities are oftentimes understaffed and overflowing with patients waiting to be seen. This leads to challenges in collecting essential information. At AIDSRelief-supported facilities, clinicians would rush to see as many patients as possible in an effort to decrease patient wait time, yet the information needed to provide continuity of care was being jeopardized. On several visits clinicians and nurses did not have time to record every data point, which resulted in missing or incomplete data. Working day to day with the field teams provided our technical teams with valuable insight that would help to refine and adjust the patient management forms for future use.

The field experience allowed us to revise the patient management forms several times until we accurately captured the most crucial indicators
on forms that could be easily filled out by the clinician and the nurse as they were observing their patients. The indicators collected were based on clinical and nonclinical criteria for initiating antiretroviral treatment. The clinical criteria included presentation with an AIDS-defining condition, a CD4 cell count below 350 cells/μL (cells per millions per microliter), pregnancy or World Health Organization (WHO) stage III or IV disease (Phair et al., 2002). The nonclinical criteria included evidence of ability to be adherent to antiretroviral treatment (ART), such as regular attendance at the health facility or adherence to cotrimoxazole prophylaxis, and demonstrated understanding of the basics of HIV infection and ART. Our patient management forms ensured a standardized approach to patient care across our partner health facilities.

The initial evaluation included a detailed medical history, physical examination, and baseline laboratory tests that included CD4 cell count, liver function tests, creatinine, and a chest x-ray. Patients were seen in the health facility weekly or fortnightly during the first month of ART and were closely monitored for early toxicities and problems with adherence. Once stable on treatment, all patients visited the health facility bimonthly to pick up their prescriptions. CD4 count testing was routinely done every six months but more frequently when clinically indicated (WHO, 2006).

e-Health Tools and Electronic Medical Records

Supporting 270 facilities and over 800,000 patients meant that the program had a significant amount of data to monitor and analyze. Moreover, within a single facility physical paper records were not conducive to analyzing patient trends and outcomes. Futures developed a series of software applications, called International Quality Solutions (IQSolutions), to address the expanding needs of facilities and the program to effectively use data for decision-making. These applications were built on the AIDSRelief quality improvement model and based on the patient management tools. We know that each country and each hospital have different clinic processes and reporting needs. IQSolutions met those needs and helped the clinics effectively provide and improve patient care through providing a platform for capturing quality data and visualization of the data. Different systems within IQSolutions meet varying capacity levels and needs of HIV care and treatment providers. In addition to the use of IQSolutions, we supported the national electronic systems when they existed. The team provided
technical assistance around the implementation and maintenance of national systems at the local facility level.

One core application within IQSolutions is the EMR system, IQCare. This is a robust and comprehensive data capture and reporting system with patient management tools designed to measure patient outcomes. IQCare helps clinics collect clean and ensure accurate patient data and provides flexible reporting leading to enhanced data use and analysis. One of the cornerstones of the PEPFAR and global health initiative (GHI) focus is mothers and exposed children. IQCare includes a form builder and separate modules for prevention of mother-to-child transmission (PMTCT), maternal and child health (MCH), TB, and so forth. The PMTCT module covers HIV-infected pregnant women prenatal, delivery, and postnatal services as well as exposed infant follow-up. In this module, countries are able to create their own forms based on MoH forms/cards. Similarly, MoH reports are integrated into the system, and countries can develop their own queries through the custom reporting feature. It is critical to ensure that facilities have access to all the data they capture. IQSolutions empowers facilities to use the data they are collecting to inform patient treatment plans and program management.

In conjunction with IQCare and other national EMRs, IQTools is an application used to assure quality data and contains a variety of data cleaning and patient and facility-level reports. IQTools works in conjunction with other systems to improve their data management and functionality. IQTools links to a variety of databases including CTC2 in Tanzania, i.Sante in Haiti, and the Management Sciences for Health (MSH) pharmacy stock-tracking tool.

