REPUBLIC OF KENYA

MINISTRY OF HEALTH

GUIDELINES FOR THE DIAGNOSIS, TREATMENT AND PREVENTION OF MALARIA IN KENYA

6TH EDITION

Revised 2020

Guidelines for the diagnosis, treatment and prevention of malaria in Kenya

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GUIDELINES FOR THE DIAGNOSIS, TREATMENT & PREVENTION OF MALARIA IN KENYA

SIXTH EDITION

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PREFACE

The ultimate goal of the malaria programme is to reduce malaria incidence and deaths by at least 75 percent of the 2016 levels by 2023 in Kenya. The purpose of malaria control is to reduce morbidity and prevent mortality due to malaria thereby mitigating the socio-economic burden of the disease on Kenya. One of the objectives is to manage 100% of suspected malaria cases according to the Kenya malaria treatment guidelines. The key strategic interventions therefore are to provide early parasitological diagnosis and prompt treatment of malaria using effective medicines.

The Ministry of Health have developed these guidelines for malaria diagnosis, treatment and prevention with an aim of improving malaria case management by all health workers and having a harmonized approach in efforts aimed at the reduction of incidence and deaths due to malaria

It is recommended that diagnosis of malaria be confirmed by testing. Management should be based on testing outcomes. The sixth edition of the guidelines contains new information in line with the revised WHO guidelines (3rd edition)[1].

The guideline document is intended to serve as a guide to all health professionals both pre- and in-service and including those in the private sector, researchers, trainers in medical training institutions and all partners involved in the implementation of malaria control and prevention activities in Kenya.

These guidelines will continue to be updated periodically taking into consideration continuous monitoring and evaluation and emerging research findings and lessons learned. We have carefully considered the cost effectiveness of the recommended interventions. We expect users to continually give feedback regarding the use of relevant sections of the guidelines.

Dr. Patrick Amoth

Ag. Director General
Ministry of Health

1 http://www.who.int/malaria/publications/atoz/9789241549127/en/

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We are grateful to the members of the Malaria Health Sector Technical Working Group, the Case Management Committee of Experts and staff of the Division of National Malaria Program for their contributions to the revision of this document. We are grateful for the technical and financial support from the United States President's Malaria Initiative (PMI) Impact Malaria. Technical support was also received from the World Health Organization, Kenya Country Office and Intercountry Support Team and Global Malaria Program.

It is our sincere hope that the guidelines will be useful in improving malaria case management and prevention of malaria in pregnancy in Kenya. By implementing the recommendations in the guidelines, there is no doubt that we shall reduce malaria incidence and deaths and put Kenya on the path towards a malaria free future.

Dr. George Githuka

Head, Division of National Malaria Programme

ABBREVIATIONS

ACSM	Advocacy communication and social mobilization
ACT	Artemisinin based combination treatment
ADR	Adverse drug reaction
AIDS	Acquired immune-deficiency syndrome
AL	Artemether-lumefantrine
ANC	Antenatal care or clinic
BWT	Birth weight
CHMTs	County Health Management Teams
CQ	Chloroquine
CSF	Cerebro-spinal fluid
DHA-PPQ	Dihydroartemisinin-piperaquine
DHIS	District Health Information System
DNA	Deoxyribonucleic acid
DOMC	Division of Malaria Control
DOT	Directly observed treatment
EIA	Enzyme Immuno-assay
ELISA	Enzyme Linked Immunosorbent Assay
ENSO	El-Nino Southern Oscillation
EPR	Epidemic preparedness and response
FIND	Foundation for Innovative New Diagnostics
G6PD	Glucose 6-phosphate dehydrogenase
GCS	Glasgow coma scale
GMP	Good Manufacturing Practices
GTS	Global Technical Strategy
Hb	Haemoglobin

HIV	Human immunodeficiency virus
HRP2	Histidine-Rich Protein 2
HRP3	Histidine-Rich Protein 3
IFA	Immunofluorescence Assay
IM	Intramuscular
IMCI	Integrated management of childhood illnesses
IPTp	Intermittent preventive treatment of malaria in pregnancy
IV	Intravenous
KEMSA	Kenya Medical Supplies Authority
kg	kilogram
KMIS	Kenya Malaria Indicator Survey
KNH	Kenyatta National Hospital
LFT	Liver function tests
LLIN	Long lasting insecticidal nets
M&E	Monitoring and Evaluation
mg	milligram
ml	millilitre
NSAID	Non-steroidal anti-inflammatory drug
PCR	Polymerase Chain Reaction
PCR	Polymerase chain reaction
PCV	Packed cell volume
pLDH	Parasite lactate dehydrogenase
PMI	President's Malaria Initiative
PPB	Pharmacy and poisons board
QA	Quality Assurance
QBC	Quantitative Buffy Coat
RDT	Rapid diagnostic test
SOP	Standard operating procedure

SP	Sulfadoxine/ pyrimethamine
TSS	Tropical splenomegaly syndrome
WBC	White blood cell
WHO/GMP	World Health Organization Global Malaria Program
µL	microlitre

GLOSSARY OF TERMS

Afebrile: Without fever.

Anaemia: A reduction in the quantity of the oxygen-carrying pigment haemoglobin in the blood.

Antipyretic: A drug such as paracetamol that relieves fever without affecting the causative agent (in this case the parasite).

Artemisinin-based combination therapy (ACT): A combination of artemisinin or one of its derivatives with antimalarial or antimalarials of a different class.

Asexual cycle: The life cycle of the malaria parasite in the host from merozoite invasion of red blood cells to schizont rupture (merozoite, ring stage, trophozoite, schizont, merozoites). Duration approximately 48hr in *Plasmodium falciparum*, *P. ovale* and *P. vivax*; 72 hours in *P. malariae.*

Asexual parasitaemia: The presence in host red blood cells of asexual parasites. The level of asexual parasitaemia can be expressed in several different ways: the percentage of infected red blood cells, the number of infected cells per unit volume of blood, the number of parasites seen in one microscopic field in a high-power examination of a thick blood film, or the number of parasites seen per 200–1000 white blood cells in a high- power examination of a thick blood film.

Base: The main active part of a drug (see also salt).

Cerebral malaria: Severe P. falciparum malaria with cerebral manifestations, usually including coma (Glasgow coma scale <11, Blantyre coma scale <3). Malaria with coma persisting for >30min after a seizure is considered to be cerebral malaria.

Cinchonism: Poisoning caused by an overdose of cinchona or the alkaloids quinine, quinidine, or cinchonine derived from it.

Combination treatment: A combination of two or more different classes of antimalarial medicines with unrelated mechanisms of action.

Cure: Elimination of the symptoms and asexual blood stages of the malaria parasite that caused the patient or caregiver to seek treatment.

Drug resistance: The World Health Organization (WHO) defines resistance to antimalarials as the ability of a parasite strain to survive and/or to multiply despite the administration and absorption of a medicine given in doses equal to or higher than those usually recommended but within the tolerance of the subject, provided drug exposure at the site of action is adequate. Resistance to antimalarials arises because of the selection of parasites with genetic mutations or gene amplifications that confer reduced susceptibility.

Endemic: Occurring frequently in a particular region or population.

Essential medicines: Are those drugs that satisfy the health care needs of the majority of the population; they should therefore be available at all times in adequate amounts and in appropriate dosage forms, at a price the community can afford.

Febrile: With an increase in temperature compared with the normal.

Fever: An increase in body temperature above the normal temperature i.e. above a normal temperature of 37.5˚C.

Febrile convulsions: Convulsions occurring in children aged 6 months - 6yrs due to fever caused by infection outside the central nervous system.

Gametocytes: Sexual stages of malaria parasites present in the host red blood cells.

Hyperpyrexia: Temperature over 39.5˚C.

Hypersensitivity: An abnormal response to the presence of a particular antigen, which may cause a variety of tissue reactions ranging from serum sickness to an allergy.

Hypnozoites: Persistent liver stages of *P. vivax* and *P. ovale* that remain dormant in host hepatocytes for an interval (most often 3–45 weeks) before maturing to hepatic schizonts. These then burst and release merozoites, which infect red blood cells. Hypnozoites are the source of relapses.

Immunity: All those natural processes which prevent infection, re-infection, or super- infection, or which assist in destroying parasites or limiting their multiplication, or which reduce the clinical effects of infection.

Isotonic solution: Refers to two solutions having the same osmotic pressure across a semipermeable membrane.

Low parasitemia: <200 parasites/µL or <5 parasites/200 WBC

Lumbar puncture: The insertion of a needle into the fluid-filled space of the spinal cord in the lumbar region and the removal of a sample of that fluid for examination.

Monotherapy: Antimalarial treatment with a single medicine (either a single active compound or a synergistic combination of two compounds with related mechanisms of action).

Non-immune: Having no immunity at all to a particular organism or disease.

Parenteral: The provision of medication into the body by any means other than through the alimentary canal (oral route or rectal), such as by subcutaneous, intramuscular or intravenous injection.

Plasmodium: A genus of protozoan vertebrate blood parasites that includes the causal agents of malaria. *Plasmodium falciparum, P. malariae, P. ovale* and *P. vivax* cause malaria in humans. Human infections with the monkey malaria parasite, *P. knowlesi* have also been reported from forested regions of South-East Asia.

Pre-erythrocytic development: The lifecycle of the malaria parasite when it first enters the host. Following inoculation into a human by the female anopheles mosquito, sporozoites invade parenchyma cells in the host liver and multiply within the hepatocytes for 5–12 days, forming hepatic schizonts. These then burst liberating merozoites into the bloodstream, which subsequently invade red blood cells.

Proficiency assessment: It is a process of exposing practicing microscopists to slides of known results with a view of assessing their ability to correctly read slides.

Pruritus: Itching caused by local irritation of the skin or at times nervous disorders.

Radical cure: In *P. vivax* and *P. ovale* infections only, this comprises a cure as defined above plus prevention of relapses by killing hypnozoites.

Malaria Rapid diagnostic test (mRDT): Is an immunochromatographic test for malaria presented in the form of a dipstick, cassette or card in which the coloured line indicates that plasmodial antigens have been detected.

