REPUBLIC OF RWANDA

MINISTRY OF HEALTH

RWANDA INTEGRATED MALARIA CONTROL GUIDELINES

Rwanda Biomedical Centre

Healthy People, Wealthy Nation

Edition 2024

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Rwanda Integrated Malaria Control Guidelines

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List of Abbreviations

ACT	Artemisinin-based Combination Therapy
AL	Artemether Lumefantrine
ANC	Ante-Natal Care
SBC	Social Behavior Change
CDC	Center for Disease Control
CHAN	African Nations Championship
CHW	Community Health Worker
CPDS	Coordinated Procurement and Distribution System
DHS	Demographic and Health Survey
EPI	Expanded Program on Immunization
EQA	External Quality Assurance
FY	Fiscal Year
GF	Global Fund
GoR	Government of Rwanda
HBM	Home Based Management
HBMA	Home Based Management in Adults
HMIS	Health Management Information System
HSSP III	Third Health Sector Strategic Plan
ICCM	Integrated Community Case Management of Malaria
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
IVM	Integrated Vector Management
LLINs	Long-Lasting Insecticide Nets
MCHIP	Maternal and Child Health Integrated Program
MCP	Malaria Contingency Plan
MIP	Malaria In Pregnancy
MIS	Malaria Indicator Survey
MoH	Ministry of Health

MOPDD	Malaria and Other Parasitic Diseases Division
MSP	Malaria Strategic Plan
MTEF	Mid-Term Expenditure Framework
NRL	National Reference Laboratory
NSP	National Strategic Plan
NTD	Neglected Tropical Diseases
PCR	Polymerase Chain Reaction
PMI	President's Malaria Initiative
PSM	Procurement and Supply chain Management
QC	Quality Control
QMIA	Quality Management Improvement Approach
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SBC	Social Behavior Change
SOP	Standard Operating Procedure
TWG	Technical Working Group
UC	Universal Coverage
WHO	World Health Organization

PREFACE

Since establishing the Malaria Contingency Plan in 2016, the Ministry of Health has made significant progress in health indicators including a reduction in overall child mortality and reductions in the incidence of malaria and other infectious diseases. Achievements in the Rwanda health sector are the result of innovative practices including implementation of evidence-based interventions for the control of infectious disease, expansion of community-based care, introduction of initiatives to increase access to community health insurance, use of performance-based financing, and others. These groundbreaking innovations have been implemented with the intention to improve access to quality health care through the delivery of effective and efficient health services.

In Rwanda, the epidemiological pattern of malaria has changed over the last few years with more than 88% decrease in severe malaria and malaria- related mortality compared to 2016. Severe malaria cases decreased from 10,748 severe malaria cases in FY2017/2018 to 1316 severe malaria cases in 2022/2023. Similarly, malaria case fatality rates declined from 17 deaths per 100,000 malaria cases in FY2015/2016 to 6.4 per 100,000 in FY2022/2023. This reduction in severe cases and fatality rates is inversely related to the proportion of cases diagnosed and treated at the community level, which increased from 13% to 59% in 2015-2016 and 2022-2023, respectively, indicating that community care allows for earlier detection and treatment of malaria thus avoiding more severe cases and preventing deaths. Malaria incidence has also reduced by 23% from 418 per 1,000 people in 2016-2017 to 47 per 1,000 in FY 2022/2023. From July 2022 to June 2023, at 621,465 uncomplicated malaria cases were reported and treated representing an 87% decrease in cases from FY 2017/2018. Notably, according to the MIS 2017, more than 11% of malaria prevalence occurs in people of 5-14 years.

Despite this progress, Rwanda continues to face a significant malaria burden in endemic areas. For this reason, it is very important that the National Guidelines for the treatment of malaria in Rwanda serves as the standard by which quality care is delivered and provides indicators by which quality can be assessed.

Through the use of proven methods for prevention, diagnosis and treatment of malaria, these guidelines bring together current knowledge essential for health care providers to deliver evidence-based services for malaria patients at all levels of the health system.

This edition of the National Guidelines for the treatment of malaria in Rwanda is meant to be used at all levels of healthcare, both in the public and private sectors, throughout the country, and will guide healthcare professionals in their treatment choices. This is a comprehensive document, designed to serve as a clinical guide as well as an educational tool for health professionals. I believe that it will bring us closer to ensuring the proper management of all patients suffering from malaria throughout Rwanda in a manner that is evidence based, standardized, high quality and cost-effective.

Executive Summary

The National Guidelines for the treatment of malaria in Rwanda provides up-to- date, WHO –recommended practices aligned with the Rwanda national malaria control strategies for all health facilities on malaria diagnosis and treatment. The guidelines cover the diagnosis and treatment of uncomplicated and severe malaria for all malaria types.

The first edition of National Guidelines for the treatment of malaria in Rwanda was published in 2006 and recommended using artemisinin-based combination therapy (ACTs) in conformity with WHO guidelines. Rwanda introduced ACTs with artemether-lumefantrine (AL) as the first-line treatment of uncomplicated malaria

The second edition introduced the recommendation of a parasitological laboratory test to diagnose malaria in all malaria suspect cases and a requirement for testing to confirm malaria before treatment was initiated. A new classification of malaria was also established in addition to the traditional “simple malaria” and “severe malaria.”

The third version of the national treatment guidelines introduced artesunate for the treatment of severe malaria. It also highly recommended renewed focus on compulsory laboratory diagnostic testing for all malaria cases including severe malaria in all age groups. It finally defined the new classification as “simple malaria with minor gastrointestinal symptoms” which took into consideration the clinical experiences of health care providers.

The fourth version introduced the revised dose of parenteral Artesunate in young children weighing <20kg to receive a higher dose of Artesunate (3mg/kg bw per dose) than larger children and adults(2.4mg/kg bw per dose) to ensure equivalent exposure to the drug

This fifth Edition recommend the use of ACTs to treat women with uncomplicated Malaria in their first trimester of pregnancy. This current guideline advises the gradual phase out of oral and injectable Quinine as a treatment of Malaria cases, with a preference for Artemisinin derivatives as the best alternatives before resorting to Quinine. Additionally, the guideline recommends the incorporation of a new ACT, Artesunate-Pyronaridine, for the treatment of uncomplicated Malaria cases, along with the introduction of Artemeter injections for managing severe Malaria cases.

In revising the guidelines, comments and observations made by the health care providers during their training or during their day-to-day work have been taken into consideration.

This revised and simplified manual aims to improve the quality of malaria care in Rwanda by serving as a guide for staff working in health facilities for the management of malaria in adults, pregnant women and children.

Key Changes in the Guidelines

A. Malaria Diagnosis

Diagnostic Method	CHW/HP	Health Center	Hospital/Private Clinic
RDT	+	+ (If Microscopy is not available)	-
Microscopy	-	+	+

B. Malaria Treatment Options

Malaria Classification	First Line Treatment	Second Line Treatment
Simple Malaria	Artemether-Lumefantrine (AL)	DAHP or ASPY
	DihydroArtemisinin –Piperaquine (DHAP)	AL or ASPY
	Artesunate –Pyronaridine (ASPY)	AL or DHAP
Simple Malaria + Minor Digestive Symptoms	Artesunate injection*	Artemether Injection*
Severe Malaria	Artesunate injection*	Artemether Injection*
*NB: Complete with Oral ACT for 3 Days		

C. Malaria Treatment Indications

Malaria Product	Under 5 Years Old	Above 5 & Adults	Pregnant Women 1st Trimester	Pregnant Women 2nd and 3rd trimester
Artemether-Lumefantrine (AL)	+	+	+	+
Dihydroxyartemisinin –Piperaquine (DHAP)	+	+	+	+
Artesunate –Pyronaridine (ASPY)	+	+	-	+
Artesunate Injection	+	+	+	+
Artemether Injection	+	+	+	+

D. Management of Malaria Treatment Failure

I. Treatment Failure Definition

1. Absence of Therapeutic Response (TR) after 3 days of treatment with ACTs, within 28 days
2. Persistence of Symptoms or
3. Clinical Deterioration
4. Confirmed by Microscopy+ (Parasitemia)

II. Management of Treatment Failure

1. Investigate Causes
    - Inadequate Drug Exposure (Low Dose, Vomiting, Non-adherence)
    - Drug Resistance* (Take blood sample/DBS for Resistance Testing)
2. Confirm Persistent Parasitemia (Microscopy+ Parasitemia)
3. Manage (Address the cause or Switch to Second Line*)

III. Drug Resistance Mutigation Plan

MFT Definition

- The Multi-First Line Treatment of Malaria (MFT) Strategy is the Deployment of Multiple Therapies across Public and Private Sectors, allowing clinicians to Select Treatment according to established criteria (country-specific).
- Different mechanisms of action can help reduce the risk of resistance developing
- The WHO recommends MFT in areas where there is a high risk of drug resistance (Rwanda)
- The specific combination of drugs used in MFT can vary depending on factors such as the local prevalence of drug-resistant strains of malaria parasites and the overall malaria control strategy in a particular region

Proposed List of Drugs (A detailed protocol will be developed)

1. Artemether Lumefantrine (AL)
2. DihydroArtemisinin –Piperaquine (DHAP)
3. Artesunate –Pyronaridine (ASPY)

IV. Updated List of Insecticides for IRS And Rotation Strategy

New Generation of Insecticides for IRS	With PQ WHO	Existing of Local Evidences	Period of Evaluation (Months)	Residual Efficacy in Months (with Local Evidences)
Actellic 300Cs	Yes	YES	12 M	12 M (24 H)
Fludora Fusion WP 56.25	Yes	YES	12 M	12 M (24 H)
SumiShield	Yes	No	N/A	N/A
2GARD™	Yes	Yes	9 M	>9 M (24 H of Mortality Observation)
Klypson 500WG	Yes	Yes	9 M	> 9 M (72 H of Mortality Observation)
VectronT500	Yes	Ongoing	Planned 11 M	Not Yet Available)
SOVRENTA®	Yes	Ongoing	Planned 11 M	Not Yet Available)

Note:

- Blanket IRS on Rotation Basis: 1 or 2 Years
- Focal IRS where needed
- Cost Implication
  - A. Deploy Dual Active Ingredients ITNs
  - B. Do not combine IRS and ITNs (Exception for Routine and Special Cases)
  - C. Standard ITNs not Recommended in Rwanda (Insecticide Resistance Management)
  - D. Mass Distribution every 3 Years
  - E. Routine Distribution (ANC, EPI, Boarding Schools, Prisons, Refugees Camps)

Foreword

The Ministry of Health and Rwanda Biomedical Center (RBC) would like to take this occasion to express its deep appreciation and sincere thanks to everyone who contributed to the compilation of this Integrated Malaria Control Guidelines and 5th edition of the Rwanda Malaria Treatment Guidelines.

We thank you all for your support in the fight against Malaria in Rwanda.

Prof. Claude Mambo MUVUNYI
Director General/ RBC

Purpose and Scope of the National Guidelines

The purpose of these guidelines is to serve as a guide for health workers at all level of health care in reducing morbidity and mortality due to malaria in Rwanda. The National Guidelines for malaria will be used at all levels of healthcare, both in the public and private sectors. Further, these guidelines apply countrywide and hold specific content for high burden districts.

The MoH through Rwanda Biomedical Center (RBC) is responsible for managing medical technology and infrastructure, including management and implementation of all policies related to malaria control in Rwanda.
Any update or change to these guidelines whether initiated by the MoH, health facility (private or public) or any other third party should be coordinated by the MoH to ensure all policies are followed.

Target Audience

These guidelines are intended for use across all health facilities down to the community level including health professionals (doctors, nurses, pharmacists, clinical officers, community health workers, etc.). Management at central level, data managers, and other public health/ policy professionals working on malaria control in hospitals, research institutions, and non-governmental organizations will find it a useful reference.

Part one:

MALARIA
CASE MANAGEMENT

1. DEFINITION AND CLASSIFICATION OF MALARIA CASES

1.1. Simple and/or Uncomplicated Malaria

This is an illness characterized by axillary temperature higher or equal to 37.5 °C (hot body) or history of fever in the last 24 hours with or without the following signs: headache, weakness, chills, loss of appetite, stiffness, joints pain and muscular pains. The parasitological confirmation of Plasmodium by either blood smear or rapid test is compulsory without any exception. Signs of severity and other illnesses must be looked for and excluded systematically.

1.2. Simple Malaria with Minor Digestive Symptoms

An illness characterized by signs of simple malaria where the patient additionally has vomiting prevents oral medication with or without associated moderate diarrhea. The parasitological confirmation of Plasmodium by either blood smear or rapid test is compulsory without any exception. Signs of severity and other illnesses must be looked for and excluded systematically.

1.3. Severe Malaria

Severe malaria is characterized by positive plasmodium parasitaemia, accompanied by one or more of the following signs of severity as per table 1 below. Signs of severity and other illnesses must be looked for and excluded systematically

Table 1: Danger Signs and Symptoms of Severe Malaria

Sign	Definition/ Clinical Manifestation
Acidosis	Base deficit of >8 mEq/L or, if not available, a plasma bicarbonate level of <15 mmol/L or venous plasma lactates at 5 mmol/L Severe acidosis manifests clinically as respiratory distress (rapid, deep, labored breathing)
Hypoglycemia	Blood or plasma glucose <2.2 mmol/L (<40 mg/dL)
Severe malaria anemia	In children under 12 years of age, hemoglobin concentration ≤5 g/dL or a hematocrit of ≤15% with a parasite count >10,000 parasites/µL with signs of compensation In adults, hemoglobin concentration <7g/dL or a hematocrit of <20% with a parasite count >10,000 parasites/µL with signs of compensation
Renal impairment	Plasma or serum creatinine >265 µmol/L (3 mg/dL) or blood urea >20 mmol/L
Jaundice	Plasma or serum bilirubin >50 µmol/L (3 mg/dL) with a parasite count >100 000 parasites/µL

Pulmonary edema	Acute respiratory distress syndrome, radiologically confirmed or air oxygen saturation <92% with a respiratory rate >30/ min in adult, often with chest in drawing and crepitation on auscultation
Significant bleeding	Recurrent or prolonged bleeding from the nose, gums or venipuncture sites; hematemesis or melena
Shock	Compensated shock is defined as capillary refill >3 sec or temperature gradient on leg (mid to proximal limb), but no hypotension Decompensated shock is defined as systolic blood pressure <70 mm Hg in children or <80 mm Hg in adults, with evi- dence of impaired perfusion (cool peripheries or prolonged capillary refill)
Hyperparasi- taemia	P. falciparum parasitaemia > 10%
Pediatric Danger Signs	Inability to drink or suckle; Vomiting everything; Convulsions (at least 2 in 24 hours); Lethargy and unconsciousness
Impaired Consciousness	Glasgow coma score <11 in adults or a Blantyre coma score <3 in children
Prostration	Generalized weakness where the person is unable to sit upright, stand or walk without assistance

Criteria for severe malaria are marked by the presence of signs of vital distress. This form of malaria is an extreme emergency and requires hospitalization in a district or referral hospital.

2. MALARIA DIAGNOSTIC TESTS

All cases of suspected malaria should have a parasitological test (Microscopy or Rapid Diagnostic Test (RDT)) to confirm the diagnosis.

With the appropriate training, RDTs are simple to use and are sensitive in detecting low parasitaemia. The RDT for P. falciparum detects histidine- rich protein 2 (HRP2) & parasite lactate dehydrogenase (pLDH). Microscopy remains gold standard as it allows direct visualization of malaria parasites species and density.

Both microscopy and RDTs should be supported by quality assurance programme.

2.1. In the Community

- Community Health Workers managing malaria cases at Community Level (Binomes) are recommended to use RDTs
- Since the PfHRP2& pLDH -based RDTs are unable to distinguish new malaria infection from recently and effectively treated malaria infection, all patients who come back to the CHW with clinical manifestations compatible with malaria after treatment in the previous month will be referred to the Health Facility for microscopy examination1
- Quality Assurance of RDTs in community: For Community Health Workers, all quality assessment activities for RDTs should be done by direct observation of Community Health Workers' competence in performing an RDT during supervisory visits using a standardized checklist. Supervisory visits should be made routine quarterly. Corrective action should be taken during the visit, which might include retraining in blood collection, RDT preparation, and interpretation of the result.

2.2. At the Health Facility

- Microscopy allowing direct visualization of malaria parasites species and quantification of the density of parasites is recommended as the Gold Standard of malaria diagnosis
- At Health Facility Level, well-trained Laboratory Technicians will use Microscopy (Blood Smear) to determine malaria parasites, stages of the parasites, quantification and species identification of the parasites.
- RDTs are recommended for use at health facilities to allow rapid diagnosis when microscopy is not feasible (Absence of Laboratory Personnel, non-availability of microscopy, night duties, lunchtime, workload at HF, mass screening at facility level in case of outbreaks, etc.)
- If the initial blood film examination is negative in patients with manifestations compatible with severe malaria, a series of 2 blood films should be examined at 6-12 h intervals or an RDT should be performed.
- If a patient is referred for severe malaria from a lower level to a higher level of care, the patient`s examined blood film should be sent with the patient for confirmation of diagnosis and to avoid double reporting.
- The BS sent with the patient is re-examined at referral facility laboratory. If negative and the patient received a recent pre- transfer malaria treatment, an RDT should be performed as well (BS is likely to be negative).

- If both blood smear and RDT results are negative, malaria is extremely unlikely, and other causes of illness should be sought and treated.

Microscopy Test Reporting System

Thick and thin blood films for parasite counts should be obtained and examined. The thick blood smear for malaria screening will be used to count the numbers of asexual parasites and white blood cells in a limited number of microscopic fields.

The adequate parasitaemia is at least one parasite for every three white blood cells, corresponding to approximately 2000 asexual parasites per microlitre, for high transmission areas or at least one parasite for every six white blood cells, corresponding to approximately 1000 asexual parasites per microlitre, for low-to-moderate transmission areas.

If more than 500 parasites have been counted before 200 white blood cells have been reached, the count will be stopped after the reading of the last field has been completed.

Parasite density, expressed as the number of asexual parasites per µl of blood, will be calculated by dividing the number of asexual parasites by the number of white blood cells counted and then multiplying by an assumed white blood cell density (typically 6000 per µl).

$$\text{Parasite density (per µl)} = \frac{\text{number of parasites counted.}\ (6000)}{\text{Number of leukocytes counted}}$$

2.3. At the National Level (National Reference Laboratory).

Although microscopy remains the Gold Standard diagnostic test for malaria in clinical settings, the Polymerase Chain Reaction (PCR)-based assays can have 100-fold greater sensitivity, useful in the setting of low parasitaemia or subclinical infections. The Rwanda National Reference laboratory is in the process of building capacity on malaria PCR diagnosis mainly for research purpose, but no clinical management uses.

2.4. Quality control of diagnostic tests.

- Both microscopy and RDTs should be supported by a quality assurance program.
- The Quality assurance of RDT at Community level is performed by the health Center team and compiled report is transmitted on quarterly basis to the Hospital level.
- For Community Health Workers, all quality assessment activities for RDTs should be done by direct observation of Community Health Workers' competence in performing an RDT during supervisory visits using a standardized checklist. Supervisory visits should be made routine on quarterly basis. Corrective action should be taken during the visit, which might include retraining in blood collection, RDT preparation, and interpretation of the result.
- At Hospital level, the Quality Control of Blood Smear will be performed by Central level (NRL&MOPDD) team on quarterly basis. At Health Center level, the Quality Control of Malaria Diagnosis (Microscopy and RDT) is performed by the Hospital level team on Quarterly Basis and compiled report is transmitted to the central level (MOPDD).