AIDSRelief completed the development of the Site Capacity Assessment dashboard, a visualization tool to aid all levels of users in decision-making. Global-level users (program headquarters, country managers, health facility managers) can compare aggregated results between countries and within a country. They can identify and address overarching problems. Country managers can compare selected facility segments and regions. They can drill down to view component and facility score trends over time. Health facility managers can query site-level indicators and look at the individual pieces that are required to meet a specific score. They can create action plans for improvement where additional focus is needed. The dashboard aggregates data at the global, country, and facility levels by component and functional areas. Maps, charts, and tables are automatically generated and are color-coded to match the sustainability ranges so that it is easy to analyze the results at different levels of detail.
These e-health applications and others used within AIDSRelief provide the tools necessary to perform analytics on large data sets as well as inform individual client decisions. The tools can send patient reminders to individual patients and evaluate the percentage of those patients receiving an appointment reminder that were retained in care and treatment. It was critical to strengthen the capacity at facilities to implement these systems.

**Patient-Level Outcome**

At the time of program implementation, routine use of viral load testing for patient management was not recommended in resource limited settings. For many of these countries, this test was much too costly and the resources needed to maintain the viral load machine were too great and at the time seemed unsustainable. However, an integral part of our ART program was ongoing program evaluation and patient-level outcomes (PLO). The PLO involved an annual nonexperimental quality assurance survey of a randomly selected subset of patients receiving care at each site. Deidentified information was collected and analyzed centrally to evaluate program-level measures of quality of care as well as outcomes of care. The information was fed back to the facilities and guided targeted technical assistance to each site for program quality improvement. Information obtained in the survey included baseline demographic and clinical data, antiretroviral regimen information, biannual CD4 test results, opportunistic infections, drug toxicities, and side effects. In addition, the program provided viral load testing and collection of self-reported adherence information for a minimum of 10% of patients accessing ART at each site as part of the program.

The first round of the PLO survey was carried out in Kenya and Uganda between February and March 2006. Eight sites in Kenya and five sites in Uganda were included. All patients who began receiving ART at any of these sites between August 2004 and April 2005 were considered program year one patients and potentially eligible for inclusion in the survey. Of all eligible patients at each site, 10% were randomly sampled to participate in the PLO survey. Active patients were defined as those still receiving ART and in care, whereas inactive patients were defined as having stopped their ART and no longer in care. Demographic and clinical information, free of any individual identifiers, was collected for all survey participants through abstraction from both the electronic database and the patient medical charts using a standardized abstraction tool.
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Active survey participants were also administered an adherence questionnaire that obtained self-reported adherence information. Preliminary analysis was done at IHV, and the information was fed back to the sites. This allowed for real-time use of the data, implementing positive changes as a result of patient outcomes for continued program quality improvement.

**Sustainability of the PLO Activity**

The initial PLO activity was also an opportunity to mentor the sites to be able to carry this out on their own. We worked hand in hand with the site staff from calculating the sample size to collecting patients' medical information as well as specimens for viral load analysis to reporting the findings. Our team ensured that this was an activity that could be carried out in our absence. Several years later with support from the IHV to analyze the samples and the data, the sites continued to perform their PLO activities and began to focus on targeted populations such as pediatrics and pregnant women. (PLO activities were expensive to carry out, and due to budgetary constraints we could not sample all patients on ART. The 10% sampling method helped give us a general picture of the health of our program, and additionally it gave clinicians extra information that could be used to make appropriate clinical decisions for their patients.)

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**TRAINING OF HEALTH CARE PROVIDERS**

As the technical arm of the consortium UMSOM/IHV conducted baseline assessments of knowledge that would help enhance programmatic and clinical support. This provided for useful information that would guide our own technical support and provided a true assessment of the work we were doing. The IHV housed senior infectious disease clinicians who were responsible for individual partner countries within the consortium. The senior technical advisors worked with the Ministries of Health and partner sites within each country to ensure that the clinical needs were met for that country. The advisors led a comprehensive team of clinicians, nurses, laboratory specialists, CQI specialists, and community-based treatment supporters (CBTS) who were responsible for each aspect of the program.
Meeting the Site-Level Needs for Quality Data