Recrudescence: The recurrence of asexual parasitaemia after treatment of the infection with the same infection that caused the original illness. This results from incomplete clearance of parasitaemia due to inadequate or ineffective treatment. It is therefore, different to a relapse in *P. vivax* and *P. ovale* infections, and it differs from a new infection or re-infection (as identified by molecular genotyping in endemic areas).

Recurrence: The recurrence of asexual parasitaemia following treatment. This can be caused by a recrudescence, a relapse (in *P. vivax* and *P. ovale* infections only) or a new infection.

Relapse: The recurrence of asexual parasitaemia in *P. vivax* and *P. ovale* malaria deriving from persisting liver stages. Relapse occurs when the blood stage infection has been eliminated but hypnozoites persist in the liver and mature to form hepatic schizonts. After variable intervals of weeks to months, the hepatic schizonts burst and liberate merozoites into the bloodstream.

Resistance: See drug resistance.

Salt: Any compound of a base and an acid, e.g. quinine dihydrochloride or quinine sulphate.

Schizonts: Mature malaria parasites in host liver cells (hepatic schizonts) or red blood cells (erythrocytic schizonts) that are undergoing nuclear division. This process is called schizogony.

Sensitive: Possessing the ability to respond to a stimulus.

Severe anaemia: Haemoglobin concentration of <5g/100 ml (haematocrit <15%).

Severe falciparum malaria. Acute falciparum malaria with signs of severity and/or evidence of vital organ dysfunction.

Slide rechecking: It is a verification process where slides are re-examined by a second reader and a third reader where there is disagreement.

Sporozoites: Motile malaria parasites that are infective to humans, inoculated by a feeding female anopheles mosquito. The sporozoites invade hepatocytes.

Treatment failure: A failure to achieve the desired therapeutic response after the initiation of therapy. Treatment failure is not synonymous with drug resistance.

Trophozoites: A stage of development of the malaria parasites within host red blood cells. Mature trophozoites contain visible malaria pigment.

Uncomplicated malaria: Symptomatic infection with malaria parasitaemia without signs of severity and/or evidence of vital organ dysfunction.

Table 1: MALARIA TREATMENT SNAPSHOT

Diagnosis of Malaria
All people with suspected malaria should have a parasitological test to confirm the diagnosis. The diagnosis can be confirmed by use of a rapid diagnostic test (RDT) *or* microscopy. If needed, only microscopy can be used to monitor response to treatment.
Treatment of uncomplicated *P. falciparum* malaria
Treat adults and children (excluding pregnant women in their first trimester) with uncomplicated *P. falciparum* malaria with an artemisinin-based combination therapy (ACT) drug The current recommended first line ACT is artemether plus lumefantrine, (AL). The second line ACT is dihydroartemisinin plus piperaquine, (DHAPPQ) All treatments with ACTs should be for *at least three days*
Treatment of uncomplicated *P. falciparum* malaria in special risk groups
Treat pregnant women in the first trimester with uncomplicated *P. falciparum* malaria with quinine plus clindamycin for seven days (if unavailable use an ACT). Treat infants weighing less than 5 kg with uncomplicated P. falciparum malaria with an ACT dosed at the same mg/kg target as for children weighing 5 kg. People with *P. falciparum* hyperparasitemia are at increased risk of death and require close monitoring in addition to an ACT.
Treatment of uncomplicated *P. vivax, P. ovale* and *P. malariae* malaria
Treat all adults (excluding pregnant women in the first trimester) and children with uncomplicated *non-falciparum* malaria using the first line ACT similar to treatment of *P. falciparum.*
Preventing relapse in *P. vivax or P. ovale* malaria
Treat all adults and children (excluding pregnant or breastfeeding women, infants, and people with G6PD deficiency) with *P. vivax* or *P. ovale* in all transmission setting with a 14- day course of 0.25 -0.5mg/kg per day of primaquine in addition to ACT to prevent future relapse.
Pre-referral treatment of severe malaria pending transfer to higher level facilities
At health care levels where treatment of severe malaria is not possible, injections are available, give a single dose of intramuscular artesunate 2.4mg/kg for adults and 3.0mg/kg for children <20 kg and refer to an appropriate facility for further care. Use artemether3.2mg /kg or quinine 20mg/kg if artesunate is not available. In settings where intramuscular injections are unavailable or not possible, treat children below the age of six years with a single dose of rectal artesunate 10mg/kg and refer immediately to an appropriate facility for further care.
Treatment of severe malaria

Severe malaria is a medical emergency and all patients should be treated as in-patients and provided the highest level of care including intensive supportive care available

Treat all adults including pregnant women in all trimesters and children with severe malaria with intravenous or intramuscular artesunate, for a minimum of 3 doses/ or 24hrs.

Give children weighing less than 20 kg 3mg/kg per dose of artesunate. Heavier children and adults should receive 2.4mg/kg per dose of artesunate.

Once the patient has received at least 24hrs of parenteral therapy, AND is able to tolerate oral therapy, complete treatment with three-days of the first line ACT which is AL.

Prevention of malaria in pregnancy

In malaria endemic areas, give Intermittent Preventive Treatment (IPTp) with SP to all pregnant women at every scheduled antenatal visit commencing at the start of the second trimester. Each SP dose should be given at least one month apart.

1. INTRODUCTION

1.1 Background

Malaria is one of the leading causes of morbidity and mortality, particularly in children under five years of age in Kenya. *Plasmodium falciparum* is the commonest cause of malaria in Kenya. Interventions to manage malaria in Kenya have been integrated and include:

- Provision of prompt diagnosis and effective treatment of malaria
- Prevention and treatment of malaria in pregnancy
- Vector control using long lasting insecticidal nets, indoor residual spraying, larvicidal source management and other integrated vector management strategies
- Active case detection, notification, investigation, and response system(s) for elimination in targeted counties
- Strengthen malaria surveillance and use of the information
- Strengthen Social Behavioral Change

The provision of prompt and effective treatment is the cornerstone of malaria case management. ACTs are at present the best treatment for uncomplicated malaria and the efficacy of the treatments recommended in this guideline continue to be monitored regularly.

1.2 Objective

The objective of this treatment guideline is to provide the target audience with evidence-based recommendations for the treatment and prevention of malaria. Information is shown on the treatment of uncomplicated malaria and severe malaria including disease in special risk groups for example young children and pregnant women as well as chemoprophylaxis for special groups including travellers from non-malaria endemic countries.

1.3 Target Audience

These guidelines are intended for: All healthcare professionals, public health and policy specialists working in hospitals, research institutions, medical schools, non-governmental organizations and agencies working as partners in health or malaria programs may also find this guideline useful.

1.4 Formulations

Only ACTs that are co-formulated (both medicines combined in the same tablet) should be used for the treatment of uncomplicated malaria in Kenya. In order for the ACT to provide its intended benefits of effective treatment and extended useful therapeutic life of both drugs, it is strongly recommended that ACTs should include **at least 3 days of treatment with an artemisinin derivative.** Paediatric formulations

should be used for infants and children in order to ensure the correct dosing. Where available, child friendly formulations (flavoured / liquefiable by dose) should be used. All other previously used monotherapies including oral artemisinins should not be used for treatment of malaria and will not be licensed for this purpose anymore.

1.5 Diagnosis Based Treatment

Diagnosis of malaria is based on detection of parasites and parasite products in the blood (parasitological or confirmatory diagnosis) following clinical suspicion. It is currently recommended to confirm diagnosis of malaria in all age-groups and in all epidemiological settings. The two methods used routinely for parasitological diagnosis of malaria are microscopy and RDTs. This is done to ensure that patients with fever arising from other causes are managed accordingly and treatment is targeted to patients with confirmed malaria infection.

Diagnostic tests are available at all levels of the health care system. Under no circumstances should a patient with suspected malaria be denied treatment or provided with delayed treatment for lack of a parasitological diagnosis.

Parasitological diagnosis of malaria is recommended for all patients with suspected malaria, appropriate **treatment should NEVER be delayed or denied** due to inability to test for malaria.

2. MALARIA IN KENYA

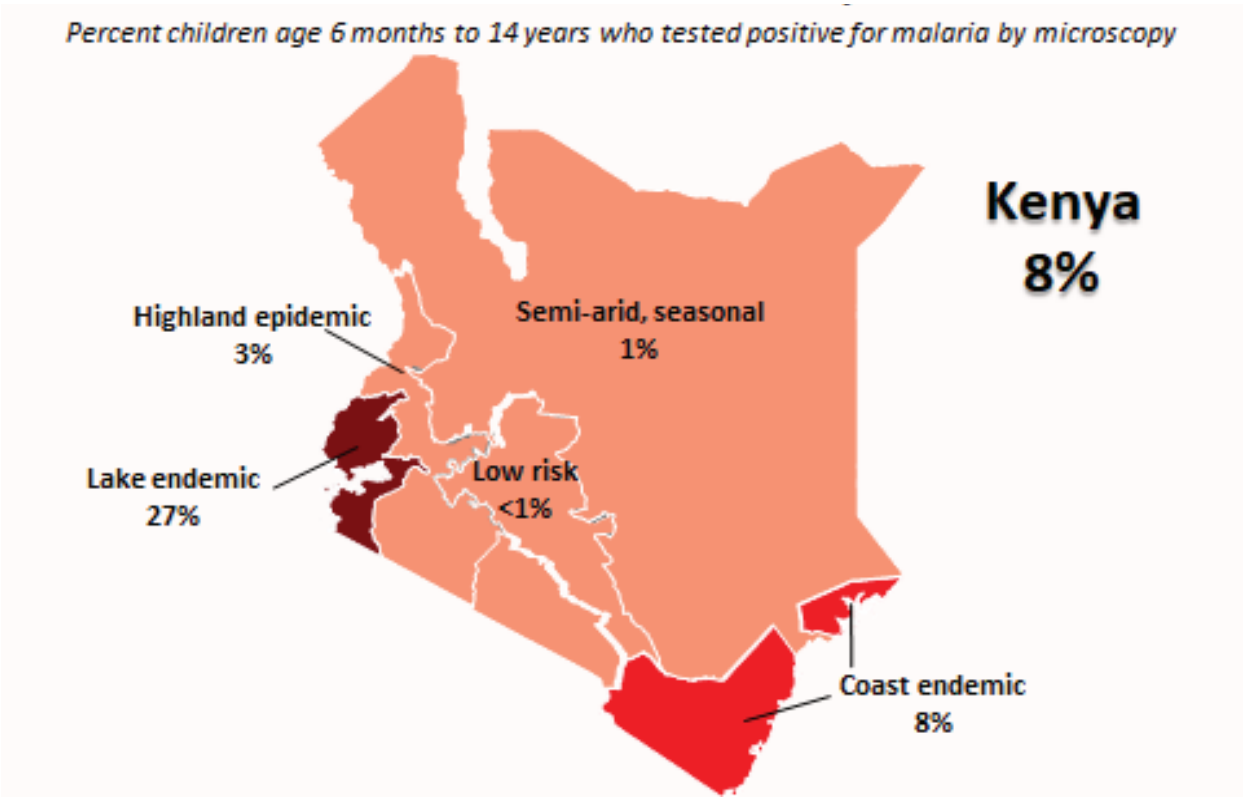
Malaria is a disease caused by parasites of the genus plasmodium. In Kenya, *Plasmodium falciparum* is the predominant species (92%%), 6% *P. malariae*, *P. ovale* is 2%. Some malaria infections are as a result of mixed infections (MOH, 2016). The last three Kenya Malaria Indicator Survey (KMIS) surveys have not identified presence of *P. vivax* transmission in the country (KMIS 2015).