FIGURE 1: DIAGNOSTIC ALGORITHM FOR MALARIA AT HEALTH CENTER

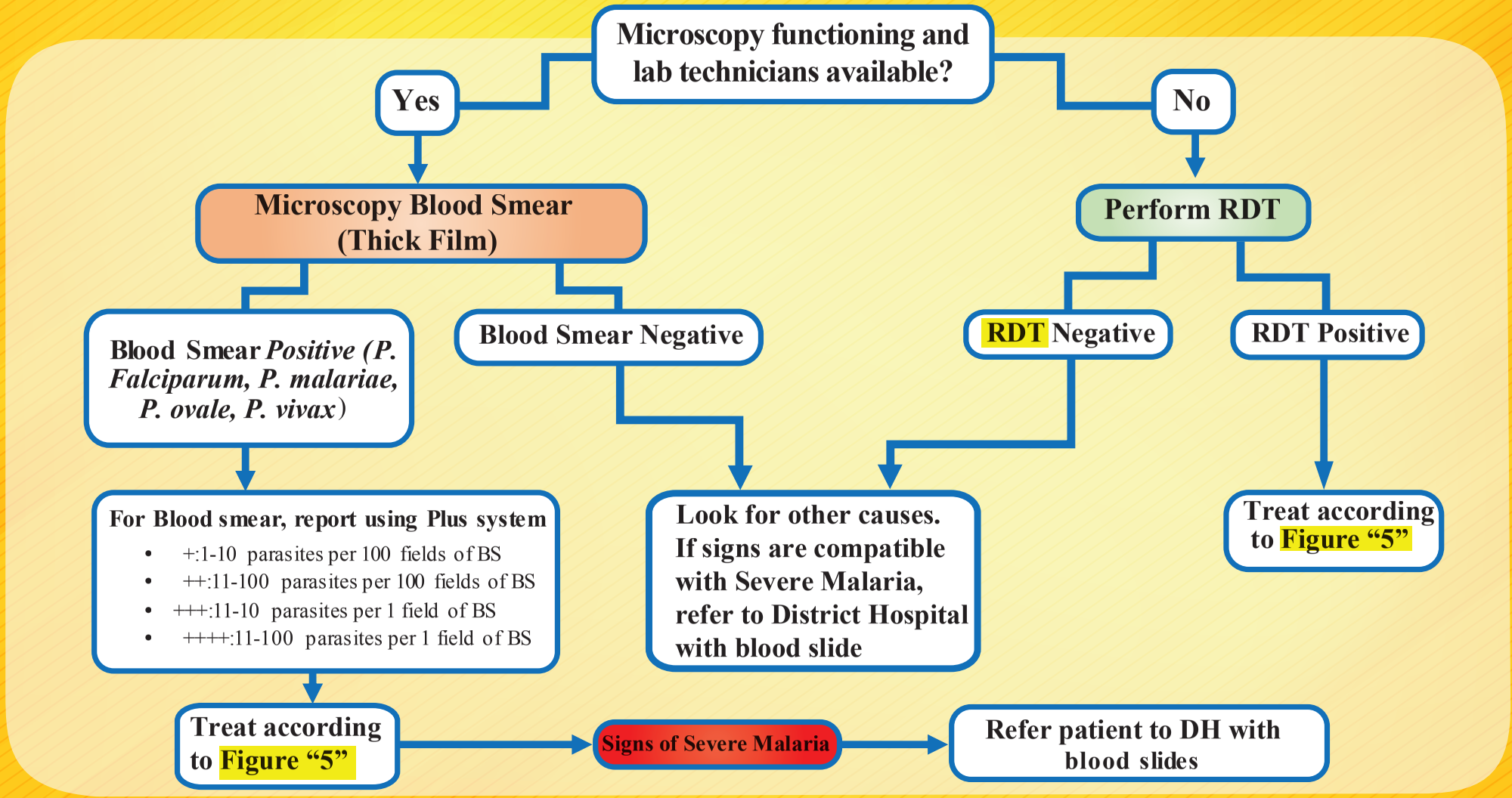


FIGURE 2: DIAGNOSTIC ALGORITHM FOR SUSPECTED MALARIA AT DH, PH, AND RH

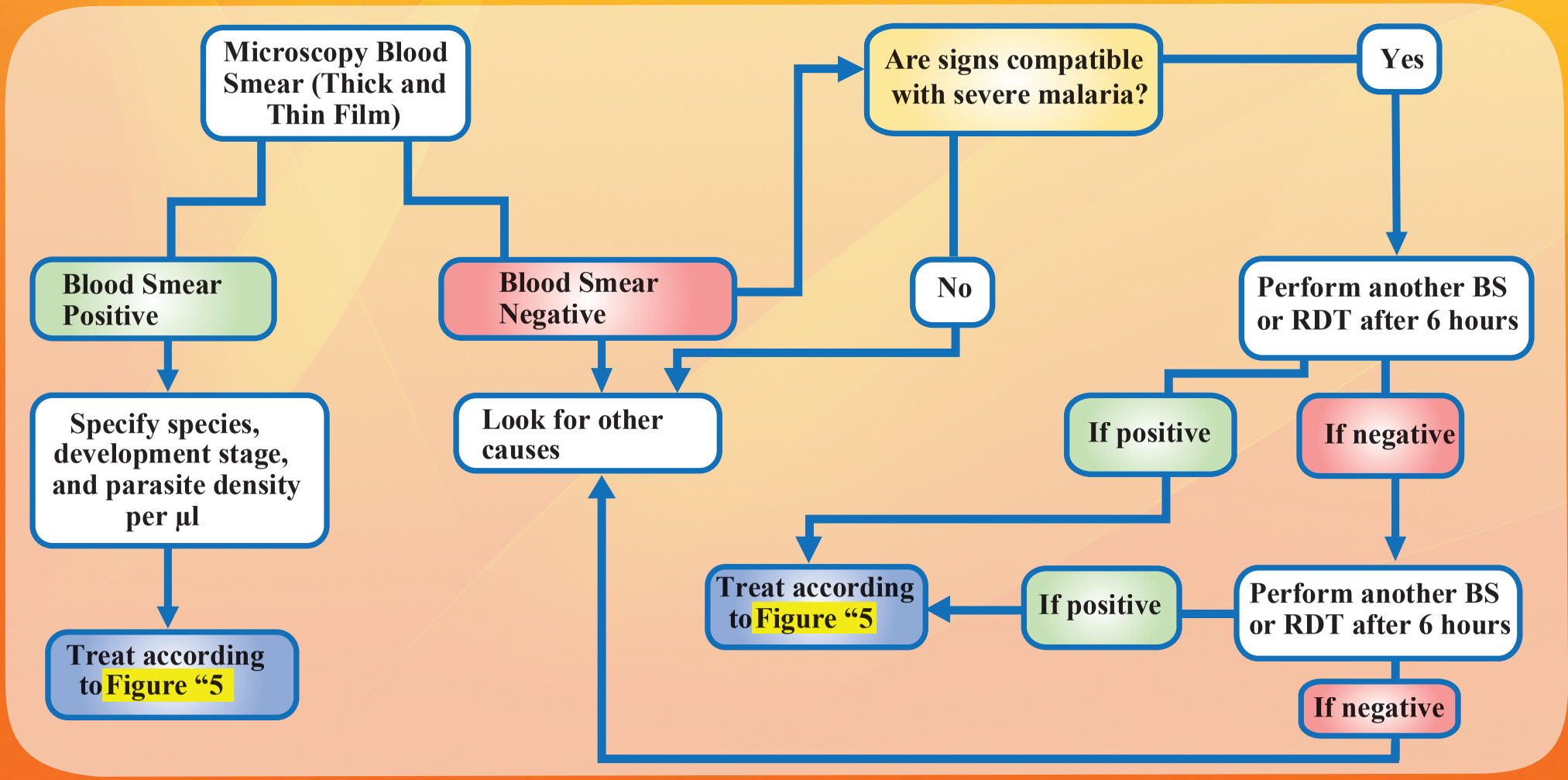


FIGURE 3: DIAGNOSTIC ALGORITHM FOR REFERRAL MALARIA CASES AT DH, PH, AND RH

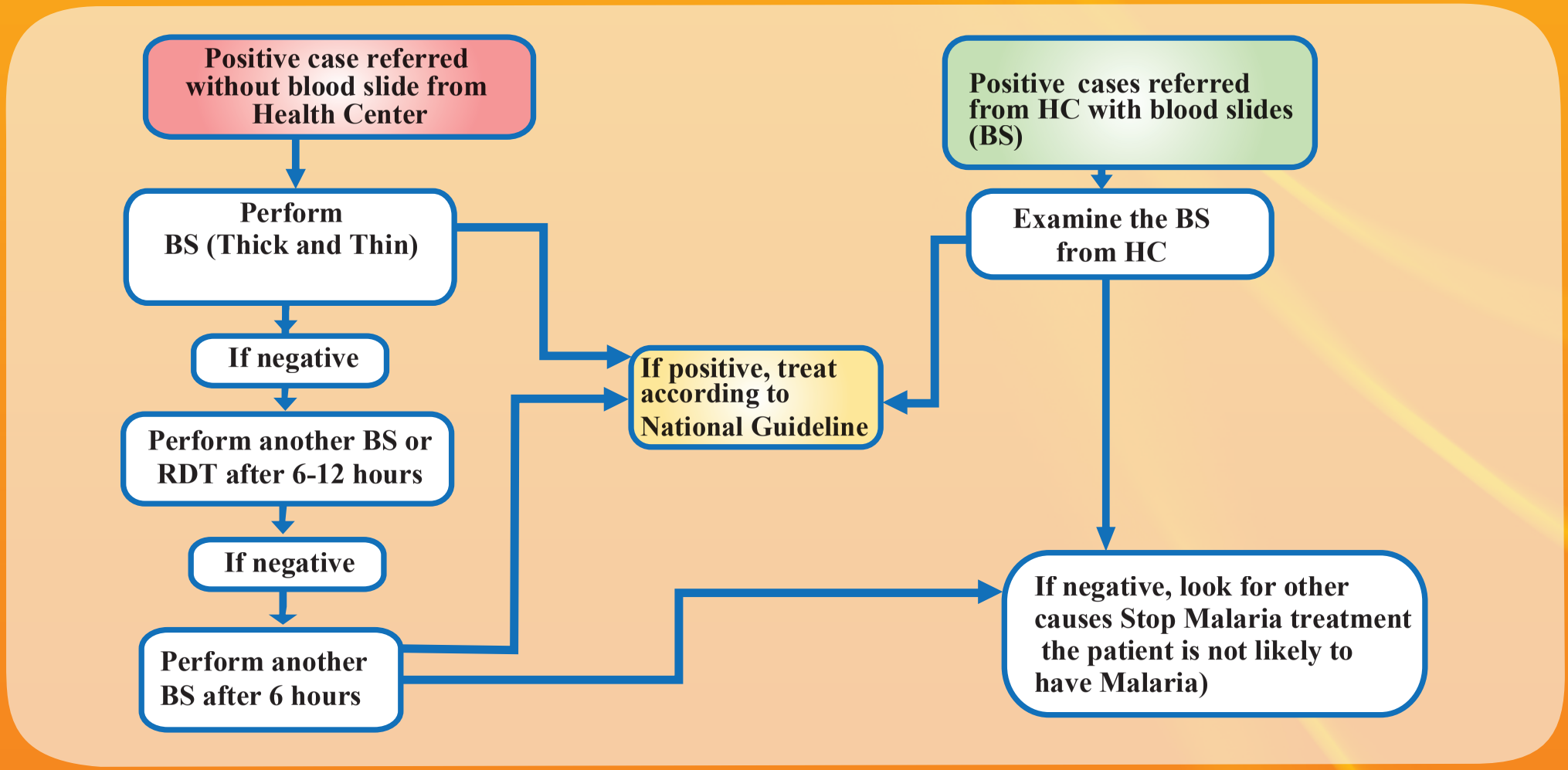
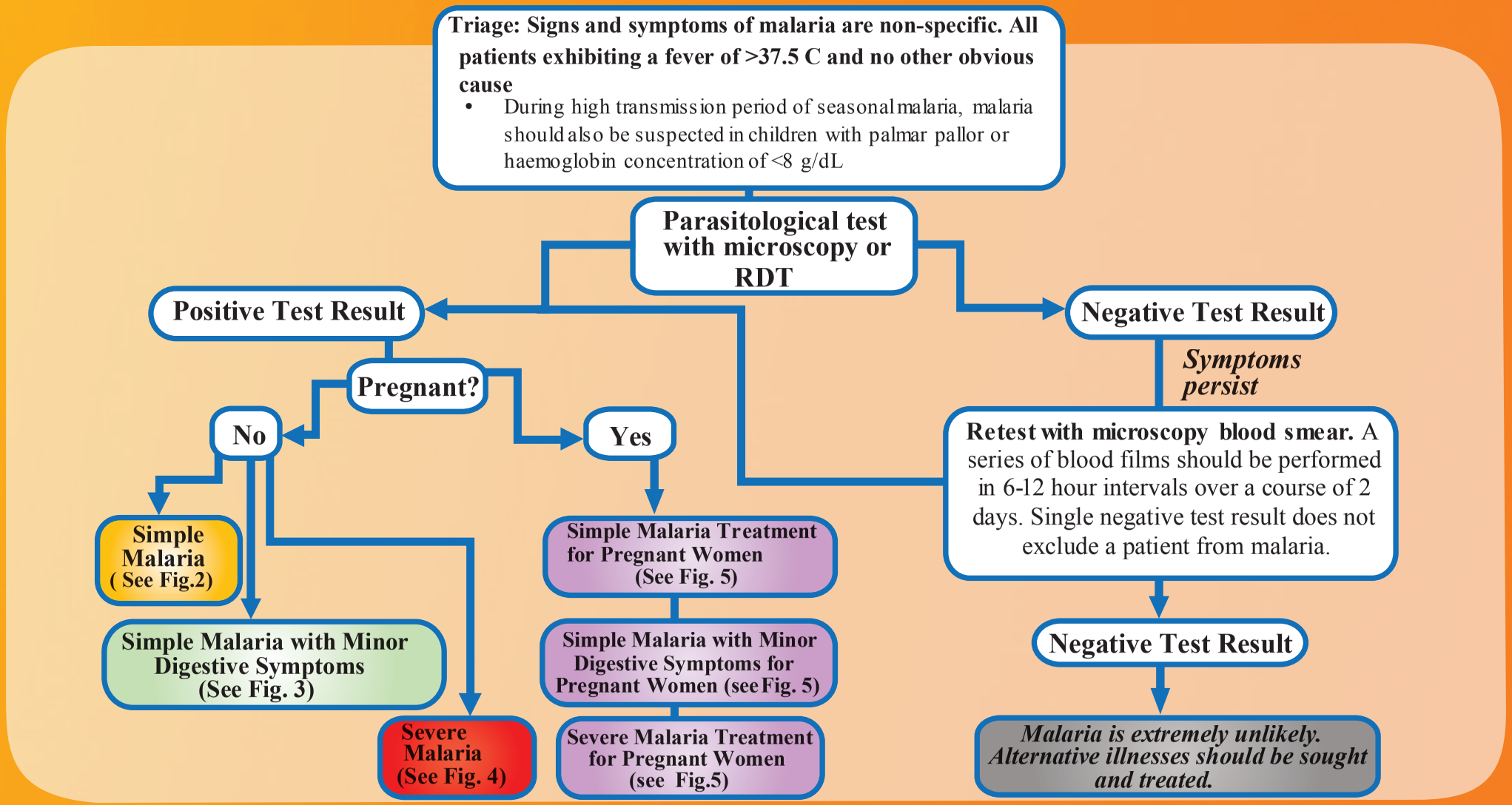


FIGURE 4: ALGORITHM FOR GENERAL PATHWAY OF MALARIA DIAGNOSIS AND TREATMENT AT HC,DH, PH, AND RH



3. TREATMENT AND MANAGEMENT OF SIMPLE MALARIA

3.1. At the Family Level

Amongst the patient's family, emphasis will be made on Social Behavior Change.

- Recognition by the family members of the signs/symptoms of simple malaria, simple malaria with minor digestive symptoms and severe malaria is imperative
- If fever is present, use tepid sponging, remove clothes, bathe with mild warm water
- After reducing fever, seeking care in a timely manner from a community health worker or the nearest health facility.

3.2. Community level.

The role of the community health worker is to:

- First, confirm malaria diagnosis using a rapid diagnostic test (RDT) and then treat under the framework of home based management of fever (HBMF) or integrated community case management (iCCM), and, if necessary, refer to a health facility.
- The first line of treatment: artemisinin combination therapy (ACT) comprising of Artemether 20mg + Lumefantrine 120mg administered only after obtaining a positive rapid diagnostic test, taken preferably during meals.
- Other available ACTs may be used.

  - ***Dispersible ACTs are available for use in the pediatric age (this formulation will be dissolved in a small amount of water on a spoon). The formulation is used for both for infants and children weighing <15 kg body weight (BW) and for children weighing 15 to <25 kg body weight.***

- Other causes of fever should be sought systematically according to ICCM algorithm and treated accordingly.
- Transfer patients to nearest Health Center if needed.

In order to attain universal health coverage for Malaria Treatment, individuals with low socioeconomic status and vulnerability will be provided with malaria treatment free of charge at Community, Health Center, Health Post, and Hospital levels. The criteria for selecting patients eligible for free malaria treatment will be communicated through ministerial instructions as deemed necessary.

3.3 Health Center Level

3.3.1 Diagnosis

Prescribe the first line of treatment only after obtaining a positive blood smear or positive rapid diagnostic test in case of emergency if no availability of microscopy. After three consecutive negative blood smear result, other causes of fever should be sought systematically and treated accordingly. In this case, glycaemia and hematocrit/ hemoglobin are recommended

3.3.2 Treatment options for uncomplicated Malaria

The first line recommended treatment for all malaria positive cases is an artemisinin combination

therapy (ACT) comprising of Artemether 20 mg and Lumefantrine 120 mg,taken preferably during meals or Dihydroartemisinin-piperaquine (DHAP) or.

See 3 Tables below for dosage specifications. The ACT is administered orally, once or twice a day for 3 days.

To fight against malaria resistance emerging in Rwanda, the program has adopted to conduct a pilot study for the implementation of Multiple First Line Treatment Strategy that including three ACTs accepted in Rwanda (Artemether Lumefantrine (AL), Dihydroartemisinic- piperaquine (DHAP) and Artesunate -pyronaridine (ASPY). The findings of the pilot study will inform the adoption and implementation strategies of multiple first line treatment of uncomplicated malaria in Rwanda.

Table 2: AL Treatment Dosage Timeline and Specifications.

Category of body weight of the patient in kg	Arthemether (20mg) + Lumefantrine (120mg) (Blisters	Number of tablets of AL per dose					
		Day 1		Day 2		Day 3	
		First dose	8 hours after	24 hours after	36 hours after	48 hours after	60 hours after
5 kg to < 15 kg	6x1	1	1	1	1	1	1
15 kg to < 25 kg	6x2	2	2	2	2	2	2
25 kg to < 35 kg	6x3	3	3	3	3	3	3
≥ 35 kg	6x4	4	4	4	4	4	4

Table 3: Dosage of Artesunate-pyronaridine (ASPY) (Dose administered orally once daily for 3 days)

Formulations available	Body weight (kg)	Dosage
For children weighing ≥5 to 20 kg bw: use oral suspension of granules from a sachet containing: Artesunate 20 mg plus pyronaridine tetraphosphate 60 mg	≥5 to <8	20 mg plus 60 mg
	8 to <15	40 mg plus 120 mg
	15 to <20	60 mg plus 180 mg (use oral suspension)
For patient weighing > 20kg bw :use Artesunate 60 mg plus pyronaridine tetraphosphate 180 mg	20 to <24	60 mg plus 180 mg (use tablet)
	24 to <45	120 mg plus 360 mg
	45 to <65	180 mg plus 540 mg
	≥65	240 mg plus 720 mg

Table 4: Dihydroartemisinin + piperaquine dosage

Body weight (kg)	Dihydroartemisinin + piperaquine dose (mg) given daily for 3 days.
5 < 8	20 + 160
8 to < 11	30 + 240
11 to < 17	40 + 320

17 to < 25	60 + 480
25 to < 36	80 + 640
36 to < 60	120 + 960
60 < 80	160 + 1280
>80	200 + 1600

Revised dose recommendation for dihydroartemisinin + piperaquine in young children: Children weighing <25kg treated with dihydroartemisinin + piperaquine should receive a minimum of 2.5 mg/kg bw per day of dihydroartemisinin and 20 mg/ kg bw per day of piperaquine daily for 3 days

3.3.3 Treatment Failure

Treatment failure is defined as failure to achieve the desired therapeutic response 3 days after initiation of therapy. Treatment failure should be suspected if a patient deteriorates clinically at any time, or if symptoms persist after initiation of treatment according to the guideline. Treatment failures may result from drug resistance, or inadequate drug exposure (sub-optimal dosing, poor adherence, vomiting, unusual pharmacokinetic properties or substandard medicines).

Treatment failure must be confirmed preferably with microscopy while RDTs is not recommended.

Patients with uncomplicated P.falciparum malaria who deteriorate by developing features of severe disease while taking CAT should be considered as having severe malaria, admitted to hospital, investigated and treated as appropriate.

If no improvement on AL after 3 days, verify if the patient adhered to the drugs correctly, re-examine the patient carefully and do another blood smear;

- If the test is **positive,** change the treatment to oral dihydroartemisinin + piperaquine (DHAP), with a target of dose(range) of 4 (2-10) mg/kg BW per day dihydroartemisinin and 18(16-27) mg/kg bw per day piperaquine given once a day for 3 days for adults and children weighing >= 25kg. The target doses and ranges for children below 25kg are 4 (2.5-10) mg/kg per day dihydroartemisinin and 24 (20- 32) mg/kg BW per day piperaquine once a day for 3 days.
- In case the DHAP is not available or contra indicated, change the treatment to Oral Artesunate Pyronaridine as per Table 3.
- If the test is **negative,** and ACT have been taken correctly and completed in 3 days; exclude and treat other causes of illness and/or refer the patient to the nearest district hospital.

If treatment failure occurs after 28 days, distinction between recrudescence or a new infection can only be made by PCR parasite genotyping of the initial and recurrent infections. As PCR are not routinely used in patient management, all presumed treatment failures after 4 weeks of initial treatment should, from an operational standpoint, be considered as new infections and be treated with AL.

Note:

Oral Monotherapy using artemisinin derivatives is strongly discouraged and is banned for the management of simple malaria in Rwanda.

FIGURE 5: SIMPLE MALARIA TREATMENT

Nonspecific Symptoms include: **fever, sweats/ chills, malaise, myalgia, headache, diarrhea, cough, minor jaundice.** Simple malaria is a febrile parasitic illness with manifestation of any of the above attributes and RDT/BS positive without the presence of severe malaria symptoms.

- Artemisinin combination therapy (ACT) treatment with dosage following the adjacent table for 3 days.
- Artemeter Lumefantrine should be taken with meals/ milk, while Artesunate Pyronaridine should be taken with water
- For pediatric administration use dispersible tablet formulation
- The first dose of ACT should be taken at the point of care, under medical supervision.
- The second dose of AL should be taken 8 hours after the first dose

Age	Category of body weight of the patient in kg	Arthemether (20mg) + Lumefantrine (120mg)/Blisters
6-35 months	5 kg to < 15 kg	6 Tablets
3 years-8 years	15 kg to < 25 kg	12 tablest
9-14 years	25 kg to < 35 kg	18 tablets
15 years and above	≥ 35 kg	24 tablets

Body weight (kg)	Dihydroartemisinin+ piperaquine dose(mg) given daily for 3 days
5 to <8 kg	20+160
8 to <11 kg	30+240
11 to <17 kg	40+320
17 to <25 kg	60+480
25 to <36 kg	80+640
36 to <60 kg	120+960
60 to <80 kg	160+1280
>80 kg	200+1600

Formulations available	Body weight (kg)	dosage
For children weighing ≥5 to 20 kg bw: use oral suspension of granules from a sachet containing: Artesunate 20 mg plus pyronaridine tetraphosphate 60 mg	≥5 to <8	20 mg plus 60 mg
	8 to <15	40 mg plus 120 mg
	15 to <20	60 mg plus 180 mg (use oral suspension)
For patient weighing > 20kg bw :use Artesunate 60 mg plus pyronaridine tetraphosphate 180 mg	20 to <24	60 mg plus 180 mg (use tablet)
	24 to <45	120 mg plus 360 mg
	45 to <65	180 mg plus 540 mg
	≥65	240 mg plus 720 mg

Supportive Treatment

- If patient cannot tolerate oral treatment, treatment may require parenteral or for 1-2 days until patient can swallow and retain oral medication
- Paracetamol is recommended over Ibuprofen/ aspirin to reduce fever
- Anti-emetics should be used with caution
- Patients, especially children, that have >2 seizures within 24 hours should be treated for severe malaria

**Monotherapies are not advised as a first-line treatment*

4. TREATMENT AND MANAGEMENT OF SIMPLE MALARIA WITH MINOR DIGESTIVE SYMPTOMS

4.1. Community Steps

The role of the community health worker is to:

- Test for confirmation using an RDT.
- Notify using trough Rapid sms in order to inform the health center of the emergency case.
- For children U5, provide oral rehydration solution (ORS/Zinc).
- Rapid transfer of the patient to the nearest health center,
- If patient presents fever, reduce fever by using tepid sponging prior to transfer.

4.2. Health Center Level

4.2.1 Diagnosis.

The management of simple malaria with minor gastrointestinal symptoms is done at the health center, or when not possible, at the district hospital. The patient must be admitted in the health center where he/she will receive treatment for at least 24 hours. Diagnose malaria with microscopy or rapid diagnostic tests and measure hemoglobin level and where possible FBC (full blood count). It is indicated to administer antimalarial treatment (artesunate injectable) only after obtaining a positive blood smear or positive rapid diagnostic test. After 24 hours, a clinical and paraclinical re-evaluation is done to assess if the patient can be discharged home (if improvement) on a full 3days dose of AL, or can be transferred to the district hospital (if no improvement) for care continuity.

4.2.2 Treatment

The first line recommended treatment for all malaria positive cases with minor gastrointestinal symptoms is **Artesunate by intramuscular injection or intravenous injection**. Administered as dose of 2.4 mg/kg (or 3.0 mg/kg for children <20 kg) IV given on admission (time = 0), then at 12h and 24h.

- ***If the patient's condition does not improve within 24 hours of treatment, refer the patient to the nearest district hospital. If the patient's condition improves, change to oral Artemether-lumefantrine twice a day for three consecutive days.***

Artemether injection (IM) is recommended as second option if artesunate is not available. Administer Artemether IM during at least for 24hrs and as soon as the patient can tolerate oral medicine, complete with a full 3days of ACT. The initial dose of artemether is 3.2 mg/kg bw intramuscularly (to the anterior thigh), the maintenance dose is 1.6 mg/kg bw intramuscularly daily.

4.2.3 Supportive Treatment.

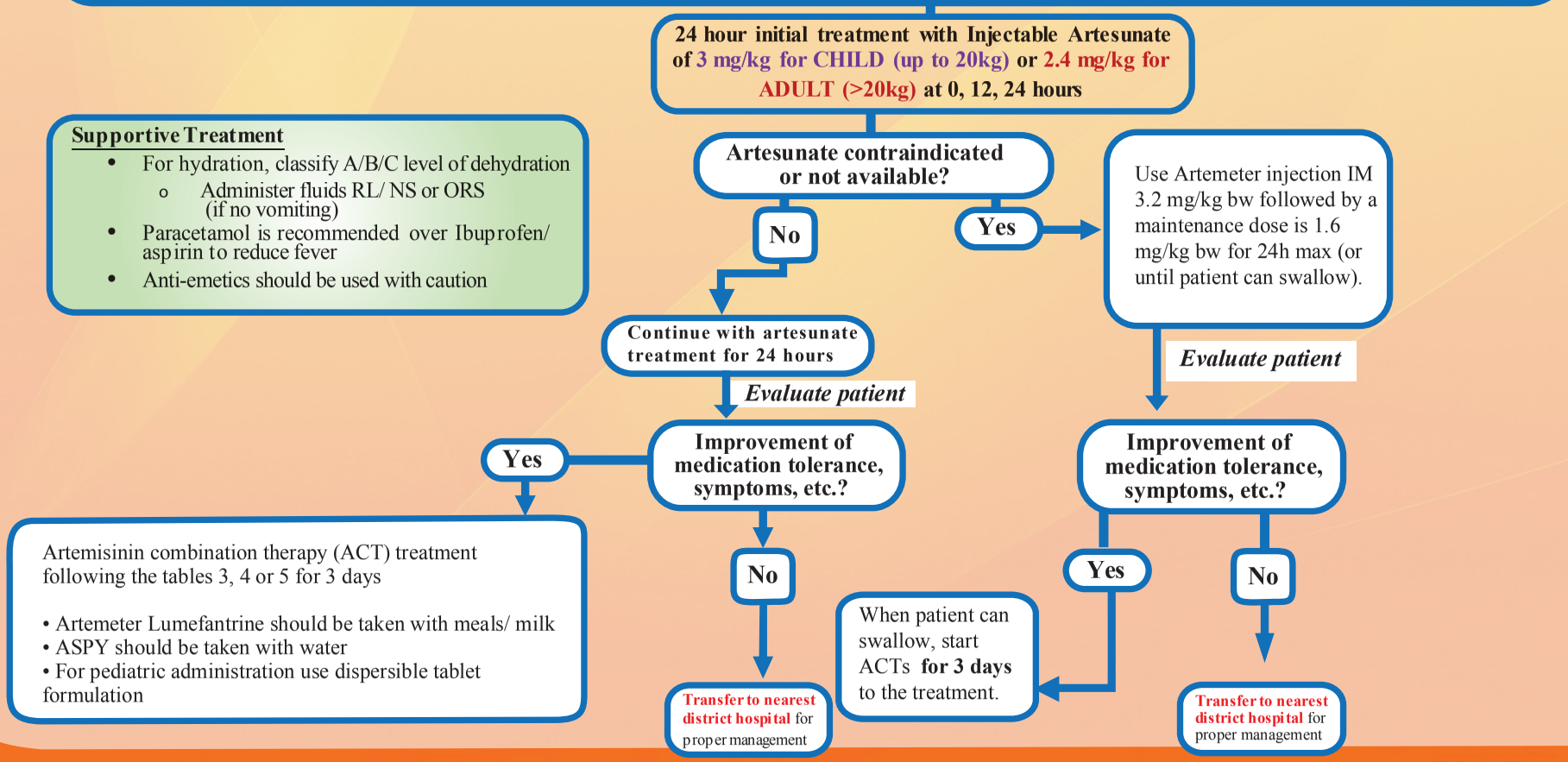
In case of diarrhea and/or vomiting:

- Evaluate and monitor the hydration status of the patient
- Rehydrate patient with oral rehydration salts (ORS) or other available liquids (normal saline, ringer lactate), zinc if diarrhea, encourage breast feeding and other modes of feeding and if necessary use a nasogastric tube
- Anti-emetics should be used with caution
- In case of fever, give oral/suppository Paracetamol 15 mg/ kg, or any other antipyretic as may be indicated.

FIGURE 6: TREATMENT OF SIMPLE MALARIA WITH MINOR DIGESTIVE SYMPTOMS

Nonspecific Symptoms include: fever, sweats/ chills, malaise, myalgia, headache, cough, minor jaundice WITH VOMITING AND/OR DIARRHEA [WHICH PREVENTS ORAL OR RECTAL MEDICATION ADMINISTRATION] AND positive BS/RDT

Simple malaria is a febrile parasitic illness with manifestation of any of the above attributes without the presence of severe malaria symptoms.



