Improving Malaria Care: Experiences from Kenya

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Improving Malaria Care: Experiences from Kenya

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DISCLAIMER

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For more information on the work of the USAID ASSIST Project, please visit www.usaidassist.org or write assist-info@urc-chs.com.

Recommended citation

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<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ACT</td>
<td>Artemisinin-based Combination Therapy</td>
</tr>
<tr>
<td>AL</td>
<td>Artemether – Lumefantrine</td>
</tr>
<tr>
<td>ANC</td>
<td>Antenatal care</td>
</tr>
<tr>
<td>ASSIST</td>
<td>USAID Applying Science to Strengthen and Improve Systems Project</td>
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<tr>
<td>CME</td>
<td>Continuous Medical Education</td>
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<td>DHIS</td>
<td>District Health Information System</td>
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<tr>
<td>IP</td>
<td>Implementing partner</td>
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<tr>
<td>IPTp</td>
<td>Intermittent Preventive Therapy in Pregnancy</td>
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<tr>
<td>KQMH</td>
<td>Kenya Quality Model for Health</td>
</tr>
<tr>
<td>M&amp;E</td>
<td>Monitoring and evaluation</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>mRDT</td>
<td>Malaria rapid diagnostic test</td>
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<tr>
<td>MSCH</td>
<td>Matungu Sub County Hospital</td>
</tr>
<tr>
<td>OPD</td>
<td>Out-patient department</td>
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<tr>
<td>PMI</td>
<td>President's Malaria Initiative</td>
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<tr>
<td>QI</td>
<td>Quality improvement</td>
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<td>QIT</td>
<td>Quality improvement team</td>
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<tr>
<td>RTK</td>
<td>Rapid Test Kits</td>
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<td>TWG</td>
<td>Technical working group</td>
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<td>USAID</td>
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<tr>
<td>WIT</td>
<td>Work improvement team</td>
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**I. INTRODUCTION**

Malaria is the leading cause of morbidity and mortality in Kenya, with 25 million out of a population of 34 million at risk. The disease accounts for 30-50% of all outpatient attendance and 20% of all admissions to health facilities. An estimated 170 million working days are lost to the disease each year (Ministry of Health [MOH], 2001). Malaria is also estimated to cause 20% of all deaths in children under five (MOH, 2006). The group most vulnerable to malaria infections are pregnant women and children under five years of age.

In collaboration with partners, the government developed the 10-year Kenyan National Malaria Strategy 2009-2017, launched in November 2009 with the goal of reducing morbidity and mortality associated with malaria by 30% by 2009 and to maintain it to 2017.

There are several partners and stakeholders across Kenya who working towards realization of these objectives, however activities have traditionally lacked coordination, and there are also huge challenges with the malaria commodities supply chain. These challenges, if not addressed, will remain as bottlenecks for the realization of the strategic objectives. In view of this, the USAID Applying Science to Strengthen and Improve Systems (ASSIST) project was invited by the President’s Malaria Initiative (PMI) to apply quality improvement (QI) techniques in collaboration with county governments and USG implementing partners to strengthen capacity in program management in order to achieve malaria program objectives at all levels of the health care system.

**II. Implementation**

ASSIST’s malaria QI work was focused on the three high-burden counties of Siaya, Busia, and Kakamega. The objectives of the malaria QI work were to improve supply chain management of malaria diagnostics and antimalarial drugs from county level to facility level, streamline stakeholders’ support to the county, and improve case diagnosis and management at facility level.

ASSIST’s improvement advisor and malaria consultant, in collaboration with three Department of Health county governments, selected facilities with malaria high case load in each of the 25 sub-counties in June 2014. The laboratory, clinical officer, pharmacist, and sub-county malaria personnel from the selected facilities were then trained in the Kenya Quality Model for Health (KQMH) in August 2014. The trainees formed sub-county Quality Improvement Teams (QITs) in September 2014. However, the teams tabled addressing continuous QI issues. Instead, the QITs settled on quarterly sub-county Continuous Medical Education (CME) sessions and data reviews to help address the gaps in malaria case management. The CMEs were organized on the basis of the 25 centres of excellence that were selected for ASSIST to work directly with; nonetheless, all of the facilities were also involved.

In the same period, the county malaria coordinator formed a malaria technical working group (TWG). The TWG brought together all sub-county malaria coordinators, as well as the county pharmacist, county medical laboratory technologist, county health records officer, and the county director for health on a quarterly basis. After the QI sensitization sessions supported by ASSIST done in October and November 2015, the TWGs incorporated PMI partners into the team of sub county malaria coordinators, and county level pharmacist, records officer and laboratory. The focus shifted from handling only operation levels issues to planning, coordinating and providing oversight to the QITs. The TWG monitored the progress of the QITs, reviewed their reports, and gave recommendations on areas for improvement. Due to the TWG meetings, over time county governments took control of the malaria quality improvement activities and are now providing leadership among stakeholders.

Quarterly CMEs and TWGs continued for a year. A re-evaluation was done in August 2015, and it was established that few QITs were active. Some members of the QITs had dropped out and most of them did not have improvement charters to help them focus better. Sensitization training in QI was done by ASSIST for the sub county malaria coordinators, who were then serving as coaches in October and November 2015. The teams went back to their sub counties and reconstituted their QITs and selected improvement areas based on gaps observed at their facilities.
ASSIST oriented county health management teams on QI, trained them, and helped them form work improvement teams (WITs) who are pushing the QI agenda. WITs were formed at 25 high case load facilities and focused on improving malaria services by implementing the 3Ts strategy: test, treat, track.

ASSIST also supported monthly coaching sessions targeting the pharmacy, laboratory, and outpatient departments. The government’s malaria program coordinator holds meetings with the facilities to discuss improvement on the key malaria improvement outcomes. ASSIST supported the coaches with transport facilitation while the project’s technical officer attended some of the coaching sessions.

In December 2015, August 2016, March 2017 and May 2017 ASSIST supported malaria learning sessions. The first brought together three county and 25 sub-county malaria coordinators from the three focus counties and five county malaria coordinators from other counties within the region. It provided an opportunity for inter-county peer learning, sharing of change ideas across the 3T strategy, and achievements. The second learning session included additional improvement team members and the final two included the coaches and WIT members.

In February 2016, ASSIST shared malaria QI results at a national malaria case management meeting from Khunyangu sub-county Hospital (Busia County), providing an opportunity for other partners to adopt/adapt best practices from the facility. Thereafter, ASSIST was requested by the National Malaria Control Program (NMCP) to scale up the improvement work to other counties. Change ideas implemented at facility level include:

- Several CMEs conducted on malaria case management to educate on national guidelines
- Job aids on malaria case management provided in clinical rooms
- Posters of malaria case management put up in waiting areas to educate the clients on treatment of malaria only for confirmed malaria cases
- Health education to reinforce importance of not providing antimalarial if diagnosis is not confirmed
- Pharmacy to confirm malaria testing and diagnosis before issuing antimalarial. Pharmacist not issuing antimalarial if there is no evidence of malaria diagnosis through testing. They follow up antimalarial prescriptions that had no evidence of a test with the concerned clinician.
- Malava Health Centre introduced 24-hour laboratory services
- Monthly data review to compare cases registered as febrile illness in the outpatient department register, malaria tests conducted in the lab daily activity log, Rapid Test Kits (RTKs) daily activity register, and the malaria commodities daily activity register (which captures information on the patient ID, age weight band, malaria test done, and Artemether – Lumefantrine [AL] band issued). With this too, they are also able to check if the client had a correct dose of AL issued.

A. Spread of improvement

With the successes in the 25 malaria case management COEs across the three counties, the change ideas have been cascaded to other facilities within the counties through the sub-county level CMEs, and learning sessions. In October 2016 ASSIST increased its PMI scope to five counties from the initial three. In the two additional counties (Homa Bay and Migori) the focus being on malaria in pregnancy in 20 COEs. Appendix XI has a summary of change concepts identified to work by teams.

B. Results

Across the three case management counties, the percentage of supported facilities reporting stock-outs of malaria rapid diagnostic tests (mRDTs) decreased from 33% in October 2015 to 0 in May 2017 and the percentage with stock-outs of Artemisinin-based Combination Therapy (ACTs) decreased from 24% to 9% in the same time period (Figure 1). To learn more about how this was achieved, see Appendix I.
III. CASE STUDIES

The following are eight case studies developed from implementation of malaria QI activities in Kenya. Each describes the changes tested and results achieved by specific facilities. These case studies are intended to provide guidance to other stakeholders, county leaders, and implementing partners (IPs) who are interested in improving quality of malaria services. Appendix I, II, III, IV, VI, and VIII are on malaria case management work, while V and VII are on malaria in pregnancy.

- **Appendix I: Improving Commodity Security in 16 Malaria High Case Load Facilities in Busia, Kakamega, and Siaya Counties.** In this case study, the efforts undertaken to reduce stock-outs of malaria medicines and mRDTs. Teams conducted root cause analyses on commodity challenges on the demand side. A WhatsApp group was formed to track and report commodities; sites began testing all suspected malaria cases at night and during weekends and reserving m-RDTs for odd hours when laboratories were closed; and only issuing ACTs to client with confirmed malaria and change ideas were implemented to eliminate commodity insecurity. Sites were able to decrease stock outs of ACTs and m-RDTs from a median of 28 days at the start of the project, to less than five days.