2.1 Epidemiology of Malaria In Kenya

Kenya has four malaria epidemiological zones, with diversity in risk determined largely by altitude, rainfall patterns and temperature. The zones are:

- ***Endemic:*** Areas of stable malaria have altitudes ranging from 0 to 1,300 metres around Lake Victoria in western Kenya and in the coastal regions. Rainfall, temperature and humidity are the determinants of the perennial transmission of malaria. The vector life cycle is usually short and survival rates are high because of the suitable climatic conditions. Transmission is intense throughout the year, with annual entomological inoculation rates between 30 and 100.
- ***Seasonal transmission:*** Arid and semi-arid areas of northern and south-eastern parts of the country experience short periods of intense malaria transmission during the rainfall seasons. Temperatures are usually high and water pools created during the rainy season provide breeding sites for the malaria vectors. Extreme climatic conditions like the *El Niño* southern oscillation lead to flooding in these areas, resulting in epidemic outbreaks with high morbidity rates owing to the low immune status of the population.
- ***Epidemic prone areas of western highlands of Kenya:*** Malaria transmission in the western highlands of Kenya is seasonal, with considerable year-to-year variation. Epidemics are experienced when climatic conditions favour sustainability of minimum temperatures around 18˚C. This increase in minimum temperatures during the long rains favours and sustains vector breeding, resulting in increased intensity of malaria transmission. The whole population is vulnerable and case fatality rates during an epidemic can be up to ten times greater than those experienced in regions where malaria occurs regularly.
- ***Low risk malaria areas:*** This zone covers the central highlands of Kenya including Nairobi. The temperatures are usually too low to allow completion of the sporogonic cycle of the malaria parasite in the vector. However, the increasing temperatures and changes in the hydrological cycle associated with climate change are likely to increase the areas suitable for malaria vector breeding with the introduction of malaria transmission in areas where it had not existed before.

Figure 1: MALARIA PREVALENCE BY ZONE



Malaria prevalence is highest in the Lake endemic zone where 27% of children tested positive for malaria. Malaria prevalence is lowest in the Low risk zone where less than 1% of children tested positive for malaria.

3. CLINICAL FEATURES AND CLASSIFICATION OF MALARIA

Infection with malaria parasites may be asymptomatic or result in a wide variety of symptoms, ranging from very mild to severe disease and even death. Malaria is a curable disease if promptly diagnosed and effectively treated.

3.1 Asexual life cycle of malaria

All the clinical symptoms associated with malaria are caused by the asexual erythrocytic or blood stage parasites. When the parasite develops in the erythrocyte, numerous known and unknown waste substances such as hemozoin pigment and other toxic factors accumulate in the infected red blood cell. These are dumped into the bloodstream when the infected cells lyse and release invasive merozoites. The hemozoin and other toxic factors such as glucose phosphate isomerase (GPI) stimulate macrophages and other cells to produce cytokines and other soluble factors which act to produce fever and rigors and probably influence other severe pathophysiology associated with malaria.

Plasmodium falciparum-infected erythrocytes, with mature trophozoites, adhere to the vascular endothelium of venular micro-circulation leading to their sequestration in the vessels of the brain causing the severe disease syndrome known as cerebral malaria, which is associated with high mortality.

3.2 Classification of malaria

Malaria can be classified as either uncomplicated or severe based on clinical presentation.

3.2.1 Uncomplicated Malaria

This is characterized by fever in the presence of peripheral parasitaemia. Other features may include chills, profuse sweating, muscle pains, joint pains, abdominal pain, diarrhoea, nausea, vomiting, irritability and refusal to feed. These features may occur singly or in combination.

3.2.2 Severe Malaria

This is a life-threatening manifestation of malaria, and is defined as the detection of *P. falciparum* in the peripheral blood in the presence of any one or more of the clinical or laboratory features listed in Table 3.

4. PARASITOLOGICAL DIAGNOSIS OF MALARIA

The recommended tests to detect the presence of malaria parasites and parasite products are microscopy or malaria rapid diagnostic tests (mRDTs). Microscopy is the gold standard method for parasitological diagnosis of malaria. mRDTs are used where microscopy services are not available. Quality assurance of microscopy and RDTs is vital for ensuring the reliability of test results.

4.1 Microscopy

- This is performed by examining Giemsa stained thick and thin blood films for the presence of malaria parasites.
- Thick films are recommended for parasite detection and quantification and can be used to monitor response to treatment.
- Thin films are recommended for species identification and parasite quantification in high parasitemia

4.1.1 Quality assurance in Malaria microscopy

Quality assurance in microscopy should be assured through slide rechecking and proficiency assessments.

4.1.1.0 Slide rechecking

- It is an important component of effective Quality Assurance. It indicates whether a laboratory is providing accurate results and can detect major deficiencies in laboratory performance due to level of competence, poor equipment, poor reagents, poor infrastructure or poor work practices.
- This ensures results reported by the laboratory are accurate and reproducible

4.1.1.1 Proficiency testing (PT)

- Malaria Proficiency testing is a National independent assessment scheme that checks competencies in testing and reporting of malaria results
- PT is conducted in two levels; Proficiency testing for facility and Individual.
- The assessment covers three key areas;
    - parasite detection,
    - speciation
    - quantification.

4.1.2 Recommended procedure for microscopy

- Prepare thick and thin blood film on the same clean microscope slide
- Stain using Giemsa stain

- Examine under power 100 oil immersion objective lens starting with the thick followed by the thin film
- Report the type of parasite(s) seen, species, developmental stage and parasite count per 200 WBCs or parasites per microlitre of blood
- Always adhere to Standard Operating Procedures (SOPs) for all processes

4.2 Malaria Rapid Diagnostic Tests

Malaria Rapid diagnostic tests (mRDTs) are immunochromatographic tests based on detection of specific parasite antigens. Tests which detect histidine-rich protein 2 (HRP2) are specific for *P. falciparum* while those that detect parasite lactate dehydrogenase (pLDH) or aldolase have the ability to differentiate between *P. falciparum* and non-*P. falciparum* malaria (*P. vivax, P. malariae and P. ovale*). With the appropriate training, mentorship and technical support supervision, mRDTs are simple to use and sensitive in detecting low parasitemia.

The use of mRDTs is however not recommended for follow-up of previously confirmed cases as most of the tests remain positive for between 2 to 3 weeks following effective antimalarial treatment and clearance of parasites. mRDTs cannot be used to determine parasite density.

When using mRDTs, it is important to adhere strictly to the manufacturer's instructions, especially the time of reading, amount of blood, number of buffer drops and the interpretation of the test results. Remember to observe biosafety procedures at all times. Malaria program reviews specifications for mRDTs to be used taking into account among other things the latest WHO recommendations.

There is no need to confirm an initial mRDT Positive with microscopy. Microscopy should be used for all treatment follow up.

4.2.1 Quality assurance of mRDTs

The following key steps are involved in quality assurance of mRDTs to ensure quality/ accurate results.

Table 2: QUALITY ASSURANCE OF mRDTs

QA process	QA location
GMP in production	Manufacturer
Product evaluation	FIND/WHO
Lot testing (pre-shipment/ post-shipment)	In-country
Post Marketing Surveillance	In-country
IQC	At point of use

4.2.2 PfHRP2/3 gene deletion

Deletions in the pfHRP2 and pfHRP3 genes of the parasite render parasites undetectable by mRDTs based on histidine-rich protein 2 (HRP2).

Surveillance on the prevalence of suspected false-negative HRP2 mRDTs results among symptomatic patients attending public health facilities with *P. falciparum* infection detected by pf-pLDH mRDT will be conducted. During the periodic surveillance if the threshold of pfHRP2/3 gene deletions causing false negative *P. falciparum* mRDTs is at or above 5%, it warrants a change in mRDT and informs the country policy on mRDT

4.3 Other Parasite Detection Methods

Other parasite detection techniques are available; however, they are unsuitable for use in routine disease management. They include:

4.3.1 Serological Tests

Serological tests are based on the detection of antibodies against asexual blood stage malaria parasites. They measure prior exposure and not current infection. Examples are; latex agglutination assay immunofluorescence antibody testing (IFA), enzyme linked immunosorbent assay (ELISA) and enzyme immunoassay (EIA).

4.3.2 Detection of parasite DNA

The DNA is specific and detects current infections.

4.3.2.1 Qualitative Buffy Coat (QBC) technique

This method involves staining parasite deoxyribonucleic acid (DNA) in microhematocrit tubes with fluorescent dyes, e.g. acridine orange, and subsequent detection by epi-fluorescent microscopy

4.3.2.1 Molecular techniques

Polymerase chain reaction (PCR) is sensitive and a specific technique that involves amplification of target DNA. This procedure requires specialized and costly equipment and reagents, as well as laboratory conditions that are often not available.

