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A quality improvement model for the rapid scale-up of a program to prevent mother-to-child HIV transmission in South Africa

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Abstract

Quality problem and assessment. In South Africa (SA), non-governmental organizations (NGOs) have a major role in the provision of health services, but they often compete for funding and influence rather than collaborate. The National Department of Health (NDOH) sought to coordinate existing non-governmental organizations (NGOs) to optimize the prevention of mother-to-child HIV transmission (PMTCT) at scale.

Solution. We describe how a group of NGO and government partners were brought together to jointly develop the 'Accelerated Plan' (A-Plan) to improve PMTCT services at health-care facilities in SA. The A-Plan used four main principles of large-scale change to align the network of NGO partners and NDOH: setting targets and improving data, simplifying processes and facilitating local execution, building networks and enabling coordination.

Implementation. In the first 6 months of the project, six NGO partners were engaged and the program reached 161 facilities. The program spontaneously spread from five planned subdistricts to nine subdistricts and produced a package of tested interventions to assist in scale-up of the PMTCT program elsewhere.

Evaluation. Districts reported high levels of provider engagement in the initiative. In the 6-month project period, a total of 676 health-care workers and managers were trained in quality improvement methods and tools. Coverage of seven key processes in the PMTCT program was tracked on a monthly basis within each subdistrict.

Lessons learned. We found that a network model for the A-plan could successfully recruit key stakeholders into a strong partnership leading to rapid scale-up of a life-saving public health intervention.

Keywords: PMTCT, HIV, scale-up, implementation, South Africa

Introduction

Around the world, low- and middle-income countries struggle to implement large-scale HIV/AIDS programs with limited or declining resources [1]. Despite availability of evidence-based protocols, increasing medication availability, and favorable policy and legislative environments, programs for maternal and child health have not achieved population-level health targets [2, 3]. Approaches are needed to speed the scale-up and adoption of effective, life-saving public health interventions within existing resource constraints.

Medical interventions that can virtually eliminate mother-to-child transmission (MTCT) of HIV are well described [4]. In the USA and Europe, MTCT rates have been reduced to <2%, yet high transmission rates persist in developing countries as they struggle to implement the complete package of PMTCT services [5–7]. In South Africa (SA) in 2009, surveillance studies of the PMTCT program reported MTCT rates of between 4.4 and 10.1% for 6-week old infants [8, 9]. More recent data suggest that in 2010, these rates have fallen to 1.9 from 6.2% [10]. Higher rates of infection can be expected for infants exposed to HIV-infected breast milk in the first 2 years of life [11]. SA's difficulties delivering key antiretroviral interventions to HIV-infected mothers and their children have contributed to worsening maternal, infant and child mortality rates over the past decade [12, 13].

In 2007, the SA National Department of Health (NDOH) had established a goal of reducing MTCT rates to <5% by 2011. Noting persistently high MTCT rates, the NDOH launched a health systems improvement intervention to rapidly

improve the performance of the PMTCT program in 18 priority districts over 18 months (January 2009–June 2010) [14, 15]. These districts included some of the most vulnerable, HIV-affected districts as well as districts where MTCT rates remained persistently high. Under the banner of a national initiative to improve MTCT called the 'Accelerated Plan' (A-Plan), the NDOH supported a network of NGOs to improve both 'supply' of and 'demand' for high-quality, reliable, evidence-based clinical care to prevent perinatal transmission of HIV.

Elsewhere in SA, the use of the model for improvement, collaborative networks and data quality improvement approaches had led to improved PMTCT service delivery [16, 17]. Based on these successes, the NDOH sought to apply these methods to improve the 'supply-side' of PMTCT service delivery. The primary objective of the A-Plan was to reduce MTCT rates to <5% in all intervention districts by improving DOH-NGO collaboration, providing clear shared aims and improving information flow between clinics and Districts and building networks amongst health facilities to spread best practice. In this report, we report on the design, specific methods, interventions and key processes that resulted in a coordinated response to support the district management teams to improve PMTCT performance.

Methods

The A-Plan was devised by the Division of Strategic Health Programs and the PMTCT Directorate in the NDOH. The plan had two main components to improve PMTCT service delivery: a 'demand-side' intervention that sought to increase the number of pregnant women attending antenatal care and gaining access to PMTCT interventions and a 'supply-side' intervention that sought to strengthen the reliable delivery of key PMTCT services at health-care facilities. The primary methodology used in the 'supply-side' intervention was quality improvement as described below.