- **Appendix II: Improving Documentation of Malaria Suspects at Shiamakhubu Health Centre Outpatient Department in Kakamega County.** At Shiamakhubu Health Centre, a review of the records in the department revealed that no client was documented as a malaria suspect in both the morbidity tally sheet and out-patient department (OPD) register. The team had weekly spot checks on documentation in May 2016. In parallel, they had a discussion on the client flow for enhanced documentation and client follow up with the clinician. Since May 2016, the team managed to decrease the proportion of missed malaria suspects tallied at the OPD to less than 5% since July 2016. Accurately tallying suspected malaria cases enables facilities to: plan commodities through forecasting (for testing in the lab and ACTs in the pharmacy) and staffing (roll calls and vacations) due to workloads.

- **Appendix III: Improving Malaria Case Management through Accuracy and Completeness of Data in the District Health Information System (DHIS): Case of Siaya,**
Busia, and Kakamega Counties. This case study explains the process WITs undertook to improve malaria case management data quality and reporting after they discovered discrepancies between their malaria source documents and the reported DHIS data. The WITs developed a number of changes to test, which included: Data Quality Audits, Data Validation, CMEs and on-job training on proper documentation. Through these efforts, within 5 months, 50% of their reported data in DHIS was accurate.

- **Appendix IV: Improving malaria case management at Khunyangu Sub-County Hospital, Kenya.** Khunyangu Sub-County Hospital’s WIT had high rates of presumptive treatment for malaria, with more than half of patients receiving ACTs without confirmation of malaria. The WIT developed a number of changes to test, including conducting continuing medical education sessions at the facility, displaying job aids, extending laboratory hours, informing clients of changes in procedure, and reordering patient flow. Through these efforts, 58.8% of their yearly supply of ACTs has been saved as a result of rational use, which provide approximately 10 months of additional ACTs to the facility.

- **Appendix V: Improving screening and management of malaria in pregnancy during first Antenatal Clinic Visit at Rongo Sub-County Hospital, Migori, Kenya.** It describes Rongo Sub-County Hospital’s efforts to increase routine screening for malaria at their first antenatal care (ANC) visit. Among the changes the QI team tested, they developed a malaria in pregnancy cascade tool to improve documentation and tracking of patients. Through these efforts, within 6 weeks, 100% of their first ANC visits had been screened for malaria.

- **Appendix VI: Improving Quantification of Parasitaemia on Confirmed Malaria Blood Smears at Matungu Sub County in Kakamega County.** At Matungu Sub County Hospital (MSCH). The MSCH laboratory team was required to report blood slides of confirmed cases in terms of the number of parasites observed, yet this was not being done. To address this, in September 2016 they conducted process mapping for malaria testing, and root cause analysis for failure to quantify parasitaemia. Sorting and setting was done in October 2016 to improve the work environment in the laboratory. In the preceding four months, quantification of malaria parasites on blood smears confirmed to have malaria increased from zero to greater than 90%.

- **Appendix VII: Improving Uptake of Intermittent Preventive Therapy in Pregnancy (IPTp) at Rachuonyo Sub County Hospital in Homa Bay County.** Rachuonyo Sub County Hospital (RSCH) wanted to improve uptake of IPTp to prevent malaria among pregnant women. The team began addressing this by providing on-the-job training in properly filling the antenatal care (ANC) register in early March 2017 by the coach and deputy coach. This was followed by a county level facilitative supervision targeting documentation, reporting, and quantification of malaria commodities. The facilitative supervision realized excess months of stock of SP in facilities in the sub county, and thus RSCH benefited from a redistribution exercise. In May 2017, new staff were deployed and the coach again provided training on documentation of ANC register and on the benefits of good malaria in pregnancy care and support. IPTp 1 uptake more than doubled the baseline median of 42% (October to December 2016) after three months of implementation (April 2017) and is a progressive high above 90%.

- **Appendix VIII: Khunyangu Sub County Hospital Spread Rational Use of ACTs at Bumala B, in Western Kenya.** In February 2016, the coach at Khunyangu Sub-County Hospital, an active QI site, selected a coach in Bumala B health facility and the two formed a WIT. The coach from Khunyangu with the support of ASSIST provided on-job training for the new coach at Bumala B in March 2016. The two coaches working together with the new WIT formed a work plan to help secure ACTs and ensure Bumala B follows through on the 3T model. ACT doses issued in Bumala B have since dropped from a median of 126% to 100%. Bumala B continues rationally using ACTs.

- **Appendix XI: Change Concepts for Improving Malaria Services as Established in Western Kenya.** The change concepts used to improve malaria case management and malaria in pregnancy are provided along with the rankings QI teams gave them.
IV. ANNEX

Appendix I: Improving Commodity Security in 16 Malaria High Case Load Facilities in Busia, Kakamega, and Siaya Counties
CASE STUDY

Improving Commodity Security in 16 Malaria High Case Load Facilities in Busia, Kakamega, and Siaya Counties

Summary
The USAID Applying Science to Strengthen and Improve Systems project (ASSIST) supports selected high-volume facilities in each sub county in Busia, Kakamega, and Siaya Counties in improving the quality of malaria case management. Sixteen (16) of the 25 facilities were experiencing shortages of artemisinin combined therapy (ACT) and rapid malaria diagnostic kits (m-RDT). To address the gaps in these essential commodities, ASSIST, in collaboration with the Department of Health in the three county governments, formed improvement teams at the counties, sub-counties, and facilities. Root cause analyses were conducted on commodity challenges on the demand side and change ideas were implemented to eliminate commodity insecurity. Employing the Plan-Do-Study-Act (PDSA) cycle; using the WhatsApp platform to track and report commodities; and integrating improvement activities in county, malaria schedule decreased stock outs of ACTs and m-RDTs from a median of 28 days at the start of the project, to less than five days.

Background
The USAID Applying Science to Strengthen and Improve Systems project (ASSIST), with funding from the President’s Malaria Initiative (PMI), began supporting quality improvement (QI) with a focus on improving malaria case management, increasing security of essential malaria commodities (ACTs and m-RDTs), and reporting through the test-treat-track (3T) model in June 2014. The three select counties were Busia, Kakamega, and Siaya Counties whereby 25 high-volume facilities, each drawn from the 25 sub-counties were selected to initiate QI in improving malaria case management. Since October 2016, ASSIST has been supporting implementation of malaria QI activities (both case management and malaria in pregnancy) in 45 facilities across five counties in Kenya.

Implementation
ASSIST’s improvement advisor and malaria consultant, in collaboration with three Department of Health county governments, selected facilities with malaria high case load in each of the 25 sub-counties in June 2014. The laboratory, clinical officer, pharmacist, and sub-county malaria personnel from the selected facilities were then trained in the Kenya Quality Model for Health (KQMH) in August 2014. The trainees formed sub-county Quality Improvement Teams (QITs) in September 2014. However, the teams tabled addressing continuous QI issues. Instead, the QITs settled on quarterly sub-county Continuous Medical Education (CME) sessions and data reviews to help address the gaps in malaria case management. The CMEs were organized on the basis of the 25 centres of excellence that were selected for ASSIST to work
directly with; nonetheless, all of the facilities were also involved. This approach would reach 403 facilities in the region with QI CMEs. In the same period, the county malaria coordinator formed a malaria technical working group (TWG). The TWG brought together all sub-county malaria coordinators, as well as the county pharmacist, county medical laboratory technologist, county health records officer, and the county director for health on a quarterly basis. The TWG monitored the progress of the QITs, reviewed their reports, and gave recommendations on areas for improvement.

Quarterly CMEs and quarterly TWGs continued for a year. A re-evaluation of case management indicators was done in August 2015 and disparate stock outs of ACTs and m-RDTs were found. In fact, 30% of the facilities had a median of 28 days of stock outs a month of these essential commodities. WhatsApp groups were then formed in each of the counties to track commodity status across the 25 sub-counties in September and October 2015. Members of the group included county and sub-county malaria control coordinators, county pharmacists, county laboratory technologists, as well as county health records information officers. Information regarding commodity status would be sent on the platform every month; including \textit{ad hoc} requests from fellow sub county malaria coordinators to their colleagues, in order to help them mitigate shortages in their sub counties by redistribution. Activity on the WhatsApp platform triggered sub-county- and county-wide redistributions in the three months that followed.

ASSIST performed a sensitization training in QI for the sub-county malaria coordinators, who were then serving as coaches in October and November 2015. The coordinators embarked on reconstituting their QITs and some even formed sub-county-based WhatsApp groups to track their commodities. In December 2016, lead members of all 25 QITs came together for the first QI learning session. It was proposed that coordinators should form work improvement teams (WITs) to further engage front-line health care workers. With the assistance of ASSIST in liaison with the county governments, WITs were formed during sub county and county review meetings convened in February and March 2016 in the counties.

Meanwhile, the review of commodity status was integrated in the quarterly CMEs by April 2016. All 403 facilities that participated in the sub county CMEs would share the ACT and m-RDT status in the CMEs and highlight steps taken to ensure appropriate management of these. Further, the various WITs proposed change ideas such as: testing all suspected malaria cases at night and during weekends; reserving m-RDTs for odd hours when laboratories were closed; and only issuing ACTs to clients with confirmed malaria. Coaching the 25 facilities that were targeting the 3T model commodity security began in June 2016. Out of the 25 facilities, 16 were established to have had long standing challenges with ACTs and m-RDTs, and these are the facilities that ASSIST, in collaboration with the county department for health, closely tracked and supported. Summary of implementation of change ideas is given in Figure 1.

The second malaria learning session was done in August 2016 and since then, the teams at the facilities have been working to ensure no more than a 5-day stock out of essential malaria commodities are reported.
Figure 2. Stepwise implementation of change ideas in the 16 facilities in Western Kenya

Figure 3. Percentage of facilities reporting stock-outs of either RTKs or ALs in Kakamega, Busia, and Siaya Counties (Oct 2015-May 2017)

Results
The median stock out days of ACTs and m-RDTs dropped from 28 to less than 5 days between October 2015 and November 2016 (Figure 2).