4.3.3 Parasite culture

It entails cultivation of live malaria parasites useful in research but not for the routine-clinical diagnosis of malaria

4.4 Biosafety During Testing

Standard biosafety precautions should be followed during sample collection, testing and disposal of waste. Good clinical practice such as standard operating procedures and provision of safety equipment should be in place during malaria testing

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Quality assurance guidelines in parasitological diagnosis of malaria 2019

5. MANAGEMENT OF UNCOMPLICATED MALARIA

5.1 Treatment of Uncomplicated Falciparum Malaria

5.1.1 First line treatment in all age groups

The recommended first line treatment for uncomplicated malaria in Kenya is *Artemether-Lumefantrine* (AL). It is currently available as a co-formulated tablet containing 20mg of *Artemether* and 120mg of *Lumefantrine* in varying strengths. Child friendly dispersible tablets are also available. AL is administered as a 6-dose regimen given over three days (See Table 3 below).

Table 3: DOSING SCHEDULE FOR ARTEMETHER-LUMEFANTRINE

Weight	Age	Dose of AL to be administered at 0 hrs, 8 hrs, 24 hrs, 36 hrs, 48 hrs and 60 hrs
5 to <15kg	5 months to <3 years	20mg *artemether* and 120mg lumefantrine
15 to <25kg	3 to <8 years	40mg artemether and 240mg lumefantrine
25 to <35kg	8 to <12 years	60mg artemether and 360mg lumefantrine
≥35kg	≥12 years	80mg artemether and 480mg lumefantrine

- In children below 5kg, if appropriate weight for age, evaluation of other causes of fever including malaria should be undertaken. Where malaria is confirmed, the current recommended treatment is one tablet of AL given according to the schedule in table 1 under close supervision[2].
- For children < 25 kg, dispersible tablets should be administered where available. Place the tablet in a cup or spoon, add a little water to it, wait a few minutes for tablets to disperse and then administer the resulting suspension to the child. (Annex 10.3 table 15)
- Administer the first dose as a Directly Observed Treatment (DOT) at the health facility or at the household.

5.1.2 Counselling and follow up

- Show all caregivers of young children how to prepare the dispersible tablet prior to administration. Ensure she/he understands how to administer the same to the child prior to leaving the facility.
- If vomiting occurs within 30 minutes after drug administration, the dose should be repeated and replaced from the facility. If vomiting persists, the patient should return to the facility for review
- Explain the dosing schedule, use probing questions to confirm the patient's understanding.

2 World Health Organization 2015. Guidelines for the treatment of malaria 3rd edition. WHO-GMP Geneva

- Emphasize that all 6 doses must be taken over 3 days even if the patient feels better after a few doses.
- Advise patients to return immediately to the nearest health facility if the condition deteriorates at any time or if symptoms have not resolved after 3 days.

5.1.3 Supportive treatment

- **Fever management**: Administer paracetamol as the recommended antipyretic for fever and exposure.
- **Encourage adequate fluids and food**: Caregivers should be encouraged to give extra fluids and where applicable continue breastfeeding. Food and fluid should be administered in small quantities at frequent intervals especially when the child is still very sick.

5.2 Treatment Failure

Treatment failure can be defined as a failure to achieve the desired therapeutic response after the initiation of therapy. Treatment failures should be suspected if a patient deteriorates clinically at any time or symptoms persists 3-14 days after initiation of drug therapy in accordance with the recommended treatment regimen. Whenever possible, treatment failure must be confirmed parasitologically (by microscopy). **Use of RDTs is not recommended**[3].

Treatment failure may result from poor adherence to treatment, unusual pharmacokinetic properties in that individual or drug resistance. In evaluating a patient with treatment failure, it is important to determine from the patient's history whether he or she used the recommended antimalarial and dose, whether they vomited the previous dose or did not complete a full treatment course. Treatment failure is not synonymous with drug resistance.

Development of symptoms 14 days after initiation of therapy where there has been prior clearance of symptoms should be considered as a new infection, Repeat the malaria blood slide test (microscopy), if positive, treat with the first line drug.

5.3 Second line treatment in adults and children of all age groups

The recommended second line treatment for uncomplicated malaria in Kenya is dihydroartemisinin-piperaquine (DHA-PPQ). This is currently available as a fixed-dose combination with adult tablets containing 40mg of dihydroartemisinin and 320mg of piperaquine and paediatric tablets containing 20mg dihydroartemisinin and 160mg of piperaquine. These are administered once daily for three days as shown in table 2 below.

Therapeutic dose and range: A target dose (range) of 4 (2-10) mg/kg body weight/ day of dihydroartemisinin and 18 (16-27) mg/kg body weight per day of piperaquine once a day for 3 days for adults and children weighing ≥ 25kg. The target dose and ranges for children weighing <25kg are 4 (2.5-10) mg/kg body weight/day dihydroartemisinin and 24 (20-32) mg/ kg body weight/day piperaquine once a day for 3 days.

3 World Health Organization 2015. Guidelines for the treatment of malaria 3rd edition. WHO-GMP Geneva

Children weighing <25kg treated with dihydroartemisinin+piperaquine should receive a minimum of 2.5mg/kg body weight per day of dihydroartemisinin and 20mg/kg body weight per day of piperaquine daily for 3 days.

Table 4: DOSING SCHEDULE FOR DIHYDROARTEMISININ-PIPERAQUINE

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

5.4 Treatment of Uncomplicated Vivax Malaria

The recommended treatment for vivax malaria is AL. It is vital to have confirmed lab diagnosis of *P. vivax* malaria before commencing treatment. Unlike *P. falciparum, P. vivax* has dormant liver stages which require treatment. In order to achieve a radical cure and prevent relapses, Primaquine, must also be given. Primaquine causes abdominal discomfort when taken on an empty stomach; it should always be taken with food. Primaquine may also cause haemolysis in patients with glucose-6-phosphate dehydrogenase (G6PD) deficiency. Stop treatment immediately if adverse reaction such bleeding is observed and fill in the relevant ADR reporting form.

Therapeutic dose: Primaquine dose ranges between 0.25 and 0.5mg/ kg/ day once a day for 14 days. In mild-to-moderate G6PD deficiency, primaquine 0.75 mg base/kg body weight should be given once a week for 8 weeks.

In severe G6PD deficiency, **primaquine is contraindicated**. The decision to give or withhold primaquine should depend on the possibility of giving the treatment under close medical supervision, with ready access to health facilities with blood transfusion services.

5.5 M&E Indicators

i. Proportion of eligible pregnant women who receive 3 or more doses of IPTp for malaria during their last pregnancy in targeted counties
ii. Percentage of IPTp missed opportunities referred
iii. Proportion of suspected malaria cases presenting to public health facilities tested with mRDT or microscopy
iv. Proportion of suspected malaria cases presenting to public health facilities managed in accordance with the Kenya malaria treatment guidelines
v. Severe malaria case fatality rate (proportion of severe malaria cases resulting in death)

6. MANAGEMENT OF SEVERE MALARIA

Severe malaria is a medical emergency and should be managed in a facility with inpatient services. In the absence of this, pre-referral management should be initiated and patients referred to facilities that are able to comprehensively manage the patients. (Refer to section 6.5).

Delay in diagnosis and inappropriate treatment, especially in infants, children and non-immune adults leads to rapid deterioration of the situation which is often fatal. The key to effective management is early recognition, assessment, appropriate antimalarial and supportive therapy. The commonest cause of severe malaria is *p. falciparum.* In rare circumstances *P.vivax* may also manifest as severe disease.

6.1 Diagnosis

The clinical manifestations of malaria severity depend on various factors including age and the levels of malarial immunity. In children the common presentations of severe malaria are severe anaemia, respiratory distress and cerebral malaria. Severe malaria can occur in the absence of fever. An outline of the presentations, their frequency of occurrence is summarized in the Table 5 below.

6.1.1 Clinical features of severe falciparum malaria

The clinical features of severe malaria are outlined in Table 5.

Table 5: SIGNS AND SYMPTOMS OF SEVERE MALARIA IN ADULTS AND CHILDREN

Sign or symptom	Adults	Children
Duration of illness	5-7 days	Shorter (1-2 days)
Respiratory distress/deep breathing (acidosis)	Common	Common
Convulsions	Common (12%)	Very common (30%)
Posturing (decorticate/ decerebrate and opisthotonic rigidity)	Uncommon	Common
Prostration/ obtundation	Common	Common
Resolution of coma	2-4 days	Faster (1-2 days)
Neurological sequelae after cerebral malaria	Uncommon (1%)	Common (5-30%)
Jaundice*	Common	Uncommon
Hypoglycaemia*	Less common	Common
Metabolic acidosis*	Common	Common
Pulmonary oedema	Uncommon	Rare
Renal failure*	Common	Rare
CSF opening pressure*	Usually normal	Usually raised
Bleeding/clotting disturbances*	Up to 10%	Rare
Invasive bacterial infection (co-infection)*	Uncommon (<5%)	Common (10%)

* laboratory confirmation required

For epidemiological purposes, severe malaria is defined as one or more of the following parameters, occurring in the absence of an identified alternative cause and in the presence of *P. falciparum* asexual parasitaemia.

Table 6: CLINICAL PARAMETERS

Clinical state	Definition
Impaired Consciousness	Glasgow coma scale <11 (annex 4), Blantyre coma Scale <3 in children
Prostration	Generalized weakness so that the person is unable to sit, stand or walk without assistance
Multiple convulsions	More than 2 episodes within 24 hours
Pulmonary oedema	Radiologically confirmed oxygen saturation <92% on room air with respiratory rate >30/minute often with chest indrawing and crepitations on auscultation.
Significant bleeding	Including recurrent or prolonged bleeding from the nose, gums or venipuncture sites; haematemesis or malaena
Shock	Compensated shock is defined as capillary refill or temperature gradient on leg (mid to proximal limb), but no hypotension. Decompensated shock is defined as systolic blood pressure <70mmHg in children or 80mmHg in adults, with evidence of impaired perfusion (cool peripheries or prolonged capillary refill

Table 7: CLINICAL CHEMISTRY PARAMETERS

Laboratory parameters	Definition
Acidosis	A base deficit of >8mEq/L or, if not available, plasma bicarbonate level <15mmol/L or venous plasma lactate ≥5mmol/L. Severe acidosis manifests clinically as respiratory distress (rapid, deep, labored breathing).
Hypoglycaemia	Blood or plasma glucose <2.0mmol/L (<40mg/dL)
Severe anaemia	Haemoglobin concentrations ≤5g/dL or haematocrit of ≤15% in children <12 years of age (<7g/dL and <20%, respectively in adults) with a parasite count >10,000/µL
Renal impairment	Plasma or serum creatinine >265 µ/L (3g/dL) or blood urea >20mmol/L
Jaundice	Plasma or serum bilirubin >50 mmol/L (3mg/dL) with a parasite count of 100,000/ µL
Hyperparasitaemia	Plasmodium falciparum >250,000 parasites / µL (endemic) Plasmodium falciparum >100,000 parasites / µL (non-endemic)

- In all patients with suspected severe malaria the use of parasitological diagnosis is recommended irrespective of whether the patient had fever or history of fever
- Do not withhold antimalarial treatment if parasitological diagnosis is not possible. Start presumptive treatment immediately while efforts to confirm diagnosis are ongoing.