5. TREATMENT AND MANAGEMENT OF SEVERE MALARIA

5.1. Community level

- Test for malaria confirmation using a rapid diagnostic test (RDT)
- Notify through Rapidpro or any other community digital reporting tool (CEMR, ..) in order to inform the health center of the emergency case, and request the health center authority to call the ambulance for a rapid transport Administer Artesunate suppository.

5.2. Health Center and Pre-Transfer.

5.2.1. First Line Treatment.

- Administer antimalarial treatment only after obtaining a positive blood smear or positive rapid diagnostic test (empirical antimarial is strongly Discouraged in Rwanda).
- Artesunate will be administered as a single dose before transferring the patient:
    - ***Dosage is 2.4 mg/kg (or 3.0 mg/kg for children <20 kg) IV or IM given on admission (Ho=time of administration), and refer the patient to the nearest district hospital.***

5.2.2. Supportive Treatment at Health Center.

High Fever

If the temperature is higher or equal to 38°C:

High Fever

If the temperature is higher or equal to 38°C:

- Do tepid sponging;
- Give Paracetamol 15 mg /kg by oral route or suppository form, or any other antipyretic that may be indicated.

Hypoglycemia

To treat /prevent hypoglycemia (characterized by loss of consciousness, severe weakness):

- The threshold for intervention is glucose <3.3 mmol/l(60mg/dl) for children <5 years and 3.9 mmol/l(70mg/dl) for older and adults or when unable to get blood sugar test:
    - In adults, give 20-50 ml of 50% glucose by intravenous injection administered over 5-10 minutes;
    - In children, give 5 ml/kg of 10% glucose or if not available dilute 1 ml/kg of 50% glucose in 4 ml/kg of normal saline or in 9 ml/kg of glucose 5%;
    - Or administration of water with 10% sugar per mouth or with nasogastric tube, at a rate of 10 ml/kg for children and 50 -100 ml for the adults;
    - Water with 10% sugar is readily prepared in the following way: take 100 ml of boiled clean water and add 10 g of sugar or measure of 2 coffee spoons.

Convulsions

In case of convulsions:

- For children, administer Diazepam 0.5 mg/kg Intrarectal, and
- For adults, administer Diazepam 10 mg IV slowly;
- If convulsions persist, give Phenobarbital 10-15 mg/kg IM; there must be capabilities to support breathing before giving phenobarbital as it can cause respiratory arrest;
- Maintain airways as necessary;
- Refer the patient to the nearest district hospital or referral hospital.

5.3. District or Referral Hospital.

Death from severe malaria often occur within hours of admission to a hospital or clinic, so it is essential that therapeutic concentrations of a highly effective antimalarial drug be achieved as soon as possible. In all patients with suspected severe malaria with or without fever or history of fever, parasitological diagnosis is recommended. The treatment must be initiated based on malaria positive blood microscopy or rapid diagnostic test (RDT) results.

5.3.1 First Line Treatment.

- Verify When, What and How the pre-transfer treatment administered to patient before to administer another dose of antimalarial drugs based on patient health condition;
- Artesunate will be administered at 2.4 mg/kg IV or IM following the first dose administration at admission (time = 0). For children weighing below 20 kg, they will receive a higher dose of Artesunate at 3 mg/kg.
- For all patients, artesunate 2.4 mg/kg BW IV or IM given on admission (time = 0) (for children <20kg, give artesunate 3mg/kg/ dose), then at 12h and 24h. Then once a day is the recommended treatment for a maximum of 7 days, or until the patient is able to take oral medication where he/she is suitched to a full dose of ACT.
- Give parenteral anti-malarials in the treatment of severe malaria for a minimum of 24h, once started (irrespective of the patient's ability to tolerate oral medication earlier), and, thereafter, complete treatment by giving a complete course of ACT for three days.

5.3.2 Second Line Treatment.

- If artesunate is not available, administer Arthemeter at 3.2 mg/kg by intramuscularly (to the anterior thigh), the maintenance dose is 1.6 mg/kg bw intramuscularly daily.

5.3.3. Note on quinine use.

In all cases of malaria quinine should be avoided and be used only when arthesunate and arthemeter or other antimarial drugs allowed to treat malarial in Rwanda, are unvailable countrywide or the patient has allergy to artemisinin derivatives.

5.4 Management of severe malaria complications

See Figure 8 below.

FIGURE 7: SEVERE MALARIA MANAGEMENT ACROSS HEALTH LEVELS

Community/ Health Center/ District Hospital/ Provincial Hospital/ Referral Hospital

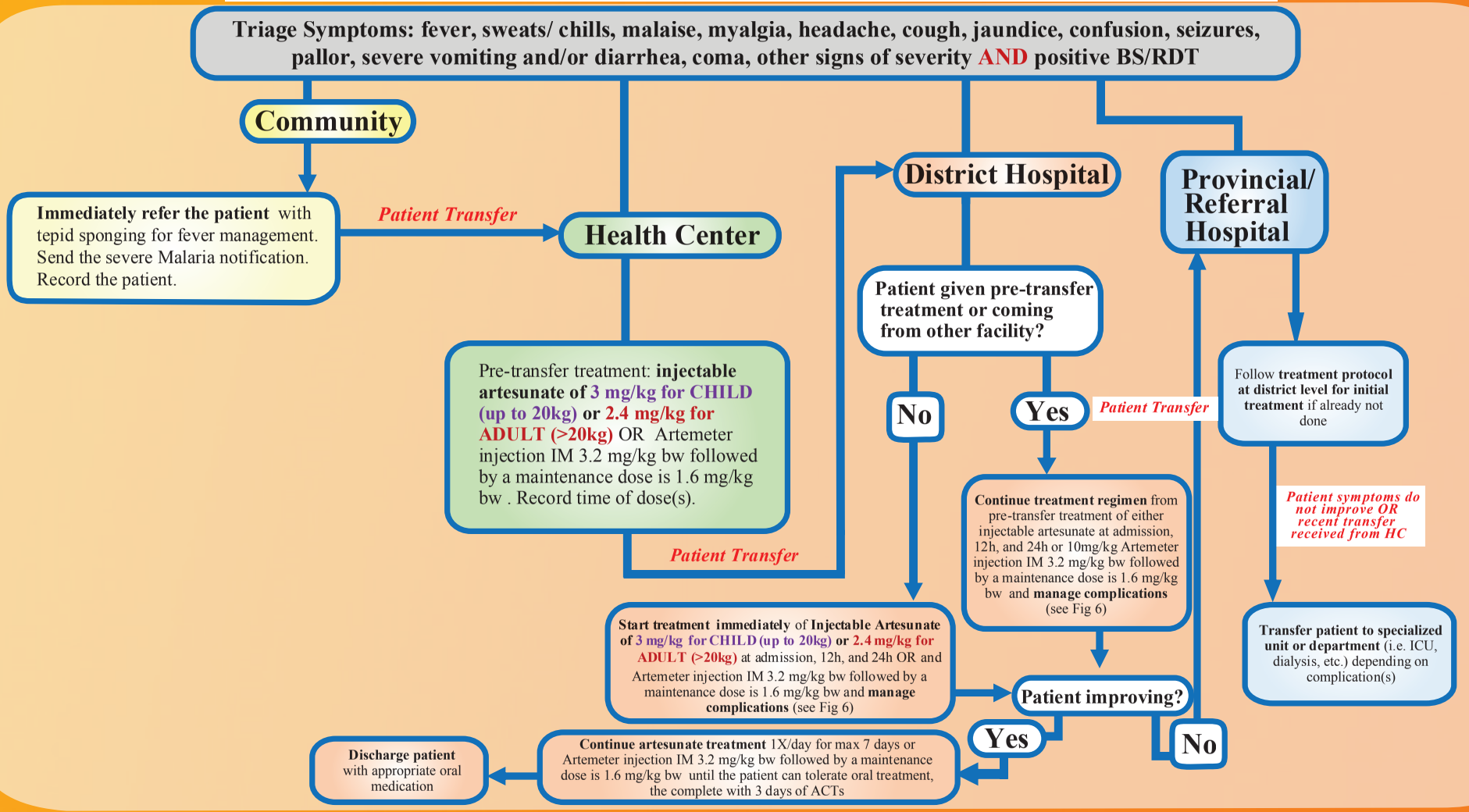


FIGURE 8: MANAGEMENT OF SEVERE MALARIA COMPLICATIONS

	IMMEDIATE MANAGEMENT	SPECIFIC MANAGEMENT
Hyperpyrexia	• Tepid sponging, fanning, cooling blanket • Paracetamol 15mg/kg (oral or suppository)	• Oral paracetamol 15 mg/kg 6 hourly • Oral paracetamol 15mg/kg with ibuprofen 10mg/kg every 4 hours
Hypoglycemia	• Check blood glucose; correct hypoglycemia and maintain with Glucose-containing infusion	*Children* • For children, administer 3 ml/kg of 10 % glucose or if not available, 1 ml/kg of 50 % glucose IV slow (over 5 minutes) • For hypoglycemia prevention in children, maintain a drip of 5 ml/kg of 5% glucose in Ringer or normal saline or 3-4 ml/kg of 10% *Adults* • For adults in coma, a test dose of 20 ml of 50% dextrose by intravenous injection is administered over 5 minutes
Convulsions	• Maintain airways • Treat promptly with intravenous or rectal diazepam, lorazepam, midazolam or intramuscular Paraldehyde • Check blood glucose	*Cerebral Malaria* • For children, intravenous diazepam 0.5 mg/kg • For adults, diazepam slow intravenous dose or 10mg IR *Repeated Convulsions* • Intramuscular Phenobarbital at a dose of 15 mg/kg for infants, 15-20 mg/kg for children and 5 mg/kg for adults is recommended; maintenance dose of Phenobarbital is 5 mg/kg for children, 48 hours after the loading dose • Seizure management as needed: o Phenobarbitol 20 mg/kg loading dose; 12 hours later begin maintenance with 5 mg/kg/ dose twice per day; or o Phenytoin 20 mg/kg loading dose (infuse over at least 20 minutes); 12 hours later begin maintenance with 2.5 mg/kg/dose twice per day
Coma	• Maintain airway, keep in lateral position, exclude other causes of coma (encephalopathies), avoid harmful ancillary treatments, intubate if necessary, lumbar puncture, blood sugar temperature, convulsions, aspirate, diuresis, pressure sores preventions, monitoring. • Evaluation several times and make a chart	*Health Center* • Manage acute needs (eg, check glucose) • Manage airway and place NG tube (as needed) • Elevate head of the bed by 30 degrees • Transfer to higher level of care promptly *District or Referral Hospital* • Administer oxygen (regardless of oxygen saturation) • Maintain normothermia: administer Paracetamol and/or ibuprofen via nasogastric tube/IR in children • Monitor blood pressure and glucose levels; maintain normoglycemia • Elevate head of the bed by 30 degrees • Obtain CT scan if any acute decompensation, focal neurologic sign, or inability to control seizures

FIGURE 9: MANAGEMENT OF SEVERE MALARIA COMPLICATIONS (CONTINUED)

	IMMEDIATE MANAGEMENT	SPECIFIC MANAGEMENT
Severe Anemia	• Transfusion must be considered if haematocrit <18% or concentration of haemoglobin is <5.1 g/dl; or in presence of the clinical signs of cardio respiratory distress (pallor, tachypnoea, and tachycardia)	• For children, transfusion with packed cells is recommended at 10 ml/kg for 2 hours • In case of lack of packed cells, transfuse with whole blood at a rate of 20 ml/kg body weight • For children with severe malnutrition, transfusion with whole blood is recommended at 10ml/kg body weight over ≥ 3 hours
Shock	• Suspect septicaemia, take blood for cultures; give parenteral broad-spectrum antimicrobials • Correct haemodynamic disturbances	• Normal saline or Ringer Lactate 20ml/kg to run less than 15 minutes • For malnourished children (kwashiorkor or marasmus), give dextrose 5% in Ringer lactate 10 ml/kg for 1 hour
Acute Pulmonary Edema	• Verify the level of haemoglobin and treat anaemia • Treat possible cardiac failure or pulmonary oedema, if necessary give a diuretic/ stop intravenous fluids • In life-threatening hypoxaemia, intubate and put on ventilator on positive end-expiratory pressure or continuous positive airway pressure	• Prop patient up at an angle of 45° • Administer oxygen at >5 litres per minute continuously until improvement • Furosemide 1mg/kg (adults iv 40mg) • Consider associated infection if respiratory distress persists
Acute Kidney Injury	• Exclude pre-renal causes • Check fluid balance and urinary sodium; monitor the daily diuresis in order to timely detect possible renal insufficiency • Add haemofiltration or haemodialysis; or, if not available, peritoneal dialysis	• Transfer patient to national referral hospital • If patient is on quinine with persisting acute kidney injury or no improvement by 48h the dose of quinine should be reduced by one third, to 10mg/kg every 12h
Spontaneous Bleeding	• Perform FBC (Hg level, platelet) and liver function test • Transfuse fresh whole blood (cryoprecipitate, fresh frozen plasma and platelets, if available) • Give Vitamin K injection	• Consult indication for blood transfusion: o Fresh frozen plasma: 10-15ml/kg o Platelets: 5-10ml/kg o Vitamin K: S/C, 2.5-10 mg at maximum 25mg
Metabolic Acidosis	• Evaluate level of dehydration • Perform blood gases • Exclude or treat hypoglycaemia, hypovolaemia and septicaemia	• Rehydrate accordingly the level of dehydration. See available protocol at health facility • See indication of acute haemodialysis/ haemofiltration • Transfer to ICU unit for appropriate management

6. MALARIA IN PREGNANCY

Administer antimalarial treatment only after obtaining a positive blood smear or positive rapid diagnostic test.

All pregnant women with fever attending ANC clinic at Health Facility should be tested by microscopy or RDT to exclude Malaria.

6.1. Simple Malaria Management in Pregnancy.

Because malaria during pregnancy can aggravate latent anemia, it is recommended to do a complete clinical exam.

- Arthesunate-lumefantrine(AL) and Dihydroarthemesinin-piperaquine (DHAP) are indicated during all trimesters of pregnancy; ASPY(arthesunate-pyronaridine) is contraindicated during first trimester but indicated in second and 3rd trimester of pregnancy.
- In case of fever, administer paracetamol tablets, 500 mg three times per day;
- See Figure 10 for more information.

6.2. Simple Malaria with Minor Digestive Symptoms in Pregnancy

The symptomatology of this type of malaria is similar to the one described earlier in children and adults. The alteration of the general status can be accentuated by the vomiting and other symptoms related to the pregnancy.

6.2.1. First trimester.

- Use arthesunate IV or arthemeter IM, switch to a full 3days Oral AL or DHAP
- See Figure 10 for more information.

6.2.2. Second and third trimester

- Artesunate IV injection of 2.4 mg/kg BW IV or IM given at 0h then at 12h and 24h;
- Once patient improves, change to oral Artemether-lumefantrine twice a day for three consecutive days.
- Arthemeter IM at 3.2mg/kg bw as loading dose followed by 1,6mg/kg bw daily, is a acceptable 2nd option in case arthesunate cannot be used for any reason, switch to a full dose oral ACT(AL, or DHAP or ASPY)
- See Figure 10 for more information.

Supportive treatment

Diarrhea or Vomiting

- Evaluate and monitor the state of hydration;
- Rehydrate with ORS or other available liquids and even introduce nasogastric tube if necessary;
- Anti-emetics are not recommended.

High Fever

- Administer paracetamol 15 mg/kg orally or any other antipyretic that may be indicated.

6.3. Severe Malaria in Pregnancy

6.3.1. Health Center

- Treatment must not be delayed
- Parenteral Artesunate will be administered as a single dose (Dosage is 2.4 mg/kg IV or IM) before transferring the patient to the nearest District hospital.

6.3.2. District Hospital

- Use Artesunate IV injection of 2.4 mg/kg BW IV or IM given at 0h then at 12h and 24h;
- Once the patient improves, change to oral ACT (AL, or DHAP or ASPY);
- See Figure 10 for more information.

Note: Whatever the medicine and the mode of administration used, if the state of health of the patient doesn't improve in 24 hours, do a rapid diagnostic test or blood smear and refer the patient with the referral note or treatment file, giving detailed information on the treatment provided so far, to the nearest next level hospital.

6.3.3. Supportive Treatment

High Fever

If the temperature is higher or equal to 38°C:

- Do tepid sponging;
- Give Paracetamol 15 mg /kg by oral route or suppository form, or any other antipyretic that may be indicated.

Hypoglycemia

To treat/prevent hypoglycemia (characterized by loss of consciousness, severe weakness):

- The threshold for intervention is glucose is 3,9 mmol/l (70mg/dl) for adults or when unable to get blood sugar test:
- Give 20-50 ml of 50% glucose by intravenous injection administered over 5-10 minutes;
- Or administration of water with 10% sugar per mouth or with nasogastric tube, at a rate of 50 -100 ml for the adults;
- Water with 10% sugar is readily prepared in the following way: take 100 ml of boiled clean water and add 10 g of sugar or measure of 2 coffee spoons(cool down to a reasonable temperature before oral use to avoid burn injury that may raise from using very hot oral fluid).

Convulsions

- Administer Diazepam 10 mg via IV slowly;
- If convulsions persist, give Phenobarbital 10-15 mg/kg IM; there must be capabilities to support breathing before giving phenobarbital as it can cause respiratory arrest;
- Maintain airways.

FIGURE 10: : TREATMENT OF MALARIA IN PREGNANT WOMEN

Determine malaria type by symptoms (See Figure 2 for Simple Malaria, Figure 3 for Simple Malaria with Minor Digestive Symptoms, Figure 4 for Severe Malaria)

Simple Malaria

All Trimesters

Standard 6-dose treatment of ACT regimen

- Artemisinin combination therapy (ACT) treatment of **dispersible artemether 20mg and lumefantrine 120mg** of 4 tablets given 2x/day for 3 days
- Dihydroartemisinin Piperaquine

NB: Artesunate Pironaridine is contra-indicated during the fisrt trimester of pregnancy.

Simple Malaria with Minor Digestive Symptoms

All Trimesters

Use 2.4mg/kg Parenteral Artesunate at 0, 12, 24 hours OR

Artemeter injection IM 3.2 mg/kg bw followed by a maintenance dose is 1.6 mg/kg bw

Artemisinin combination therapy (ACT) treatment of **Artemeter Lumefantrine or (second option) Dihydro-artemisinin Piperaquine, or (3rd option) Artesunate-Pyronaridine**

Severe Malaria

All Trimesters

Administer **injectable artesunate of 2.4 mg/kg** at 0, 12, 24 hours OR Artemeter injection IM 3.2 mg/kg bw followed by a maintenance dose is 1.6 mg/kg bw

When patient can swallow, give appropriate Artemisinin combination therapy (ACT) for 3 days

Considerations for Pregnant Women

- Postpartum bacterial infections are common complications for those with malaria during pregnancy
- Hypoglycaemia is expected with anti malarial treatment and is recurrent with quinine treatment types

For ALL Malaria Manifestations

If no improvement of signs/ symptoms after 24 hours of treatment, transfer to nearest district hospital for proper management

7. OTHER RISK GROUPS

Table 5: Treatment of Other Risk Groups.

Risk group	Treatment	Special attention
Malnourished young children	Artemisinin derivative are safe and well tolerated by young children therefore, the choice of ACT is determined largely by the safety and tolerability of the partner drug. Always determine gastrointestinal tolerability. In malnourished children investigations and drugs administration are the same as other children.	Delay in treating **P. falciparum** in infant and young children can have fatal consequences.
Obese adults	In principle dosing of large adults should be based on achieving the target mg/ kg dose for each antimalarial regimen however do not exceed maximum allowed dosage (should be tailolled to eachparticular drug).	
Patients with HIV	Studies of administration of quinine/ AL with Lopinavir/Ritonavir or ritonavir alone in healthy volunteers gave conflicting results. In our settings patients with HIV infection on treatment who get infected with malaria are treated as the same as the other patients.	They should be moni- tored closely as there is a risk of recurrent malaria episode. In the immune-compro- mised adult with HIV whose respiratory distress persists, think about a lung infection due to **Pneumocystis jiroveci** (op- portunistic infection) or pulmonary tuberculosis.
Patients with TB	Rifampicin or Efavirenz; Rifampicin is potent CYP3A4 inducers with weak antimalarial activity. There is insufficiency evidence at this time to change the current mg/kg dosing recommendations.	These patients are at higher risk of recrudes- cence infections they should be monitored closely.
Non-immune travelers	Treat travelers with uncomplicated **P. falciparum** malaria returning to non-endemic setting with ACT.	

Congenital malaria	**Clinical features:** The most common clinical findings in cases of congenital malaria are fever, anemia, and splenomegaly. The bilirubin level may be elevated, depending on liver dysfunction or hemolysis. When malaria occurs during the first few months of life, it is frequently complicated by other illness, such as pneumonia, septicemia, and diarrhea. Symptoms can be nonspecific and confused with bacterial sepsis. Diagnosis requires high level of suspicion as malaria can look like neonatal sepsis. **Treatment:** Artesunate at a dose of 3 mg/kg/dose at 0, 12, and 24 hours then every 24 hours, followed by Arthemether-lumefantrine: adjust dose to goal total dose of 5-25 mg/ kg body weight for artemether and 29-114 mg/kg for lumefantrine.	Congenital malaria can be acquired by transmission of parasites from mother to child during pregnancy or perinatally during labor. Newborns with congenital malaria can present as early as 8 hours to as late as 8 weeks of age and may not have fever, but can present with symptoms similar to neonatal sepsis. Congenital malaria may occur in infants of mothers who are asymptomatic. Parasitemia is often not demonstrable in the mother. Most infants with congenital malaria have the onset of the first sign or symptom at 10 to 28 days of age. However, passively transferred maternal antibody in the neonate may lengthen the incubation period.
Recurrent malaria	Recurrent malaria can be due to recrudescence or new infection. The only way to distinguish between the two is via PCR testing. • If patient had malaria <28 days ago, treat with DHA-Piperaquine. • If patient had malaria >28 days ago, treat with AL. Patients with more than 1 recurrence of malaria must have blood sent to a reference laboratory for specification of parasites and, if available, PCR.	
Asymptomatic patients	All people should be treated with safe, effective anti-malarial medicines that will clear all asexual stage parasites. For **P. falciparum** infections, treatment to clear sexual stage parasites (gametocytes) should also be given. Currently available artemisinin based combination therapy (ACT) is effective against developing stages 1–4 gametocytes but not the infectious stage 5 gametocytes, which require a gametocytocide (i.e. single-dose primaquine at 0.25 mg/ kg of body weight), which can prevent the transmission to mosquitoes of sexual stage parasites present in the blood.	In general, in areas of high transmission, people usually experience repeated infections from early in life and develop a significant degree of immunity with increasing age and exposure. Acquired immunity tends to limit parasite replication but rarely leads to sterilizing immunity. As such, in areas with significant levels of acquired immunity, a high proportion of the population can harbor parasites in the absence of significant clinical manifestations.

8. CHEMOPROPHYLAXIS FOR TRAVELERS

Since Rwanda is country-wide endemic for malaria, chemoprophylaxis is recommended to all travelers specifically from no-malaria endemic countries including Splenectomized and Sickle cell disease patients.

The recommended treatment is Atovaquone/Proguanil (Malarone); Doxycycline; or, Mefloquine (Lariam) with different dosage as per the table below:

Table 6: Chemoprophylaxis Dosages

Medicines	Dosage
Adults	
Atovaquone/Proguanil (Malarone): 250mg atovaquone plus 100mg proguanil	1 tablet/day
Doxycycline	100 mg/day
Mefloquine Lariam (228mg base and 250mg salt)	1 tablet/week
Children	
Atovaquone/Proguanil (Malarone): 62.5mg atovaquone plus 25mg proguanil	5–8 kg: 1/2 pediatric tablet daily > 8–10 kg: 3/4 pediatric tablet daily >10–20 kg: 1 pediatric tablet daily >20–30 kg: 2 pediatric tablets daily >30–40 kg: 3 pediatric tablets daily >40 kg: 1 adult tablet daily
Doxycycline*	100 mg/day
Mefloquine Lariam (228mg base and 250mg salt)	1 tablet/week

*Doxycycline should not be used by pregnant women nor should it be given to children under the age of 8 years.
* For children above 8 years, the clinician will calculate the correct weekly dose for child based on the child's weight.

8.1. Malaria Prevention in children under 5 and pregnant women.

Currently, Rwanda is no longer implementing the IPT-p since 2008 due to the resistance to Sulphadoxine-Pyrimethamine. In line with WHO guidance, Rwanda will continue the routine distribution of LLINs during ANC visit and EPI service to pregnant and children under one year. In addition, the home- based care management for malaria will be continued for early diagnosis and treatment of all suspected malaria cases.

8.2 Malaria vaccine

There is currently no WHO recommendation policy for the large-scale use of malaria vaccine. However, pilot implementation program is ongoing in sub-Saharan countries for children aged 5-17 months for further evaluation including operational feasibility by the organization.

Part two:

SUPPLY CHAIN MANAGEMENT OF MALARIA COMMODITIES

1. LEVELS OF SUPPLY CHAIN

Malaria commodities follow the same supply chain channel as for other health commodities. There are three levels in the supply chain of malaria commodities in Rwanda:

Central Medical Store (RMS Ltd) / Private Wholesalers

This is the first level of supply chain in charge of procurement, distribution, and storage of health commodities at national level. RMS central warehouse (Headquarter) distributes malaria commodities to its district branches, the second level of the supply chain in Rwanda. BUFMAR and MEDIASOL also distribute commodities to RMS branches following the agreement signed with RMS headquarter.