Figure 3: Percentage of facilities reporting stock-outs of either RTKs or ALs in Kakamega, Busia, and Siaya Counties (Oct 2015-May 2017)
**Lessons Learned**

Working systematically with teams to address demand-related commodity challenges is attributed to the success achieved with improving commodity security in the malaria case management sites that ASSIST has been working in, in Western Kenya.

**Next Steps**

In January 2017, USAID Kenya – PMI team motivated ASSIST to collaborate with existing PMI partners and county governments in the malaria lake endemic region to highlight and initiate improvement projects that will respond to the region specific challenges in essential malaria commodity security.
Appendix II: Improving Documentation of Malaria Suspects at Shiamakhubu Health Centre Outpatient Department in Kakamega County
CASE STUDY

Improving Documentation of Malaria Suspects at Shiamakhubu Health Centre Outpatient Department in Kakamega County

Summary
During a clinical encounter of a suspected malaria patient in Kenya, it takes the triad of the clinician serving the patient, the morbidity tally sheet, and outpatient register to correctly capture the patient as a malaria suspect. Complete and accurate documentation of suspected malaria enables clinicians and malaria programs to determine testing rates, workload and thus planning and resource allocation. In cases where documentation is incomplete and inaccurate, malaria tests done and documented in the laboratory can be used to identify untallied malaria cases in the outpatient department. Shiamakhubu health centre is one the 12 centres of excellence in Kakamega County. In a bid to ensure that they account for all malaria suspects, they resolved to use their quality improvement team to address this area. Working with a baseline report in April 2016, the team developed countermeasures for the root causes of the problem. Implementation of this work began in May 2016 and through teamwork, 100% complete and accurate data was reported in August and through October 2016 until there was stock out of tally sheets and health care providers went on strike in November and December 2016.

Background
Shiamakhubu Health Centre (SHC) was opened in 1975. It is a tier two facility located in Kakamega County, Shinyalu Sub-County, Murhanda Ward. It serves three Sub Locations Namely Itenyi, Mukulusu and Shiswa. It has a catchment population of 11,778. The annual workload is approximately 29,990. SHC offers in-patient and outpatient services. Malaria is the leading outpatient department (OPD) disease.

The USAID Applying Science to Strengthen and Improve Systems project (ASSIST), with funding from the President's Malaria Initiative (PMI), began supporting quality improvement (QI) with a focus on improving malaria case management in Kakamega County in June 2014. SHC is a high malaria caseload facility and was selected among 11 other facilities for initial implementation of malaria QI within the county. ASSIST is currently implementing malaria QI activities (both case management and malaria in pregnancy) in 45 facilities across five counties in Kenya.

Implementation

County Background
USAID ASSIST, in collaboration with Kakamega County Department for Health selected facilities with malaria high caseload in each of the twelve sub counties in June 2014. Laboratory, clinical officer,
Pharmacist and sub county malaria personnel from the selected facilities were then trained in Kenya Quality Model for Health in August 2014. The trainees formed sub county quality improvement teams (QITs) in September 2014. The QITs then conducted a baseline assessment on malaria case management and pinpointed large disparities in reporting, and adherence to national malaria guidelines. As a priority, the QITs settled on quarterly sub county continuous medical education (CME) sessions and data reviews to help address the gaps in malaria case management. In the same period, the county malaria coordinator formed a malaria technical working group (TWG). The TWG brought together all sub county malaria coordinators, as well as county pharmacist, county medical laboratory technologist, county health records officer, and the county director for health on a quarterly basis. The TWG monitored the progress of the QITs, reviewed their reports and gave recommendations on areas for improvement.

Quarterly CMEs and TWGs continued for a year. A re-evaluation was done in August 2015, and it was established that only three out of the 12 QITs were active. Some members of the QITs had dropped out and most of them did not have improvement charters to help them focus better. Sensitization training in QI was done by ASSIST for the sub county malaria coordinators, who were then serving as coaches in October and November 2015. The teams went back to their sub counties and reconstituted their QITs and selected improvement areas. Malaria case management theme for this team was on improving the test-treat-track (3T) cascade. The first learning session was done in December 2016. In this first learning session, members of the QITs and those proposed to be part of the work improvement teams (WIT) in the selected facilities participated.

**Shiamakhubu Health Centre**

SHC formed their QIT in March 2016. The QIT included the sub county malaria control coordinator, the records officer, laboratory and pharmacy personnel, and an OPD clinician.

In April 2016, the team agreed through consensus, to improve documentation of suspected malaria cases. A review of the records in the department revealed that no client was documented as a malaria suspect in both the morbidity tally sheet and OPD register. In the same month of April 2016, a process map (Figure 1) for OPD services was done but nothing revealing was established and hence nothing was done. Using a fishbone diagram, the team discovered that the lack of standard operating procedures on documenting malaria suspects; few available tally sheets; little understanding of the tally sheets; poor data storage and poor staff interpersonal qualities as root causes for the problem. As a result, the QIT developed change ideas and prioritized which countermeasures to implement first using the priority-setting matrix (Table 1).

Figure 4. Process Map for OPD services at Shiamakhubu Health Centre
Table 1. Priority-setting matrix used by the team. The highest scoring ideas were the first implemented

<table>
<thead>
<tr>
<th>Change Idea</th>
<th>Evidence</th>
<th>Pilot test</th>
<th>Importance</th>
<th>Difficulty</th>
<th>Scaleability</th>
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<td>3</td>
<td>5</td>
<td>3</td>
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<td>Monthly coaching coupled with weekly spot checks</td>
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<td>Daily supervision and reviews on use of tally sheets</td>
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<td>4</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

The team began seeking support from the sub-county health office for provision of photocopies of tally sheets at the OPD. This, combined with monthly support from the sub-county coach and weekly spot checks on documentation in May 2016, led to marked improvement. In June 2016, the team decided to have the OPD clinician conduct daily supervision and reviews on use of tally sheets. Parallel, a discussion on the client flow for enhanced documentation and client follow up with the clinician was done in August 2016 with the support of the ASSIST’s project officer and county malaria coordinator.

**Results**

Since the inception of the QI project in May 2016, the team managed to decrease the proportion of missed malaria suspects tallied at the OPD to the desired of less than 5% since July 2016. Though the team could not get photocopies from the sub county office in November 2016, less than 5% of clients were not tallied at the OPD (Figure 2). Accurately tallying suspected malaria cases enables facilities to: plan commodities through forecasting (for testing in the lab and ACTs in the pharmacy) and staffing (roll calls and vacations) due to anticipated workloads.
Lesson Learned

The good results of this work have been attributed to team work, and judiciously working through priority countermeasures to address poor documentation at the OPD.

Next Steps

The team is now seeking to spread these change concepts to the rest of the 44 selected malaria facilities supported by ASSIST in Western Kenya.
Appendix III: Improving Malaria Case Management through Accuracy and Completeness of Data in the District Health Information System (DHIS): Case of Siaya, Busia, and Kakamega Counties
CASE STUDY

Improving Malaria Case Management through Accuracy and Completeness of Data in the District Health Information System (DHIS): Case of Siaya, Busia, and Kakamega Counties

Summary

Facilities in three high malaria burden counties (Siaya, Busia and Kakamega) formed Work Improvement Teams (WITs) in October 2015 to improve malaria case management data quality and reporting. They reviewed their malaria source documents in comparison with the reported DHIS data and identified gaps. The WITs developed a number of changes to test, which included data quality audits, data validation, continuing medical education (CME) and on-the-job training on proper documentation. Through these efforts, within 5 months, 50% of their reported data in DHIS was accurate. By May 2017, 95% of facilities in the three counties had complete and accurate malaria data in DHIS.

Background

Busia, Siaya, and Kakamega are malaria endemic counties in Kenya surrounding Lake Victoria with a prevalence rate of 27% compared to the national prevalence rate of 8% (National Malaria Indicator Survey 2015).

The USAID Applying Science to Strengthen and Improve Systems project (ASSIST), with funding from the President’s Malaria Initiative (PMI), began supporting quality improvement (QI) with a focus on documentation and reporting in the three focus counties in October 2015. ASSIST is currently implementing malaria QI activities in 45 facilities across five counties in Kenya, two of which are focused on malaria in pregnancy.