A collaborative effort between UMSOM/IHV CQI specialists and Futures strategic information staff were responsible for training the health facility teams on all aspects of data, including data entry, data quality and management of information, facility assessment, and quality assurance. This included quality data collection through the patient management forms, data entry into the EMR, and data use for optimal clinical and program outcomes. A key objective of training and technical assistance was to make data relevant, valid, accessible, and useful to the facility for patient care and effective program management. Ultimately, it was the facility that had to take ownership to drive their individual quality improvement program. Additional objectives were (1) to have data that were clean, comprehensive, and valid; (2) to ensure that the data system maintained patient confidentiality; (3) to facilitate accurate and timely submission of required reports; (4) to ensure that facility M&E teams provided information to the clinical care team and key stakeholders for planning and adaptive management; (5) to provide data that can be used to enhance access to and retention in quality care; and (6) to provide data to enhance efficiency and effectiveness of the program and management at the facility. Training and targeted technical assistance were designed based on the capacity at the facility, the local context, and the priorities of the country program and MoH.

Through the use of EMRs, facilities were empowered to use their data for decision-making and ensure information was entered correctly or missing data was completed. Routine weekly and monthly data cleaning processes were put in place by facilities. In most facilities, we used a mixed model of paper-based and electronic data entry. This allowed facilities to cross-reference the records and conduct data quality audits.

Curriculum Development

The O&E component of the consortium supported the development and implementation of sustainable CQI programs from the national to the health facility level. The CQI programs in many of our partner countries were harmonized with the national program. This encouraged the continued use of data to assess, measure, plan, and improve performance for all health sectors including HIV/AIDS care and treatment at all levels of the health care system. To carry out this task effectively, we needed to develop a useful curriculum that could be sustained overtime.
and used in multiple settings. The curriculum had to include didactic and, most important, hands-on technical training filled with examples and field-based activities that would be useful to health care professionals. Quality improvement teams were formed in about 250 health facilities. The quality improvement teams were composed of health staff from various disciplines (e.g., medicine, nursing, social support, health records, pharmacy, laboratory). This multidisciplinary approach lends itself to enhanced staff cooperation and satisfaction as well as opportunities to solve problems jointly across disciplines. Meetings were held as needed but no less than quarterly to design quality improvement activities, establish objective criteria for use in monitoring, develop plans for improvement based on findings, assess the effectiveness of these plans after implementation, and refine the plans as needed.

Training of Trainers—Localized and Regionalized Training

All the quality improvement (QI) teams were trained and continuously mentored. The main purpose of the training was to provide a platform for the uses of data. Health care providers were exposed to the concepts of quality improvement and how this could be relevant in their daily work. At the end of the training and through continuous mentorship, the QI teams, within their own context were able to do the following:

1. Describe the overall management approach to quality and what is to be accomplished (goals) over a defined time frame.
2. Develop a plan to elicit patients' expectations and prepare a proactive quality management plan to meet those expectations.
3. Define key terms relating to quality improvement that were well-known across disciplines within the facility and could be used by all disciplines. It was also important to have consistent language throughout the health facility to avoid misconceptions and unclear messages.
4. Describe how the quality initiatives would be managed and monitored. Some health facilities adopted a formal HIV clinic QI team approach to manage and prioritize the quality activities, while others used an existing management committee structure to accomplish the coordination of quality improvement activities.
5. Describe the process for selecting quality improvement projects through understanding the project cycle and selecting team leaders.

6. Describe the quality process and quality tools and techniques to be utilized throughout the health facility. Graphs were used to present outcomes data (Figures 7.3 through 7.10). This format allowed the clinicians in often busy clinics to quickly assess information in areas for improvement.

7. Describe the importance of sustainability and progress and how planned QI activities and processes should be updated for the management and staff on a regular basis keeping them informed on progress and achievements.

8. Describe any quality roles and responsibilities that will exist in the organization (e.g., sponsor, team leader, team member, facilitator) during or after implementation.

A set of performance indicators was introduced to help assess performance and prioritize areas for improvement. QI team meetings and

![Model for Improvement](image)


FIGURE 7.3
Model for improvement.
FIGURE 7.4
Proportion of HIV-infected infants < 2 years accessing ART among all HIV-infected children less than 15 years on ART between 2004–2010 in AIDSRelief sites.