The private wholesalers and/or retailers provide health commodities not available at RMS HQ, BUFMAR and MEDISAOL.

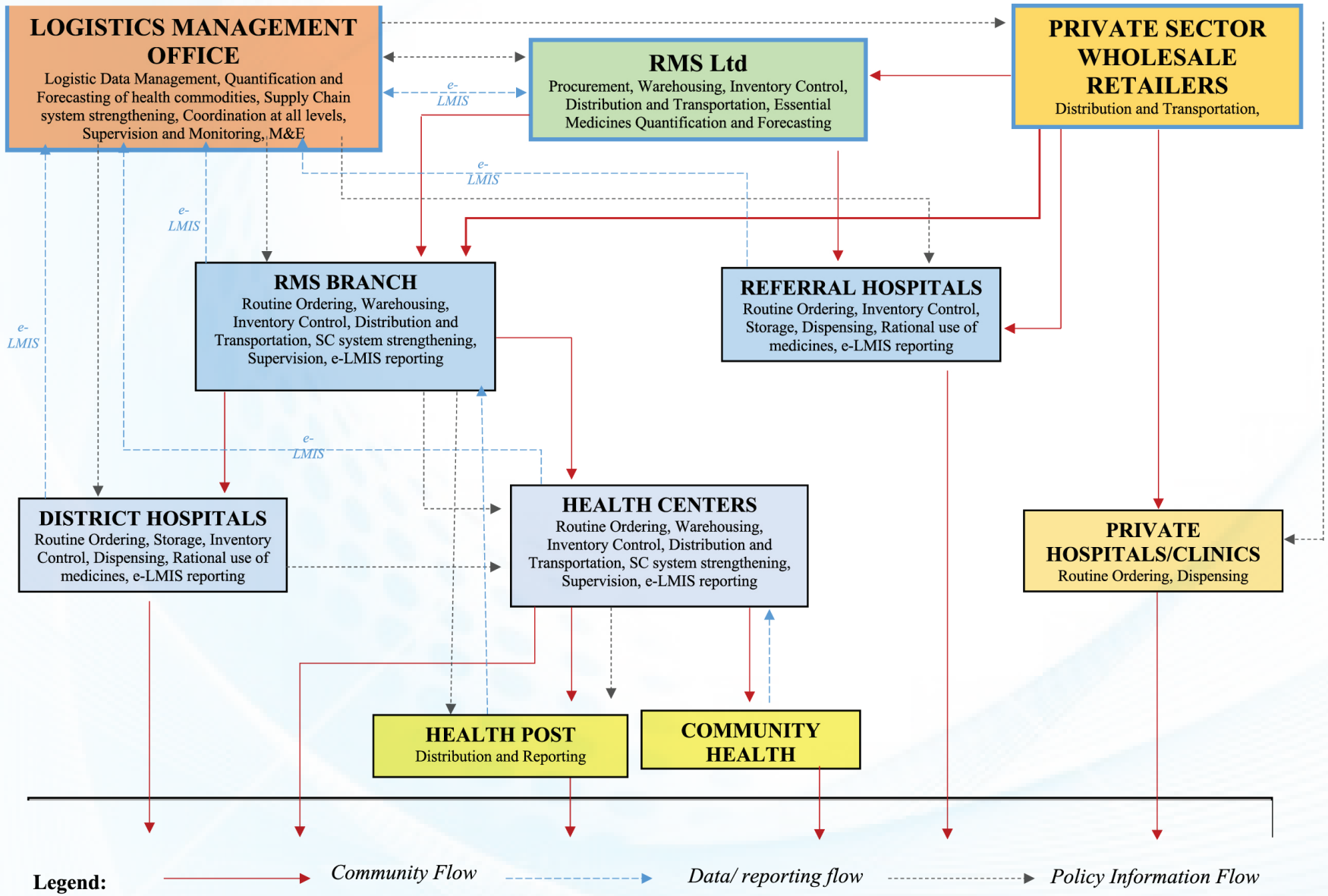
District Level (RMS Branches)

This is the intermediate level of the supply chain which oversees the supply chain of malaria commodities at district level. All the RMS branches should request malaria commodities through RMS HQ or must obtain a written notice to buy in private sector when RMS do not have product.

Health Facilities

The third level of the supply chain includes provincial hospitals, district hospitals, Health Centers and private clinics. All public health centers and hospitals as well as accredited private facilities receive commodities from the public sector that are supplied by RMS branches. Private clinics are supplied by the private wholesalers. The third level of the supply chain is responsible for receiving, storing, inventory management and distributing malaria commodities to the end user directly or indirectly through community health workers or health posts.

FIGURE 11: RWANDA SUPPLY CHAIN NETWORK



2. QUANTIFICATION AND MONITORING

Quantification of malaria commodities is done annually by the CPDS quantification malaria sub-committee which is composed of different stakeholders involved in malaria commodities management including MoH, funding and implementing Partners and RMS). A continuous monitoring to ensure uninterrupted availability of malaria commodities and to avoid losses due to expiry is done through quarterly supply plan reviews and monthly stock status assessment.

3. PROCUREMENT OF MALARIA COMMODITIES

3.1. Procurement and Technical Specifications

Once the annual quantification exercise is completed, a procurement plan for the next one year is shared with procuring entities to start the procurement process. The procurement is based on both WHO criteria and funding partners' specific regulations. Commodities arriving in country should have at least:

- 85% of the specified shelf life upon delivery at port/airport of entry for goods with a shelf life of more than two years and
- 75% for goods with a shelf life of two years or less of remaining shelf life.
- Exception to this shelf life requirement, should be pre-approved by the malaria program and supported with a detailed report with clear justification of accepting such products

3.2. Routine ordering

At central Medical Store, Malaria commodities are stored und 2 budget Holders: all ACTs and RDT that are used by CHWs and RDT, Malaria Drugs used to treat people with low socioeconomic status at Health Facilities are stored under MF budget holder. All ACTs, Artesunate and Artemeter used at Health Facility level (HP, HC, Hospitals) that are not provided to patients for free are stored under MP budget holder.

Health facilities request malaria commodities to RMS branches monthly through e-LMIS. RMS branches request commodities to RMS via e-LMIS on monthly basis. The upper level receiving requests should have the following accurate data available to validate the request:

- Stock at the beginning of the month
- Quantity received during the month
- Number of days of stock out
- Quantity consumed during the month
- Physical quantity at the end of the month

To avoid stock out or expiry of commodities, the Rwanda Health supply chain system was designed to have:

- A maximum stock lasting for 2 months and a minimum of 1 month at each health facility (health centers and hospitals)
- A maximum stock lasting for 3 months and a minimum stock of 2 months at RMS branches having an overstock at health facilities may results not only in risk of expiration but also a risk of stock out for other health facilities due to irrational distribution of malaria commodities. At the end of each month, it is recommended to assess the stock status by month to ensure the correct order amount to bring the maximum quantity back up to 2 months. During the stock status review, when the quantities in stock are estimated to last 0.25 months, a health facility should make an emergency order to RMS branches.

4. DISTRIBUTION AND STORAGE

Monthly active distribution occurs from RMS to RMS branches and from RMS branches to health facilities.

To prevent irrational distribution of ACTs and RDTs within the supply chain levels, it is important for health centers and RMS branches to monitor regularly their consumption trend as well as stock usability based on expiration dates and seasonality pattern of the consumption.

Health Centers should not distribute commodities with less than one-month shelf life to CHWs unless there is no other medicines with better shelf life. In this case, the health Center giving the stock should emphasize that the stock given is expiring in one month, and should not be given beyond the expiration dates; however, exceptions are made per facility if average monthly consumption of drugs/tests is forecasted to be used before expiry date.

Distribution is done using the principle of first expire first out (FEFO); commodities in the stock with closest expiry dates must be the first out to avoid expiration in the health facility.

The Health center bear the first responsibility to ensure Malaria medicines are well managed in order to prevent stock out and expiries in its catchment area. In case a risk of expiration of one product (ACT or RDT) is identified the priority should be given to the consumption of that specific product. In this case, all measures including combination or spiting of that age group, redistribution, or exclusive use of RDT at Health Facility (in case RDT is at risk) should be undertaken until the concerned product is fully consumed.

If expired product is found, the head of facility needs to notify and submit a report to next upper level supply chain management and proceed with incineration of those products.

Malaria commodities among other health commodities must be kept in storage conditions as per good storage practice and storage conditions required for the specific product. This is especially pertinent for ACTs and RDTs as they must be stored out of humidity and high temperature.

Special consideration to RDTs: in line with Ministerial instruction regulating the distribution of malaria drugs and RDTs in health facilities and community for HBM strengthening, the distribution of RDTs from RMS branch to health facilities and community will be done as follow:

- 15% of all RDTs will be distributed to Health Posts
- 85% of all RDTs will be Distributed to Health Centers.
- 95% of the total RDTs received at HC will be distributed to CHWs.
- 5% of total RDTs received at HC will be used at HF.

5. QUALITY CONTROL OF COMMODITIES

5.1. Antimalarial drugs

The Quality Control of antimalarial medicines is done once a year by the Malaria Program as per GF recommendation to make sure antimalarial medicines retain proper quality through the supply chain down to community level. To account for these quality standards, samples are collected from RMS branches/District Hospitals, Health Centers, and community and then taken to the approved laboratory to perform the QC tests. At random, samples are taken to the international laboratory prequalified by WHO. This activity is conducted in collaboration with Rwanda Food and Drug Authority.

Antimalarial medicines QC per product is performed at in-country arrival of commodities before distribution to districts by Central Medical Store. As part of the requirement by Rwanda FDA to issue the Import license, the supplier need to Provide a valid Certificate of analysis before importing the product in the country. Additionally, upon reception at RMS Ltd, products are physically checked by the Quality Control team to ensure the product quality conformity as per attached checklist. RBC/MOPDD will require the Import License from RFDA and the Inspection Report performed by RMS Ltd prior to the distribution of Malaria commodities to lower level of the supply chain.

5.2. Malaria RDTs

The QC of malaria RDTs is done once year as per GF recommendation to make sure tests used in country have good quality. RDTs samples are collected from RMS branches, health centers, Health Posts and community and then taken to the international laboratory prequalified by WHO for QC tests.

Malaria Rapid Diagnostic Tests QC is performed at in-country arrival of commodities before distribution to districts by Central Medical Store. As part of the requirement by Rwanda FDA to issue the Import license, the supplier need to provide a valid Certificate of Analysis before importing the product in the country. Additionally, upon reception of Malaria Rapid Diagnostic Tests at RMS Ltd Central where house, products are physically checked by the Quality Control team to ensure the product quality conformity as per attached checklist. RBC/MOPDD will require the Import License from RFDA and the Physical Inspection Report performed by RMS prior to the distribution of Malaria Rapid Diagnostic Tests to lower level of the supply chain.

6. KEY SUPPLY CHAIN DEFINITIONS

- Stock out of a product is the absence of stock of a product so that a facility is unable to treat patients in need of that product.
- Expiration date of a product/commodity: An expiration date or expiry date is a previously determined date by the manufacturer after which the commodity should no longer be used.
- Security stock or buffer stock is the stock of commodities that can be used while waiting for the replenishment or supply of enough stock, in Rwanda context, we use a security stock of buffer stock equal to 25% of the monthly consumption of a facility.
- Months of stock of a product/commodity is number that represents a period in which a quantity of product/commodity available in stock can last. This is calculated by dividing the usable available stock on hand in quantity unit of measure by the quantity consumed for each health commodity for the current month.
- Consumption data is the quantity of product/commodity that has been dispensed or used directly for the patients testing or treatment.
- Distribution data is the quantity that has been distributed from one storage place to another. This is intended to be distributed later to patients.

7. TECHNICAL SPECIFICATIONS OF COMMODITIES

See Annex 1 for specifications per product.

Part three:

VECTOR CONTROL AND MALARIA PREVENTION

1. INTRODUCTION

Vector control is a vital component of malaria prevention, control and elimination strategies because it can be highly effective in reducing disease transmission and/or providing personal protection. Ideally, malaria vector control results in the reduction of malaria transmission rates by reducing the vectorial capacity to a point at which transmission is interrupted. According to WHO 2019, vector control is defined as measures of any kind against malaria-transmitting mosquitoes, intended to limit their ability to transmit the disease. Thus, vector control interventions include tools, technologies and approaches. This section of malaria vector control guidelines has been developed in accordance with the latest WHO guidelines, for malaria vector control (2019) and for malaria (2022). Recommended vector control interventions cover core interventions, supplementary interventions, personal protection measures and other interventions. Core interventions for malaria vector control are applicable for all populations at risk of malaria in most epidemiological and ecological settings, namely -i) deployment of insecticide-treated nets (ITNs) that are prequalified by WHO, which in many settings are long-lasting insecticidal nets (LLINs); and ii) indoor residual spraying (IRS) with a product prequalified by WHO supported by local evidences on bio-efficacy and residual insecticidal activity. Once high coverage with one core intervention has been achieved, supplementary interventions – namely. the deployment of chemical or biological larvicides or predators, environmental management of mosquito breeding habitats can be used to complement the core interventions in specific settings and circumstances. Supplementary interventions are those with conditional recommendations that may be applicable for specific populations, situations or settings. These include community based or personal protection measures that have a primary use-pattern of protecting community or individual users, although they may have some as yet unproven impact when deployed at the community level.

The interventions are divided into categories of those recommended for large-scale deployment and those recommended as supplementary. Interventions that are recommended for large-scale deployment are those that have demonstrated public health value, i.e., have proven protective efficacy to reduce or prevent infection and/or disease in humans at the community level, and - in the case of insecticide treated nets (ITNs) - at the individual level, and that are broadly applicable for populations at risk of malaria in most epidemiological and ecological settings.

In Rwanda, malaria vector control, core or supplemental interventions are implemented under the Integrated Vector Management (IVM) strategy as an approach for the management of vector borne diseases including malaria. The core interventions are implemented as public interventions with universal coverage for ITNs/LLINs and supplemental interventions target specific groups or settings through social marketing or community based. The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness, and sustainability of disease-vector control. The rationale of the IVM is the need to overcome challenges experienced with conventional single-intervention approaches for vector control and the opportunities for promoting inter-sectorial collaboration approach for integrated management of malaria disease.

Personal protective measures will include those giving individual protection to reduce the human-mosquito contacts, for example the use of mosquito repellents using the topical (lotion, creams, gels, ointments, sprays, roll-ons, wipes, bathing soaps, etc…) or spray (coils, mat vaporizers, sprays, candles, bracelets etc…) applications and local herbs (i.e Geranium, Lemon grass), protective clothing, insect proofing houses, insecticide space sprays etc.

2. CORE VECTOR CONTROL INTERVENTIONS

2.1. LONG LASTING INSECTICIDE-IMPREGNATED NETS

2.1.1. Definition

A Long Lasting Insecticide-Impregnated Net (LLIN) is a bed net treated with an insecticide which forms a physical and chemical barrier around people sleeping under it.

a. **The physical barrier**: mosquitoes cannot have access to individual sleeping under the net.

b. **The chemical barrier**: the insecticides incorporated/coated into the net fabrics kill mosquitoes. The insecticides also repel mosquitoes, reducing the number that enter the house and attempt to feed on people inside.

The National Malaria Strategic Plan for 2020-2024 and the World Health Organization (WHO) emphasize the importance of achieving universal coverage (UC) for populations at risk by deploying Long-Lasting Insecticidal Nets (LLINs). To this end, LLINs are provided to households with low to moderate malaria rates via large-scale distribution efforts and through regular distribution mechanisms targeting high-risk groups, especially children under the age of five and pregnant women, across the entire country.

A LLIN is designed to remain effective for 3-5 years and in Rwanda, based to the results of the LLINs monitoring survey, the replacement period was set to two years without re-treatment. In order to be effective, WHO recommends the universal coverage (1 LLIN for every 2 people in the targeted population).

c. **Shelf life of LLIN:** The Shelf-Life of the net is the period for which the net stored in its original bag or package retains its properties. This Shelf-life is assessed by each manufacturers using Laboratory Data.

The National Malaria Control Program recommends all manufacturers of LLINs supplied to Rwanda to determine and indicate the production date as well as the Shelf-life of their products that should not go below 2 years at the reception.

It is important to note that in case LLINs are kept in correct storage conditions can maintain their chemical content longer. Passed this period of shelf life, a net can be retested to assess its chemical content or simply be used as physical barrier.

d. **Lifespan of LLIN:** According to WHOPES/WHO PQ, the Lifespan of the net also called Usefulness refers to 20 standard washes or 3 years in the field/ 3 years after opening (on field use in 'serviceable' condition exposing the insecticide to a gradual decay). all manufacturers of LLINs supplied to Rwanda recommended to comply to this.

The National Malaria Control Program recommends all manufacturers of LLINs supplied to Rwanda to determine the shelf life and Lifespan or Usefulness of their products.

2.1.2. Implementation

The implementation of LLINs activities is done by the following institutions:

- **MOH/RBC:** The Ministry of Health and RBC provide leadership and guidance through the Malaria Strategic Plan which guides government entities and partners involved in planning and implementation of LLINs activities. These activities include provision of quantities needed, technical specifications, organizing distribution campaigns (HH), implementation of the routine distribution (EPI, ANC), supervise the LLINs selling in the private and public sector, oversight on the HH use routine monitoring, mobilization of required funds and conduct operational research;

- **District hospitals and health centers:** Conduct the needs assessment to provide the number of LLINs and beneficiaries in the community, implement the LLIN distribution campaigns in their respective operational areas, supervise the distribution to children under one year and pregnant women through EPI and ANC services, community mobilization, and utilization monitoring on a routine basis;
- **MOH partnership organizations:** Resources mobilization, funds mobilization, participation in the distribution campaigns, community mobilization.
- **Local leaders:**
  Ensure LLINs are distributed according to their needs
  Ensure proper use of LLINs in the community

2.1.3. Recommended LLINs Technical Specifications

Since 2006, Rwanda is procuring LLINs produced by WHO recommended manufacturers and based also to the country needs. Technical specifications are developed in collaboration with partners and approved for implementation. Currently, the WHO approved LLINs are Pyrethroid impregnated, and double active ingridients treated LLINs with Pyrethroid plus another class of insecticide or treated with Pyrethroid plus PBO. For the Rwanda approved technical LLIN specifications, please see Annex 6 (Rectangular LLIN), Annex 7 (Conical LLIN) and Annex 8 (Conical Extra-Large LLIN). However, as Rwanda is implementing the LLINs social marketing, private sector should sell customized LLINs (LLINs with special technical specifications) in order to satisfy the market need.

2.1.4 Procurement of LLINs

2.14.1. Quantification

- According to WHO recommendation, an overall ratio of 1 LLIN for every 1.8 people in the targeted population should be used to calculate overall LLIN need for the household mass campaign distribution in order to reach the universal coverage. This important quantity should be decided on the basis of net durability (which in Rwanda currently is 2 years), and only WHO-recommended LLINs should be procured and distributed. The government and partners should consider maintaining stocks of LLINs for local replacement, which requires a modest additional number of LLINs over the calculated procurement. Addition to the quantity needed for mass campaign distribution, the children under 1 years and pregnant women are protected by receiving LLINs through routine distribution and the needed quantity for those vulnerable groups is calculated as follow:
- For children under one year is, the needed quantity is calculated on the basis of the average of children attending the first immunization (BCG1) during the 4 last years multiplied by the annual increase rate of 4.8%;
- For pregnant women, the needed quantity is calculated on the basis of the average of new ANC registration of PW attending the ANC during the 4 last years multiplied by the annual increase rate of 4.8%;

2.1.4.2. Procurement Process

The procurement process will be done by 2 sectors as follow:

For public sector

- The procurement is done by the National Medical Procurement Entity based on the country needs and technical specifications submitted by the MOPDD following the national procurement regulations.

For private sector

- This will be done by any private institution to a LLIN WHO-approved manufacturer according to the approved national technical specifications. Additionally, any private distributor will seek a waiver from the MoH according to the regulations in place. Provisions of LLINs through private sector (both manufacturing and selling) is another option for maintaining and sustaining the universal coverage of LLINs in Rwanda.

2.1.5. Quality Control and Quality Assurance of LLINs

As per the WHO guidance and country regulation, all procured LLINs will be subject to the QC/QA before it's reception and distribution to the population. For LLINs procured for the public sector, the Medical Procurement Entity has the responsibilities to conduct the QC/QA and those procured by the private sector will be inspected by the MoH. Three type of QC/QA will be followed:

2.1.5.1. QC/QA before Shipment

The supplier is responsible for pre-shipment physical and chemical testing using a WHO-approved laboratory.

2.1.5.2. QC/QA at Arrival In-Country

At arrival, the procuring entity in collaboration with the MOPDD and RBS has the mandate to conduct the physical and chemical testing for LLINs procured through the public sector while the MoH have the mandate to conduct the QC/QA of LLINs procured by the private sector. This will be measured through 2 aspects as follow:

a) Physical Inspection Methodology

- **Inspection Team**

The inspection team will be composed by the procuring entity, the malaria program and the third party (RBS).

- **Definition of Defects**

For defect standardization and clarity, the following definitions are being used:

Major defect: A defect that is likely to result in a material failure or to render the product not fit for its intended purpose. Major defects in workmanship and material such as holes, shape, etc. are shown in Annex 9.

Minor defect: A defect that is not likely to reduce the usability of the product for its intended purpose or a deviation from established standards of quality, having little bearing on the effective use or operation of the product. Minor defects in workmanship and material such as color, stains, etc. are shown in Annex 9.

Other observations will be included for review of the supplier and to give feedback to manufacturer for continuous improvement. Further, it is still the supplier's responsibility to ensure the product delivered is fit for purpose irrespective of the AQL levels applied at pre-delivery inspections.

b) Chemical Inspection Methodology

Samples will be tested in a WHO approved laboratory and Rwanda Standard Regulatory Agency for the parameters mentioned in the technical specifications. The methodology will refer to the WHO Guidelines for Laboratory and Field-Testing of Long Lasting Insecticidal Nets (2014).

Additionally, see Annexes 9-13 for detailed information.

2.1.6.3. QC/QA on field

This will be conducted by the MOPDD as the LLINs monitoring survey and LLINs durability.

2.1.7. Distribution of LLINs

In Rwanda, as recommended by World Health Organization, LLINs for malaria prevention should be distributed through a combination of mass free distributions and continuous distributions through multiple channels such as antenatal and immunization services.

Mass campaigns are a cost-effective way to rapidly achieve high and equitable coverage, but coverage gaps appear, requiring complementary continuous distribution channels. In Rwanda three channels are used in LLINs distribution: household campaigns every 2 to 3 years, EPI, and ANC.

c) 2.1.7.1 Routine Distribution of LLINs

The routine distribution of LLINs is organized at the health center level. It targets all children aged 9 months attending the measles and rubella vaccination and all pregnant women attending the antenatal care service. The distribution will be done also to children under one year and pregnant women coming from their catchment area including "Hors Zone". The distribution of the free LLIN to the age group of 9 to 12 months is organized during **measles and rubella (MR1) immunization** visit while the distribution to pregnant women is held during **first antenatal care visit**.

2.1.7.2 Household LLIN Distribution

During this distribution, LLINs will be distributed taking into account to the need from the community, LLINs will be distributed free of charge for the population. The estimated quantities of LLINs needed per village are made in advance by decentralized level with the support of the community health workers (or other individuals identified qualified to implement the need assessment) and approved by local authorities. This estimation is based on needs assessment of LLINs done for each household according to the total number of household members devised by 1.8

people. It takes into account the number of LLINs with effective insecticide and available nets in the households that have not exceed two years of usage. The assumption used is 1 LLIN for 1.8 people according to the WHO/ RBM guidance.

All completed forms will be brought back to the health center by the community health workers (or other individuals identified qualified to implement the need assessment) for compilation and submission to the district hospital. The district hospital will compile all needs in its catchment area into one report which will be sent to the Malaria & OPD Division for the identification of gaps and preparation of the supply plan for health centers.

When health centers are supplied with LLINs, they collaborate with chiefs of village and Community Health Workers to inform the public on the distribution plan using the available communication channels. The health center will compile reports of LLINs distributed and will report that to the central level through the HMIS and hard copies.

2.1.8. Usage and Management of LLINs

LLINs should be kept clean and can be washed as needed. However, 20 washes are the maximum during the utilization period. RBC recommends washing LLINs only once in a quarter (or more) and with normal soap, not detergent.

Key measures for washing LLINs:

- Wash apparatus to be used: basin and soap;
- The LLINs should be washed in cold water. Hot water weakens the fibers and accelerates the insecticide decay;
- Do not mix LLINs during their washing. Wash them individually;
- Wash hands with soap and lots of water;
- Do not wash/ rinse LLINs in or near drinking water sources, ponds, lakes, rivers, streams;
- Dispose of water for washing/ rinsing in the toilet or in a hole away from habitation, animal shelters, drinking water sources, ponds, rivers and streams;
- Let the LLIN dry flat in the shade.

Health centers must collaborate with the local authorities so that the community does not use the LLINs for other purposes within two to three years after distribution (such as fence of poultry, fishing, kitchen garden, etc.).

2.1.9 Environmental and Safety Considerations for LLIN Disposal

2.1.9.1. Disposal of LLINs Plastic Bag

For the environmental protection purpose, the health center staff will tear the plastic bag before giving the LLINs to the beneficiaries and keep them at the health center to be sent to the district hospital. Recycling companies approved by REMA will be allowed to collect all plastic bags from district hospitals. The LLINs distributed to the beneficiaries have to match with the plastic bag to be disposed. Empty plastic bags of LLINs distributed during routine activities must be well stored at health centers and brought to district hospitals during routine supervisions. The Malaria & OPDD will communicate with the approved recycling companies and district hospitals for the implementation of the collection schedule.