Implementation

In August and September 2015, it was identified by the ASSIST QI advisor and monitoring and evaluation (M&E) team that the counties did not have sub-county QI teams despite having been trained on the Kenya Quality Model for Health (KQMH) in June 2014 (Figure 1). The KQMH stipulates in its dimensions on leadership that at every health level there should be a functional QI team. In this regard, sub-county teams were

Figure 6: Timeline of QI work

- Sub-County QIT (MLTs, Pharmacists, Records, SCMCs)
- Reviewed quarterly malaria TWGs
- Sensitization on QI
- Integrated QI CMEs (Case management, QI projects, Sub-county data reviews)
- Monthly QI CMEs
- Malaria LS; NMCP Engagement
- PMI Partner collaborations
- Monthly QI CMEs
- WIT Formed
- Coaches and SCMCs Oriented in coaching
- QI projects firmed up
- Implementation in line with the PDSA cycle

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This case study was authored by Lindah Chebet, Maero Lutta, and Nicholas Sewe of University Research Co., LLC (URC) and produced for review by the United States Agency for International Development (USAID) by the USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project, funded by the American people through USAID’s Bureau for Global Health, Office of Health Systems. The project is managed by URC under the terms of Cooperative Agreement Number AID-OAA-A-12-00101. URC’s global partners for USAID ASSIST include: EnCompass LLC; FHI 360; Harvard T.H. Chan School of Public Health; HEALTHQUAL International; Initiatives Inc.; Institute for Healthcare Improvement; Johns Hopkins Center for Communication Programs; and WI-HER, LLC. For more information on the work of the USAID ASSIST Project, please visit www.usaidassist.org or write assist-info@urc-chs.com.
formed in conjecture with the facility based work improvement teams (WITs) (which were functional and running in some facilities after the training in June 2014) in an attempt to mainstream QI at facility, sub-county, and county levels. However, most of the teams formed were dormant due to national and county teams being hesitant to buy in to the QI work. In October 2015, teams were re-sensitized on QI and new teams were formed where needed. Following QI trainings from ASSIST on malaria case management, the WITs were formed between January and February 2016 at the facilities were formed and included: the nursing officer in charge of the departments, clinician in charge of the out-patient departments, the facility pharmacists, laboratory technologist, and health record departments. QI coaches who in most incidences are clinicians within the facilities supported the WITs.

In order to identify gaps, the teams together with their QI coaches and ASSIST QI Officers, reviewed their data on completeness and accuracy of data reported on DHIS. They realised that their data was inaccurate and not in tandem with DHIS data. The WIT conducted a fishbone analysis to determine root causes of these gaps and developed changes to test to improve documentation and reporting on malaria case management. They decided their first change would be to have the data persons clean all the data as well as have the Sub-County Health Records Information Officer (SCHRIO) provide on-the-job training and mentorship to the health records staff in the facility on malaria case management documentation and reporting. They provided mentorship on timely, accurate and complete data reporting as well as weekly data review and cleaning in both the DHIS and the source documents (Figure 2).

**Figure 2: Snapshot of validated data in Matungu Sub-County Hospital, Kakamega County**

<table>
<thead>
<tr>
<th>Months</th>
<th>Under 5</th>
<th></th>
<th>Over 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec-16</td>
<td>512</td>
<td>561</td>
<td>258</td>
</tr>
<tr>
<td>Jan-17</td>
<td>1017</td>
<td>1612</td>
<td>456</td>
</tr>
</tbody>
</table>

Quarterly data validation was identified as a key component of the change ideas that would assist in the improvement process. This was done by comparing facility based reported data with validated data and source documents with data reported on DHIS. The team also developed a cascade template that would be used to ensure and monitor if all data was accurately completely and timely filled.

On a weekly basis, the teams sat down together to assess their data, clean it, and use this data for decision-making. They looked at the documentation tools such as the tally sheets used to calculate the number of patients who were malaria suspects and those with confirmed malaria. In their weekly reviews, teams began to see improvements. For instance, when reporting stock of malaria commodities (rapid test kits, AL medicine) most facilities would not accurately fill the data on DHIS. When it came to receiving M-RTKs and AL from Kenya Medical Supply Authority (KEMSA), based on data indicated in the DHIS, most facilities would experience stock outs before the end of the month. After the data cleaning, data validation, mentorship, coaching and formation of QI teams, there was a shift in this indicator and facilities reduced the frequency of stock outs of AL and m-RTKs.

**Results**

Since the WIT began their continuous validation processes, the percentage of accurately and completely filled data in the DHIS has greatly improved (see Figure 3). By May 2017, 95% of facilities in the three counties had complete and accurate malaria data in DHIS.
Facilities previously reported cases in which patients were treated on AL yet they had not been tested for malaria. When further investigated with the PMI team, it was discovered that there were various causes that led to this and the main one was the lack of m-RTKs or electricity to conduct microscopy (for the facilities that owned a microscope). When probed further it came to the attention of the PMI team that stocks of commodities were distributed based on the malaria cases reported in the DHIS meaning a facility cannot receive more m-RTKs or ALs if the reported malaria cases are low.

The improvement on data reporting has therefore not only improved accuracy and completeness of data in the DHIS, but has reduced stock-outs of key commodities because KEMSA is now basing supply distribution on accurate needs. This improves facilities’ ability to follow the key malaria case management dimensions: Test-Treat-Track (3T) model as stipulated by the National Malaria Control Programme, Ministry of Health, and the World Health Organization (WHO).

**Figure 3:** Facilities with complete and accurate malaria data in DHIS in 3 malaria case management Counties (Oct 2015-May 2017)

**Facilitating Factors**

The counties attribute their success to the PMI, county health management teams; facility leads, especially departmental leads who form the QI teams and WITs; and above all the Health Records department.

**Lessons Learned**

- Continuous shared and peer learning sessions between QI team is core to QI.
- County governments are generally receptive to QI initiatives as they are viewed from a cost effectiveness perspective. For instance, when you look at the cost in poor documentation of malaria RTKs and ALs stock, it results in over stocking of drugs, which is expensive for the county. Enhanced partner coordination through county TWGs is a useful approach for implementation of QI approaches. The county malaria coordinator formed a malaria TWG. The TWG brought together all sub county malaria coordinators, county pharmacist, county medical laboratory technologist, county health records officer, and the county director for health on a quarterly basis. The TWG monitored the progress
of the QI teams, reviewed their reports, and gave recommendations on areas for 

improvement. This led to accountability and even one language when reporting to PMI on 

these counties.

- Increasing data demand and information use. Counties now realise the importance of 

accurate and complete data reporting, namely that it leads to quality decision making for 

instance in procurement of drugs, nets and other malaria case management initiatives.

This is among the most important factors leading to QI.

**Next Steps**

Encouraged by what they have achieved, the CHMT, QI teams and WITs are exploring other ways to 

strengthen accurate, timely and completely recorded/reported data in the DHIS.
Appendix IV: Improving malaria case management at Khunyangu Sub-County Hospital, Kenya
CASE STUDY

Improving malaria case management at Khunyangu Sub-County Hospital, Kenya

Summary
Khunyangu Sub-County Hospital formed a work improvement team (WIT) in May 2014 to improve malaria case management. They reviewed their data to look for gaps for the first time and quickly saw they had high rates of presumptive treatment for malaria, with more than half of patients receiving artemisinin-based combination therapies (ACTs) without confirmation of malaria. The WIT developed a number of changes to test, including conducting continuing medical education sessions at the facility, displaying job aids, extending laboratory hours, informing clients of changes in procedure, and reordering patient flow. Through these efforts, 58.8% of their yearly supply of ACTs has been saved because of rational use, which provide approximately 10 months of additional ACTs to the facility. As a result, there have been no stock-outs of anti-malarials, despite erratic supplies.

Background
Khunyangu Sub-County Hospital in Busia County, Western Kenya provides preventive and curative services through outpatient and inpatient departments. The USAID Applying Science to Strengthen and Improve Systems project (ASSIST), with funding from the President’s Malaria Initiative (PMI), began supporting quality improvement to improve malaria case management in Busia County in May 2014. Khunyangu Sub-County Hospital is a high malaria caseload facility and was selected, along with four other facilities, for initial implementation of malaria quality improvement within the county. ASSIST is currently implementing malaria quality improvement activities in 25 facilities across three counties in Kenya.

ASSIST is currently implementing malaria quality improvement activities in 25 facilities across three counties in Kenya. The hospital formed a WIT in May 2014 following trainings from ASSIST on quality improvement and malaria case management. The WIT included the clinician in charge of the out-patient department, the facility Pharmacist, Laboratory Technologist, a nurse, and the head of the records department. They reviewed their data to look for gaps for the first time and quickly saw they had high rates of presumptive treatment for malaria with more than half of patients receiving ACTs without confirmation of malaria. Of 6,683 cases diagnosed clinically, only 4,306 were confirmed through laboratory testing. They also knew they experienced stock-outs of ACTs because of irrational use. The WIT conducted a fishbone analysis to determine root causes of these challenges and developed changes to test in order to reduce discrepancies between confirmed malaria cases and prescribing of ACTs.

Implementation
The County and Sub-County formed a malaria technical working group (TWG) at each level comprised of the County Malaria Coordinator, County Medical Lab Technologist, County Pharmacist, County Clinical Officer and sub-county health managers to spearhead the implementation of the national policy on malaria. The members of the WIT at Khunyangu Sub-County Hospital not only oversee their departments.

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at the hospital, but also supervise other sub-county facilities. The WIT knew they faced a knowledge gap among clinicians who presumptively prescribed ACTs. The hospital already held regular continuing medical education (CME) sessions, so the WIT decided their first change would be to add CMEs on the national guidelines for malaria case management. This change was designed to ensure that providers follow the national guidelines, test all patients presenting with fever for malaria, and not treat presumptively. In the past, staff would typically wait until they were called by the ministry to attend trainings. Through CMEs held at the hospital, different WIT members began covering the various aspects of malaria case management in weekly sessions, emphasizing the necessity of sending patients for confirmatory testing at the laboratory. WIT members also began conducting on-the-job training to refresh skills and support staff and provided job aids in clinical rooms.

They began to see improvements with increases in patients receiving tests, but discrepancies remained. In August 2014, there were 472 clinical case and 393 cases were confirmed, but they saw in the registers that 985 ACTs had been dispensed. The WIT realized that the problem was that some personnel were buying ACTs to take home to people who were sick at home or in the community and that not all patients were being recorded in the registers. They added all of the pharmacy staff to the WIT and changed hospital operations to only allow technical staff to dispense treatment adhering to a strict drug dispensing policy.