FIGURE 7.5
Total number of children enrolled into care and treatment in AIDSRelief 2006–2010.
Use of family-based testing compared with provider initiated testing (PITC) as entry point to care and treatment of children.

FIGURE 7.7
HIV-exposed infants enrolled for follow-up from 2009–2010 at Bunda DDh RCH.

Trainings centered on setting clear targets for what the facility wanted to achieve through the use of quality improvement tools such as root cause analysis to understand system barriers, process mapping to understand patient flow and clinical pathways, and data review and patient chart analysis to identify opportunities for improvement.
The Culture of Routine Data Use in Rural Health Facilities

Dynamic strategic information systems were at the core of AIDSRelief's quality improvements and clinical excellence. Careful program monitoring allowed health facilities and AIDSRelief to make day-to-day and long-term decisions to ensure that activities were carried out as designed and altered when necessary. Evaluation enabled AIDSRelief and its local
partners to understand and demonstrate the results of their work, to determine the best strategies for achieving their goals, and to document lessons learned.

The program cultivated a culture of data demand and information use (DDIU) and CQI that encourages collaboration and improvement across all technical areas with the shared goal of optimal patient outcomes. AIDSRelief supported existing and established new health management information systems as appropriate for each country’s context. The IQSolutions software applications, developed by Futures, are flexible and responsive to evolving information needs and have been well received by stakeholders from the facility level to the national level. In 2010, a WHO evaluation rated IQCare (an EMR system) as one of the best health management information system in Kenya.

DATA DEMAND AND USE AND SUSTAINABILITY

Resource-limited settings experience challenges in providing chronic HIV care resulting from system failures. In these settings the critical functions of the health system often are challenged by inefficient standards, lack of evidence-based practice, inadequate data, and information use.
QI measures have been proven to be highly effective in the poorest health systems, but they are not often applied appropriately. QI offers providers a standardized approach for addressing appropriateness of care that can be applied even in the most resource-limited settings. Within the O&E component of the UMSOM/IHV, quality improvement is defined as a process that addresses identified gaps in performance and assists in improving care to produce more consistent outcomes. Improvements are achieved through repeated cycles of testing changes to the system, measuring the impact, and then adapting or expanding the changes based on the results. Ideally for most health facilities, QI efforts help to strengthen critical systems by ensuring that services are delivered according to accepted standards of care and lead to desired outcomes. As QI is data-driven, performance must be measured for quality to be improved.

Creating Data Demand

Health facilities are usually complex adaptive systems. Suggesting changes to improve quality of care can therefore become quite challenging. Fundamentally it required us to gain an understanding of the daily occurrences within the delivery of health services. It was important for our teams to assess which factors affected care delivery and how we could facilitate health care improvement. Solid evidence was needed to support decision-making rather than information based on isolated occurrences, assumptions, emotions, or politics.

The Approach

The teams adopted the plan–do–study–act (PDSA) cycles to test process changes in multiple settings. This model for improvement, developed by Associates in Process Improvement, provided a framework for developing, testing, and implementing change and is a powerful tool for accelerating improvement (Langley, 2009). The model for improvement is used to successfully improve care processes and outcomes by numerous health care organizations (Speroff et al., 2004). The model (Figure 7.3) is composed of three improvement questions:

1. What are we trying to accomplish? A QI team’s response to this question helped to clarify which improvements it should target and their desired results. Since system failures varied by clinic, QI teams
generated multiple ideas for change across each step in the clinical care pathway to improve patient outcomes. QI teams adapted ideas from the clinical literature and used HIV performance standards. Findings from the PLO activity as well as the site capacity assessment (SCA) tool were used to identify opportunities for improvement. The SCA is a specialized tool developed by our consortium and is used to assess each health facility's overall capacity to deliver quality HIV care and treatment. The SCA also serves as a tool for routine program monitoring and supporting the long-term sustainability of health facilities. Measures were developed to assess the impact of individual changes and to identify changes associated over time with documented improvement in processes and system performance.

2. How will we know that a change is an improvement? Actual improvement could be proven only through measurement. We asked the health facility partners to describe what they wanted to change within their health system. A measurable outcome that clearly demonstrated movement toward the desired result was considered an improvement.