- Frequent monitoring of the parasitemia (every 12 hours) is important during the first three days of treatment in order to monitor parasite response to treatment with antimalarial medicine. A negative malaria blood slide result may be indicative of another cause of infection.
- Other investigations to determine severity and prognosis to be undertaken where feasible.

6.1.2 Clinical features of severe P. vivax malaria

Severe vivax malaria may present with some symptoms similar to those of severe **P. falciparum malaria and can be fatal.** Prompt and effective treatment and follow-up should be the same as for severe falciparum malaria.

6.2 Evaluation of Some Clinical Manifestations

Along with other clinical and laboratory evaluation for severe malaria, the following are to be undertaken as the minimal investigation package for the different clinical scenarios described below:

6.2.1 Cerebral malaria

Clinical assessment

a. Assess level of consciousness using coma scores (Annex 10.4, table 22).
b. Determine the presence of severe anaemia by examining for pallor on the palms and conjunctiva.
c. Determine presence of respiratory distress (deep and fast breathing, chest in-drawing).
d. Determine hydration status (check for sunken eyes, loss of skin turgor, dry tongue and measuring blood pressure).
e. Assess for renal insufficiency (oliguria).
f. Assess for evidence of disseminated intravascular coagulopathy (spontaneous bleeding from the gums, injection sites, or any other site.
g. Check for clinical signs of meningitis (stiff neck, Kernig's sign in children, photophobia) cerebral malaria does not cause meningism although patients may present with opisthotonus.

Laboratory Tests

Eliminate other causes of alteration in the level of consciousness including Cerebral Spinal Fluid (CSF) analysis to rule out meningitis, blood glucose levels to rule out hypoglycaemia, and other common causes of coma.

6.2.2 Severe anaemia

Clinical assessment

a. Determine the presence of severe anaemia by examining for pallor on the palms and conjunctiva.
b. Determine presence of respiratory distress (deep and fast breathing, chest in-drawing).
c. Assess for evidence of disseminated intravascular coagulopathy (spontaneous bleeding from the gums, injection sites, or any other site).
d. Assess for evidence of cardiac failure (respiratory distress, tachycardia, peripheral oedema).

Laboratory tests

a. Determine haemoglobin levels, Packed Cell Volume (PCV), peripheral blood film assessment and blood group and cross match where applicable.
b. Liver Function Tests (LFTs), Renal Function Tests and Blood Culture.

6.2.3 Hypoglycaemia

Clinical assessment

Assess the level of consciousness using the coma scores (annex 4).

Laboratory test

Determine the blood glucose level.

6.3 Treatment of Severe Malaria

The recommended treatment for severe malaria is **parenteral artesunate**. The preferred route of administration is intravenous (IV). However intramuscular (IM) can be used as an alternative where the intravenous route is not feasible. In the absence of artesunate, parenteral quinine or IM artemether should be administered.

6.3.1 Artesunate

Artesunate is dispensed as a powder of artesunic acid. **This must be dissolved in sodium bicarbonate (5%) to form sodium artesunate**. The solution is then diluted in approximately 5ml of normal saline and given by intravenous (IV) injection or by intramuscular (IM) maximum 5ml per site. The solution should be freshly prepared prior to administration and should be used within 1 hour. The solution should **NEVER** be stored.

Dosage and administration of artesunate:

Dosage:

- For children ≤ 20kg administer 3.0 mg/kg
- For other patients >20kg administer 2.4 mg/kg
- A dosing schedule for parenteral artesunate-based on body weights and dose (ml) is given in Annex 10.3, Table 21

Administration of Artesunate:

6.3.1.1 Intravenous

- Intravenous routes are preferred.
- Weigh the patient to determine the dosage needed and therefore the number of vials required.
- Dissolve each vial of artesunic powder with all the 5% sodium bicarbonate solution provided with each vial. Shake gently until the resultant solution is clear. (If it doesn't dissolve and become clear, discard the vial and reconstitute a new one)
- Dilute resultant solution in each vial with 5ml normal saline if normal saline is not available 5% dextrose* can be used.
- The final solution has a strength of 10mg/ml.
- Calculate the volume of solution containing the required amount to be given seed *skill in calculation of artesunate (refer to Annex 10.3, Table 21)*
- Administer by slow IV over 3-5 minutes.

6.3.1.2 Intramuscular

- Weigh the patient to determine the dosage needed and therefore the number of vials required.
- Dissolve each vial of artesunic powder with all the 5% sodium bicarbonate solution provided with each vial. Shake gently until the resultant solution is clear. (If it doesn't dissolve and become clear, discard the vial and reconstitute a new one)
- Dilute resultant solution with 2ml normal saline if normal saline is not available 5% dextrose* can be used.
- The final solution has a strength of 20mg/ml.
- Calculate the volume of solution containing the required amount to be given see *skill on calculation of artesunate (Annex 10.3, Table 21)*.
- Administer by IM route.
- Spread the doses of more than 2ml over different sites for babies and 5ml for adults.

* This refers to 60mg artesunate. For all other strengths refer to product insert for diluent volume.

Figure 2:

Artesunate powder

Saline solution

Bicarbonate solution

Artemether is dispensed as a clear oily solution of differing concentrations. Artemether must only be given by intramuscular (IM) injection.

Administer artemether, as follows:

- Artemether is administered by the intramuscular route at a loading dose of 3.2mg/ kg IM stat then 1.6mg/kg IM once every 24 hrs until the patient is able to tolerate oral medications (Maximum of 7 days).
- Thereafter a complete course of *Artemether-lumefantrine* is given.

6.3.1 Quinine

- Quinine should only be given as an intravenous infusion and **NEVER** given as an intravenous (**bolus**) injection.
- Loading dose should be omitted if the patient has received quinine in the last 24 hours or has received mefloquine in the last 7 days.
- Quinine is **not** contraindicated in severe anaemia.
- In renal insufficiency, the dose of quinine should be reduced by a 1/3 to 10mg/ kg every 12hours.
- In hepatic insufficiency, the dose of quinine should be reduced by 25%. Hypoglycaemia is a potential side effect of quinine administration particularly in pregnant women and should therefore be administered in a glucose containing infusion (preferably 10% glucose)

!

Give child quinine doses every 8 hours to standardized practice and comply with WHO guidelines.

6.3.1.2 Quinine administration in children

Administer quinine as follows:

- Put up IV quinine drip 20mg/kg body weight loading dose in 15mls/kg of 5% dextrose or normal saline to run over 4 hours to run at a rate not exceeding 5mg salt/kg body weight per hour.

- Calculate the number of drops per minute to deliver the quinine in 4 hours - see *skill on calculation of drops/min (annex 10.3, table 20 - quinine IV infusion)* .
- Give 10mg/kg in 10ml/ kg of isotonic solution (5% dextrose or normal saline) to run at the same rate as the previous one, 8 hours from commencement of the initial dose of quinine.
- Repeat 10mg/kg quinine infusion every 8 hours until the patient can take medication orally. Thereafter give a complete course of artemether-lumefantrine (AL).
- Alternatively, if AL is not available, treat with oral quinine given at 10mg/kg every 8 hours to complete a total of 7 days.

6.3.1.3 Quinine administration in adults

Administer quinine as follows:

- A loading dose of quinine 20mg/kg (maximum 1,200mg) diluted in maximum 500ml of isotonic solution (5% dextrose or normal saline) is given intravenously to run over 4 hours to run in a way not to exceed 5mg salt/kg body weight per hour.
- Calculate the number of drops per minute to deliver the quinine in 4 hours - see *skill on calculation of drops/min (Annex 3, Table 20)*
- Give 10mg/kg (maximum 600mg) diluted in 10ml/kg (maximum 500ml) of isotonic solution (5% dextrose or normal saline) 8 hours from commencement of the initial dose of quinine to run over 4 hours at the same rate as previous one.
- Repeat 10mg/kg quinine infusion every 8 hours until the patient can take medication orally.
- Thereafter a complete course of artemether-lumefantrine (AL) is given.
- If AL is not available, oral quinine is continued at 10mg/kg (maximum 600mg) every 8 hours to complete a total of 7 days treatment, in combination with clindamycin 150mg twice daily for 7 days or doxycycline 100mg twice daily for 7 days.

In the absence of injectable artemisinins or quinine, patients, particularly children with severe malaria who are able to tolerate orally, should be given AL or other available ACT to initiate treatment. If the patient is unable to take oral medications, a **nasogastric tube** should be used to administer AL.

Note: In the case of severe *P. vivax* malaria, once the patient has completed treatment, a full dose of primaquine should be administered to clear liver stages.

6.3.2 Severe malaria patients who may be able to tolerate oral treatment

Patients with the following features can be treated with AL, if not available, oral quinine can be used .

- Severe anaemia (haemoglobin level of <5g/dl or haematocrit of <15%, or
- Two or more convulsions within a 24hr period, or
- Hyperparasitaemia and who are stable but show none of the features of prostration, respiratory distress (acidotic breathing) or alteration in the level of consciousness.

They should however be treated as in-patients for close monitoring. Thus, any emerging complications of severe malaria should be managed promptly and appropriately

6.4 Supportive Treatment

Supportive treatment is crucial in reducing the high mortality associated with severe malaria. The table 6 below highlights specific management for manifestations or complications of severe malaria.