Another challenge the WIT encountered was that the laboratory closed at 4pm, while patients would still be coming. The Laboratory In-Charge agreed to extend the hours to 6pm. Also at the laboratory, they had frequent shortages of reagents. They discussed this with the Superintendent and began reordered supplies in advance of using them up instead of waiting until they were gone.

In Kenya, ACTs are provided at health facilities free of charge but patients do have to pay for laboratory testing. Because of this, the WIT found that if they told patients to go to the cashier before the laboratory, patients were more likely to leave without getting the test done. Thus, the WIT changed the patient flow to go to the cashier at the end of their visit. For patients who cannot pay for the testing, there is a Social Worker at the hospital to help them sign up for fee waivers.

After improving dispensing of ACTs, the WIT faced a new challenge. Patients were used to receiving ACTs when presenting with fevers and did not understand the changes. The WIT began discussing the importance of rational use of ACTs during morning health education talks and hung posters in English and Kiswahili informing clients of the change.

**Results**

Since the WIT began testing changes, trends of ACTs dispensed versus confirmed cases have greatly improved (see Figure 1). Roughly, 98% of patients receive confirmatory tests now. The WIT attributes this 2% gap to patients who come after laboratory hours and are admitted as in-patients due to high fever. The national guidelines state that in case such as these, providers should treat presumptively. The total number of ACTs dispensed 6 months before the intervention were 12,608 and 5,190 after the intervention. This translates to approximately 58.8% of ACTs saved as a result of rational use which could provide approximately 10 months of additional ACTs to the facility. As a result, there have been no stock-outs of anti-malarials despite erratic supplies.

**Facilitating Factors**

The Khunyangu WIT attributes their success to teamwork and support from the hospital administration. Prior to forming the WIT, each department of the hospital ran independently of each other. “It’s hard to approach a colleague from another department and correct them,” said the WIT Chair. Having each department represented on the WIT, however, allowed them to synchronize efforts across the hospital system. The support from the hospital administration has been invaluable to the WIT and helped them source funds for reagent supplies, hire more support staff for the Records Department, and purchase fuel for a generator.
Box 1. Center of Excellence: Bumala B Health Center

In March 2016, ASSIST and the members of the WIT at Khunyangu Sub-County Hospital began working with the staff at Bumala B Health Center to establish themselves as a Center of Excellence (COE), focusing on improving malaria case management. Bumala B was chosen to serve as a COE because it is a high-volume clinic, it has all the departments to deal with malaria case management (clinical, laboratory, pharmacy, and records), and it has qualified personnel. After initial quality improvement training from ASSIST and supportive supervision from the WIT of Khunyangu Sub-County Hospital, Bumala B established a WIT with the two Clinical Officers, nurse, Laboratory Technician, and Pharmacy Technician. They looked at their clinical processes to see if patients were getting confirmatory tests, if they were receiving their results, and getting the right treatment. They also looked at their registers and pharmacy records to see if they matched. The WIT realized they needed to focus on patient management, documentation, and commodity management and developed an improvement action plan. The first change they made was to have monthly data review meetings and to review the weekly surveillance reports together. Previously, these had been completed and submitted solely by one of the Clinical Officers. Now, they review the reports together and discuss discrepancies they see. This change led to others. They discussed with clinicians the importance of not treating just based on the clinical diagnosis and asked clinicians to stop writing presumptive diagnoses on patient cards and in registers. This is to ensure that the confirmed diagnosis is the only one recorded. They have also established new registers in the laboratory in which they only track malaria tests. This is to make data review faster for the WIT. The WIT also reordered the patient flow. Prior to their improvement efforts, patients would arrive at the facility, visit the register, go to triage and have their vitals taken, go to consultation, then the laboratory, back to consultation for their results, then to the pharmacy for treatment, then a final stop to the register to record their diagnosis and treatment before departing. The WIT found that registers were often incomplete because patients would leave after visiting the pharmacy. Now, patients are entered in the register at registry, where they receive a stamp to signify that their final diagnosis has been recorded before going to the pharmacy. The team still has challenges of inadequate staffing and occasional stock-outs of test kits, but they are positive about the improvement they have achieved. They are eager to continue their efforts, and working with community units to sensitize patients to the benefits of the changes to malaria case management and are planning more changes to test in the coming months.

The Bumala B Health Center’s quality improvement action plan. Photo by Kate Fatta, URC.
Lessons Learned

The WIT is very clear that the marked improvement in malaria case management at the facility required a team effort from all departments and hospital leadership. Consistent data reviews are also necessary and teams need to meet frequently to discuss gaps and changes. The WIT also recognizes that staff need to be open to change, embrace the malaria case management guidelines, and stay up to date on technical issues through regular CMEs.

The improvement efforts at Khunyangu Sub-County Hospital were designed to not only improve care at their facility, but also to equip them with skills and understanding of quality improvement for malaria case management so they could establish and coach a Center of Excellence at Bumala B Health Center (see Box 1 for the Bumala B story).

Next Steps

Among patients there remain some negative perceptions of the changes in malaria care at Khunyangu. Patients are disappointed when they do not receive ACTs, and some buy them outside the hospital, despite negative test results. To address this, the WIT is considering a number of changes, including engaging community health volunteers and community health extension workers to spread messages, to tap into community health action days, to tailor their messaging to address patients’ concerns, and to add patient representatives to the WIT.

Encouraged by what they have achieved, the WIT has also spread quality improvement initiatives to other departments within the facility, including the Comprehensive HIV Care Clinic, and is exploring other areas of care they can improve together.
Appendix V: Improving screening and management of malaria in pregnancy during first Antenatal Clinic Visit at Rongo Sub-County Hospital, Migori, Kenya
CASE STUDY

Improving screening and management of malaria in pregnancy during first Antenatal Clinic Visit at Rongo Sub-County Hospital, Migori, Kenya

Summary
Rongo Sub-County Hospital formed a work improvement team (WIT) in November 2016 to improve malaria case management. They reviewed their malaria data to look for gaps for the first time and quickly saw that pregnant women were not routinely getting screened for malaria at their first antenatal care (ANC) visit which was compounded by poor documentation for those who were screened. The WIT developed a number of changes to test, which included: on the job training of staff on malaria in pregnancy, development and use of a malaria in pregnancy cascade tool, redesigning patient flow, client health talks on effects of malaria in pregnancy and importance of screening, and case management. Through these efforts, within 6 weeks, 100% of their first ANC visits had been screened for malaria. The team has been able to maintain this performance to date.

Background
Rongo Sub-County Hospital in Migori County provides preventive and curative services through outpatient and inpatient departments. There are an estimated 1,160 pregnant women within the facility catchment area. An average of 60 first antenatal care (ANC) clients are attended to monthly in the Maternal Child Health (MCH) Clinic.

The USAID Applying Science to Strengthen and Improve Systems project (ASSIST), with funding from the President’s Malaria Initiative (PMI), began supporting quality improvement (QI) with a focus on screening and management of malaria in pregnancy in Migori County in November 2016. Rongo Sub-County Hospital is a high malaria caseload facility and was selected, along with nine other facilities, for initial implementation of malaria QI within the county. ASSIST is currently implementing malaria QI activities in 45 facilities across five counties in Kenya.

Implementation
The hospital formed a work improvement team (WIT) in November 2016 following a training from ASSIST on QI and malaria case management. The WIT included the nursing officer in charge of the MCH Clinic, nurses within the department, clinician in charge of the out-patient department, the facility pharmacist, laboratory technologist, and the two staff from health records department. The WIT was supported by a QI coach who is a clinician within the facility.
In order to identify gaps, the team, together with their QI coach and ASSIST QI Officer, reviewed their data on screening of pregnant women at first ANC visit for malaria; testing for those who are symptomatic during subsequent visits; and treatment of confirmed malaria cases. They realised that screening of pregnant women for malaria during first ANC visit was low and documentation of malaria screening for those who had been screened was poor. Mothers who were symptomatic were also referred to the outpatient department (OPD) for clinical consultation then to the laboratory for testing which led to drop outs along the cascade.

The WIT conducted a fishbone analysis the first week of January 2017 to determine root causes of these gaps and developed changes to test to improve documentation, screening, and treatment of confirmed malaria cases (Figure 1). They began testing changes the following week.

**Figure 8: Fishbone diagram used for root cause analysis by WIT at Rongo Sub-County Hospital**

The WIT decided their first change would be to have the coach provide on the job training and mentorship to the staff in the facility on malaria screening and case management in pregnancy and documentation of results in the ANC register.

The pharmacist provided mentorship on commodity forecasting and quantification and timely ordering of rapid diagnostic tests (RDTs) and antimalarials to prevent any stock outs.

To increase client awareness, the facility began discussing the effects of malaria in pregnancy and the importance of screening, testing, and treatment for malaria during the morning health talks at the MCH Clinic.

The WIT redesigned the patient flow to reduce leaks along the cascade. This ensured that the symptomatic pregnant women were attended to at the ANC clinic instead of being referred to the OPD.
The team also developed a cascade template that would be used to ensure and monitor if all first ANC clients were screened symptomatic cases tested and confirmed cases treated appropriately (Figure 2). They monitored their data on a weekly basis and began to see improvements.

**Results**

Since the WIT began testing changes, the number of first ANC women who are screened for malaria has greatly improved (Figure 3). 100% of all first ANC clients are now screened for malaria. Three pregnant women have been confirmed to have malaria since the team began their QI project and all have been treated as per the national guidelines.