3. What changes can we make that will result in improvement? Improvement occurs only when a change is implemented, but not all changes result in improvement. One way to identify which change would result in improvement was to test the change before implementing it.

**Sustainability Plan**

The amount of time for improvement cycles to be completed varied across hospitals. Most facilities also struggled with resistance to change, resource limitations to maintain quality-related investments, and complacency with achieving past improvements. While virtually most of the healthcare providers agreed in theory on the need to reduce errors, there was resistance to some of the actions associated with the QI approaches. For example, nurses viewed the new reporting requirements as an additional burden rather than an integral part of their daily routine. Clinicians had to give up some autonomy and independence when asked to adopt best practices as their behaviors and practices would easily be audited. To address these challenges facilities were encouraged to use a cascade approach in educating staff. The most effective educational strategy happened through small groups. For example, CQI training involved 2-10 people at a time over two days. Also effective, were one-on-one meetings with QI core team
members in which participants explored how QI could be helpful in their line of work.

The QI teams stressed the nonpunitive nature of the new QI focus. To increase the culture of QI, health facilities demonstrated how their HIV programs were able to improve processes and outcomes through the use of QI methodologies. Many hospital management staff found it critical for other departments (e.g., outpatient, surgery, labor and delivery) to adopt similar QI techniques to improve trends. IHV supported local leadership capacity to review progress, provide accountability, and understand and support QI clinic activities. Health managers and leaders from the local community health councils were also trained on the use of these methods. This enabled local and continued support for the implementation of QI activities. We focused on capacity building of local leaders to sustain QI activities independently. Regional and local health leaders were trained as trainers of trainers in QI and were able to mentor facility staff and over time were charged with assuming control of the QI activities and incorporating them into the Comprehensive Council Health Plans under the Ministry of Health.

CASE STUDIES

Increase in Pediatric Enrollment

Upon reviewing performance indicators a QI team in one facility in Kenya identified that they had very low pediatric uptake on ART. The team developed a simple one-page tool (separate from the EMRs) assessing five questions:

1. Do you have any children living with you?
2. Have they been tested?
3. Do you have a spouse?
4. Has your spouse been tested?
5. (If no to question 4) Can we test your spouse?

Each client of child-bearing age (15 and above) regardless of gender was asked these questions. The response rate was impressive, with almost 85% agreeing to have their children/spouses tested. This approach was
adopted by 14 other facilities and was seen to yield higher results than the recommended provider-initiated testing and counseling (Figure 7.4). The intervention was then expanded to 40 clinics within 18 months (Figure 7.5). The resultant scale-up due to the intervention is best illustrated in Figure 7.6.

Best Practice Approach

The early success of data utilization and quality improvement in Nigeria and Tanzania gave rise to the best practice approach model, whereby facilities were invited to a four-day symposium to present their successes and share challenges. This was an opportunity for health facilities to get together and addresses broad and complex systemic processes within health care systems and has facilitated the scale-up of quality improvements. This model was designed to continuously improve organizational and individual performance. Facilities were able to meet as a team, identify a problem, and come up with interventions to mitigate the problem. This best practice approach has been successful in Tanzania and was also used in Nigeria. The preliminary results have led to impressive changes in the process of care. In one rural health facility in Tanzania the HIV-exposed infant enrollment was quite low compared with the number of HIV+ women delivering in the hospital wards. The CQI team identified that the number of HIV-exposed infants enrolled in 2009 was low at 60%. The data were shared with the hospital administration team who designated one nurse to coordinate activities within the health facility. The activities included ordering and documentation of dried blood spot results; pregnant HIV+ positive women were educated on the importance of returning to the health facility with their infants within four weeks of delivery; proper documentation of sociodemographic information for easier patient tracing was also emphasized. Enrollment of HIV-exposed infants shot up to 80% (Figure 7.7).

Using Chart Abstractions to Improve Care

Medical chart reviews have been used to measure technical quality. The core strength of the medical chart is that it is ubiquitous and can generally be obtained after each encounter. Existing challenges to medical chart reviews include problems of legibility when notes are handwritten. One prospective study showed that charts identified only 40% of items
performed during the clinical encounter. This led the health facility's QI team to focus on medical documentation as a QI project, and after six months a sample review of charts revealed there was an increase in the completeness of the medical records from the random sample selected (Figure 7.8).