Table 8: SUPPORTIVE TREATMENT FOR MANIFESTATIONS OF SEVERE MALARIA

Manifestation/ Complication	**Immediate Management**
Coma (cerebral malaria)	Maintain airway, place the patient to lie on their side, manage other treatable causes of coma; avoid harmful supportive treatment, such as corticosteroids, heparin and adrenaline; intubate if necessary. Provide proper nursing care to avoid aspiration and pressure sores.
Hyperpyrexia (≥39C)	Exposure and antipyretic drugs (Paracetamol is preferred).
Convulsions	Maintain airways; treat promptly with: Diazepam (0.3mg/kg IV, or 0.5mg/kg by rectal administration) or phenobarbitone (15mg/kg IM loading dose then a maintenance dose of 4-8mg/kg/day for 48 hours) if convulsions persist. Phenytoin (18mg/ kg loading dose then maintenance dose of 5mg/kg/day for 48 hours) may be used instead of phenobarbitone. **Check blood glucose and control temperature.**
Hypoglycaemia	Check blood glucose, correct hypoglycaemia with glucose (IV or oral), and ensure adequate caloric intake (nutritional support) thereafter. Hypoglycaemia (≤3mmol/l) should be corrected with 500mg/kg of glucose. Using parenteral dextrose, immediately give 5ml/kg of 10% dextrose through a peripheral line, followed by a slow intravenous infusion of 5 ml/kg per hour of 10% dextrose or 10ml/kg per hour of 5% dextrose to prevent recurrence of hypoglycaemia.

Manifestation/ Complication	**Immediate Management**
Severe anaemia	Transfuse with screened fresh whole blood as per national blood transfusion guidelines. With paediatric patients transfuse for severe malarial anaemia when Hb<4g/dl and that if Hb is between 4-5g/dl. Transfuse if signs of respiratory distress or cardiac failure are present.
Fluid and electrolyte imbalance	Ensure adequate fluid and electrolyte balance. Note that strict fluid management is vital in the comatose patient. Fluid used in administration of antimalarials and any other transfusions (e.g. blood transfusion) must be calculated as part of the total fluid requirement of the patient.
Acute pulmonary oedemic	Prop the patient up at an angle of 45˚, give oxygen, give a diuretic, stop intravenous fluids, intubate and add positive end-expiratory pressure/ continuous positive airway pressure in life-threatening hypoxaemia.
Acute renal failure	Exclude pre-renal causes, check fluid balance and urinary sodium; if in established renal failure refer for specialised care.
Spontaneous bleeding and coagulopathy	Transfuse with screened fresh whole blood (cryoprecipitate, fresh frozen plasma and platelets, if available); give vitamin K injection.
Metabolic acidosis	Exclude or treat hypoglycaemia, hypovolaemia and septicaemia. If severe, refer for haemofiltration or haemodialysis.
Shock	Suspect septicaemia, take blood for culture; give parenteral broad- spectrum antibiotics, correct haemodynamic disturbances.

- It is assumed that appropriate antimalarial treatment will have been started in all cases.
- Prevent by avoiding excess hydration.

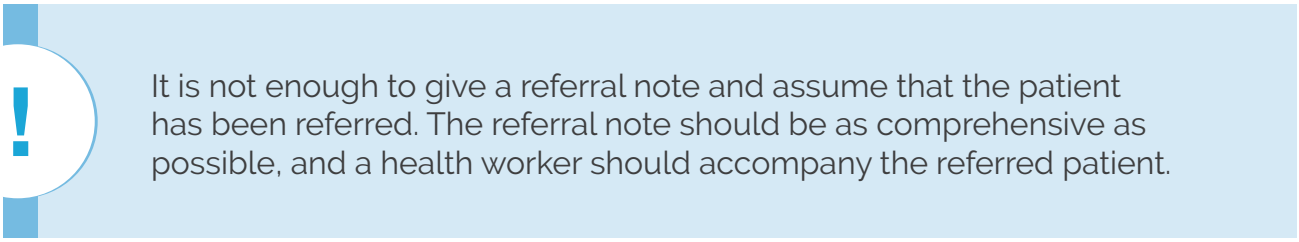
6.5 Pre-Referral Management of Severe Malaria

Since severe malaria is a medical emergency, treatment of a patient with severe malaria should begin in the primary health facility (while waiting for referral) so that life-saving therapy is not delayed.

The risk for death from severe malaria is greatest in the first 24 hours, therefore, upon recognition of severe malaria, pre-referral treatment should be initiated at the peripheral facility using IM artesunate or rectal artesunate. In the absence of artesunate, IM artemether should be used. All efforts should be made to move the patient to a centre where the expertise and infrastructure exist for the adequate management of severe malaria.

In patients with alteration in the levels of consciousness, broad spectrum parenteral antibiotics (preferably IV Ceftriaxone, if available) should also be administered along with the antimalarial.

If for any reason referral is not possible or delayed, treatment for severe malaria with the use of IM artesunate should be continued. Health workers at such facilities should ensure that treatment continues until the patient **PHYSICALLY** moves to another facility.



6.6 Administration of parenteral artemisinins

- Artesunate is dispensed as a powder of artesunic acid. This must be dissolved in 5% sodium bicarbonate (diluent) to form sodium artesunate. (Refer to 6.3.1.2 for administration instructions).

6.6.1 Administration of rectal artesunate

- Artesunate for rectal administration is presented in suppositories of different strengths. The appropriate single dose of artesunate should be administered.
- A single dose of 10mg/kg body weight should be given to children <6 years and only when intramuscular artesunate is not available.
- In the event that a suppository is expelled from the rectum within 30 minutes of insertion, a second suppository should be inserted. In young children the buttocks should be held together for 10 minutes to ensure retention of the rectal dose of artesunate. Patients should be transported immediately to a higher-level facility where IM or IV treatment is possible. In the event that referral is not possible a single daily dose of artesunate should be administered until parenteral treatment or oral AL is instituted.

6.6.2 Administration of intramuscular quinine

- Quinine **MUST** be diluted (maximum concentration is 100mg/ml for adults, and 50mg/ml for children) before intramuscular injection.
- A loading dose of 20mg/kg of quinine (diluted to a maximum 100mg/ml for adults and 50mg/ml for children) is given by intramuscular injection (preferably into the anterior thigh). A maximum of 3ml should be injected into one site. If the amount to be injected exceeds 3ml, multiple sites should be used.
- An example of body weights and doses (ml) of injection is given (*refer to Annex 10.3, Table 20*).

6.6.3 Artemether

- Administer a STAT dose of 3.2mg/kg of artemether solution by the intramuscular route to the anterior thigh.

6.6.4 Referral of the patient

- Inform the facility about the patient being referred
- Send a clear referral note about the clinical picture, including dosages, times, and route of administration for any medications given.
- Carry all blood film examinations or slides (if these have been taken) along with the patient to the referral centre.
- Send potential blood donors.
- Keep the patient lying down on their side during the journey.
- Accompany or ask a fellow health worker to accompany the patient to the referral centre.

6.7 Follow-Up of All Patients With Severe Malaria

- Monitor for possible complications and manage accordingly.
- Monitor Hb levels and manage anaemia appropriately.
- Monitor and rehabilitate patients with complications

7. MALARIA IN PREGNANCY

Pregnancy increases the risk of malaria infection in all women. Malaria during pregnancy causes febrile illness, anaemia and increases the risk of maternal illness and death, miscarriage, stillbirth, low birth weight and neonatal death. All pregnant women living in malaria risk areas should be advised on use of relevant malaria prevention measures and confirmed cases of malaria treated promptly with effective antimalarials as per malaria treatment guidelines. Women in their first and second pregnancies, and all HIV infected women are at greatest risk of the effects of malaria.

7.1 Management of Uncomplicated Malaria in Pregnancy

7.1.1 Diagnosis

Table 9: SYMPTOMS AND SIGNS OF UNCOMPLICATED MALARIA IN PREGNANT WOMEN

TYPE OF MALARIA	SIGNS AND SYMPTOMS USUALLY PRESENT	SIGNS AND SYMPTOMS SOMETIMES PRESENT
Uncomplicated malaria	Fever shivering/ chills/ rigors Headache, muscle/joint pain nausea and vomiting, False labor pain (uterine contractions)	Enlarged spleen

In all pregnant women with fever or history of fever the use of parasitological diagnosis is recommended.

- At health facilities where malaria diagnostics (microscopy or RDT) are not available, patients suspected to have malaria should be treated for malaria.

7.1.2 Treatment

7.1.2.1 First trimester

The recommended treatment for uncomplicated malaria in the first trimester is a 7-day therapy of oral quinine. Do not withhold *Artemether-lumefantrine* or any other treatment in the 1st trimester if quinine is not available. Malaria if untreated can be fatal to the pregnant woman.

7.1.2.2 Second and third trimesters

AL is the recommended treatment in the 2nd and 3rd trimesters. Oral quinine may also be used but compliance must be ensured. Dose regimens for quinine and AL are as given in the uncomplicated malaria section. (Annex 10.3, table 17 and 18)

7.1.3 Supportive care

- Monitor and prevent hypoglycaemia (particularly if taking quinine).
- Foetal monitoring.
- Check Hb and treat anaemia[5].
- Give antipyretics if indicated.

7.1.4 Follow-up management

- Counsel on Antenatal Care[6]

7.2 Management of Severe Malaria in Pregnancy

Severe malaria in pregnancy is a medical emergency that puts the lives of both the mother and unborn baby at high risk. Aggressive management is essential.

7.2.1 Diagnosis

Features of severe malaria in pregnant women are similar to those in non-pregnant women. These are detailed in Section 6.1.1. and table 10 below. Pregnant women have an increased risk of quinine induced hypoglycaemia and also complications from severe anaemia.