2.1.9.2. Disposal of Used LLINs

Obsolete LLINs are appropriately managed and disposed at the health facility level by proper burning. The disposal methods must follow WHO recommendations on sound management of old LLINs and the in-country environmental management policies.

2.1.10. LLINs in Social Marketing and Private Sector

The GoR sustains the LLIN universal coverage through distribution in the public sector and also by strengthening the availability in the private sector. This is done through two channels as follows:

2.1.8.1. Social marketing

The National Malaria Control Program will ensure an integrated marketing concepts with other approaches to influence behaviors that benefit communities for the greater social good regarding malaria prevention through LLINs. Social marketing of LLINs will target the entire population in needs. The MOH will work with partners to ensure LLINs are available, socially marketed and at a given a subsidized price.

2.1.8.2. Private sector

The private sector will be encouraged to make LLINs available to those willing to purchase them at the market price. All LLINs procured will be required to comply with the national guidelines in terms of technical specifications, quality control and quality assurance.

2.2. INDOOR RESIDUAL SPRAYING

2.2.1. Definition

Indoor Residual Spraying (IRS) is the application of a targeted dosage (g/m^2) of an insecticide with residual action to the inside surface walls of human habitations for a given duration, in order to kill the adult vector mosquitoes that land and rest inside houses. The primary effects of IRS towards curtailing malaria transmission are 1) to reduce the lifespan of vector mosquitoes so that they can no longer transmit malaria parasites from one person to another, and 2) to reduce the density of the vector mosquitoes and reduction in overall vectorial capacity and thus malaria transmission.

For IRS to be effective:

- There must be a high coverage of wall sprayable surfaces in all targeted structures;
- The vector (mosquitoes) must feed and rest indoor houses;
- The targeted vectors must be susceptible (i.e. not resistant) to the insecticide to be used for spraying.

According to WHO 2017, all programs for malaria control should establish and maintain their capacity to conduct IRS for rapid clearance of transmission in high malaria endemic areas even where ITNs/LLINs are the core vector control intervention, especially in areas in which the vectors are resistant to pyrethroids. A significant advantage of IRS for the containment of malaria transmission is that it does not require human behavioral change, except when people refuse access to their houses or re-plaster their house walls soon after spraying. Unlike ITNs/LLINs, which remain effective during several transmission seasons, the effectiveness of IRS may depend on the residual period of insecticide formulation and spray surface. Failure to achieve high coverage and high-quality implementation of either ITNs/LLINs or IRS should not be compensated by adding another intervention.

2.2.2. Usage of IRS

The Revised Malaria Contingency Plan 2017-2020 and the Extended Malaria Strategic Plan 2020-2025 recommend 15 districts with high malaria burden to be regularly sprayed. IRS target districts are chosen based on epidemiological, and entomological data for the areas with high malaria burden; and the target districts are annually reviewed and determined based on the available budget and following the top incidence of malaria.

The annual spraying rounds are determined by the residual efficacy of the insecticide used. For example, Pirimiphos Methyl/Actellic 300 CS and Fludora® Fusion 56.25 WP are sprayed once year as the efficacy monitoring has proven that they can cover two malaria transmission peaks occurred in Rwanda (May-June and November-December).

It is important to note that other areas (boarding schools, prisons, health facilities, refugee camps, security force barracks, private households, and other places) and hotspots of malaria transmission can be sprayed through targeted IRS and depending on the expressed needs, evidences and availability of funds.

2.2.3. Selection of IRS Insecticides

Insecticides that are selected must be pre-qualified by WHOPES/WHO for IRS. All selected insecticides must be duly registered and locally evaluated for the purpose of IRS in Rwanda. The local vector populations in the IRS target areas must be susceptible to the selected insecticide formulation. This shall be ascertained through standardized WHO or CDC protocols on susceptibility tests. WHO guidance for the interpretation of susceptibility results will be followed. Where resistance exists, an insecticide with a different mode of action will be used to manage the resistant vector strain. Evidence-based/ operational research on new insecticide formulations are used for suitability assessment and to generate local evidences. The annual cost per structure sprayed which includes the cost of insecticide as well as the operational cost associated to a given insecticide has also to be considered in the selection of insecticide.

The choice and rotation of insecticide for IRS is guided by the national insecticide resistance management strategy, which is elaborated with closer consultation of all involved stakeholders and following the results of insecticide resistance monitoring carried out on annual basis. The current innovative and non-pyrethroid insecticides such as Actellic 300 CS (Pirimiphos methyl), Fludora Fusion, SumiShield, Klypson 500WG, 2GARD™ Vectron T500 and Sovrenta 15WP other non-pyrethroid insecticides registered by WHO can be considered for 1-2 years' rotation strategy once they are registered for use in Rwanda and based on the WHO-PQ list, the cost effectiveness and the local evidences.

2.2.4. IRS Implementation

- **MOH/RBC:** The Ministry of Health/RBC provides leadership and guidance through the development of strategic plan which guides the government entities and partners involved in planning and implementation of IRS activities. Also, MOH/RBC is involved in mobilization of required funds.
- **Administrative districts and local leadership:** Ensure community mobilization, provide at free of charge necessary infrastructures required for IRS such as offices, stores, places for soak pits constructions etc…; Participation in planning, implementation, supervision and closure of IRS implementation during the campaigns.

- **District hospitals:** Coordinate and implement IRS activities in their respective administrative districts.
- **Other MoH/RBC partners:** Plan and implement IRS activities in target districts. Conduct capacity building on IRS to MOH/RBC, district hospitals and local authorities.
- **Other Public and Private institutions or organizations:** Institutions such as hotels, health facilities, boarding schools, refugee camps, other temporal/agglomerated habitats and individual dwellings/households are encouraged to regularly use LLINs and implement IRS as appropriate in compliance with the national guidelines in use.

2.2.5. IRS Quality Control

To determine the decay rate of insecticide and the efficacy of intervention:

- WHO cone bioassays are conducted one week after spraying for quality control and then on a monthly basis to determine the residual period, and thus until the end of effectiveness of insecticide on the surface wall (defined as WHO threshold <80% susceptible mosquito mortality rate)

To determine the IRS entomological impact indicators:

- Parity (age-grading): to monitor mosquito survivorship in the presence of IRS intervention;
- Insecticide susceptibility and mechanism of resistance conducted annually;
- Bionomic of malaria vectors:
    - Species composition, abundance, distribution and seasonality on a monthly basis;
    - Time and location of vector feeding and to understand where and when transmission is occurring;
    - Sporozoite infection and the source of blood meals to determine the infection rate and preferred hosts;
- Use the malaria epidemiological data/ HMIS to monitor the impact of IRS on malaria morbidity, mortality, incidence, and prevalence.
- Meteorological data to determine the effect of climate on mosquito density and intensity of malaria transmission

3. COMBINATION OF LLINS AND IRS

The systematic review published in 2019[1] on the deployment of ITNs, (specifically pyrethroid-only LLINs) in combination with IRS provided evidence that, in settings where there is optimal coverage with ITNs and where these remain effective, IRS may have limited utility in reducing malaria morbidity and mortality. WHO guidance was developed accordingly to emphasize the need for good-quality implementation of either ITNs or IRS, rather than deploying both in the same area. However, the co-deployment of these interventions are recommended in Rwanda for research, resistance prevention or mitigation according to the sufficient availability of financial resources and evidences.

1 Choi L, Pryce J, Garner P : Indoor residual spraying for preventing malaria in communities using insecticide-treated nets. The Cochrane database of systematic reviews 2019;(5):CD012688 Pubmed Journal Website

The deployment of a second core vector control intervention on top of optimal coverage with an existing one will be only considered with the aim to achieve the maximum impact on malaria disease with the available resources and local evidences on the bio-efficacy and residual activity of the product. A switch from ITNs to IRS or vice versa, rather than their combination, is likely to be the financially feasible option. Deployment of either intervention needs to ensure optimal coverage of populations at risk of malaria and ensure they are delivered to a high standard. Evidences are needed to determine the effectiveness of combining IRS and ITNs in malaria transmission foci, both in historically known high and low malaria transmission foci. The combination of ITNs and IRS will be implemented in Rwanda as focal mitigation of insecticide resistance management through the basis of evidences on the impact on malaria disease.

4. OTHER SUPPLEMENTAL VECTOR CONTROL INTERVENTIONS

4.1. Larval Source Management

4.1.1. Definition and methods

The Larval Source Management (LSM) is the management of aquatic habitats (water bodies) which are also larval habitats for mosquitoes and aimed to prevent the completion of the immature/aquatic development cycle to the adult mosquito stage. LSM is recommended in mosquito breeding habitats that are "few, fixed and findable" (WHO, 2013) in all malaria endemic areas. There is a need to develop and ensure the implementation of the mitigation plan for any human activity and/ or development projects that can potentially create larval habitats such as irrigation systems, manmade containers, quarries, construction sites, seepage from dams, poor waste water management or broken water pipes, and urban agriculture. Other forms of larval habitats to be explored might be small ground pools resulting from ground depressions filled with rain or low water table and house containers used to harvest rain water.

There are four methods of LSM: habitat modification, habitat manipulation, biological control, and larviciding.

a) Habitat modification

A permanent alteration to the environment, aimed at eliminating larval habitats, including: Landscaping, surface water drainage, filling and land reclamation. In Rwanda, this is done through monthly community work (Umuganda). Moreover, the community members have to be mobilized to control the peri-domestic mosquito breeding sites using above described techniques.

b) Habitat manipulation

It consists of temporary environmental changes to disrupt vector breeding, and includes: Water-level manipulation, e.g. flushing, drain clearance to eliminate pooling; shading or exposing habitats to the sun and depending on the ecology of the vector. This is done through community mobilization.

c) Biological control

The introduction of natural predators into larval water habitats (water bodies) may include the following methods: predatory fish in fish ponds and water dams **(Clarias spp, Tilapia spp, Carpio spp, Gambusia affinis and Poecilia reticulata)**, predatory invertebrates, parasites or other disease-causing organisms. In Rwanda, larvivorous fish have to be introduced in water dams for irrigation, production of hyrdropower and in fish ponds after approval by the

Ministries in charge of Agriculture and livestock, and environment. Restocking of larvivorous fish requires to cover the entire targeted area of water bodies in compliance with the carrying capacity determined per species and involvement of local community based organizations.

d) Larviciding

The application of biological or chemical larvicide to water bodies may include the following methods:

- Surface oils and films, e.g. highly refined oils and biodegradable ethoxylated alcohol surfactants, or "monomolecular films" (MMF) that suffocate larvae and pupae;
- Synthetic organic chemicals, e.g. organophosphates that interfere with the nervous system of immature larval stages, such as chlorpyrifos, fenthion, pirimiphos-methyl and temephos;
- Bacteria, e.g. **Bacillus thuringiensis subsp. israelensis (Bti)**, and **Bacillus sphaericus** (Bs) that produce insecticidal crystal proteins which, when ingested by larvae, attack the gut lining causing cessation of feeding and subsequent mortality of mosquito larvae;
- Spinosyns, e.g. metabolites extracted from the bacterium Saccharopolyspora spinosa, that act as nicotinic acetylcholine receptor (nAchR) allosteric activators and can cause mortality through both contact and ingestion;
- Insect growth regulators, e.g. diflubenzuron, methoprene, novaluron and pyriproxyfen that prevent emergence of adult mosquitoes from the pupal stage.

e) The role of LSM in Integrated Vector Management

Vector control programs are now being encouraged to adopt the concept of Integrated Vector Management (IVM). The IVM approach seeks to improve the efficacy, cost-effectiveness and sustainability of disease-vector control, through:

- The selection of vector control methods based on knowledge of local vector biology and disease transmission;
- Collaboration between the health sector, other private and public sectors and local communities;
- The use of a range of interventions;
- Rational use of insecticides;
- Good management.

IVM embraces the principle that vector control is not solely the responsibility of the health sector, but can be achieved through coordination of all sectors whose activities potentially affect vector-borne diseases. IVM implementation will be based on the five following pillars: 1- capacity building of targeted groups, 2-evidences based interventions, 3- social mobilization and community awareness, 4- integration of interventions, 5- policies and regulations.

In areas where LSM is feasible, it can be implemented through IVM approach, for instance by:

- Targeting outdoor resting and biting mosquitoes by controlling vectors that are less affected by LLINs and IRS such as the vectors that rest and bite outdoors.
- Targeting malaria 'hotspots': In some locations malaria may persist even with high LLIN and/ or IRS coverage. LSM may therefore be particularly useful in helping to remove residual foci of malaria transmission in elimination programs.

- Managing insecticide resistance: Resistance of Anophelines mosquitoes was reported to the class of pyrethroid insecticide and on some other classes of insecticides used for IRS. The wide diversity in the classes and modes of action of different larvicides, used in combination with habitat modification and manipulation, presents an opportunity to:

  (i) Reduce overall dependence on insecticides,

  (ii) Preserve the efficacy of existing insecticides, and

  (iii) Manage the spread of insecticide resistance once it has emerged.

- Controlling other vector-borne diseases: LSM can be adapted to target the vectors of other diseases, thereby improving cost-effectiveness. For example, it was reported from other countries that LSM year-round enable to reduce the populations of arbovirus vectors such dengue, yellow fever, lymphatic filariasis, rift valley fever, as well as other mechanical indoor vectors or pests (flies, bedbugs, cockroaches, fleas, lices etc...).

Rwanda does not currently implement large scale mosquito control with larviciding but is actively doing advocacy for resource mobilization to allow the introduction of this strategy to complement the core vector control interventions. See Annex 15 for WHO recommended larval insecticides.

4.2. Repellents

Repellents are normally applied directly to skin or clothing or with spatial applications. Mosquito repellents are recommended for people staying indoor before bedtime or outdoors at night for work or leisure and those working in plantations and may be at risk during daytime. There are two categories following their mode of application:

- Topical or skin applied mosquito repellents: lotions, creams, gels, ointments, spray, roll-ons, wipes, bathing soaps, bracelets, wristbands, patches etc...
- Spatial applied mosquito repellents: coils, spray, candles, papers, liquid vaporizers, vaporizer mats, tables, liquid detergents

4.3. Protective Clothing

Long sleeve clothes are won to reduce areas exposed to mosquito bites. These are convenient in cooler areas and in the evening for outdoor activities. However, in hot climate they are uncomfortable and inconvenient to wear while working. There is little or no protection when the material used is light and mosquitoes can bite through them.

4.4. Aerosols

Aerosols are packed in pressurized cans for easy spraying or can be applied with a spray pump. Aerosols are normally sprayed indoors in the evening with doors and windows closed to allow the insecticide to knock down and kill any mosquitoes, which could be resting inside. Some aerosols are also repellents and will prevent further mosquito entry for a day or so. But in most cases the effects of aerosols are very short lived.

4.5. Natural anti-mosquito plants

Burning or planting of local herbs known to have repellent effects e.g. Citronella spp, Geranium spp, Eucalyptus spp, Pyrethrum spp and other aromatic trees fall into this category. Usually these are burned indoors or outdoors and the smoke repels and sometimes knocks down mosquitoes.

4.6. House screening/proofing

This involves screening of doors, windows and other opening eaves or holes to prevent insects from entering inside the houses. Netting materials or ware mesh are recommended to cover the windows and other ventilation areas of houses.

4.7. Prevention of breeding in and around dwellings/houses

Prevention of breeding around dwelling involve the coverage of water containers and removal of possible breeding sites near homes by filling ditches, borrow pits and holes where water collects, burying empty tins and other containers where water may be collected and act as breeding sites. The containers of drinking water or used in different purpose such as construction sites, harvesting rain water have to be always covered. Individuals or communities in rural or urban areas may apply this measure to reduce mosquito populations.

4.8. Environmental management

Environmental management involves the modification of the environment to make it unfavorable for the vectors to breed. These include draining or filling up of ponds and borrow pits, intermittent draining of irrigated areas and maintenance of irrigation channels and flushing stagnant water in drainage channels. Environmental management can effectively be used in urban and modified environment such as settings of mining areas to control mosquito breeding sites.

4.9. Space Spraying

Space spray employs the same principles as the small aerosols but applied in a larger scale. However, ultra-low volume (ULV) sprays or fogs are used. Space spraying is usually applied in and around houses and outdoor resting-places. Space spraying requires special equipment such as thermal foggier and motorized knap-sacks. Sometimes large pumps mounted on vehicles are used for the purpose. They are fast acting and therefore highly recommended in outbreak situations. This method is recommended for abatement of high mosquito density in controlled environment and the impact on non-targeted organisms has to be investigated and managed.

4.10. Insecticide wall paints.

The insecticide wall paint is recommended and using paints evaluated and approved by the Ministry of health/Rwanda Biomedical Center with local evidences on their effectiveness and residual efficacy.

4.11. Electronic, electrical and light repellent mosquito control system

The electronic or electrical-discharge mosquito systems repel or attract mosquitoes and other insects with light and then kill then with a “zap” of electricity. For electrical mosquito killer, they use ultraviolet light, or neon or mercury lighting, which mosquito and other insects seem to be drawn to them and killed. The electrical repellent is usually emitted by Led-Lamp Bulb light.

5. INSECTICIDE RESISTANCE MANAGEMENT

Continuing the usage of LLINs, including scaling-up, as an insecticide treated bed nets is always better than no protection against human-vector contact, even in an area with insecticide resistance. In areas with vectors resistant to pyrethroids, where ITNs/LLINs are used as the primary intervention, IRS will use a different class of insecticide. In addition, the insecticide used in IRS will be rotated every 2 to 3 years with a different class of insecticide to manage the resistance.

To mitigate against the insecticide resistance, there will be an increasing role of inter-sectoral collaboration with other government Ministries and agencies such as the MINAGRI/RAB, REMA, RSB and private sector. Routine insecticide susceptibility monitoring will be undertaken annually and preferably every 6 months in the situation of high malaria transmission using WHO test tubes protocol or CDC-bottle assays.

The interpretation of WHO, 2016 susceptibility results are as follows:

a) To determine phenotypic resistance frequency

Susceptibility test with discriminating concentration (1×)

- 98-100% mortality: Susceptible population
- 90-97% mortality: Possible resistance within the population of mosquito tested and confirmation of resistance is required by other tests.
- < 90% mortality: Resistance individuals within the population of mosquito species tested

b) To determine resistance intensity

Susceptibility test, with intensity concentration (5×)

- ≥ 98% mortality: low intensity resistance
- < 98% mortality: moderate to high intensity resistance

Susceptibility test with intensity concentration (10×)

- ≥ 98% mortality: Moderate intensity resistance
- < 98% mortality High intensity resistance

c) Synergist-insecticide bioassay - comparing insecticide versus synergist-insecticide exposures

- Insecticide-synergist mortality not higher than for insecticide-only: Metabolic mechanism not involved
- Insecticide-synergist <98% mortality but higher than for insecticide-only: Metabolic mechanism partially involved
- Insecticide-synergist ≥98% mortality and higher than for insecticide-only: Metabolic mechanism fully involved

6. VECTOR CONTROL IMPLEMENTATION PLAN

All the vector control products imported into the country will be subject to evaluation of their quality at the point of entry according to national or international standards. See Annex 13 for implementation chart for vector control.

7. MALARIA PREVENTION METHODS

7.1. Chemoprophylaxis for Travelers

Since Rwanda is country-wide endemic for malaria, chemoprophylaxis is recommended to all travelers specifically from no-malaria endemic countries. The recommended treatment is Atovaquone/Proguanil (Malarone); Doxycycline; or, Mefloquine (Lariam) with different dosage as per the table below:

Table 10: Chemoprophylaxis Dosages

Medicines	Dosage
Adults	
Atovaquone/Proguanil (Malarone): 250mg atovaquone plus 100mg proguanil	1 tablet/day
Doxycycline	100 mg/day
Mefloquine Lariam (228mg base and 250mg salt)	1 tablet/week
Children	
Atovaquone/Proguanil (Malarone): 62.5mg atovaquone plus 25mg proguanil	5–8 kg: 1/2 pediatric tablet daily > 8–10 kg: 3/4 pediatric tablet daily >10–20 kg: 1 pediatric tablet daily >20–30 kg: 2 pediatric tablets daily >30–40 kg: 3 pediatric tablets daily >40 kg: 1 adult tablet daily
Doxycycline*	100 mg/day
Mefloquine Lariam (228mg base and 250mg salt)	1 tablet/week

*Doxycycline should not be used by pregnant women. It should either not be given to children under the age of 8 years

*For children, the doctor will calculate the correct weekly dose for your child based on the child's weight.

7.2. Malaria Prevention in children under 5 and pregnant women

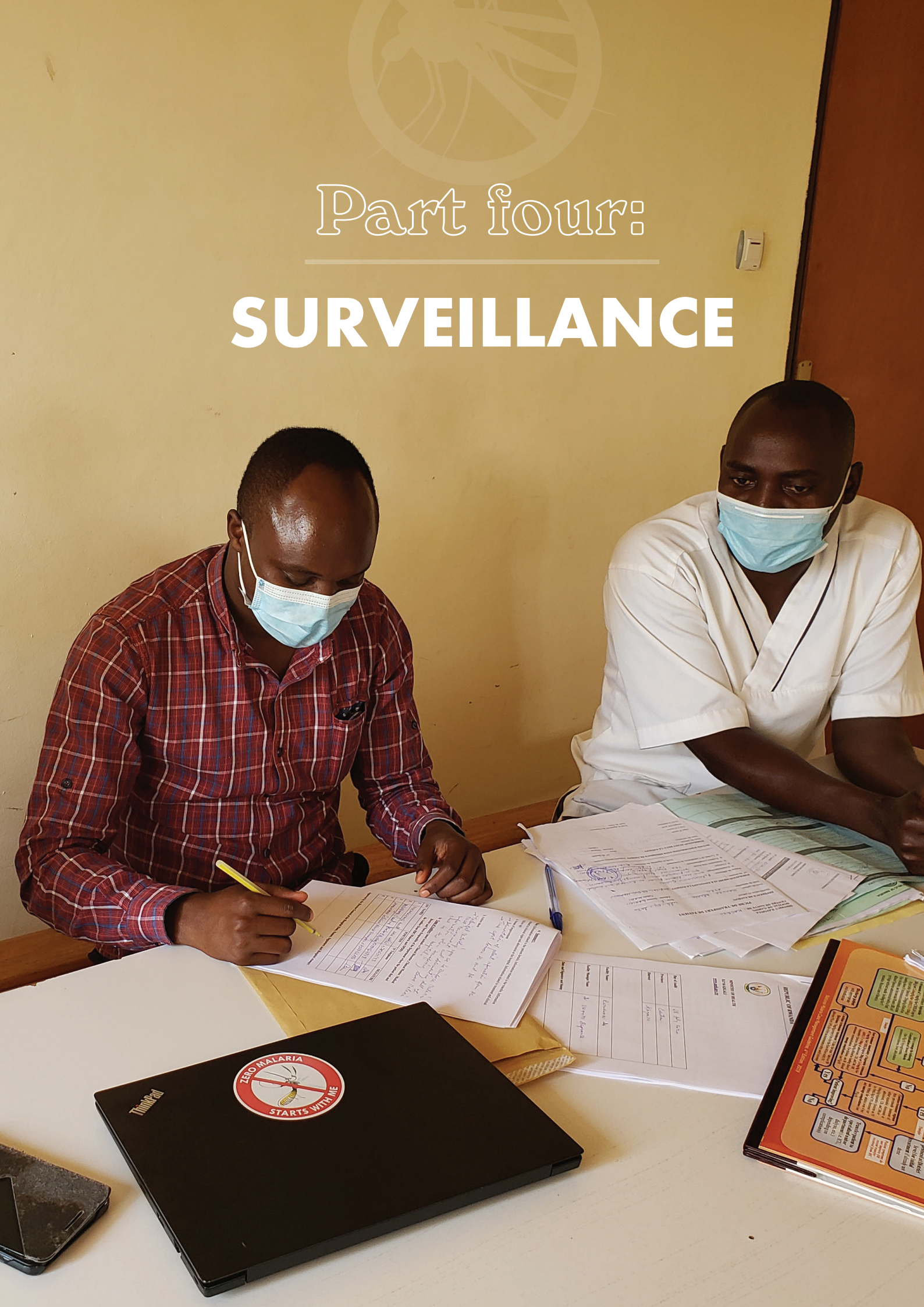
Currently, Rwanda is no longer implementing the IPT-p since 2008 due to the resistance to Sulphadoxine-Pyrimethamine. In line with WHO guidance, Rwanda will continue the routine distribution of LLINs during ANC visit and EPI service to pregnant and children under one year. In addition, the home-based care management for malaria will be continued for early diagnosis and treatment of all suspected malaria cases. However, once the IST study results will be available, the MOPDD will advise on which additional prevention intervention in malaria in pregnancy.

7.3. Malaria vaccine

There is currently no WHO recommendation policy for the large-scale use of malaria vaccine. However, pilot implementation program is ongoing in sub-Saharan countries for children aged 5-17 months for further evaluation including operational feasibility by the organization.

Part four:

SURVEILLANCE



1. INTRODUCTION

In case management, several approaches at both community and health facility levels have been implemented. A malaria surveillance system consists of the tools, procedures, people and structures that generate information on malaria cases and deaths, which can be used for planning, monitoring and evaluating malaria control programs. Effective malaria surveillance system will enable health centers, district, provincial, referral hospitals and national program to:

- Identify the areas or population groups most affected by malaria;
- Identify trends in cases and deaths that require additional intervention; and
- Assess the impact of control measures.