The project had the following primary objectives: (i) to test the deployment of a support system for the NDOH, using quality improvement (QI) methods to improve the implementation of the PMTCT program in five subdistricts and (ii) to develop the knowledge and capacity at all levels of the health system to sustain and spread the improvement initiative.

Setting

The NDOH selected 18 health districts for improvement of PMTCT care processes based on their own internal criteria, which included considerations about PMTCT performance, socio-economic status and geographic coverage. Five subdistricts were chosen within these 18 districts by NDOH leadership to start the A-Plan.

Project administration and study period

The project was funded by the UK Department for International Development. The first subdistrict was engaged in May 2009 and the project and study ended in November 2009.

Assembly of prior knowledge and experience

Before the initiative was launched, the NDOH established three face-to-face meetings for the initiative: an initial harvesting meeting, a mid-term feedback meeting and an end-of-project meeting. IHI facilitated the harvesting meeting where all partners were asked to present their evidence-based best practices to overcome barriers encountered at seven key points in the PMTCT cascade (Fig. 1). During the harvesting meeting, all ideas were voted on by the partners. The highest value ideas formed a 'package' of interventions that were locally developed, tested and shown to be effective in SA to improve the performance of one or more aspects of PMTCT (Table 1). This provided a rich source of local knowledge and fostered a sense of collaboration and partnership among the contributing organizations. The partner NGOs continued to work together in a collaborative network throughout the A-Plan using conference calls, list-serve communications and two additional face-to-face meetings to share experiences and update the package of best practices.

Quality improvement methods

The A-Plan used four main principles of large-scale change to align the network of NGO partners and NDOH: setting the foundation for coordinating across all stakeholders, target-setting and improving the quality of data to inform progress towards those goals, simplification of complex clinical care processes and facility-level execution and network building [18]. Specific elements of these principles are described further in Table 2.

Coordination efforts focused on creating alignment between the NDOH, district departments of health and the existing NGO partners operating at the district level. For each clinical process associated with the PMTCT care pathway, all stakeholders agreed to targets that were reported in the SA District Health Information System (DHIS) (e.g. >95% of

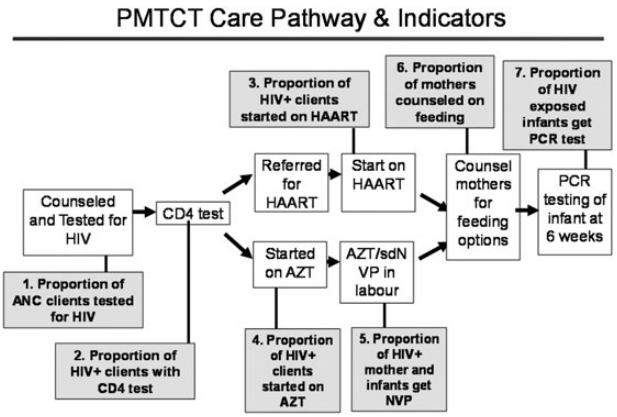

Figure 1 The PMTCT care pathway and indicators used in the accelerated PMTCT plan.