**Figure 9: Malaria in pregnancy identification and treatment cascade template created by the WIT**

![Malaria in pregnancy identification and treatment cascade template created by the WIT](image)

**Figure 10: Malaria screening among first ANC visits at Rongo Sub-County Hospital, Migori County (Dec 2016-Feb 2017)**

![Malaria screening among first ANC visits at Rongo Sub-County Hospital, Migori County (Dec 2016-Feb 2017)](image)
Lessons Learned

The Rongo WIT attributes their success to teamwork and support from the hospital administration. The WIT is very clear that the marked improvement in malaria screening and case management among pregnant women at the facility required a team effort from all departments and hospital leadership. Consistent data reviews are also necessary and teams need to meet frequently to discuss gaps and changes. The WIT also recognizes that staff need to be open to change, embrace the malaria case management guidelines, and stay up to date on technical issues through regular continuing medical education.

Next Steps

While it is mandatory to screen for malaria during ANC visit in the lake endemic region, there are challenges with access particularly in high volume (tier 3 onward) facilities. High volume facilities have user fees that cut out eligible clients who cannot afford them. In the lower tier facilities, lack of operational laboratories or lack of malaria RDTs prevent them from consistently screening women for malaria during ANC. These are some of the challenges to be surmounted. However, encouraged by what they have achieved, the WIT is exploring other areas of care they can improve together. They are now exploring new malaria in pregnancy indicators for improvement.

Changes tested

- Design and use of a malaria in pregnancy cascade tool
- On job training of health workers on malaria in pregnancy
- Timely ordering of RDT’s and antimalarials
- Morning health talks with women
Appendix VI: Improving Quantification of Parasitaemia on Confirmed Malaria Blood Smears at Matungu Sub County in Kakamega County
CASE STUDY

Improving Quantification of Parasitaemia on Confirmed Malaria Blood Smears at Matungu Sub County in Kakamega County

Summary

The USAID Applying Science to Strengthen and Improve Systems project (ASSIST) has been supporting quality improvement (QI) with a focus on improving malaria case management in Kakamega County since June 2014. In February 2016, Matungu Sub County Hospital (MSCH) formed a work improvement team with the goal of improving malaria testing of suspected malaria cases through quality improvement. Rapid improvement was achieved with this initial work that they began looking for new areas to work on. In August 2016, laboratory personnel were trained in expert microscopic examination of blood slides for malaria parasites. MSCH laboratory team was required to report blood slides of confirmed cases in terms of the number of parasites observed. Two months passed by without the team having begun quantifying malaria parasites on confirmed blood smears. The coach working with the ASSIST’s Project Officer picked this as an improvement theme, and at the end of September 2016 conducted process mapping for malaria testing, and root cause analysis for failure to quantify parasitaemia. Countermeasures were identified and small tests of change initiated in October 2016 to help the team improve. In the preceding four months, quantification of malaria parasites on blood smears confirmed to have malaria increased tremendously from zero to greater than 90%, and the team has since sustained this performance.

Background

Matungu Sub County Hospital (MSCH) is one of 12 malaria case management centers of excellence in quality improvement in Kakamega County. It serves a catchment population of about 50,000 people. The facility offers both curative and preventive services. Malaria is the leading cause of morbidity and mortality in this facility. Approximately 2,800 clients are tested for malaria and its positivity rate is about 25%. In August 2016, laboratory personnel in MSCH were trained in expert microscopic examination of blood slides for malaria parasites by Malaria Care in conjuction with the Ministry of Health (MoH). The MSCH laboratory team was required to report blood slides of confirmed cases in terms of the number of parasites observed. Two months passed by without the team having begun quantifying malaria parasites on confirmed blood smears.

The USAID Applying Science to Strengthen and Improve Systems project (ASSIST), with funding from the President’s Malaria Initiative (PMI), began supporting quality improvement (QI) with a focus on improving malaria case management in Kakamega County in June 2014. MSCH is a high malaria case load facility and was selected among 11 other facilities, for initial implementation of malaria QI within the county. ASSIST is currently implementing malaria QI activities (both case management and malaria in pregnancy) in 45 facilities across five counties in Kenya.

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Implementation

County Background

ASSIST, in collaboration with Kakamega County Department for Health selected facilities with high malaria case load in each of the 12 sub counties in June 2014. A laboratory, clinical officer, pharmacist, and sub county malaria personnel from the selected facilities were then trained in Kenya Quality Model for Health in August 2014. The trainees formed sub county quality improvement teams (QITs) in September 2014. The QITs then conducted a baseline assessment on malaria case management and pinpointed large disparities in reporting, and adherence to national malaria guidelines. As a priority, the QITs settled on quarterly sub county continuous medical education (CME) sessions and data reviews to help address the gaps in malaria case management. In the same period, the county malaria coordinator formed a malaria technical working group (TWG). The TWG brought together all sub county malaria coordinators, as well as the county pharmacist, county medical laboratory technologist, county health records officer, and the county director for health on a quarterly basis. The TWG monitored the progress of the QITs, reviewed their reports, and gave recommendations on areas for improvement.

Quarterly CMEs and TWGs continued for a year. A re-evaluation was done in August 2015, and it was established that only three out of the 12 QITs were active. Some members of the QITs had dropped out, and most of them did not have improvement charters to help them focus better. Sensitization training in QI was done for the sub county malaria coordinators, who were then serving as coaches in October and November 2015. The teams went back to their sub counties and reconstituted their QITs and selected improvement areas. The malaria case management theme for this team was on improving the Test-Treat-Track (3T) cascade. The first learning session was done in December 2016. In this first learning session, members of the QITs and those proposed to be part of the work improvement teams (WIT) in the selected facilities participated.

Matungu Sub County Hospital (MSCH)

Matungu was one of the three active QITs. It was found that this was because all the QIT members were from MSCH whereas the inactive QITs were comprised of sub-county level officials who did not have enough contact with the facilities in order to drive improvement activities. In February 2016, a WIT for malaria case management was formed at the out-patient department in the hospital. The team conducted their first root cause analysis and put in place change ideas to further improve the 3T model in March 2016, after a coaching meeting done regionally. By forming an improvement team comprising front-line personnel phenomenally improved results of the 3T cascade, so much that by June 2016 the facility was considering new improvement areas. This improvement was shared at the second learning session for malaria case management held in August 2016.

In August 2016, laboratory personnel were offered a chance to train in expert microscopic examination of blood slides for malaria parasites. Nonetheless, two months passed by without the laboratory having begun quantifying malaria parasites on confirmed blood smears. The coach working with ASSIST’s Project Officer picked this as an improvement theme, and at the end of September 2016 the WIT with the support of their coach conducted process mapping (Figure 1) for malaria testing, and root cause analysis using the fish bone diagram (Figure 2) was done for failure to quantify parasitaemia.

Figure 11: The WIT’s process map
A simplified tree and matrix table (Table 1) was used to establish countermeasures. The small tests of change were initiated by the WIT in October 2016 to help the team improve.

Table 2. Simplified Tree and Matrix Table used by the team

<table>
<thead>
<tr>
<th>Problem / Issue</th>
<th>Root Cause</th>
<th>Counter-measure</th>
</tr>
</thead>
</table>
| Use of plus system instead of quantification in reporting positive malaria cases. | Knowledge gap on quantification and interpretation of results. | • Training of laboratory staff on quantification.  
• OJT for those not trained.  
• CME on interpretation of results. |
| Old Microscope | | • Procure a better microscope. |
| Sorting and setting | | • CME on 5s (Work Environment Improvement)  
• Lab to do sorting and setting of their work environment. |
| WHO Guidelines on Malaria parasite reporting | | • Provide the malaria guidelines in laboratory |
| Workload and staff shortage | | • Forward to hospital QI team and management for action. |

Sorting and setting was done in October 2016 to improve the work environment in the laboratory. Copies of the WHO guidelines on malaria parasite reporting were downloaded online by the coach who shared the soft copy with the laboratory staff in November 2016. During their departmental meeting in the same month, the unit in-charge agreed to harmonize work schedules for the department to ensure balanced allocation of duties at peak and off-peak hours and days in the calendar.

This work was shared in the third case management learning session in March 2017.
Results

Since the team in the laboratory began testing the changes, the proportion of slides confirmed with malaria have increased astronomically and remained above 90% (see Figure 3).

Figure 12. Percentage of malaria slides with positive results return with parasitaemia quantified

Lesson Learned

The team at MSCH attribute their improvement to a functional team and their commitment to tackle countermeasures within their capacities. They acknowledge the value of working on areas with easily achievable gains. The WIT strived to address root-causes and factors within their scope, other than wait for the health managers and county government to address strategic level issues such as staff posting.

Next Steps

Laboratory personnel at MSCH are looking at engaging more with the QIT to help address strategic level countermeasures such staff shortages and postings, even as they continue working on simpler improvements. Utilizing the QIT should then enable them achieve 100% quantification of malaria parasites for all confirmed blood smears.
Appendix VII: Improving Uptake of Intermittent Preventive Therapy in Pregnancy (IPTp) at Rachuonyo Sub County Hospital in Homa Bay County
CASE STUDY

Improving Uptake of Intermittent Preventive Therapy in Pregnancy (IPTp) at Rachuonyo Sub County Hospital in Homa Bay County

Summary
The use of Sulfadoxine Pyrimethamine (SP), commonly known as fansider in pregnant women without malaria has been shown to provide requisite protection against the disease in malaria endemic regions. A dose of SP is given to women at 16 weeks’ gestation, four weeks apart as a directly observed therapy during antenatal clinic (ANC). Greater therapeutic benefits are realized with more intermittent preventive treatment in pregnancy (IPTp) doses. In Kenya, momentum is gaining towards pregnant women receiving three or more doses of IPTp. Rachuonyo Sub County Hospital formed a quality improvement team in November 2016. Following a brainstorming and multi-voting exercise, they settled on improving IPTp uptake. A baseline assessment was done, followed by process mapping, root cause analysis, and development of change ideas to address poor IPTp uptake. Deming’s Plan–Do–Study–Act (PDSA) cycle was followed during implementation, and by closely tying their performance to the prioritized countermeasures, the team has since improved uptake of both IPTp 1 and IPTp 3 or more from baseline median of 45% to uptakes greater than 90%.