Table 10: SIGNS AND SYMPTOMS OF SEVERE MALARIA IN PREGNANT WOMEN

TYPE OF MALARIA	SIGNS AND SYMPTOMS USUALLY PRESENT	SIGNS AND SYMPTOMS SOMETIMES PRESENT
Severe	Three or more signs and Symptoms of uncomplicated malaria plus one or more of the following • Convulsions • Severe jaundice • Signs of severe dehydration, especially if woman has been vomiting repeatedly • Sudden weight loss • Sunken eyes • Reduced skin turgor • Dry mouth • Reduced amount of urine or no urine at all • Spontaneous bleeding from the gums, skin and vein puncture sites	Three or more signs and Symptoms of uncomplicated malaria plus one or more of the following: • Confusion, drowsiness, coma • Fast breathing/ breathlessness/ difficulty in breathing • Vomiting at every feed or unable to feed • Pale conjuctivae, mucous membranes, tongue and palms • Jaundice

Convulsions in pregnancy

Eclampsia is a differential diagnosis in pregnant women presenting with convulsions or alteration in level of consciousness. In which case Table 11 below should be used to differentiate between the two.

Table 11: CONVULSIONS IN PREGNANCY

SIGNS/ SYMPTOMS	SEVERE MALARIA	ECLAMPSIA
Recent history of fever, chills (from patient or family)	Yes	No
Temperature	>38˚C	<38˚C
Blood pressure	Diastolic < 90mm hg	Diastolic ≥ 90mm hg
Enlarged spleen	Yes	No
Jaundice	Yes	No

Additionally, check for protein in urine which commonly occurs in Eclampsia.

! Parasitologically confirmed diagnosis should be done in ALL suspected cases of severe malaria in pregnancy. If such confirmation is missing or delayed, start treatment for severe malaria immediately

7.2.2 Treatment

The recommended medicine for severe malaria in pregnancy is parenteral artesunate. In the absence of artesunate, artemether or quinine can be given. The preferred route of administration is intravenous for artesunate. However, the intramuscular route can be used as an alternative where intravenous route is not feasible. Due to the increased risk of hypoglycaemia in pregnant women, a dextrose containing solution must be used for quinine administration.

! NOTE: Pregnancy is not a contraindication for the use of a loading dose of quinine

7.2.3 Pre-referral treatment for severe malaria in pregnancy

- Treatment of a patient with severe malaria should begin in the primary health facility (while waiting for referral) so that life-saving therapy is not delayed.
- Management of severe malaria in pregnancy should follow the adult dosage for artesunate. Where artesunate is not available, artemether can be administered. . A loading dose of artesunate at 2.4mg/kg body weight should be administered.

- All efforts should be made to move the patient to a centre where the expertise and infrastructure exist for the adequate management of severe malaria.
- In patients with alteration in the levels of consciousness, a broad spectrum parenteral antibiotic (preferably Ceftriaxone, if available) should also be administered along with the antimalarial.
- It is not enough to give a referral note and assume that the patient has been referred.
- A health worker should accompany the referred patient to the next level of health care.

7.3 Prevention of Malaria in Pregnancy

The goal of prevention of malaria in pregnancy is to reduce maternal and perinatal morbidity and mortality associated with malaria. The strategies in prevention of malaria in pregnancy are integrated into the overall antenatal care (ANC) package for maternal health. They include the provision of:

- Intermittent Preventive Treatment of malaria in pregnancy (IPTp).
- Long lasting Insecticidal Nets.
- Provision of prompt diagnosis and treatment of malaria.
- Health promotion.

7.3.1 Intermittent preventive treatment of malaria in pregnancy (IPTp)

IPTp is the presumptive (regardless of whether the woman is infected or not) provision of a full treatment course of the recommended antimalarial at specific intervals during pregnancy. IPTp has been shown to reduce the risk of placental infection and the associated risk of maternal anaemia, miscarriage, premature deliveries and low birthweight. The current recommended medicine for IPTp is sulfadoxine 500mg and pyrimethamine 25mg (SP).

- IPTp is recommended in moderate and high malaria transmission areas.
- Administer IPTp with each scheduled visit from 13 weeks of pregnancy to ensure women receive a minimum of 3 doses.
- IPTp should be given at an interval of at **least** 4 weeks apart according to the IPTp schedule (Annex 10.6).
- IPTp should be given under Directly Observed Treatment (DOT) in the antenatal clinic and can be given on an empty stomach.
- SP for IPTp is safe up to term *(40 weeks pregnancy)* and even one dose is beneficial for women presenting late in pregnancy.

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5 All pregnant women should receive an iron supplementation during ANC as part of the prevention of anaemia.

6 IPTp-SP should be prescribed in high transmission areas and LLINs given during the ANC visit to all pregnant women.

- Low dose Folic acid 0.4mg is recommended during pregnancy and can be given together with SP. If low dose folic acid is not available, high dose folic acid (5mg) tablets should NOT be administered with SP given for IPTp and if need be, may be taken 14 days following administration of IPTp-SP.

Always ask the mother if she is allergic to sulphur-based drugs or has experienced side effects to sulphur-based drugs beforegiving SP.

7.3.3.1 IPTp and HIV+ pregnant women

HIV infection during pregnancy increases the risk of the complications of malaria in pregnancy while malaria infection during pregnancy particularly placental malaria increases the risk of mother to child transmission of HIV.

Pregnant women who are HIV positive and are on daily Cotrimoxazole chemoprophylaxis should **NOT** be given SP for IPTp.

7.3.2 Long Lasting Insecticidal Nets (LLINs)

- LLINs are key in the prevention of malaria in pregnancy.
- Each pregnant woman living in a malaria risk area should receive a LLIN at the first contact visit to the ANC.
- Each pregnant woman should be shown how to hang the LLIN correctly and encouraged to use the net each and every night during her pregnancy and thereafter.
- LLINs are not a substitute for IPTp and vice versa. Both must be used in order to achieve maximum benefits in the reduction of both maternal and perinatal morbidity and mortality.

7.3.3 Health promotion

- Continuous maternal health education should be provided at the ANC encouraging use of all interventions and services and encouraging the pregnant woman to attend all ANC visits as scheduled.
- At the community level, CHVs should promote and monthly follow up on use of malaria prevention intervention including IPTp and LLIN.

8. BASIC PRINCIPLES IN MANAGING MALARIA COMMODITIES

8.1 Introduction

Health commodities required for the management of malaria include those for prevention, diagnosis and treatment of malaria. For case management of malaria, the commodities required are as follows:

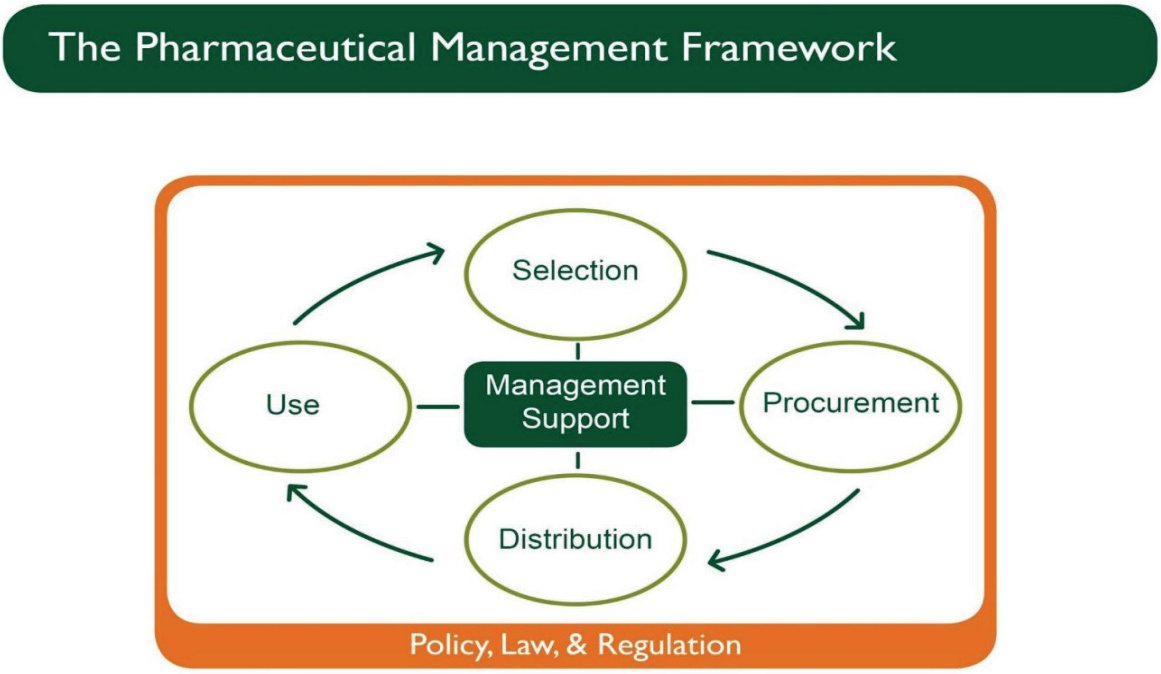
- **Prevention:** sulfadoxine + pyrimethamine tabs, proguanil, mefloquine, long lasting insecticidal nets (LLINs)
- **Diagnosis:** malaria rapid diagnostic tests (RDTs), microscopy reagents
- **Treatment:** artemether + lumefantrine tablets

8.2 Commodity management (Managing Access to medicines and health technologies)

Commodity management is a set of practices aimed at ensuring the timely availability and appropriate use of safe, effective, quality products in any health-care setting.

The Commodity Management Cycle is a systematic approach to ensure that medicines at all levels of health care delivery are consistently available and appropriately used. It emphasizes the connections between four drug management activities - selection, procurement, distribution and use. The cycle is depicted below:

Figure 3: THE COMMODITY MANAGEMENT CYCLE



The cycle was developed by the Management Sciences for Health Centre for Pharmaceutical Management in collaboration with the World Health Organization's Action Program on Essential Drugs.

8.3 Selection

Selection of products for malaria prevention and control is based on the latest WHO guidelines and takes into account local considerations e.g. local resistance patterns and prevalent malaria species. Malaria commodities recommended for use in the country are included in the latest Kenya Essential Medicines List (KEML) and the Kenya Essential Medical Laboratory Commodities List (KEMLCL).

8.4 Procurement

Procurement entails quantification (forecasting and supply planning), acquisition of the desired commodities and overall management of the acquisition process.