Table I Components of the technical manual of best practices to improve PMTCT

Problem	Best practice
Step 1: Early ANC booking (<20 weeks), counseling, HIV testing and CD4 testing	
Not all mothers are counseled and tested for HIV testing at first antenatal booking	Mandatory counseling, voluntary testing of all the first ANC bookings by: – Palpation only after counseling – Group or cohort counselling – Provider-initiated counseling and testing (nurses counsel if lay counselor busy or not there)
Not all HIV-positive mothers have CD4 test drawn	Draw blood for CD4 test with routine ANC bloods on first ANC booking Note: can either draw extra tube for CD4 or add on to full blood count depending on PHC or hospitals
Step 2: Treatment for patients w/CD4 >200	
Mothers have CD4 test drawn, but do not return for results	Audit CD4 register at the end of each month and contact all patients who did not get results and refer to appropriate location (crosslink with Step 3)
Mothers are often delayed AZT while waiting for CD4 count result	Start AZT immediately if HIV positive and >28 weeks pregnant at the time of first ANC booking (do not wait for CD4 count result)
Step 3: CD4 < 200: rapid referral and HAART initiation	
HAART clinics are overburdened and so clients are delayed in starting HAART while pregnant	Perform as many HAART preparation' steps at the PHC level as possible then coordinate fast track ARV initiation at the ARV site
Clients are referred for HAART but do not pitch up at ARV clinic	Use one or more of the following to improve reliability of patient referral from ANC to ARV site: – Walk patient to ARV clinic – Phone ahead – Give appointment card – Send SMS reminder
Clients are referred for HAART but no information is sent to the patient, which leads to delays and duplication	Use checklist with completed tasks and pertinent laboratory results to improve the quality of patient referral from ANC to the ARV site
Clients are delayed for HAART because a treatment supporter has not been identified	Start HAART without treatment supporter ('buddy') if you feel confident in the patient's ability to adhere
Step 4: Labor ward: three-hourly AZT during labor, sdNVP to mother and baby, and start AZT to infant	
The delivery of PMTCT medicines is unreliable during labor	Use a labor ward checklist to identify PMTCT patients and track interventions in the labor ward
It is not always clear which mothers are part of the PMTCT program	Mother's ANC card clearly marked with HIV status—for example, a CD4 bar code sticker on inside of card
Some mothers did not get tested during the ANC period but can still receive ARV for PMTCT	Mandatory counseling and voluntary testing to all 'unknowns' at the time of presentation. If HIV positive, give salvage therapy of sdNVP and AZT to mother and baby or baby alone (<48 h) if already delivered
Step 5: HIV exposed babies get PCR at 6 weeks	
The *post natal* care clinic does not always know which babies were HIV exposed	Communicate mother's PMTCT information to baby clinic by stapling ANC card to Road-to-Health Card (RTHC) for all mothers. Can also: – Discretely mark RTHC – Staple labor ward PMTCT checklist (Step 4A) to RTHC
PCR testing is not always reliable	Combine PCR test, immunization and mother's CD4 count, and make immunization the last step of 6-week visit

ARV, antiretroviral; AZT, Zidovudine; sdNVP, single-dose Nevirapine; QI, quality improvement.

Table 2 Core quality improvement activity areas of the intervention

Coordination and alignment
Strong alignment with the NDOH HIV/AIDS and STI strategic plan for SA
Ownership by national, provincial and district leadership of the initiative and expectation that the district leadership would 'champion' the A-Plan as a priority activity and that the district management team would implement the initiative
Integration of the A-Plan into existing PMTCT program efforts and operational plans of district health authorities
Utilization and strengthening of existing relationships between districts and NGO partners
Aims and data improvement
Development of district and facility specific aims based on past performance and future aspiration
Direct mentoring of clinic staff by NGO partners in methods to use local clinic data to guide performance improvement
Training of district information officers on data feedback, data process mapping and run-chart methods to improve the reliability of data collation and reporting
Improvement to the reliability, accuracy and completeness of data that are sent to the DHIS and feedback of core PMTCT indicators to district managers and facilities every month
Simplification and facility-level execution
Simplification of the clinical PMTCT pathway, using process mapping methods, and pairing each step with a related core process indicator to make it possible to measure progress on a regular basis
Identification of a core set of high-value 'best practices' that would result in removing specific bottlenecks when they emerged
Training of district managers and supervisors in the Model for Improvement, Plan-Do-Study-Act cycles, run-chart methods, root-cause analysis and process mapping
Network building
Spread of best practices across and within districts through the use of 'Breakthrough Series College' learning networks making the maximum use of pre-existing meeting structures and connectivity of partners
Building of capacity for continuous quality improvement at district, provincial and national levels through participation in QI workshops and feedback of project progress and methods to senior leaders

pregnant women would be tested for HIV). In order to ensure that the data in the DHIS were accurate, a data improvement process was undertaken to improve the quality of the data reported by each participating clinic.

At the facility level, the complex PMTCT cascade was simplified to seven essential steps (Fig. 1) with best practices to improve care at each step (Table 1). Facility-level improvement teams used the Model for Improvement and Plan-Do-Study-Act cycles to improve performance at each step in the PMTCT cascade. Finally, a structured format, known as the Breakthrough Series Collaborative (BTS), was used to build networks of participating A-Plan facilities (Fig. 2) [19]. In the BTS model, improvement is accelerated through opportunities for representatives from all levels of the health system to meet together ('learning sessions') to share lessons learned during the implementation of key PMTCT processes. In between the learning sessions, staff from partner NGOs visited clinical sites on a monthly basis to provide technical support to clinic staff as they planned, tested and evaluated changes to improve the PMTCT performance in repeated rapid improvement cycles.