Where resources and infrastructure are sufficient, the EMR is becoming a priority for health systems worldwide. EMR technology promotes uniformity, legibility, and communication, which can lead to guideline use and reduce prescription errors. It also holds the promise of managing populations rather than individuals by aggregating patients into groups. In many countries, some impressive successes have occurred. Yet the use of EMR is not without challenges. Heterogeneity exists in record-keeping practices; challenges in maintaining medical records (both paper and electronic), and retaining effective data entry personnel are all barriers to effective use of EMR. We continue to push past these barriers in an effort to improve quality of services within health facilities.

**CD4 Campaign**

A large-scale drive to improve knowledge of CD4 cell counts among people receiving HIV care in a Tanzanian district resulted in increased uptake of CD4 testing, an increase in treatment initiation, and an improvement in patient retention. Late initiation of treatment remained a major challenge in developing countries, despite a WHO recommendation that treatment should be initiated before the CD4 cell count falls below 200 c/mm², wherever CD4 testing is available and resources permit. Treatment providers in Tanzania identified lack of CD4 testing and lack of knowledge of CD4 count by clinicians and patients as a barrier to timely initiation of treatment. They developed an intervention to improve the use of CD4 counts in clinical decision-making and raise awareness of the value of knowing one's CD4 count among patients. We launched a Know Your CD4 Campaign. Treatment providers estimated that about 3,000 people eligible for treatment but enrolled in care were not on treatment. These people were the target population of the campaign.

Outcomes included improved flow of patients through the health facility. Regular meetings between care and treatment clinic staff with laboratory personnel improved communication and teamwork. Patients became more knowledgeable about their care, and the introduction of a buddy system served to reinforce patient involvement in their own care.
Within the laboratories, instruments were used to maximum capacity, specimen-handling improved, and the number of specimens from each site increased. Cooperation among laboratory staff from different sites also improved. The number of CD4 samples increased by 114% from May 2007 (3,585 samples) to October 2007 (7,698 samples).

The campaign resulted in clinicians beginning ART earlier and more closely monitoring their patients, who in turn were more involved and knowledgeable about their own care. The number of CD4 tests and people on ART increased considerably. The CD4 campaign has been replicated successfully in Zambia and Kenya, improving the use of data as well as voluntary counseling and testing (Figure 7.9).

**Improving Retention**

QI teams across all countries are working with other components on setting up functional appointment systems and improving ART prescription pick-up. Studies have shown that patients who do not attend regular HIV care are significantly more likely to die and have poor adherence than those who maintain good contact with their HIV clinic. QI teams in Kenya identified adherence to clinic visits as a problem in their health facilities for patients on ART as well as non-ART patients. This led to the team conducting a PDSA to reduce the number of patients who missed their appointments. Activities to improve patient adherence to appointments included health education sessions that focused on the importance of keeping appointments, improved filing systems, greater use of data to identify and verify patients due for appointments, and active patient tracing for patients who missed appointments. These activities led to a significant reduction of missed appointments across clinics in Kenya and therefore an increase in retention.

**CONCLUSION**

Our program has demonstrated that quality care and excellent patient outcomes can be delivered and sustained in resource-constrained environments. The CQI framework enabled through systematic data collection, the use of electronic medical records and surveys provided a system that fed valuable information back to clinicians in a timely manner.
Health facility CQI teams used data from key indicators such as VCT, TB, and PMTCT enrollment, missed ARV pickup, missed CD4 tests, and cohort mortality. Data helped program staff monitor missed appointments, manage clinic schedules, and examine lost-to-follow-up and mortality rates. After identifying a challenge through observation or data analysis, AIDSRelief and facility staff discussed why the challenge might have come about and how it could be addressed. By making and observing incremental modifications to a process or system, teams were able to isolate simple variations to the status quo that made an impact before rolling out an expensive or complicated response that might not work. This paper-based longitudinal system linked to computerized data management system is highly effective and could be utilized in any resource-limited country to support improved patient outcomes.

REFERENCES