The design and implementation of a malaria surveillance system depends on two factors: (i) the level of malaria transmission and (ii) the resources available to conduct surveillance.

2. KEY MALARIA INDICATORS BY MALARIA STRATEGIES

2.1. Malaria case management

- Proportion of suspected malaria cases that receive a parasitological test at public sector health facilities
- Proportion of suspected malaria cases that receive a parasitological test at health posts
- Proportion of suspected malaria cases that receive a parasitological test at community health workers
- Confirmed malaria cases treated (number and rate, disaggregated by age, sex and location)
- Proportion of confirmed malaria cases that received first-line antimalarial treatment at public sector health facilities
- In-patient malaria deaths: rate per 100,000 persons per year
- Malaria incidence: Confirmed malaria cases (microscopy or RDT): rate per 1000 persons per year (desagregated by species, age, location)
- Inpatient malaria cases (number and rate, disaggregated by age, sex and location)
- Inpatient malaria deaths (number and rate, disaggregated by age, sex and location)
- Malaria test positivity rate (RDT and/or blood slide, disaggregated by health facility and community level and by age, sex and location)
- Percentage of inpatient cases with a discharge diagnosis of malaria
- Percentage of inpatient deaths due to malaria
- Annual blood examination rate (RDT and Microscopy)
- Malaria case fatality rate
- Completeness of health facility reporting
- Timeliness of health facility reporting

2.2. Malaria prevention

- LLINs distributed (disaggregated by PW, U5s, Boarding Schools, HHs Distribution)
- Proportion of pregnant women, who slept under a LLIN the previous night
- Proportion of total population who slept under an LLIN the previous night
- Proportion of children under five years old who slept under a LLIN the previous night
- Percentage of the population that could sleep under an ITN if each ITN in the
- household were used by up to two people
- Proportion of PW new registered who received LLINs during ANC visits
- Proportion of children under 1 year who received LLINs in EPI
- Structures sprayed (IRS, disaggregated by District)
- Population protected by IRS, LLINs
- Proportion of population at risk receiving at least one round of IRS within the last 12 months in areas targeted for IRS
- Percentage of districts achieving national target for the proportion of population at risk receiving at least one round of IRS within the last 12 months in areas targeted for IRS
- Proportion of population that slept under an insecticide-treated net the previous night

2.3. Malaria commodities

- Malaria commodities stocks at national level (RDTs, ACTs, Quinine, Artesunate)
- ACTs consumption per malaria case
- Health facilities reporting no stock-out of ACTs continuously for 1 week
- Health facilities reporting no stock-out of RDTs continuously for 1 week
- Health facilities reporting no stock-out of Artesunate
- Health facilities reporting no stock out of LLINs
- CHWs reporting no stock out of ACTs
- CHWs reporting no stock out of RDTs

2.4. SBC Indicators:

- District Coordination meeting
- Radio and TV spot
- Community outreach
- TV and Drama

2.5. Other malaria impact and outcome indicators

- Malaria Parasite prevalence (disaggregated by age and sex)
- Malaria prevalence in U5
- Malaria prevalence in Pregnant Women
- LLINs utilization rate (General Population, PW, U5s)

- Proportion of pregnant women, who slept under a LLIN the previous night
- Proportion of total population who slept under an LLIN the previous night
- Proportion of children under five years old who slept under a LLIN the previous night
- Percentage of the population that could sleep under an ITN if each ITN in the household were used by up to two people
- Proportion of households with at least one LLIN
- Knowledge of malaria transmission, prevention measures, signs and symptoms
- Proportion of women who recognize fever as a symptom of malaria
- Proportion of women who reported mosquito bites as a cause of malaria

3. DATA COLLECTION AND REPORTING

3.1. Data source

Malaria surveillance in Rwanda is integrated into a broader system of health information or communicable disease surveillance. At the health facility level, case-based surveillance of malaria inpatient cases and deaths is undertaken with the aim of responding to cases of severe disease and attaining a target of zero malaria deaths. Cases are graphed weekly and monthly to assess the extent to which control measures are reducing the incidence of malaria.

The main sources of data are the following:

- Registers and forms at all levels of care and treatment
- Rwanda Health Management Information System (R-HMIS)
- Sentinel Surveillance Systems
- Household Surveys (DHS, MIS, Other specific surveys)
- Health Facility Surveys
- NMCP Monitoring System (ITN, HBM, IRS)
- Community Health Workers Activity monitoring system

From Health center level to Referral level, R-HMIS will serve as the main source of data. R-HMIS is an integration of different platforms such as SISCOM, DHIS2, eIDSR, eTB which can be accessed as one comprehensive database. At national level, HMIS will be triangulated by other sources of data as listed above annually for more comprehensive understanding of the progress of programs and stratification.

3.2. Data collection and reporting tools

- **The tools includes** report forms, tally sheets, registers, patient files, computer hardware and software, documentation and training materials.
- **Procedures includes** case definitions, reporting frequency, pathways of information flow, data quality checks, incentive schemes, data analysis, mechanisms for review of performance, methods for disseminating results, using data for making decisions, supervision and planning.
- **The people include**s decision-makers both inside and outside the health service who use data from surveillance systems, the health staff who gather or use the data and the community whose details are registered.

- **The structures** includes the ways staff are organized to manage, develop and use the system.

3.3. Data quality

All data have limitations that affect their reliability and interpretation. Before conducting analysis and interpretation, the analyst/ data manager should review the health facility data for completeness and quality to determine inconsistencies and errors and make corection if necessary.

3.3.1. Assess reporting completeness

Completeness is the percentage of expected reports which have been submitted to a higher level. The Analysts/Data Manager should assess both the completeness of facility reports (submitted to district level) and the completeness of district reports data from multiple facilities which have been submitted to the national level).

3.3.2. Internal consistency of reported data

Internal consistency of the data relates to the coherence of the data being evaluated. Internal consistency metrics examine: 1) coherence between the same data items (malaria cases, drugs used or tests) at different points in time (outliers and consistency over time), 2) coherence between related data items (consistency between Indicators eg malaria tests positives and reported malaria cases), and 3) comparison of data in source documents (registers) and in national databases.

3.3.3. External consistency with other data sources

The level of agreement between two sources of data measuring the same health indicator is assessed. The two sources of data usually compared are data flowing through the HMIS or the programme specific information system and data from a periodic population-based survey. The HMIS can also be compared to eLMIS data on drugs consumption or other types of data to ensure that the two sources fall within a similar range.

3.3.4. External comparison of population data

This data quality measurement compares two different sources of population estimates (for which the values are calculated differently) in order to ascertain the level of congruence between the two

3.3.5. Assess for presence of extreme values (outliers)

Presence of extremely low or high numbers in a given admin level for a given month or week is indication of data quality problem. In general, malaria data should be within the expected ranges allowing for seasonal patterns or fluctuations. Drastic changes in number of malaria cases are possible when effective interventions are applied or when there is breakdown in malaria control effort or other reasons that lead to an epidemic

3.3.6. Assessing missing values

Zero values in malaria are true values. Therefore missing values should be left as blank or with a specific value selected to represent missing data. Ensure that your country follows strictly the policy of non-zero as missing

4. DATA ANALYSIS AND DECISION MAKING

Routine health facility data are collected at private clinics, health posts, health centers, hospitals, community level or other health service points (public; private; community-based) at the time that services are provided. These data are processed at the health facility and summary reports are sent through Health Management Information System (HMIS) system under DHIS2. Routine health facility data are widely used for national and sub-national health sector reviews and planning. They form the basis of national annual reports of health statistics and periodic analytical reviews of health system performance, and they are used to assess health program at all levels of the health system.

4.14.1. Data Use by Health Center

Data should be reviewed at least monthly in order to answer the questions below:

- Are there unusual changes in the numbers of cases?
- Do some areas have more malaria than others do?
- Is there adequate use of malaria drugs compared to malaria cases?
- How can severe cases and deaths be prevented?

4.2. Data Use by District

Joint analysis between District administration and district hospitals shall be necessary. Data shall be reviewed at least monthly in two ways: for the district and for individual health facilities or geographical areas:

4.2.1. Examination of Trends

Trends in malaria should be examined throughout the district. This will enable managers to answer the following questions:

- Are testing and reporting targets being met?
- Are there trends in malarial disease that are of concern?
- Are there unusual differences between indicators?

In order to perform these analyses, districts should update five surveillance graphs every month to monitor trends in malaria cases and deaths. Data should be presented for the current year and the previous 3 years to follow changes in indicators:

- Malaria incidence rates
- Proportional malaria incidence
- General patient attendance
- Diagnostic activity
- Quality of diagnosis and reporting
- LLINs distributed

4.2.2. Comparison of Indicators

Indicators for different health facilities or geographical areas should be compared. This will enable managers to answer the following questions:

- Which health facilities are testing and reporting adequately and which are experiencing problems? For example, are some health facilities unable to increase the percentage of suspected cases tested?
- Are there unusual differences between health facilities for some indicators? For example, is the number of cases not decreasing despite an increase in ITN coverage?

Such comparisons can be made by three methods: by examining control charts for each health facility, by constructing surveillance tables for each indicator or by constructing a summary table of surveillance indicators by health facility with trend statistics.

4.3. Data Use at National Level:

National level malaria program shall conduct analyses similar to those in districts:

i. analysis of overall trends nationally on the five control charts,
ii. comparison of districts from the control tables, and
iii. comparison of districts from summary tables of surveillance indicators.

In addition, national level will be compared using maps. Analysis will be done **weekly, monthly, quarterly and annually**. The aims are to ascertain whether targets are being met, whether there are trends in disease that are of concern, which districts are reducing the number of cases and which are experiencing problems and any unusual differences between indicators (e.g. failure of the number of cases to decrease despite an increase in ITN coverage). When necessary, individual district control charts will be inspected to explore issues in more detail, and data will be retrieved from individual health facilities and communicated to the district.

4.4. Decision Making with Data

To ensure smooth progress and identification of loopholes in the surveillance system, regular meetings and supervisions shall be conducted.

4.4.1. Formal meetings

Given that the data generated by a surveillance system are to be used to improve the operation of malaria control program, a schedule of meetings shall be observed to review malaria trends, such as the following:

- Community health workers with health facility staff: monthly;
- Health facility staff with district malaria control program staff: monthly;
- District staff with national malaria control program staff: quarterly.

4.4.2. Supervision

Supervision from national and district levels will be conducted to support building of the information system, ensure the completeness of reporting, ensure analysis and discussion of data and follow-up of recommended actions. During visits to health facilities and district team offices, supervisors should check that registers are kept up to date, with all fields completed, that data on report forms correspond to the information in registers and tally sheets, that core analysis graphs and tables are up to date and that discussions are held about interpretation of the trends and potential action. Health facility staff shall be encouraged to investigate all inpatients malaria cases and deaths.

4.4.3. Feedback

District managers should prepare feedback for health facilities monthly. The feedback developed should reach all levels including private health facilities that provide data. This should not simply reflect the data submitted by the health facility but should include comparisons with other health facilities in the district and summary statistics for the district as a whole. A regular bulletin can be produced in a standard format to present district results (based on control charts) and comparisons of healthfacilities.

A national feedback bulletin/report shall be produced each quarter, showing indicators by district. The bulletin/report shall be widely circulated to the districts highlighting action items to be worked on by district managers, provincial hospitals and district hospitals. Not only as feedback to districts, will this also serve as information for other government departments, institutions and implementing partners. Feedback can be made immediately (monthly) in case of alerting analysis finding.

Provincial hospital compiles and analyzes data from the catchment area then gives feedback every month to the district hospitals and an analysis report containing the above graphs should be shared monthly with the lower level._Provincial hospitals will follow up on monitoring the implementation of the recommendations highlighted in the quarterly reports developed and circulated by the national level

4.4.4. Severe malaria and stock status notification:

Severe malaria cases identified by CHWs in villages will be notified through Rapidsms. The head of Health Center and in charge of CHW receive the alert notification on severe malaria cases at community level for urgent action. At the same time, the team of intervention at hospital level is notified on severe malaria case to avoid any delays (preparations to receive the patient and prompt management at district Hospital, send timely the ambulance, and technically assist the Health Center team in pre transfer management). After appropriate treatment has been provided the **Health Center Nurse** and **District Hospital Nurse** **is required to fill a diagnostic form** of each patient notified for severe malaria.

For malaria drugs and commodities, CHWs can send Stock out notification (in case he/she remains with 0 stock) or Risk of stock out notification (in case he/she remains with drugs or commodities to treat or test one patient) through Rapidsms. Upon reception of the notification, the Health Center staff (CEHO) will immediately resupply the CHW with the drugs/commodities concerned with stock out or risk of stock out. In case the Health Center does not have enough stock to supply the CHWs, an emergence request should be addressed to the District pharmacy in order to prevent stock out in community.

4.4.5. Analysis for epidemic detection using thresholds

One way of detecting epidemics early is using thresholds of retrospective surveillance data. The threshold you build is specific to each geographical unit as it dynamically established using the number of malaria cases observed in that place over time. Preferably, weekly data are needed to monitor and respond to epidemics in time. Monthly data may mask the initial and ending week of epidemics, and hence late response.

4.4.6.Stratify by admin level (national, sub-national) using selected indicators

Stratification is a vital analytic step for malaria to determine epidemiological differences (spatial, vector, ecology, resistance, etc) and socioeconomic aspects such conflict, population movement, human behavior, access to health services, etc.

The purpose of stratification is to employ different interventions in different geographical places or populations. Example: IRS vs LLIN or LSM, mobile clinic in mobile population, etc. It allows managers decide on which intervention should be applied in which population. The common parameters used for stratifications include Annual Parasite Incidence, Test Positivity Rate and aggregate case count Two stratification steps are applied: macro-stratification (broader national view) and microstratification (subnational view) both of which could be depicted using table or map

5. RESEARCHES FOR DECISION MAKING

The MOPDD Surveillance and Epidemiology Unit is in charge of coordinating all researches conducted in different unit (Case Management, Prevention, Vector Control, SBC, etc.) of the Division. Results of those researches will support the program in implementation of evidence-based interventions.

6. LEVELS AND RESPONSIBILITY IN MALARIA SURVEILLANCE AND REPORTING

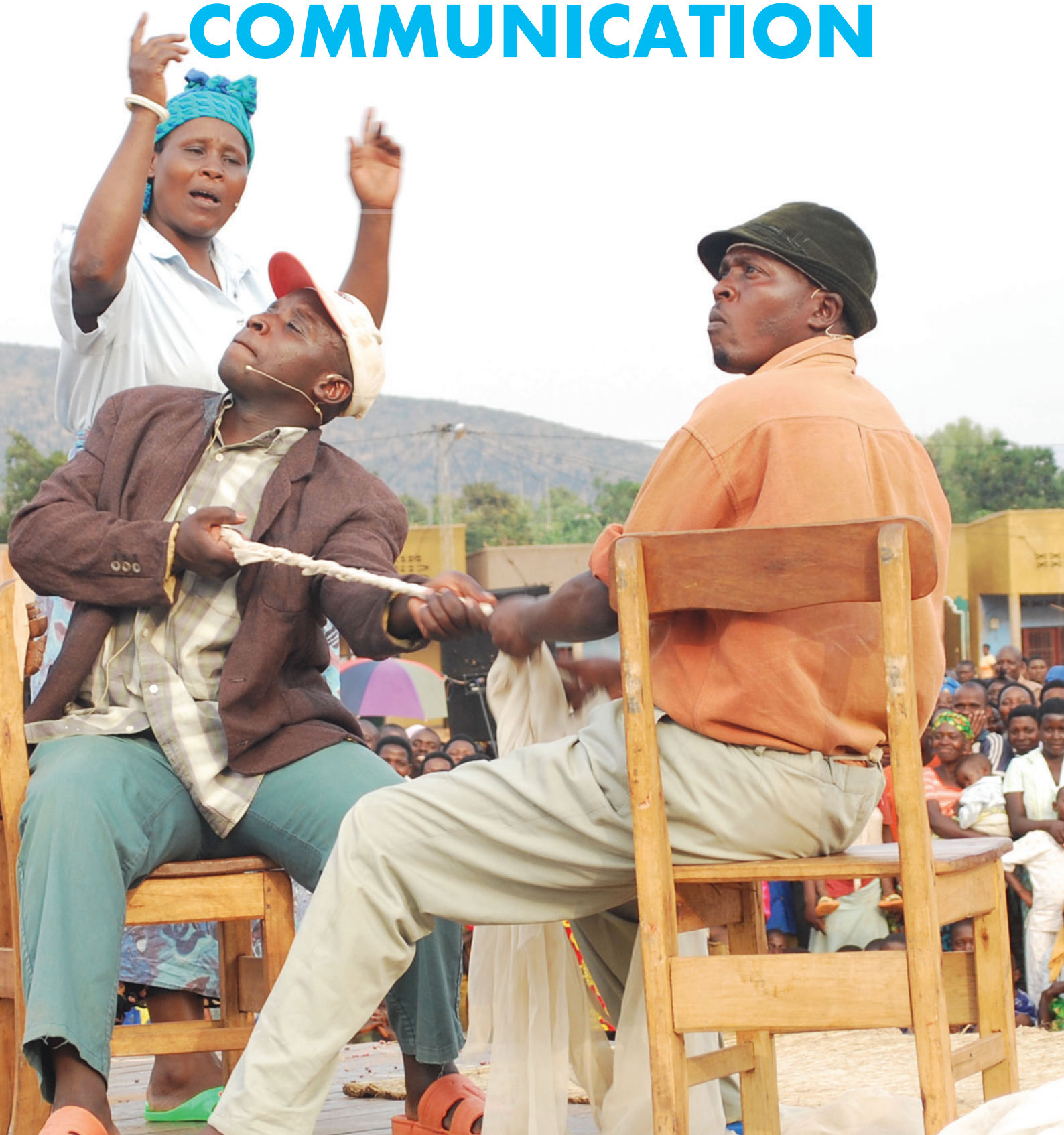
Table 7: Stratified Roles in Malaria Surveillance and Reportin

Levels	Role and Responsibilities	Frequency
MoH/RBC	More interested in: • Data analysis and use • Malaria trends • Data dissemination through booklet • Data Quality Audit and report • SDGs indicator related to Malaria	According to the need Annually
MoH/RBC Partners (e.g. WHO)	More interested in: • Malaria trends, stratification, mapping • Dissemination at worldwide level /Comparison with other countries • Impact and outcome indicators	Annually Every two years Every five year
Malaria Division	Conduct key malaria indicators analysis for decision making: • Malaria incidence and mortality rates (trend over time); • Proportional malaria incidence and mortality rates; • General patient attendance rates; • Blood examination rate); and • Quality of diagnosis and health facility reporting. • LLINs distributed /targeted groups • Malaria commodities stock management…	Monthly , quarterly, Annually
	• Malaria Stratification mapping	Annually
	• Provide comprehensive annual report	Annually
	• Feedback and Data dissemination (ppt presentation, graph, tables, etc.)	Monthly, quarterly Annually
	• Death audit, HBM Supervision	quarterly Annually
	• Capacity Building in M&E	Annually

Levels	Role and Responsibilities	Frequency
Province	Malaria data analysis and use (malaria trends, graph, tables, etc.): • Proportional malaria incidence and mortality rates; • General patient attendance rates; • Blood examination rate; • Quality of diagnosis and health facility reporting. • LLINs distributed /targeted groups; • Malaria commodities stock status; • Data use for immediate intervention or planning purpose.	Continuously Annually
District	Malaria data analysis and use (malaria trends, graphs, tables, etc.): • Malaria cases • Malaria deaths • Population protected by preventive measure (IRS, LLINs) • Availability of malaria commodities • Data use for immediate intervention or planning purpose • Feedback to District Hospital/Health centers	Any time Annually
District Hospital	Conduct Data Analysis and generation of graphs, tables. The analysis should cover the following: • Malaria incidence and mortality rates (trend over time); • Proportional malaria incidence and mortality rates; • General patient attendance rates; • Diagnostic activity (annual blood examination rate); and • Quality of diagnosis and health facility reporting. • Analysis should be also undertaken by health facility catchment area and by district in order to set priorities for malaria control activities. • Carry out Feedback to Health Centers (if needed) • Data use for immediate intervention and planning purpose **Key indicators managed:** • Severe malaria cases • Malaria deaths	Monthly Monthly Any time
Health Center	• Supervision of CHWs and review quality of data • Coordination meeting and review of data reported from the community and feedback • Data entry from community and health center/health posts **Key indicators managed:** • Fever tested • Simple malaria Cases treated • Severe malaria cases referred • LLIN distributed (PW, U5s) • Malaria commodities Stock status • IEC/BCC related indicators **Required Performance** • Timeliness and completeness reporting • Quality of data (accuracy) • Quality of cases management	Monthly basis
Community/ Health Post	• Register cases • Report cases to Health center **Key indicators managed:** • Fever cases tested (under year and above) • Simple malaria cases treated • Number of RDT received/used	Daily Monthly

Part five:

SOCIAL BEHAVIOR CHANGE COMMUNICATION



1. INTRODUCTION

Social and Behavior Change (SBC) is the systematic application of interactive, theory-based, and research-driven processes and strategies to effect change at the individual, community, and social levels. SBC examines challenges from multiple sides by analyzing personal, societal, and environmental factors in order to find an effective way to achieve sustainable change. SBC also employs strategies that influence the physical, socioeconomic, and cultural environment to facilitate and remove the barriers to healthy norms and choices. Additionally, Social and behavior change (SBC) interventions are considered an essential part of malaria prevention and treatment interventions, yet gaps in information on the cost and impact of SBC mean decision makers have underappreciated the value of SBC for contributing to improved health outcomes.

According to the desk review, Matchbox toolkit assessment findings, situation analysis, stakeholder analysis conducted at the field level and the behavior and communication gaps identified, the major problem that the Malaria SBC strategy seeks to address in Rwanda is the lack of consistency in the efforts put into SBC activities due to insufficient funding of Malaria SBC activities. Moreover, the high rate of knowledge about Malaria-control interventions in Rwandan communities, the use and prioritization of Malaria interventions remain low at the community and household levels due to a lack or decrease of SBC messages, which has made people perceive that Malaria is no longer a concern in Rwanda.

This approach will help us to go well beyond simply providing information with evidence based approach to target audiences in particular general population, malaria identified high risk groups (easy and hard to reach groups). For the effective, SBC approach must help create an environment that enables the desired Behavior change can support the people who want to adopt or facilitate the social change. This could include making the Malaria prevention services more accessible, having Malaria brand ambassadors respected leaders voice support for and model the change, getting special interest groups involved, training service providers, and many more interventions depending on what our findings have revealed.

Malaria social behavior change strategies should be used at different levels from central level to decentralized level including Provincial, District, Sector, and community levels, to promote community ownership and engagement in malaria prevention and control.

1.1. SBC for Prevention

The SBC activities for prevention involve interpersonal communication or convening people in one place, such as social mobilization, community engagement, community meetings, or household visits that to be conducted for the purpose of promoting the uptake of malaria prevention, testing, and treatment. Key messages on malaria prevention and control require to be developed and disseminated through various communication channels. Furthermore, the dissemination of the messages should focus on creating awareness on the role of community in malaria prevention and control. To continuously support in Malaria prevention and control especially for people who work at night such as security personnel, fishermen, farmers, mining workers, FSWs, truck drivers and travellers to endemic areas) there is a need to rely to SBC interventions and the use of new occupation-based vector-control products such as repellents.

1.2. Priority area

In order to increase community awareness around malaria burden disease, call for support and appropriation from local leaders and community members to address the gap in SBC around Malaria prevention and control strategic interventions and increase local leaders involvement in the program implementation require to strengthen malaria SBC interventions through various priority areas which include the distribution of LLINs through continuous/ routine channels to children under five years and pregnant women, periodic mass-distribution campaigns, IRS in high burden districts, promotion of correct and consistent sleeping under Long Lasting Insecticides Nets (LLINs), environmental management to eliminate mosquito breeding and hiding sites, seeking early treatment, personnel protection using innovative tools like mosquito repellents.

2. SBC FOR CASE MANAGEMENT

In case management, several approaches at both community and health facility levels have been implemented to address the increasing number of malaria cases in Rwanda. However, there are some behavioral challenges associated with health-seeking behaviors, such as self-treatment, the use of traditional herbs, and waiting for malaria to get cured on its own, some related religious believes (under estimating the severity of malaria as well as several myths and misconceptions that need to be addressed. It was also realized that malaria is among major causes of anemia and its increase leads to high consumption of blood from the blood bank.

SBC will continue to play a significance role in districts where Malaria transmission declines. In those areas SBC will need to be deployed to promote testing and treatment in hotspot areas, bednets and prophylaxis use for travellers.

2.1. Priority areas

To deal with the challenges observed in malaria diagnosis and treatment, this guideline suggests acting on the following priority areas including, increasing awareness of the signs and symptoms of malaria; promoting early treatment-seeking behavior using Community and health facility services, and demonstrating the importance of completing treatment, which is key to fighting treatment failure (prevention of malarial parasites developing resistance to drugs) as well as sensitizing the population to donate blood.

3. COMMUNICATION CHANNELS

The selection of key Messages and communication Approaches should be based on consideration of audience analysis, channel analysis, audience access and cost-effectiveness. Moreover, to be effective, the use of standardization information and messaging per category of population (general population, easy and heard to reach groups) requires ensuring that the same message and information are disseminated in a coordinated manner in order to bring about changes in behavior and practices at different levels (political, local leaders, health professionals, community and individual).