Background
Rachuonyo Sub County Hospital (RSCH) is situated in Kasipul Sub County in Homa Bay County in Kenya. The facility serves a catchment population of 41,739 people. The hospital offers basic and emergency, curative and preventive services; among them maternal and child health services.

The USAID Applying Science to Strengthen and Improve Systems project (ASSIST), with funding from the President’s Malaria Initiative (PMI), began supporting quality improvement (QI) with a focus on preventing malaria in pregnancy in Homa Bay County in November 2016. RSCH is a high malaria caseload facility and was selected, along with seven other facilities, for initial implementation of malaria QI within the county. ASSIST is currently implementing malaria QI activities in 45 facilities across five counties in Western Kenya, a malaria endemic lake region.

Implementation
RSCH formed a quality improvement team (QIT) in November 2016. The QIT members were trained in quality improvement by ASSIST in the same month using the Kenya Quality Model for Health curriculum. The QIT comprised of a maternal and child health (MCH) nurse, an outpatient department clinical officer, a laboratory technologist, a pharmacist, a records officer, and the sub county malaria control coordinator.

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The clinical officer served as the coach while the MCH nurse as deputy coach. To select an improvement area, the QIT with the support of ASSIST’s Improvement Advisor conducted a situation analysis of malaria in pregnancy indicators, brainstormed and multivoted settling on improving IPTp uptake. Uptake of IPTp 1 (given to eligible pregnant women for the first time in that pregnancy) was taken as the outcome measure, while IPTp 3 or more (third or more SP dose given in subsequent ANC visits) as the balancing measure.

To address the performance gap, the team in December 2016, discussed and accepted their previous client flow (Figure 1), and went head on to determining the root causes of poor IPTp 1 uptake among their ANC clients. A fish bone diagram (Figure 2) was used to identify the root causes in questions.

Change ideas (countermeasures) for the root causes were then identified through brainstorming (summarized in Table 1). To ensure that the QIT tackled the change ideas systematically, to enable them conclusively address the problem and its root causes, a decision

![Figure 1. Process map drawn by the team to show client flow in ANC](image1)

![Figure 13. Fish bone diagram used by the team](image2)

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Change idea</th>
</tr>
</thead>
</table>
| Stock out of SP             | • Budget allocation for SP.  
                             • Supervision of Rural Health facilities and redistribution of SP.  
                             • Creating a proper system favorable for ordering and distribution of SP.  
                             • Ensuring the availability of SP in the KEMSA list of essential drugs. |
| Improper Filling of ANC Register | On job Training Of MCH staff on register filing                       |
matrix was used to prioritize the countermeasures (Table 2). A work plan was then developed to guide implementation.

Fortnight QIT meetings were convened and reviews (study) of the previous work plans and latest data on the IPTp uptake done. Decision (-Act) on whether to modify, change, or disregard previous changes would then be made. Another fortnight plan would be drawn reflecting the latest decision and members would disperse to implement (-Do) again. However, the team did not meet twice in December 2016 because of an ongoing national health worker strike. A coaches review meeting was held for the county in mid-January 2017 and subsequently every two months. ASSIST supported the team to conduct continuous medical education sessions (CMEs) in quality improvement twice in a quarter. A joint ASSIST and county coaching visit was held in February, April, and May. A harvest meeting for the county was held in April 2017 to share lessons and progress on the improvement projects being implemented by the teams in the county.

The first small test of change by the team was on providing on-job-training (OJT) to MCH staffs in properly filling the ANC register in the first and second week of March 2017 by the coach and deputy coach. This was followed by a county level facilitative supervision targeting documentation, reporting, and quantification of malaria commodities in the third week of March 2017. The facilitative supervision realized excess months of stock of SP in facilities in the sub county, and thus RSCH benefited from a redistribution exercise done in the same month of March 2017. In May 2017, new staff were deployed to support the MCH, and the coach again provided OJT on documentation of ANC register and on the benefits of good MIP care and support.

### Table 4. Prioritization of change ideas / countermeasures

<table>
<thead>
<tr>
<th>Change Idea</th>
<th>Importance</th>
<th>Scope Control</th>
<th>Chances of success</th>
<th>Total score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget Allocation for SP</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Supervision and Redistribution Of SP</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Bringing on Board Sub county pharmacist with the aim of having SP in KEMSA</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>essential list of drugs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On job Training of MCH staff on proper Register filling</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

### Results

IPTp 1 uptake more than doubled the baseline median of 42% (October to December 2016) after three months of implementation (April 2017) and is a progressive high above 90%. An equivalent increase was also achieved with IPTp 3 or more (see Figure 3 comparing IPTp 1 and IPTp 3 or more uptake).
Lessons Learned

By working as a team to improve IPTp 1, the team realized that an equivalent measure of effort translates into improving new area of focus—IPTp 3 or more. Further, heightened county and sub county level support and coordination was realized amidst this improvement work that enabled the team to tackle factors beyond SP shortages.

Next Steps

This team is seeking to ensure that all women eligible for IPTp are issued with the drug. Consideration is also being made on improving early ANC onset as a process measure, with a concentration on increasing the number of eligible women accessing IPTp 3 or more.
Appendix VIII: Khunyangu Sub County Hospital Spread Rational Use of ACTs at Bumala B, in Western Kenya
CASE STUDY

Khunyangu Sub County Hospital Spread Rational Use of ACTs at Bumala B, in Western Kenya

Summary

Khunyangu Sub-County Hospital is one of the seven high volume hospitals in Busia County, in Western Kenya. It started implementing quality improvement (QI) in June 2014 when the USAID Applying Science to Strengthen and Improve Systems (ASSIST) project introduced its work in Busia County. The hospital experienced Artemesinin Combination Therapy (ACT) stock outs due to irrational dispensing of Artemether-Lumefantrine (ALs). There were no stocks of ACTs in March 2014 prompting a sub county redistribution in April 2014. In May 2014, ACTs issued were three times more than the number of confirmed cases. ASSIST introduced QI in the facility and the county in June 2014. Employing a range of QI tools and techniques, the facility was able to eliminate irrationally issued ACTs, translating to approximately 7 months of ACTs saved by January 2015. In the months that followed, the team embarked on ensuring good commodity practices with available ACT dose bands securing their stocks further. They began involving other facilities in the sub-county during sub-county continuous medical education (CME) sessions, Bumala B being one of them. In February 2016, the coach at Khunyangu selected a coach in Bumala B and a Work Improvement Team (WIT). The coach from Khunyangu helped the WIT at Bumala B implement the changes they had tried in Khunyangu to help secure their ACT and follow through on the test-treat-track (3T) model. ACT doses issued in Bumala B have since dropped from a median of 126% to 100%. Bumala B continues rationally using ACTs.

Background

Khunyangu Sub-County Hospital is one of seven high volume hospitals in Busia County, Western Kenya, with average outpatient attendance of 2,263 patients monthly. Average confirmed malaria cases among children is 540, 434 among adults, and 8 among pregnant women monthly. This improvement work involved the County, Sub-County Malaria Coordinators, USAID Applying Science to Strengthen and Improve Systems (ASSIST) project malaria QI advisor, ASSIST regional QI project officer and facility Work Improvement Team (WIT) comprising of hospital pharmacist, lab technologist, clinician in charge, nurses in out-patient department, and community representative. The hospital experienced Artemesinin Combination Therapy (ACT) stock outs due to irrational dispensing of Artemether-Lumefantrine (ALs). In May 2014, ACTs issued were three times more than the number of confirmed cases. This also created an avenue for losses of ACTs to imaginary clients as well as unconfirmed cases of malaria. There was staff resistance in accepting Malaria policy among staff.

Bumala B is a health centre in the same, Butula, sub-county with Khunyangu. It has a catchment population of 17,627. Monthly average out-patient department (OPD) workload is 2,870. Each month, between 500 and 1,000 cases of malaria are seen among all patients seen including pregnant women and under-fives.

Implementation

Khunyangu experienced stock outs of ACTs in March 2014 prompting an ACT mop up in the sub-county and redistribution at the sub county hospital in April 2014. In May 2014, ACTs issued were three times more than the number of confirmed cases. ASSIST introduced QI in the facility and the county in June 2014. Employing a range of QI tools and techniques, the facility was able to eliminate irrationally issued ACTs, translating to approximately 7 months of ACTs saved by January 2015. In the months that followed, the team embarked on ensuring good commodity practices with available ACT dose bands securing their stocks further. They began involving other facilities in the sub-county during sub-county continuous medical education (CME) sessions, Bumala B being one of them. In February 2016, the coach at Khunyangu selected a coach in Bumala B and a Work Improvement Team (WIT). The coach from Khunyangu helped the WIT at Bumala B implement the changes they had tried in Khunyangu to help secure their ACT and follow through on the test-treat-track (3T) model. ACT doses issued in Bumala B have since dropped from a median of 126% to 100%. Bumala B continues rationally using ACTs.