Standardized tools

As part of the effort to standardize the improvement approach and prepare for scale-up, four manuals were developed to assist district managers, facilities and NGO partners to support the program. The four manuals included a technical manual of best practices (summarized in Table 1), an operational manual for district leadership, a facility-based quality improvement guide and a data improvement manual to assist clinicians to improve the quality of PMTCT data. In addition, 13 job-aids were created to assist facility staff to implement each of the best practices identified (all manual and job-aids are available in the Supplementary data, Appendix). A web-based, publicly accessible data repository was created to house all PMTCT data from the A-Plan facilities and districts.

Role of district management

The district health management was primarily responsible for the execution of the project. Before the project was initiated in a district, a meeting was convened with the primary stakeholders to familiarize district management and local NGOs with the health systems improvement methodology, provide onsite analysis of the latest PMTCT performance and trends from the district and establish strategies for effective stewardship of the program for the following 6 months. Each district assigned a project leader to take responsibility for implementation of the project in that district, and to be the key contact for communications with the NGO partners and the A-Plan team. The district nominated one or more NGO partners who were already providing health systems support to that district to assist with the A-Plan initiative. Ownership by local DOH leaders was considered essential prior to commencement of A-Plan interventions. DOH funds that were already programmed for PMTCT activities were mobilized to support the district staff participation in these efforts.

Role of partner NGOs

The project relied heavily on the participation of a group of NGOs who were designated by the district health management to provide ongoing support to participating facilities. Many had provided previous assistance with health system strengthening activities and some had provided additional

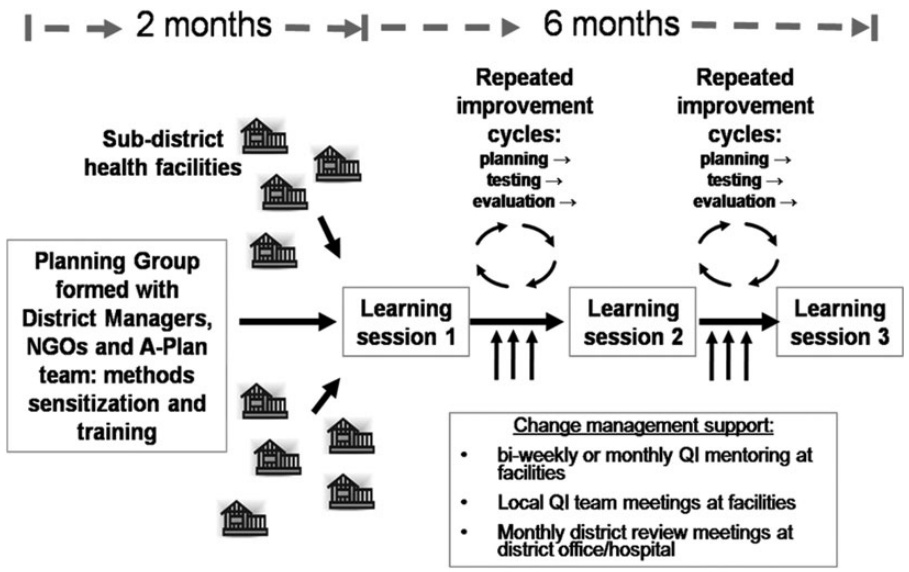

Figure 2 The breakthrough series model.

resources (health-care personnel and buildings) to support the HIV care program. These NGOs shared varying characteristics: four were local SA organizations, two were associated with Universities and one was international. Apart from supporting PMTCT services, all of these actors played other roles including support for maternal and child health, HIV services (outside of PMTCT) and TB services. In order to participate in the A-Plan, several of the NGOs reprogrammed existing PMTCT funds. Where prior funding was not available, a single donor funded the NGOs to participate.

At the outset, participating NGOs had varying levels of skills and experience with improvement methods. A 2-day training session at the beginning of the A-Plan, attended by representatives from all the participating NGOs, allowed them to coalesce around a common language, common design and common system of work for facility-level change that included the 'Model for Improvement' and the use of 'Plan-Do-Study-Act' (PDSA) cycles [20, 21]. Participating in the collaborative network describes above further accelerated the pace of change and learning [19].