Multiple **communication channels** and tools to reach various community groups which are not exhaustive can include interpersonal **communication** (IPC),messaging through songs, Focus

Group discussion (FGD), edutainment competitions, community meetings and drama, mass media both print and electronic media such radio, television and newspapers, radio talk shows, radio spots, radio sketches, TV programs, community outreaches drama Shows, Mobile video… etc, World/National Malaria campaigns, other advocacy events to be undertaken, Mother and Child Health Week, integration of Malaria messages in non-Malaria programmes (monthly nutrition meetings, Umuganda, Inteko z'abaturage, Umugoroba w'ababyeyi, gatherings/ Ibiterane organized by churches and mosques. The existing toll free Call Center to be used to obtain feedback from the community, IEC at Health Facility level, Households visits, mobile sound system, messaging using drones, targeted supportive supervision, mentorship and trainings for HCPs, key malaria stakeholders at decentralized level and community Health Workers.

The SBC guidance will provide in the form of a series of tables listing priority areas, key messages and communication channels. The hope is that malaria SBC programme can aim to leverage or change these priority areas through their activities and messages in order to promote behavior more effectively.

Priority area	Key messages	Communication channels
PREVENTION		
Address existing myths and misconceptions about LLINs and encourage household members to ensure correct and consistent use	Hang up well LLIN sand properly and sleep regularly under it	• Mass media: radio talk shows, radio drama, radio spots, radio sketches, TV programs, community outreaches drama Shows, etc. • Existing community forums, gatherings(ibiterane) • Health facility IEC • Community dialogues forums (Umuganda, umugoroba w'ababyeyi, inteko y'umudugudu, etc.) • Messaging by drones, mobile sound system, • Home visit by CHW • National campaigns such as health week, World malaria day, Mother and child health week, • Sensitization in community meetings such as churches/ mosques. • Targeted Supervision and mentorship • Promotional material like leaflets, pull up banners, T-shirts, caps etc
	Maintain and repair LLINs whenever necessary	
	LLINs should only be used for malaria prevention	
Increase IRS acceptance at the community and HH levels, and adherence to post-IRS recommendations	The benefits of IRS outweigh the inconvenience of moving HH items in preparation for spraying	
	IRS frees the house from malaria-transmitting mosquitoes	
	The HH head allows the entire house to be sprayed by helping the spray team members and agrees to remove HH belongings during spraying	
	Comply with post-spraying instructions to maintain the effectiveness of IRS	
	Keep using LLINs each night even after IRS.	
Promote environmental management including hygiene and sanitation to decrease mosquito breeding sites and mosquito bites	Malaria-transmitting mosquitoes breed in stagnant water; make sure you destroy or remove all mosquito breeding sites and ensuring effective environmental cleaning by removing bushes to prevent mosquito bites	
	People aware of bednets are frequently damaged by rodents	
Promote the prevention and control of malaria in pregnancy and children under five	Health Care Provider should provide to All Pregnant women who attend the ANC visits on their first ANC visit of their pregnancy without any conditions All Pregnant women who attend the ANC visits have right to receive LLINs on their first ANC visit of their pregnancy without any conditions	
	Pregnant women and their partners disregard the myths and misconceptions around pregnancy because ANC visits are very beneficial to the woman and the unborn child	
	Parents and care givers ensure Children < 5 sleep under LLINs correctly and consistently as one of the key preventive measures for malaria	
	Parent and care givers take children for immunization and obtain LLIN at 9 months of age (of the child)	
Promote the prevention and control of malaria in high risk groups (Easy and Hard risk groups)	High risk groups aware of existing personnel protection and use of mosquito repellents	

CASE MANAGEMENT		
Increasing community awareness of the signs and symptoms of malaria	People aware about malaria situation, causes, signs and symptoms with its prevention and control interventions	• Mass media: radio talk shows, radio drama, radio spots, radio sketches, TV programs, community outreaches drama Shows, etc. • Existing community forums, ibiterane, ….. • Health facility IEC • Community dialogues forums (Umuganda, umugoroba w'ababyeyi, inteko y'umudugudu, etc.) • Messaging by drones, mobile sound system, • Home visit by CHW • National campaigns such as health week, World malaria day, Mother and child health week, • Sensitization in community meetings such as churches/ mosques. • Targeted Supervision and mentorship • Promotional material like leaflets, pull up banners, T-shirts, caps etc
Promoting early treatment-seeking behaviour using Community and health facility services	People aware of: • Testing within 24 hours after getting one of sign of malaria • Importance of seeking medical assurance eg. Mutuelle de Santé • Appropriate sites/places (Community, public and private health facility) to receive Health care and services	
Demonstrating the importance of completing treatment	People aware of: • Disadvantages of sharing medicines and self-medication • Importance of taking medicines as prescribed by Health Care Providers	
Promote seeking of early Health care and treatment for high risk groups (Easy and Hard risk groups)	People aware of: • Testing within 24 hours after getting one of sign of malaria • Importance of seeking medical assurance eg. Mutuelle de Santé • Appropriate sites/places (Community, public and private health facility) to receive Health care and services	

ANNEXES

ANNEX 1: KEY PERFORMANCE INDICATORS FOR MALARIA

Program Area	Criteria	Description
SBC	**Name of Indicator**	**Proportion of eligible targeted areas (surface) benefiting from larviciding**
	Numerator	Eligible Area (surface) treated with larvicides (a)
	Denominator	Eligible targeted area (surface) (b)
	Formula	a/b*100
	Purpose	To control of outdoor biting of Malaria vector
	Level	Low Malaria Transmission Districts (according to the WHO Recommendations)
	Source	District
	Frequency	Monthly
	Target	TBD
	Interpretation	If low coverage, outdoor malaria transmission won't be controlled leaving the population not fully protected
SBC	**Name of Indicator**	**Number of Malaria SBC coordination meeting organized at All levels**
	Numerator	NA
	Denominator	NA
	Formula	NA
	Purpose	To increase awareness and ownership of district leaders in malaria control
	Formula	NA
	Level	District
	Source	District
	Frequency	Quarterly
	Target	120 per year
	Interpretation	If less than 120, there is a gap in malaria control awareness and ownership…
SBC	**Name of Indicator**	
	Numerator	Number of IEC/BCC message conducted on malaria control (a)
	Denominator	
	Formula	

Program Area	Criteria	Description
SBC	**Name of Indicator**	**3.3. % of the population who recognize signs of malaria**
	Numerator	Number of persons recognize signs of malaria (a)
	Denominator	Number of Sample Population (b)
	Formula	a /b *100
	Purpose	Increases awareness of the signs and symptoms of malaria.
	Level	Community
	Source	MIS or KAP
	Frequency	2-3 years
	Target	95% (MIS)
	Interpretation	If less than 85%, there is a gap in malaria control awareness
SBC	**Name of Indicator**	**3.4. % of women who recognize fever as a symptom of malaria**
	Numerator	Number of women recognize signs of malaria (a)
	Denominator	Number of Sample women (b)
	Formula	a /b *100
	Purpose	Increases awareness of the signs and symptoms of malaria among women.
	Level	Community
	Source	MIS/KAP
	Frequency	2-3 years
	Target	95% (MIS)
	Interpretation	If less than 85%, there is a gap in malaria control awareness
SBC	**Name of Indicator**	**3.5. % of people who feel that consequences of malaria are serious**
	Numerator	Number of persons who feel that consequences of malaria are serious (a)
	Denominator	Number of Sample population (b)
	Formula	a /b *100
	Purpose	Increases behavior of seeking early care.
	Level	Community
	Source	MIS/KAP
	Frequency	2-3 years
	Target	95% (MIS)
	Interpretation	If less than 85%, there is a gap in seeking early care

Program Area	Criteria	Description
SBC	**Name of Indicator**	**3.6. % of people who know the treatment for Malaria**
	Numerator	Number of persons who know the treatment for Malaria (a)
	Denominator	Number of Sample population (b)
	Formula	a /b *100
	Purpose	Increases Malaria treatment knowledge.
	Level	Community
	Source	MIS/KAP
	Frequency	2-3 years
	Target	95% (MIS)
	Interpretation	If less than 85%, there is a gap in malaria treatment knowledge
SBC	**Name of Indicator**	
	Numerator	Number of under five years of age with a fever in the last two weeks (a)
	Denominator	Number under five years of age with a fever (b)
	Formula	a /b *100
	Purpose	Promote the prevention and control of malaria in under 5 years children
	Level	Community
	Source	DHS/MIS/KAP
	Frequency	2-3 years
	Target	85% (MIS)
	Interpretation	If less than 85%, there is a gap in malaria prevention and control among under 5 years children
SBC	**Name of Indicator**	**3.8. % Children under five years of age with a fever in the last two weeks who had a finger or heel stick**
	Numerator	Number of under five years of age with a fever in the last two weeks who had a finger or heel stick (a)
	Denominator	Number of under five years of age with a fever (b)
	Formula	a /b *100
	Purpose	Reinforce testing behavior among healthcare providers
	Level	Community and HFs
	Source	DHS/MIS/KAP
	Frequency	2-3 years
	Target	75% (MIS)

Program Area	Criteria	Description
	Interpretation	If less than 70%, there is a gap in malaria prevention and control among under 5 years children
SBC	**Name of Indicator**	**3.9. % Children receiving an ACT among children under five years of age with a fever in the last two weeks who received any antimalarial drug**
	Numerator	Number of under 5 years children receiving ACT in the last two weeks (a)
	Denominator	Number of under 5 years children (b)
	Formula	a /b *100
	Purpose	Increases Malaria treatment knowledge.
	Level	Community
	Source	DHS/MIS
	Frequency	2-3 years
	Target	95% (MIS)
	Interpretation	If less than 85%, there is a gap in malaria treatment knowledge
SBC	**Name of Indicator**	**3.10. % of persons treated within 24 hours of onset of fever at community level**
	Numerator	Number of persons treated within 24 hours of onset of fever at community level (a)
	Denominator	Number of persons treated for fever at community level (b)
	Formula	a /b *100
	Purpose	Increases behavior of seeking early care at community.
	Level	Community
	Source	MOPDD Annual Report
	Frequency	1 year
	Target	96%
	Interpretation	If less than 85%, there is a gap in malaria treatment knowledge
SBC	**Name of Indicator**	
	Numerator	Number of providers who communicate the importance of adherence to treatment (a)
	Denominator	Number of providers at community level (b)
	Formula	a /b *100
	Purpose	To prevent drug resistance within community
	Level	Community

Program Area	Criteria	Description
	Source	MOPDD Annual Report
	Frequency	1 year
	Target	95%
	Interpretation	If less than 85%, there is a gap in importance of adherence to treatment
SBC	**Name of Indicator**	
	Numerator	Number of populations who know the mode of transmission of malaria (a)
	Denominator	Number of sample population (b)
	Formula	a/b*100
	Purpose	To increase knowledge of malaria transmission at community level
	Level	Community
	Source	MIS
	Frequency	2-3 years
	Target	98% (MIS)
	Interpretation	If less than 85%, there is a gap in knowledge of malaria transmission at community level
SBC	**Name of Indicator**	**5.2. % of women who reported mosquito bites as a cause of malaria**
	Numerator	Number of women who reported mosquito bites as a cause of malaria (a)
	Denominator	Number of sample population (b)
	Formula	a/b*100
	Purpose	To increase knowledge of malaria transmission at community level
	Level	Community
	Source	MIS/KAP
	Frequency	2-3 years
	Target	98% (MIS)
	Interpretation	If less than 85%, there is a gap in knowledge of malaria transmission at community level
SBC	**Name of Indicator**	**5.3. % of vulnerable group people who perceive they are at risk from malaria**
	Numerator	Number of vulnerable group people who perceive they are at risk from malaria (a)

Program Area	Criteria	Description
	Denominator	The population of vulnerable groups (b)
	Formula	a/b*100
	Purpose	To increase knowledge of malaria transmission at community level
	Level	Community among vulnerable groups
	Source	MIS/KAP
	Frequency	2-3 years
	Target	98% (MIS)
	Interpretation	If less than 85%, there is a gap in knowledge of malaria transmission at community level
SBC	**Name of Indicator**	**5.4. % of vulnerable group people who know proven preventive measures for malaria**
	Numerator	Number of vulnerable group people who know proven preventive measures for malaria (a)
	Denominator	The population of vulnerable groups (b)
	Formula	a/b*100
	Purpose	To increase knowledge of malaria transmission at community level
	Level	Community among vulnerable groups
	Source	MIS
	Frequency	2-3 years
	Target	98% (MIS)
	Interpretation	If less than 85%, there is a gap in knowledge of malaria transmission at community level
SBC	**Name of Indicator**	**5.5. % Children under five years of age who slept under an LLIN the previous night**
	Numerator	Number of Children under five years of age who slept under an LLIN the previous night (a)
	Denominator	Number of Under five children (b)
	Formula	a/b*100
	Purpose	To prevent Malaria transmission in under 5 children
	Level	Community
	Source	DHS/MIS
	Frequency	Once 2-3 years
	Target	85% (MIS)

Program Area	Criteria	Description
	Interpretation	If less than 85%, there is a gap in malaria preventive measures in under five children
SBC	**Name of Indicator**	**5.6. % Pregnant women who slept under an LLIN the previous night**
	Numerator	Number of Pregnant women who slept under an LLIN the previous night (a)
	Denominator	Number of Pregnant women (b)
	Formula	a/b*100
	Purpose	To prevent Malaria transmission in pregnant woment
	Level	Community
	Source	DHS/MIS
	Frequency	Once 2-3 years
	Target	85% (MIS)
	Interpretation	If less than 85%, there is a gap in malaria preventive measures in pregnant women
SBC	**Name of Indicator**	
	Numerator	Number of pregnant women, who attended ANC who were counselled on malaria in pregnancy (a)
	Denominator	Number of Pregnant women (b)
	Formula	a/b*100
	Purpose	To prevent Malaria transmission in pregnant women
	Level	Community
	Source	MOPDD Annual Report
	Frequency	1 year
	Target	96%
	Interpretation	If less than 85%, there is a gap in malaria preventive measures in pregnant women
SBC	**Name of Indicator**	
	Numerator	N/A
	Denominator	N/A
	Formula	N/A
	Purpose	To increase social fairness in malaria prevention and control measurement
	Level	Community

Program Area	Criteria	Description
	Source	MOPDD Annual Report
	Frequency	1 year
	Target	96%
	Interpretation	If less than 80%, there is a gap in malaria preventive measures in pregnant women
SBC	**Name of Indicator**	
	Numerator	Number of people who recall hearing or seeing any malaria messages within the last six months (a)
	Denominator	Number of Sample population (b)
	Formula	a/b*100
	Purpose	To increase awareness on malaria prevention and control
	Level	Community
	Source	MIS
	Frequency	Once 2-3 years
	Target	95% (MIS)
	Interpretation	If less than 85%, there is a gap in malaria prevention and control awareness
SBC	**Name of Indicator**	
	Numerator	Number of households with at least one LLINs for 2 people in the HH surveyed (a)
	Denominator	Number of households surveyed (b)
	Formula	a/b*100
	Purpose	To increase awareness on ITN use in malaria prevention and control
	Level	Community
	Source	MIS/DHS
	Frequency	Once 2-3 years
	Target	N/A
	Interpretation	If less than 85%, there is a gap on INTN use in malaria prevention and control awareness
SBC	**Name of Indicator**	**6.3. Proportion of HH with at least one LLIN**
	Numerator	Number of Households with at least one LLIN in the HH surveyed (a)
	Denominator	Number of household surveyed (b)
	Formula	a/b*100

Program Area	Criteria	Description
	Purpose	To increase HH access on ITN use in malaria prevention and control
	Level	Community
	Source	MIS/DHS
	Frequency	Once 2-3 years
	Target	85% (MIS)
	Interpretation	If less than 85%, there is a gap on HH access on ITN use in malaria prevention and control awareness
SBC	**Name of Indicator**	
	Numerator	Number of persons protected either by IRS or LLINS (a)
	Denominator	Number of sample population (b)
	Formula	a/b*100
	Purpose	To increase access on IRS or ITN use in malaria prevention and control
	Level	Community
	Source	MIS/DHS
	Frequency	Once 2-3 years
	Target	85% (MIS)
	Interpretation	If less than 90%, there is a gap on IRS or ITN accessibility and use in malaria prevention and control awareness
SBC	**Name of Indicator**	**6.5. Proportion of population protected by indoor residual spraying within the last 12 months in targeted districts**
	Numerator	Number of persons protected by IRS within the last 12 months in targeted districts (a)
	Denominator	Total population in targeted districts (b)
	Formula	a/b*100
	Purpose	To increase coverage of IRS in malaria prevention and control
	Level	Community
	Source	MIS/DHS
	Frequency	Once 2-3 years
	Target	85% (MIS)
	Interpretation	If less than 85%, there is a gap on coverage of IRS in malaria prevention and control awareness
SBC	**Name of Indicator**	

Program Area	Criteria	Description
	Numerator	Number of policy makers and leaders who participated in advocacy activities and social mobilization for LLIN use (a)
	Denominator	Number of policy makers and leaders who are targeted for advocacy activities and social mobilization for LLIN use (b)
	Formula	a/b*100
	Purpose	To increase engagement of decision makers in malaria prevention and control
	Level	Community
	Source	MOPDD Annual Report
	Frequency	1 year
	Target	60%
	Interpretation	If less than 50%, there is a gap on engagement of decision makers in malaria prevention and control awareness
SBC	**Name of Indicator**	
	Numerator	Number of of policy makers and leaders who advocated and mobilized communities for IRS in intervention areas (a)
	Denominator	Number of policy makers and leaders who are targeted for advocacy activities and social mobilization for IRS (b)
	Formula	a/b*100
	Purpose	To increase engagement of policy makers in malaria prevention and control
	Level	Community
	Source	MOPDD Annual Report
	Frequency	1 year
	Target	60%
	Interpretation	If less than 50%, there is a gap on engagement of policy makers in malaria prevention and control awareness

ANNEX 2: MALARIA COMMODITY SPECIFICATIONS

Product Denomination	Artemether Lumefantrine 6x1 & Artemether Lumefantrine 6x2 tablets
Dosage	The combined therapy must be Artemether 20mg and Lumefantrine 120mg(AL) per tablet
Presentation	Two age groups 6x1 and 6x2 weighing respectively 5kg-15kg and 15-25kg. The tablets are dispersible.

Common presentation of the tablet	• Weight category must be well classified for the 2 groups:
	  ○ 5-15kg
	  ○ 15-25 kg
	• Tablets must be in yellow color;
	• Drug instructions should be written on the front of the package where tablets are visible as per the design attached;
	• Product must have at least 24 months of shelf life;
	• The tablets to be taken in one dose per age group must be enclosed in one square well separated from another in order to orient patients on the way to take the ACT and ensure a good compliance;
	• The blister must show the succession of doses for the total cure from one dose to another and from day 1 to day 3 using arrows as illustrated in the design attached;
	• The blister must specify that the second dose is taken 8 hours after the first dose

Product denomination	**Artemether Lumefantrine 6x3 and Artemether Lumefantrine 6x4 tablets**
Dosage	The combined therapy must be Artemether 20mg and Lumefantrine 120mg(AL) per tablet
Presentation	Two age groups 6x3 and 6x4 weighing respectively 25kg-35kg and above 35kg; The tablets are non-dispersible

Common presentation of the tablet	• Weight category must be well classified for the 2 groups:
	  ○ 25-35kg
	  ○ And 35kg & above.
	• Tablets must be in yellow color;
	• Drug instructions should be written on the front of the package where tablets are visible as per the design attached;
	• Product must have at least 24 months of shelf life;
	• The tablets to be taken in one dose per age group must be enclosed in one square well separated from another in order to orient patients on the way to take the ACT and ensure a good compliance;
	• The blister must show the succession of doses for the total cure from one dose to another and from day 1 to day 3 using arrows as illustrated in the design attached;
	• The blister must specify that the second dose is taken 8 hours after the first dose

Product denomination	Artesunate injection
Dosage	Artesunate 60mg
Presentation	• Ampoule or vial containing 60mg anhydrous Artesunate • Co-packed 50mg/1ml ampoule of 5% sodium bicarbonate solution • Product must have at least 24 months of shelf life. • The reconstituted, diluted solutions showed acceptable stability, chemically and physically (including particulate matter), for one hour at 25 °C-30°C.
Products denomination	**Malaria Rapid Diagnostic Tests**
Presentation	• RDTs with antigen detecting pLDH/HRP2 • Detection rate:>80% of Plasmodium Falciparum at 200 parasites/µl. • Detection rate: > 90% of Plasmodium Falciparum at 2000 or 5000 parasites/µl. • False positivity rate less than 3%. • Invalid rate: less than 3%. • Storage temperature: between 4 °C and 30°C. • The RDTs to be ISO Certified. • RDT format: cassette (easy use for CHWs) with: • Capillary blood collected from fingertip • Whole blood collected by venipuncture using EDTA sample tubes • Appropriate packaging (Combo, kits 30tests). • Each sealed pouch contains test device with a pipette. • The kit contains: ○ 30 test devices individually foil pouched with a desiccant ○ 30 5µL capillary pipettes, 30 lancets, 30 alcohol swabs, 30 individual buffer ampoules ○ Instructions for use ○ 30 pairs of latex gloves, 30 dried swabs
Product denomination	○ **DihydroArtemisisnin –Piperaquine Dispersible**
Strength	○ 20/160 mg
Formulation	○ Dispersible Tablets
Pack size	○ 1 pack of 3 tablet per blister
Product denomination	○ **DihydroArtemisisnin -Piperaquine**
Strength	○ 30/240mg
Formulation	○ Tablets
Pack size	○ 1 pack of 25 blistersof 3 Tablets

Product denomination	○ **Pyronaridine Artesunate, granules**
Strength	○ 60/2omg
Formulation	○ Granules for suspension
Pack size	○ 1 box of 30 pack of 3 Sachets
Product denomination	○ **Pyronaridine Artesunate, Tablets**
Strength	○ 180/60 mg
Formulation	○ Film-Coated Tablets
Pack size	○ 1pack of 10 blisters of 9 tablets
Product denomination	○ **Artemether injection**
Strength	○ 80 mg /ml
Formulation	○ Each ampoule shall contain 01 ml of Artemether Injection.
Pack size	○ Each ml shall contain –Artemether 80 mg
	○ Artemether Injection Kit consists of 10 vials of Artemether Injection and 10 Disposable Syringes along with Disposable needles and swaps.

PRODUCT RECEPTION CHECKLIST

Product name: ……...……...…….....

Batch Number : ……..

Reception date: ……

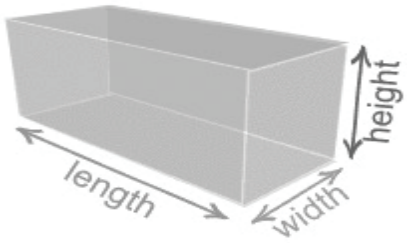
Nº	Criteria		Yes / No	Comments / Other information
1	**Product / Container status**	Broken seals		**Pass / Fail**
		Evidence of tampering or contamination		
		Overall cleanliness		
		Container damage		
		Material is being stored properly		
	Other	…… ……		
2	**Product Label**	Full name (INN/DCI if applicable)		**Pass / Fail**
		Pharmacopoeia / Other reference		Pass / Fail
		Strength is clear mentioned		Pass / Fail
		Composition mentioned		Pass / Fail
		Composition detailed		Pass / Fail
		Administration route clearly mentioned		Pass / Fail
		Manufacturer name as in the contract		**Pass / Fail**
		Batch / Lot number		Pass / Fail
		Manufacturing Date		Pass / Fail
		Expiry Date		Pass / Fail
		Shelf life (Minimum : 75% or 85 %)		Pass / Fail
3	**Storage conditions clearly mentioned**	Storage requirements mentioned		**Pass / Fail**
		Minimum temperature		
		Maximum temperature		
		Moisture requirements conditions		
		Transportation conditions respected		Pass / Fail
4	**Supplier documents**	Supplier is clear identifiable		**Pass / Fail**
		Delivery note is adequately filled		
		Purchasing Order available		
		Import License		
		Certificate of analysis / compliance (CoA / CoC)		
Decision from Quality Assurance Unit			**Accepted / Rejected**	

QA/QC personnel

Names: …… Signature: ……...

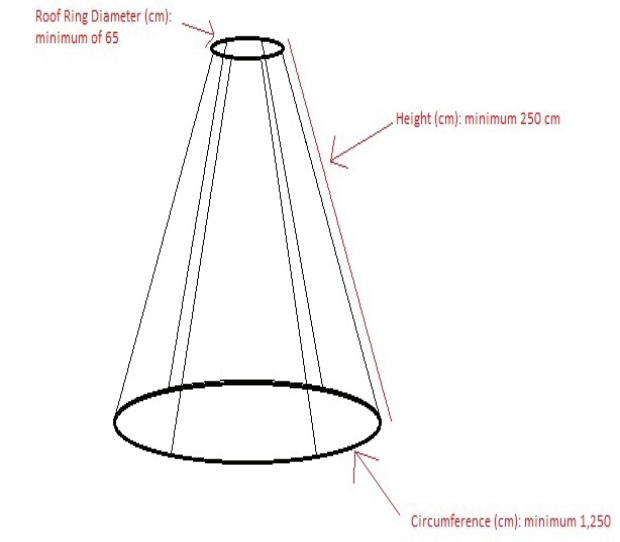
Date : …….