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county in June 2014. A quality improvement team (QIT) was formed in the same month of June 2014. The QIT comprised hospital pharmacist, lab technologist, clinician in charge, nurses in OPD, and community representative. During their first QIT meeting, the team conducted their first root cause analysis and determined that ACT losses were due to clinician treating malaria suspects for malaria clinically without a confirmatory laboratory test, in the same vein, the pharmacists were issuing ACTs to all patients prescribed the drug by the clinician without cross-checking if they were confirmed with malaria. Certain medical colleagues and family members of staff, were said to be walking in to the pharmacy and requesting ACT doses for their alleged malaria like symptoms. The flow of clients allowed suspected malaria cases from other facilities to directly access the pharmacy on entering the facility.

Employing the tree and matrix diagram to prioritize change ideas, the coach, then the hospital pharmacist, called for a meeting and sensitized the clinicians at the OPD on the 3T strategy. Clinicians also agreed to screen patients from other facilities requiring ACTs to consult with them first in the new client flow at the OPD. The pharmacy department also held a meeting and resolved not to issue any ACT unless a client had a confirmed malaria diagnosis. A notice (Figure 1) was put outside the pharmacy door and serving window informing clients about ACTs being issued to only confirmed cases. The lead pharmacist offered to establish a corner in the dispensing cupboard to hold ACTs for colleagues and or family members of staff said to ‘walk in’ and demand ACT doses. This first set of change ideas that were tested resulted in a phenomenal drop in the ACTs dispensed in the months that followed.

A QI training was the conducted to the QIT members by ASSIST in August 2014. The QIT begun meeting fortnightly. Meeting cycles followed that the first meeting done in the month focused on discussing progress of their improvement changes and work plan, while the second one, done before fifth of the new month, discussed malaria reports and indicators. The community health worker provided health education on malaria case management, and on the expected client flow.

In December 2014, ASSIST, in liaison with the county, introduced monthly county level TWG meetings to discuss malaria 3T model and commodity status. At the same time, quarterly malaria case management continuing medical education (CMEs) began at the facility to increase knowledge and skills on identification, diagnosis, management, and reporting of malaria cases. The QIT reverted to having their meetings monthly, in view of the additional support and improvements in the ACT doses. However, around May 2015, Busia County experienced serious procurement challenges with the Kenya Medical Supplies Agency (KEMSA), and the network that would deliver commodities including essential antimalarial collapsed. County malaria office refocused their efforts in attempting to salvage the looming commodity insecurity. Consequently, the TWGs and CMEs collapsed. The regional project officer from ASSIST reinitiated the monthly TWGs in October 2015 and restructured the CMEs to sub county based. More facilities were thus reached with malaria case management CMEs. Data QI sessions were introduced in the malaria CMEs, in November 2015 following the second QI sensitization. All participating facilities were required to table and discuss their malaria data, explain inaccuracies and highlight the steps they were going to take to improve it. It was at this point that Bumala B was first engaged by Khunyangu.

Figure 14. Notice on antimalarial on the pharmacy window at Khunyangu
In December 2015, the first malaria learning session was held and Khunyangu show-cased their improvement work to the rest of QIT representatives from Busia, Kakamega and Siaya participating. Bumala B did not take part in the first learning session. However, ASSIST called on the representatives to form WITs in their facilities to fast track improvement work. Instead, Khunyangu spotted an opportunity to spread the changes they had so far tested and were working for them (Table 1). In February 2016, the coach at Khunyangu selected a coach in Bumala B and the two formed a WIT. The coach from Khunyangu with the support of ASSIST provided on-job training for the new coach at Bumala B in March 2016. The two coaches working together with the new WIT formed a work plan to help secure ACTs and ensure Bumala B follows through on the 3T model. Subsequent work plans have since been formed by the WIT on a quarterly basis (Figure 2).

Bumala B has since realized a drop in ACTs dispensed. They have participated in subsequent malaria learning sessions, August 2016 and May 2017.

Table 5. Aim and Change Idea table tested by Khunyangu and Implemented by Bumala B

<table>
<thead>
<tr>
<th>Aim</th>
<th>Change Idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving malaria diagnosis among suspected cases</td>
<td>- Several CMEs conducted on national malaria case management guidelines</td>
</tr>
<tr>
<td></td>
<td>- Education of clients on malaria case management policy, through posters in</td>
</tr>
<tr>
<td></td>
<td>waiting areas and morning health education talks</td>
</tr>
<tr>
<td></td>
<td>- Redesigning of outpatient client flow</td>
</tr>
<tr>
<td></td>
<td>- Provision of malaria rapid test kits (RTKs) in OPD, for use when the</td>
</tr>
<tr>
<td></td>
<td>laboratory was too busy or lab reagents were out of stock</td>
</tr>
<tr>
<td>Improving ACT dispensing practices</td>
<td>- Job aids on malaria case management provided in clinical rooms</td>
</tr>
<tr>
<td></td>
<td>- AL strictly issued to confirmed cases in pharmacy with follow up of</td>
</tr>
<tr>
<td></td>
<td>antimalarial prescriptions with no evidence of diagnosis with concerned</td>
</tr>
<tr>
<td></td>
<td>clinician</td>
</tr>
<tr>
<td></td>
<td>- Hospital Medicine and Therapeutics Committee revived to monitor rational</td>
</tr>
<tr>
<td></td>
<td>use of AL</td>
</tr>
<tr>
<td>Improving medical documentation in patient and facility record tools</td>
<td>- Monthly data review to compare cases registered as febrile illness in the</td>
</tr>
<tr>
<td></td>
<td>outpatient department register, malaria tests conducted in the lab daily</td>
</tr>
<tr>
<td></td>
<td>activity log, RTK Daily activity register and malaria commodities daily</td>
</tr>
<tr>
<td></td>
<td>activity register</td>
</tr>
</tbody>
</table>
Both teams collected data on a monthly basis and plotted on a run chart during the implementation periods with ASSIST (Figure 3).

**Results**

By employing QI concepts, the ACT dispensed dropped from a median of 247% to 93% in Khunyangu between March 2014 and March 2016; while, that of Bumala B from 126% to 100%.

**Figure 3. Improvement Run Chart on Percentage of ACT doses issued over Malaria Cases (Mar 2014-May 2017)**

The facility has not presumably treated suspected malaria cases clinically for Khunyangu since September 2014 and Bumala B since October 2015. Total number of ACTs dispensed 6 months before and after the intervention were 11,444 and 5,355 respectively at Khunyangu translating to 53.2% of ACTs saved as a result of rational use providing approximately 7 months of additional ACTs to the facility. Similarly, no stock outs of ACTs have been experienced by the two facilities since they started took up improvement work.

**Lesson Learned**

Dedicated leadership, which sets clear improvement priorities, early identification of QI champions, motivated and strong improvement teams coupled with regular data collection and performance review and shared learning increase the potential for improvement as well as for spreading and scaling up quality improvement work.

**Next Steps**

Health facilities (such as the malaria lake endemic in Western Kenya) that have sustained improvement in their work for at least six month, should feel comfortable spreading and scaling up QI in other facilities within their reach, and possibly far and beyond by transcending change concepts established from their cycles of small tests of change.
Appendix XI: Change Concepts for Improving Malaria Services as Established in Western Kenya
## Change Concepts and their rankings for Malaria Case Management

<table>
<thead>
<tr>
<th>Change Idea</th>
<th>Evidence from Guidelines (1= Strongly disagree Support, 5 = Strongly Support)</th>
<th>Evidence from Pilot test (1= Strongly disagree Support, 5 = Strongly Support)</th>
<th>Relative importance (1= Not Important Support, 5 = Very important)</th>
<th>Difficulty or complexity (1= Very Difficult, 5 = Easy)</th>
<th>Scalability (1= Not easily replicable or needs works, 5 = Ready to spread)</th>
<th>Total rating (Out of 25 if all categories used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional WIT</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>Team work</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Bench marking</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Improved patient flow</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Proper documentation</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Weekly data review</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>CMEs on malaria</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>24</td>
</tr>
</tbody>
</table>
## Change Concepts for Preventing Malaria in Pregnancy

<table>
<thead>
<tr>
<th>Problems identified</th>
<th>Root Causes</th>
<th>Feasibility Score</th>
<th>Prioritized Root Cause</th>
<th>Change Concepts for Prioritized Root Cause</th>
</tr>
</thead>
</table>
| 1. Low IPTp uptake in ANC | i. Stock outs / Erratic supply  
ii. Documentation  
iii. Lack of knowledge  
iv. Poor community linkage  
v. Competing task | 18/25  
17/25  
14/25  
10/25  
08/25 | Stock outs | a) Commodity management  
b) Facility linkage  
c) Resources mobilization |
| 2. Low Hb screening at ANC | i. Stock out  
ii. Documentation  
iii. Knowledge gap  
iv. Referrals from other facilities  
v. Long waiting | 15/25  
14/25  
10/25  
08/25  
08/25 | Stock out | a) Prioritize cuvettes for ANC clients  
b) Proper commodity management.  
c) Facility linkage  
d) Resource mobilization |
| 3. Low malaria screening | i. Stock outs of reagents  
ii. Documentation  
iii. Long waiting time  
iv. High work loads | 25/25  
18/25  
14/25  
12/25 | Documentation | a) Weekly data review  
b) To improvise the black book for capturing the mother who have been screened  
c) Conduct on job training. |
| 4. Low ANC visits | i. Poor community linkage  
ii. Knowledge gap  
iii. Community mapping  
iv. Poor heath seeking behavior  
v. Late ANC visit | 08/25  
10/25  
10/25  
12/25  
16/25 | Late ANC visits | a) Use community health volunteers to bring ANC clients earlier e.g. before 16 weeks  
b) Use of referral forms by the CHVS  
c) Screening mothers of reproductive age pregnancies |
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