Data collection and feedback

Data that tracked the performance of PMTCT processes of care (the seven indicators in Fig. 1) were collected on a monthly basis from each facility. These data were extracted and collated from the DHIS by NGO partners and fed back to the clinics. Monthly reports of the subdistrict performance were sent to the district offices and the A-Plan managers. We measured leadership and knowledge transfer of QI approaches by how official QI training sessions were led and managed by our NGO partners and DOH officials. We measured the degree to which NGOs collaborated with one another by participation in a monthly call and by attendance at beginning and end-line 'partners collaborative' meetings.

Ethics

The initiative was conceived and led by the SA NDOH to improve the performance in the target districts, and all interactions with patients were provided as part of routine care and exclusively by Department of Health staff. Formal ethics permission was sought from the University of North Carolina Institutional Review Board, which deemed the project exempt from full review as this was a *post hoc* analysis of a program of work applied without exception or exclusion across subdistricts in support of a public health system with the purpose of improving the performance of existing protocols, using existing guidelines. The analysis used only de-identified aggregate data that was reported routinely to the DHIS of the SA DOH.

Results

Rapid deployment of support system using QI approaches

By the end of the 6-month project period, a total of 161 facilities in nine subdistricts were included in the intervention. The A-Plan extended spontaneously from the original five subdistricts to nine subdistricts in response to demand from district managers who wanted to expand the program's activities within their districts (two subdistricts), a non-included district that sought to be included in the initiative (one subdistrict) and an NGO that felt confident to spread the initiative to another district where they were active (one subdistrict).

Development of QI knowledge and capacity for further spread

Six NGO partners were engaged in the A-Plan. In the 6-month project period, a total of 676 health-care workers and managers—including 115 district office staff, 473 facility-level

staff and 88 NGO staff—were trained in basic QI methods and tools (Model for Improvement, Plan-Do-Study-Act rapid-cycle change, process mapping, the BTS structure and the IHI Framework for Execution) [20–22].

We gauged knowledge transfer in how the QI learning sessions were led and executed. In all cases in the five original subdistricts, IHI team members led the first learning session. In all five, the second learning session was led either entirely by the NGO partner or by NGO in tandem with IHI. DOH officials participated actively in leading the second learning sessions. Third learning sessions were conducted in all cases entirely by the NGO partner in tandem with the local DOH officials. For the additional four subdistricts that were not part of the original design, these were led from the start by NGO partners. In one of these expansion subdistricts, the NGO involved decided not to adopt the A-Plan methods, preferring to continue to provide independent support to the district managers. Five of the six of the NGO partners participated in all monthly partners calls. All NGO partners participated in the beginning and end-line 'partners collaborative' meetings—in fact, the end-line meeting had attracted four other NGO participants.

Lessons learned

Health-care systems improvement principles have been proposed as an approach to help close the gap between current evidence-based knowledge and the ability of health systems to improve population health outcomes [22, 23]. These methods place a premium on peer-to-peer exchange, local adaptation and highly participative management [24]. Developed and widely used in high-income nations, these systems improvement methods have increasingly found their way into global health applications in developing nations [25–27].

The PMTCT 'A-Plan' tested and implemented the start-up phase of an ambitious effort to mobilize existing resources to improve the delivery of a complete package of PMTCT services at health-care facilities in SA. As described above, we met the primary objectives of the intervention which were to test the rapid deployment of a quality improvement approach to increase the effectiveness of PMTCT processes and to capacitate NGO partners and the DOH in quality improvement methods. Within 6 months, support from district management was mobilized and several NGO partners worked together towards the common goal of improving the PMTCT performance.

The major achievement of the A-Plan was to demonstrate how a systems improvement design could coordinate available resources and speed up implementation of guideline-based PMTCT care. Two notable achievements—rapid buy-in and project leadership by district managers, and collaboration of multiple supporting NGO partners—were responsible for early success of the intervention and provide a potential model for implementation of other large-scale programs in similar resource-constrained settings.