ANNEX 3: RECTANGULAR LLIN SPECIFICATIONS

Type of Specifications	Standard Specifications with proof documents
Product	Polyester, polyethylene, polypropylene (from WHO recommended LLINs list)
Netting material	**Denier:** Not less than 100 **Bursting strength:** Not less than 350 kPa for polyester fiber, 450 kPa for polypropylene fiber and 250 kPa for polyethylene fiber **Mesh size:** should be between 56 to 161 holes per inch^2 **Dimensional stability at washing:** Not more than 10% shrinkage after washing **Wash resistance:** net quality should be maintained after not less than 20 standards washes **N.B.:** Long-Lasting Insecticidal Mosquito Nets will be based on the most recent WHO recommendations.
Shape	**Rectangular** **Definition:** the net will have six faces that are rectangles. The height must be the same at each point of measurement of the net. **Illustration:** 
Color	One of the following colors: **green, white or sky blue**
Dimensions	**Length:** 190 cm minimum (the acceptable deviation is £ 5%) **Height:** 180 cm minimum (the acceptable deviation is £ 5%) **Width:** 180 cm minimum (the acceptable deviation is £ 5%) Net attachment: 8 reinforced fabric loops
Incorporated or coated insecticide	a) Deltamethrin, permethrin or Alpha-cypermethrin: insecticide incorporated into polyethylene fibber or insecticide coated on polyester fiber; b) Additional to insecticides mentioned above, LLINs treated with insecticide synergists (e.g.: PBO) **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.
Insecticide concentration	➢ **Monotreated nets** a) Delthametrin: 1.05-2.8 g/kg b) Permethrin: 17-23 g/kg c) Alpha-cypermethrin; 3.75- 8.4 g/kg ➢ **Combination nets** **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.

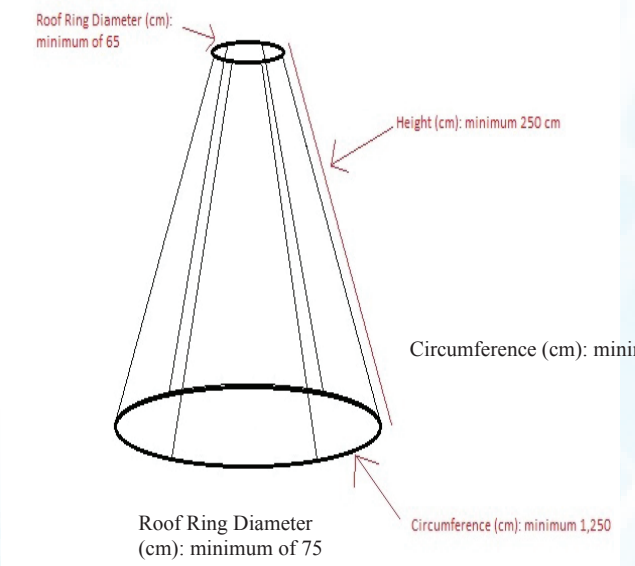
Effective duration	Not less than 3 years after opening (source)
Special Delivery Instructions	The mosquito nets must be packed with a manufacture brand name and according to design of local brand name (eg: Tuzanet®). The local brand name is given to MPPD by RBC's Malaria and Other Parasitic Diseases Division after final notification to the winner of the tender. Note that each mosquito net must have individual packaging and each bale must contain 50 pieces compressed by the accurate machine at the factory. On the bale and the individual package of each LLINs, mark name of manufacturer, quantity of mosquito nets per bale, dimension, shape, tender number, and insecticide used, concentration, date of production, shelf life of LLIN and batch number. Label on the mosquito net with product trade name, manufacturer, insecticide used, insecticide concentration and date of production, shelf life of LLIN, batch number, 5 ISO3758 pictograms. **N.B. Local branding name and design on CD to be obtained from the Medical Procurement and Production Division.**
Acceptance conditions	This is subject to in country physical and chemical inspections according to international and national guidelines

ANNEX 4: CONICAL LLIN SPECIFICATIONS

Type of Specifications	Standard Specifications with proof documents
Product	Polyester, polyethylene, polypropylene (from WHO recommended LLINs list)
Netting material	**Denier:** Not less than 100 **Bursting strength:** Not less than 350 kPa for polyester fiber, 450 kPa for polypropylene fiber and 250 kPa for polyethylene fiber **Mesh size:** should be between 56 to 161 holes per inch^2 **Dimensional stability at washing**: Not more than 10% shrinkage after washing **Wash resistance:** net quality should be maintained after not less than 20 standards washes **N.B.:** Long-Lasting Insecticidal mosquito Nets will be based on the most recent WHO recommendations.
Shape	**Conical** **Definition:** the net will have a circular base and one seam. The net will be made of one or multiple vertical panels of cloths. The distance between the seam and the base must be the same at point of measurement of the net. **Illustration:** 
Color	One of the following colors: **green, white, or sky blue**
Dimensions	**Circumference:** 1250 cm minimum (the acceptable deviation is ≤ 5%) **Height:** 250 cm minimum (the acceptable deviation is ≤ 5%) **Ring diameter:** 65 cm minimum (the acceptable deviation is ≤ 5%) **Net attachment:** 1 reinforced fabric loop

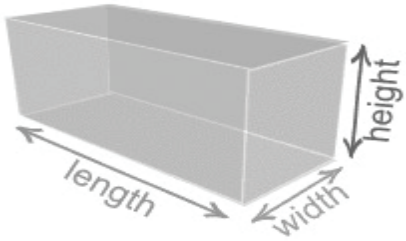
Incorporated or coated insecticide	a) Deltamethrin, permethrin or Alpha-cypermethrin: insecticide incorporated into polyethylene fibber or insecticide coated on polyester fiber; b) Additional to insecticides mentioned above, LLINs treated with insecticide synergists (e.g.: PBO) **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.
Insecticide concentration	➢ **Monotreated nets** a) Delthametrin: 1.05-2.8 g/kg b) Permethrin: 17-23 g/kg c) Alpha-cypermethrin; 3.75- 8.4 g/kg ➢ **Combination nets** **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.
Effective duration	Not less than 3 years after opening
Special Delivery Instructions	The mosquito nets must be packed with a manufacture brand name and according to design of local brand name (eg: Tuzanet®). The local brand name is given to RMS Ltd by RBC's Malaria and Other Parasitic Diseases Division after final notification to the winner of the tender. Note that each mosquito net must have individual packaging and each bale must contain 50 pieces compressed by the accurate machine at the factory. The spring ring is included in the individual packaging of each mosquito net. Note that the spring ring must be flexible, made in plastic material. On the bale and the individual package of each LLINs, mark name of manufacturer, quantity of mosquito nets per bale, dimension, shape, tender number, and insecticide used, concentration, date of production, shelf life of LLIN and batch number. Label on the mosquito net with product trade name, manufacturer, insecticide used, insecticide concentration and date of production, shelf life of LLIN, batch number, 5 ISO3758 pictograms.
Acceptance conditions	This is subject to in country physical and chemical inspections according to international and national guidelines

ANNEX 5: EXTRA-LARGE CONICAL LLIN SPECIFICATIONS

Type of Specifications	Standard Specifications with proof documents
Product	Polyester, polyethylene, polypropylene (from WHO recommended LLINs list)
Netting material	**Denier:** Not less than 100 **Bursting strength:** Not less than 350 kPa for polyester fiber, 450 kPa for polypropylene fiber and 250 kPa for polyethylene fiber **Mesh size:** should be between 56 to 161 holes per inch^2 **Dimensional stability at washing**: Not more than 10% shrinkage after washing **Wash resistance:** net quality should be maintained after not less than 20 standards washes **N.B.:** Long-Lasting Insecticidal mosquito Nets will be based on the most recent WHO recommendations.
Shape	**Conical** **Definition**: the net will have a circular base and one seam. The net will be made of one or multiple vertical panels of cloths. The distance between the seam and the base must be the same at point of measurement of the net. **Illustration**: 
Color	One of the following colors: **green, white, or sky blue**
Dimensions	**Circumference:** 1,350cm minimum (the acceptable deviation is ≤ 5%) **Height:** 250cm minimum (the acceptable deviation is ≤ 5%) **Ring diameter:** 75cm minimum (the acceptable deviation is ≤ 5%) Net attachment: 1 reinforced fabric loop

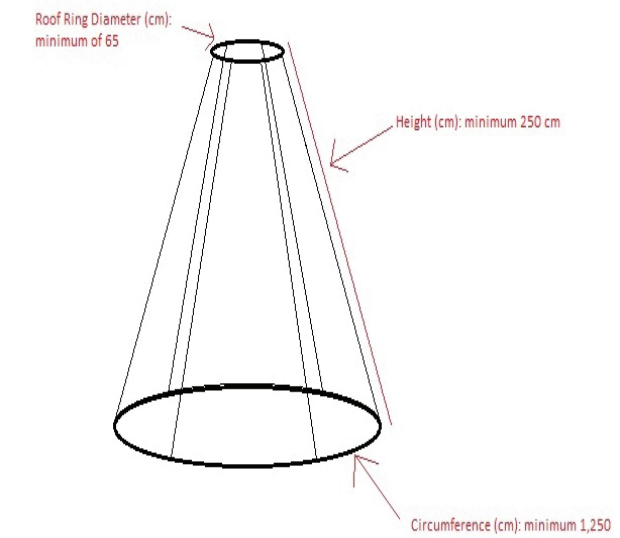
Incorporated or coated insecticide	a) Deltamethrin, permethrin or Alpha-cypermethrin: insecticide incorporated into polyethylene fibber or insecticide coated on polyester fiber; b) Additional to insecticides mentioned above, LLINs treated with insecticide synergists (e.g.: PBO) would be the preferred option **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.
Insecticide concentration	➢ **Monotreated nets** a) Delthametrin: 1.05-2.8 g/kg b) Permethrin: 17-23 g/kg c) Alpha-cypermethrin; 3.75- 8.4 g/kg ➢ **Combination nets** **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.
Effective duration	Not less than 3 years after opening
Special Delivery Instructions	The mosquito nets must be packed with a manufacture brand name and according to design of local brand name (eg: Tuzanet®). The local brand name is given to RMS Ltd by RBC's Malaria and Other Parasitic Diseases Division after final notification to the winner of the tender. Note that each mosquito net must have individual packaging and each bale must contain 50 pieces compressed by the accurate machine at the factory. The spring ring is included in the individual packaging of each mosquito net. Note that the spring ring must be flexible, made in plastic material. On the bale and the individual package of each LLINs, mark name of manufacturer, quantity of mosquito nets per bale, dimension, shape, tender number, and insecticide used, concentration, date of production, shelf life of LLIN and batch number. Label on the mosquito net with product trade name, manufacturer, insecticide used, insecticide concentration and date of production, shelf life of LLIN, batch number, 5 ISO3758 pictograms.
Acceptance conditions	This is subject to in country physical and chemical inspections according to international and national guidelines

ANNEX 6:
PBO AND DUAL AI INSECTICIDES RECTANGULAR LLINS SPECIFICATIONS

Type of Specifications	Standard Specifications with proof documents
Product	Polyester, polyethylene, polypropylene (from WHO recommended LLINs list)
Netting material	**Denier:** 75/100/120 or 150 **Bursting strength:** 75 denier: ³ 250 kPa, 100, 120 and 150 denier: ³ 405 kPa **Mesh size:** ³ 156 holes/inch² or ³ 24 holes/cm² **Dimensional stability at washing:** < 5% shrinkage after washing **Wash resistance:** net quality should be maintained after not less than 20 standards washes **N.B.:** Long-Lasting Insecticidal mosquito Nets will be based on the most recent WHO recommendations.
Shape	**Rectangular** **Definition:** the net will have six faces that are rectangles. The height must be the same at each point of measurement of the net. **Illustration:** 
Color	One of the following colors: **green, white or sky blue**
Dimensions	**Length:** 190 cm minimum (the acceptable deviation is £ 5%) **Height:** 180 cm minimum (the acceptable deviation is £ 5%) **Width:** 180 cm minimum (the acceptable deviation is £ 5%) Net attachment: 8 reinforced fabric loops
Coated insecticide	➢ Pyrethroid insecticides + PBO ➢ Alpha-cypermethrin- Chlorfenapyr: insecticides coated on polyester fiber; ➢ Alpha-cypermethrin-pyriproxyfen: insecticides coated on high-density polyethylene **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.

Insecticide concentration	➢ Pyrethroid insecticides + PBO ➢ Alpha-cypermethrin:100 mg/m^2 ± 25% + Cholrfenapyr: 200 mg/m^2 ± 25% ➢ Alpha-cypermethrin: 208 mg/m2 ± 25% + pyriproxyfen 225 mg/m2 ± 25% **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.
Effective duration	Not less than 3 years after opening
Special Delivery Instructions	The mosquito nets must be packed with a manufacture brand name and according to design of local brand name (eg: Tuzanet®). The local brand name is given to RMS Ltd by RBC's Malaria and Other Parasitic Diseases Division after final notification to the winner of the tender. Note that each mosquito net must have individual packaging and each bale must contain 50 pieces compressed by the accurate machine at the factory. On the bale and the individual package of each LLINs, mark name of manufacturer, quantity of mosquito nets per bale, dimension, shape, tender number, and insecticide used, concentration, date of production, shelf life of LLIN and batch number. Label on the mosquito net with product trade name, manufacturer, insecticide used, insecticide concentration and date of production, shelf life of LLIN, batch number, 5 ISO3758 pictograms.
Acceptance conditions	This is subject to in country physical and chemical inspections according to international and national guidelines

ANNEX 7:
PBO AND DUAL AI INSECTICIDES CONICAL LLIN SPECIFICATIONS

Type of Specifications	Standard Specifications with proof documents
Product	Polyester (from WHO recommended LLINs list)
Netting material	**Denier:** 75, 100, 120 or 150 **Bursting strength:** 75 denier: ³ 250 kPa, 100, 120, 150 denier: ³ 405 kPa **Mesh size:** ³ 156 holes/inch² or ³ 24 holes/cm² **Dimensional stability at washing**: < 5% shrinkage after washing **Wash resistance:** net quality should be maintained after not less than 20 standards washes **N.B.:** Long-Lasting Insecticidal mosquito Nets will be based on the most recent WHO recommendations.
Shape	**Conical** **Definition:** the net will have a circular base and one seam. The net will be made of one or multiple vertical panels of cloths. The distance between the seam and the base must be the same at point of measurement of the net. **Illustration:** 
Color	One of the following colors: **green, white, or sky blue**
Dimensions	**Circumference:** 1250 cm minimum (the acceptable deviation is ≤ 5%) **Height:** 250 cm minimum (the acceptable deviation is ≤ 5%) **Ring diameter:** 65 cm minimum (the acceptable deviation is ≤ 5%) **Net attachment:** 1 reinforced fabric loop

Coated insecticide	➢ Pyrethroid insecticides + PBO ➢ Alpha-cypermethrin- Chlorfenapyr: insecticides coated on polyester fiber; ➢ Alpha-cypermethrin-pyriproxyfen: insecticides coated on high-density polyethylene **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control.
Insecticide concentration	➢ Pyrethroid insecticides + PBO ➢ Alpha-cypermethrin:100 mg/m^2 ± 25% + Cholrfenapyr: 200 mg/m^2 ± 25% ➢ Alpha-cypermethrin: 208 mg/m2 ± 25% + pyriproxyfen 225 mg/m2 ± 25% **N.B.:** Insecticide products and concentration will be based on the most recent WHO recommendations for treatment of mosquito nets for malaria vector control
Effective duration	Not less than 3 years after opening
Special Delivery Instructions	The mosquito nets must be packed with a manufacture brand name and according to design of local brand name (eg: Tuzanet®). The local brand name is given to RMS Ltd by RBC's Malaria and Other Parasitic Diseases Division after final notification to the winner of the tender. Note that each mosquito net must have individual packaging and each bale must contain 50 pieces compressed by the accurate machine at the factory. The spring ring is included in the individual packaging of each mosquito net. Note that the spring ring must be flexible, made in plastic material. On the bale and the individual package of each LLINs, mark name of manufacturer, quantity of mosquito nets per bale, dimension, shape, tender number, and insecticide used, concentration, date of production, shelf life of LLIN and batch number. Label on the mosquito net with product trade name, manufacturer, insecticide used, insecticide concentration and date of production, shelf life of LLIN, batch number, 5 ISO3758 pictograms.
Acceptance conditions	This is subject to in country physical and chemical inspections according to international and national guidelines

ANNEX 8: WORKMANSHIP AND APPEARANCE MAJOR AND MINOR DEFECTS OF LLINS

No	Description of Defects	Classifications		Observation
		Major	Minor	
1	**Product**	X		This will be a subject for physical, chemical and laboratory testing
2	**Netting material**	X		This will be a subject for physical, chemical and laboratory testing
3	**Shape (**different from the one specified in the contract)	X		
4	**Color** (different color from the one specified in the contract)		X	
5	**Dimensions** different from the one provided in the technical specifications (the acceptable deviation is £ 5%))	X		
6	**Incorporated or coated insecticide**	X		This will be a subject for chemical testing
8	**Spring ring** (missing or it cannot feet in the net)	X		
9	**Drawings** as per the artwork provided and approved		X	
10	**Holes** in the netting material	X	X	**Major Defect**: A hole in the netting fabric with size bigger than 2x2 mesh or 0.5x0.5 cm **Minor Defect:** A hole in the netting fabric with size equal or less than 2x2 mesh or 0.5x0.5 cm
11	**Open seam** (Hole is observed in the seam with size bigger than 5 mesh or longer than 1 cm whichever is bigger)	X	X	**Major Defect:** When hole is observed in the seam with size bigger than 5 mesh or longer than 1 cm **Minor Defect:** Hole is observed in the seam with size less than 5 mesh or less than 1 cm

No	Description of Defects	Classifications		Observation
		Major	Minor	
12	**Joint defect.** More than 3 vertical seams in the side panel or more than 1 connecting seam in the roof of rectangular net, and Roof: width of connecting panel is not to be less than 30 cm. Panel: width of connecting panel is not to be less than 50 cm	X		
13	**Loop defect.** Missing loop, ring (only with conical net) or loop can be easily removed by hand pulling	X		
14	**Label defect.** Missing label(s) & difference from those provided from the technical specifications and approved in the Rwanda Ministry of Health Artwork	X		
15	**Repaired hole** at the site before initial shipment with proper repair. No more than 3 patches allowed		X	Hole or run, with proper repair (repaired with patch). No more than 3 patches allowed.
16	**Small knitting defect** (Hole with less than or equal to 2 x 2 mesh or 0.5 x 0.5 cm. A net with 3 or more holes of this type is to be classified as a major defect)		X	
17	**Imperfect seam.** Breaking 1 thread in double-thread seam without hole Too loose or too tight, uneven seam or lower than 3 stitches/cm seam Seam split bigger than 3 mesh or 0.5 cm and less than or equal to 5 mesh or 1 cm.		X	
18	**Trimming defect** -Raw or uncovered seams with height of 1cm or above - Untrimmed thread ends of longer than 5 cm		X	
19	**Stain.** Oil, dirt spot with reasonably significant size (≥ 5 x 5 mesh or 1cm x 1cm) or multiple (≥ 6) small spots		X	

ANNEX 9: PHYSICAL INSPECTION OBSERVATIONS OF LLINS

20	Chalk mark, spotty oil spot with size less than 5x5 mesh	**Observation**
21	Blurred stamp ink	**Observation**
22	Fold at the corner	**Observation**
23	Seam split less than 3 mesh or 0.5 cm	**Observation**
24	Trimming defect. - Raw or uncovered seams with height less than or equal to 1cm - Untrimmed thread ends of less than 5cm	**Observation**

Measurement methodology

The dimensional measurements were taken as follows:

Circumference – fold net twice along seams and measure along bottom edge and then multiply measurement by 4 to get approx. circumference.

Height – measure along the vertical seam from top to bottom edge and measure between 2 seams. The distance between the roof and the base must be the same at any point of measurement of the net. During measuring the nets should be free of creases or wrinkles and should not be stretched.

PS: If the LLIN have been packed tightly in bales, they may have to be stretched to get the original shapes with gentle force (maximum 1kg or 10 newton)

ANNEX 10: SAMPLE SIZE CODES FOR GENERAL INSPECTION LEVEL II

General Inspection Level II	Normal inspection Level II-A	
Total Number of bed nets	**Sample code**	**# of samples**
1201 to 3200	K	125
3201 to 10000	L	200
10001 to 35000	M	315
35001 to 150000	N	500
150001 to 500000	P	800
500000 and over	Q	1250

Acceptance Quality Limit (AQL)

The procuring entity will use ISO 2859-1 (1999) as a sampling guidance for inspection and acceptance limit.

LOT is definite amount of some product, material or service collected together

Batch is a definite quantity of a commodity produced essentially under the same conditions and note that an inspection LOT may consist of several batches or parts of batches.

The procuring entity will use the General inspection level I and normal inspection level II under the Table 2- A in the ISO 2859-1 (1999).

The Acceptance quality limit (AQL) levels is 2.5 for major defects.

The Acceptance quality limit (AQL) levels is 4 for minor defects.

ANNEX 11: WHOPES-RECOMMENDED COMPOUNDS AND FORMULATIONS FOR CONTROL OF MOSQUITO LARVAE, 28 JULY 2017

Insecticide compounds and formulation(s)	Class group	Dosage (active ingredient)		
		General (open water bodies)		Container breeding
		(g-l/ha)	(mg/m2)	(mg/L)
Bacillus thuringiensis israelensis , strain AM65-52, WG (3000 ITU/mg)	BL	125–750	12.5–75	1–5
Bacillus thuringiensis israelensis, strain AM65-52, GR (200 ITU/mg)	BL	5,000–20,000	500–2000	-
Bacillus thuringiensis israelensis (strain AM65-52 + B. sphaericus strain ABTS-1743; 50 Bsph ITU/mg), GR	BL	5,000–20,000	500–2000	60–80
Bacillus thuringiensis israelensis, strain 266/2 (_ 1200 ITU/mg), SC	BL	30–50 L/ha	3–5 mL/m2	0.01–0.04 mL/L
Chlorpyrifos EC	OP	11–25	1.1–2.5	-
Diflubenzuron DT, GR, WP	BU	25–100	2.5–10	0.02–0.25
Novaluron EC	BU	10–100	1–10	0.01–0.05
Pyriproxyfen GR	JH	10–50	1–5	0.01
Fenthion EC	OP	22–112	2.2–11.2	
Pirimiphos-methyl EC	OP	50–500	5–50	1
Temephos EC, GR	OP	56–112	5.6–11.2	1
Spinosad DT, EC, GR, SC	SP	20–500	2–50	0.1–0.5
Spinosad 83.3 monolayer DT	SP	250–500	25–50	
Spinosad 25 extended release GR (Open bodies of water Control of Culex quinquefasciatus in open bodies of water with high organic matter)	SP	250–400	25–40	-
	SP	1000–1500	100–150	-

DT = tablet for direct application; EC = emulsifiable concentrate; GR = granule; MR = matrix release

Formulation; SC = suspension concentrate; WG = water-dispersible granule; WP = wettable powder.

2 BL = Bacterial larvicide; BU = Benzoylureas; JH = Juvenile hormone mimics; OP = Organophosphates;

SP = Spinosyns.

ANNEX 12: IMPLEMENTATION PLAN OF VECTOR CONTROL

No	Interventions	Beneficiaries	Partners involved	
			Names	**Roles and Responsibilities**
1	IRS	General population in targeted districts	MoH/RBC	IRS Policy development, Macroplanning of IRS including selection of IRS target districts, selection of insecticide, operational research, Planning and Supervision of IRS campaigns, capacity building, Funds mobilization, coordination of partners
			Local government (District and sector authorities)	Community mobilization, IRS microplanning including IRS seasonal workers recruitment, supervision of the IRS campaign,
			Health facilities (District hospitals and health centers)	IRS seasonal workers' recruitment, IRS microplanning, supervision and implementation of the IRS campaign, management of adverse effects linked to the insecticide.
			Other GoR partners	In collaboration with MoH/RBC conduct macroplanning of IRS, management of IRS funds, implementation of IRS campaigns, IRS quality control, capacity building
		Private sector	Hotels, lodges, boarding schools, military and Police camps, prisons, Refugee camps	Spraying in accordance to the national policy and guidelines

2	LSM	General population countrywide	Population	Larval habitat modification and manipulation through community work (umuganda), and other interventions at household level (Water drainage, flushing etc…)
			MINAGRI/ RAB, PSF, REMA, RDB, MININFRA	Advocacy and policy development in the management of water bodies (water dams, irrigation schemes, etc.) i.e: Introduction of larval natural predators into water bodies/Larvivorous fish plantation, Ensure the mitigation plan for malaria control is part of all development projects
			Agriculture cooperatives	Implementation of the LSM policy including mitigation plans of larval proliferation
3	IRM	General population	MoH/RBC, MINAGRI/ RAB, PSF, REMA, RDB, MININFRA	Policy development and implementation, inter-sectoral collaboration with other government Ministries and agencies such as the MINAGRI/RAB, REMA, RSB, Routine insecticide susceptibility monitoring, Ensure quality control of all imported VC tools, policy development in alignment with the IRM strategy
4	OTHER PROTECTIVE MEASURES	General population	MoH/RBC, MINAGRI/ RAB, PSF, REMA, RDB, MININFRA, MINALOC	Ensure quality of imported tools, policy development and implementation, PSF to ensure availability of products on the market, social mobilization, regulations

(1) Vector Control Technical Expert Group Report to MPAC September 2013, (2) Phase III evaluation of the insecticidal efficacy and durability of a deltamethrin treated polypropylene long-lasting net LifeNet®, in comparison with long-lasting nets made from polyester and polyethylene: study protocol, (3) Effects of environmental factors and storage conditions on the performance of Olyset Plus against sand flies in WHO cone bioassays.

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