The rapid buy-in of the district management team could be attributed to deliberate attempts to engage the managers before the project launch. To communicate the aims and methods more credibly, we asked local NGOs who had used quality improvement methods previously to use their personal experiences with improvement methods to explain how the project would be executed. A few 'early adopter' subdistricts applied the methods more rapidly than others, and improvements were seen in specific parts of the PMTCT care pathway. Positive changes in performance amongst these early adopters were communicated widely to other district managers at existing, routine provincial and national PMTCT meetings which provided a major impetus for the demand-led expansion of the project beyond the initial five subdistricts.

In our experience, it is unusual to see NGOs working collaboratively, following a common methodology and strategy to support a national program, and sharing knowledge and experiences with each other. While NGO/government collaboration is common [28, 29] and multi-sectoral NGO collaboration has been used to bring together partners with different skills, [30] we are not aware of reported interventions that seek to harness numerous local NGOs to work together to achieve a common program-specific objective that is so closely tied to a common execution method and measurement system.

NGOs have a major role in the provision of HIV services in resource-limited settings, but typically these NGOs compete for available funding and geographic influence [31] The current pool of NGOs supporting government programs in resource-limited settings represents a considerable capacity, but their effect may be diluted through duplication of efforts and lack of coordination. This initiative demonstrates that this capacity can be systematically harnessed through coordinated action and the common use of methods derived from the field of quality improvement to the improve performance on a national scale.

Without a rigorous sociological analysis similar to recent studies of large-scale QI initiatives in patient safety, we cannot be sure of what elements led to the A-Plan's success [32]. However, we believe the A-Plan capitalized on an environment with many NGOs seeking ways to distinguish themselves, donors who were interested in systems strengthening methods, a group of leaders within the NGOs who were willing to work collaboratively based on strong personal relationships and a NDOH that had selected improvement methods based on prior experience in the country of these methods yielding improved PMTCT outcomes. Some of these conditions are commonly found elsewhere, while others may be more specific to this particular context and moment.

We did encounter implementation obstacles that limit the current and future effectiveness of similar interventions. Like many other national health systems delivering HIV services, PMTCT falls between HIV and maternal and child health directorates, and agreement on design and execution of novel programs required many months of discussion and negotiation. The novelty of the systems improvement methodology led to some uncertainty among program leadership in the DOH. Finally, while there was clear acknowledgement of benefit of the start-up phase of activities from national, provincial, district and facility managers, as well as participating NGOs, the intended scale-up of the program took time to move along due to funding difficulties.

Despite these limitations, the A-Plan is an important illustration of how to motivate health systems to improve and how

to engage multiple NGOs to collaborate. Recent calls from WHO and our SA colleagues have highlighted substantial gaps between the power of current evidence-based interventions and the inability of our health system to deliver these interventions to those in greatest need [2, 33, 34] There has been widespread recognition that such 'implementation' failures perpetuate unnecessary suffering, illness and death [35] The A-Plan has helped to remediate the implementation failure around PMTCT in SA by ultimately inspiring further support to complete coverage to the 18 priority districts and helping to secure financing to spread coordinated action to all 52 districts in the country [36, 37]

Systems improvement projects have sought to change health-care practice on a large scale [38] For example, quality improvement efforts in the Russian federation have reduced oblast-wide neonatal mortality by 60%; [39] in Niger, malnutrition-related fatality was halved in a single year; [40] in Ecuador, an essential obstetric care collaborative substantially reduced the incidence of *post partum* hemorrhage and [41] in projects in SA, we have seen rapid scale up of access to HIV care and treatment services and falling rates of MTCT of HIV at a district level [16, 42, 43]. These reports, as with the A-Plan, document district or regional spread, but only the A-Plan leveraged numerous NGOs and the government to achieve spread across multiple areas simultaneously.

The first phase of the SA PMTCT A-Plan effectively introduced and tested a systems improvement infrastructure and mobilized a supportive NGO network. This experience provides a useful model to respond rapidly, with evidence-based care, to other health-care challenges such as TB, chronic diseases, injuries and violence, using a system-based approach. Further study to collect complete and accurate data on similar multi-NGO collaborative efforts will be needed to validate this model in the future.

Supplementary material

Supplementary material is available at *INTQHC* Journal online.

Authors' contributions

K.S.M. designed the study, participated in its execution and coordination and helped to draft the manuscript. G.N. designed the study and led its execution and coordination. P.M.B. designed the study, participated in its execution and helped to draft the manuscript. All authors read and approved the final manuscript.

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