8.4.1 Quantification

Quantification is the process of estimating the quantities of products needed for a specific period of time in order to ensure an uninterrupted supply. Quantification is an important step in procurement and ordering for re-supply. Good quantification ensures the appropriate allocation of funds to enable purchase of the right commodity in the right quantity at the right time.

The rationale for quantification of malaria commodities:

- To ensure that there are sufficient quantities to meet clients' / patients' needs and avoid shortages/ stock-outs.
- To avoid surpluses that may lead to over-stocking, expiries and/or wastage of commodities.
- To make informed adjustments to procurement when faced with budgetary constraints.

Quantification methods

This guideline focuses attention on the two most commonly used methods—consumption and morbidity. The particular method used depends on the type of data available. The *Guidelines for Quantification and Pipeline Monitoring of Malaria Commodities of 2018* provided detailed guidance on the processes to be followed for forecasting, supply planning and pipeline monitoring for malaria commodities. A brief description of the two main forecasting methods is provided below.

8.4.1.1 Consumption method

This is the currently recommended quantification method for malaria commodities. The consumption-based method uses historical data on the actual commodities to calculate the quantity of commodities that will be needed in the future. When using the consumption method for quantification, reporting rates and out of stock periods must be factored into the calculation. Additionally, for artemether + lumefantrine, substitution across the four AL presentations should be taken into account.

8.4.1.2 Morbidity method

The morbidity-based method uses data about diseases and the frequency of their occurrence in the population (incidence or prevalence) or the frequency of their presentation for treatment. It determines the quantity of commodities needed for the treatment of specific diseases, based on projections of the incidence of those diseases. The morbidity method is currently used to forecast requirements for long-lasting insecticidal nets for routine and mass distribution, indoor residual spraying supplies and sulfadoxine + pyrimethamine tablets for prevention of malaria in pregnancy.

8.4.2 Acquisition and management of the tender process

Acquisition of malaria commodities in Kenya is done by the Kenya Medical Supplies Authority (KEMSA) as well as other international procurement agencies with guidance by the National Malaria Program. International best procurement practices should be followed to ensure that appropriate and quality assured health commodities are obtained at the lowest possible acquisition cost. The Procurement and Supply Management (PSM) unit of the Malaria Program is responsible for ensuring appropriate coordination of the various funding and procuring agencies to ensure a well-managed pipeline.

8.5 Distribution (WHO Good distribution practices)

The goal of distribution is to maintain a steady supply of health commodities to facilities while ensuring that resources are used in the most effective way. The distribution cycle includes the following: customs clearance, transport and delivery, inventory management and storage.

8.5.1 Customs clearance, transport and delivery

These processes should be undertaken by the agency responsible for warehousing and distribution i.e. KEMSA in collaboration with the malaria program and any other procuring agencies.

8.5.2 Inventory management

An inventory management system is a cycle of activities comprising ordering, receiving, storage, issuing and reporting of commodities.

Definitions of terms in inventory management

- **Average monthly consumption (AMC)**: This refers to the average quantity of commodities consumed per month.
- **Months of stock (MOS):** The quantity on hand expressed as the number of months that quantity should last. It is calculated based on the commodity's average monthly consumption.
- **Lead time:** The time interval between when a new stock is ordered and when it is received and available for use.

- **Review period:** The routine interval of time between assessments of stock levels to determine if an order should be placed. It is also known as order interval or resupply interval.
- **Maximum stock level:** The amount of stock above which a facility should not exceed under normal circumstances, a maximum of 6 months of stock.
- **Minimum stock level:** The amount of stock below which a facility should not fall under normal circumstances, a minimum of 3 months of stock.
- **Shelf life:** The length of time a product may be stored without compromising its usability, safety, purity or potency.
- **Pipeline:** The entire chain of storage facilities and transportation links through which supplies are moved from manufacturers to clients
- **Stock out days:** The number of days that the commodity is not in stock.

8.5.2.1 Ordering

The facility should order commodities quarterly from KEMSA through the KEMSA logistics management information system (LMIS). The LMIS is linked to the Kenya Health Information System (KHIS) and consumption data from the latter is used to derive reorder quantities using the formula below:

Quantity to Order = (Average Monthly Consumption x review period in months) less stock on hand

8.5.2.2 Receiving

Commodities should be received by a designated health facility staff who should counter-check commodities received against what was ordered and what is on the delivery note. Any discrepancies should be noted on the delivery note and all receipts should be accurately recorded in the stock card.

8.5.2.3 Storage (WHO Good storage practices)

Commodities should be stored under optimal conditions to ensure their safety and efficacy in accordance with good storage practices:

- Proper arrangement
- Quality maintenance (appropriate temperature, light and humidity).
- Assured security
- Good inventory control and stock rotation (First in First Out/ First Expiry First Out)
- Good record keeping

- Regular stock counts during which damaged, expired and obsolete items are identified and separated from the usable stock. Disposal of unusable stock should be carried out according to the guidelines for disposal of pharmaceuticals and biosafety guidelines for medical waste.

8.5.2.4 Issuing

The facility should issue commodities to various points of use, using an issue/ requisition voucher (S11/ S12) and must record the issue on the bin card.

8.5.2.5 Reporting

The facility should report on a monthly basis through KHIS. Primary data sources for this include the daily activity registers, stock/bin cards, S11s, S12s. The data is collated in the monthly summary tool by the facility staff and forwarded to the sub-county level by the 5th of the following month. The relevant sub-county official should upload all the reports within the sub-county by the 15th of the same month.

Malaria commodity data from the community health units (CHU) is captured in the CHU DARs, reported in the CHU monthly summary form and submitted to the link health facility by the 3rd of the following month. The link health facility should submit the CHU reports alongside the facility health report to the sub-county.

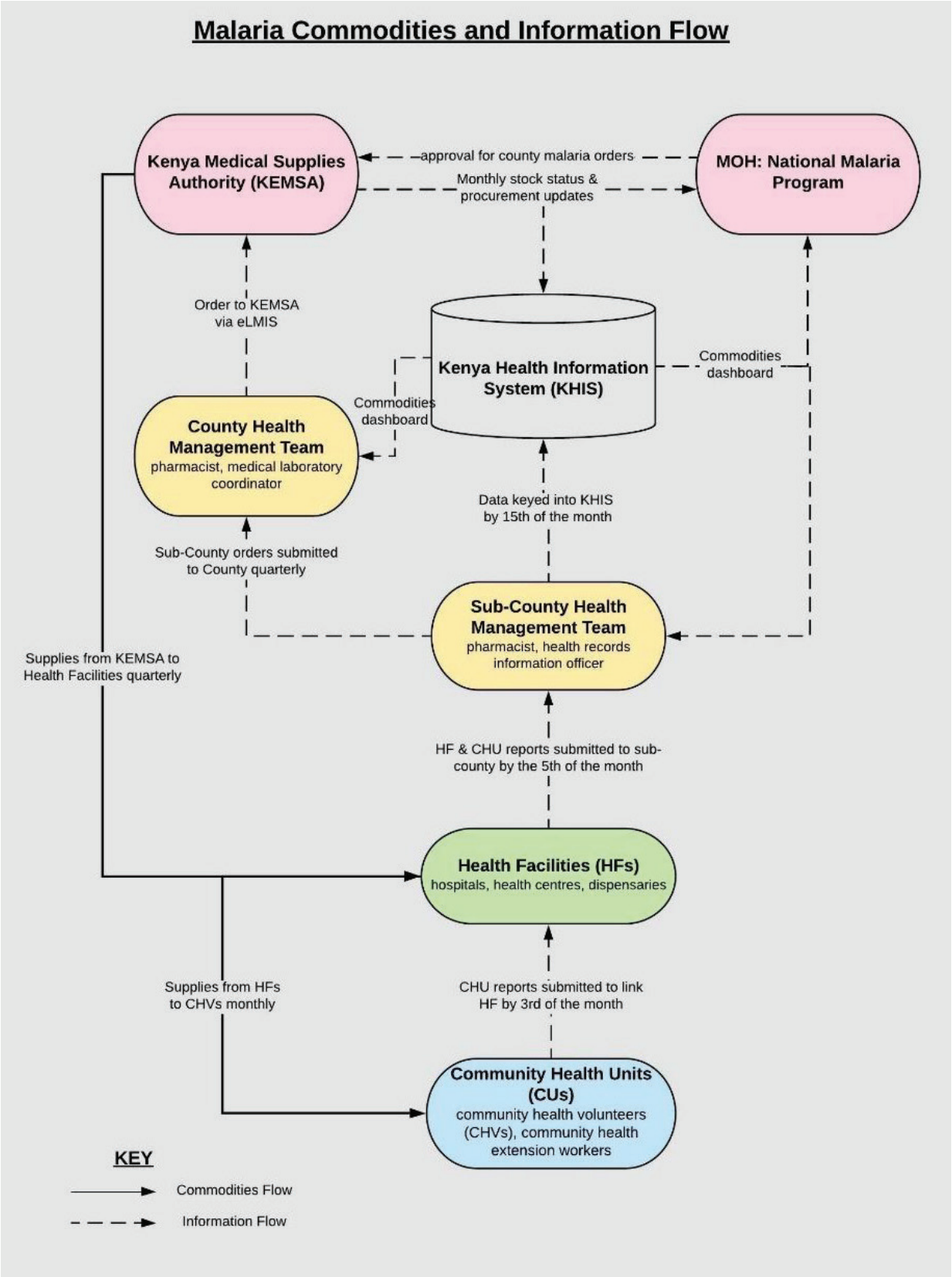
Types of inventory records

Various forms are used for requisitioning and issuing medicines, financial accounting, and preparing consumption and stock balance reports.

Table 12: TYPES OF INVENTORY RECORDS

Record type	Source document	Information
Stock keeping records	Bin cards, stock ledger card	Stock at hand; receipts, losses and adjustments
Transaction records	Issue and receipt voucher (S12, S11), KEMSA delivery notes, standard order form	Orders, issues and receipts
Consumption records	Daily activity register, health facility monthly summary	Consumption data; stock out days; patient numbers

Figure 4: FLOW OF LOGISTICS MANAGEMENT INFORMATION



8.5.3 Reverse Logistics

This is the process of moving malaria commodities from health facilities back to the supplier or KEMSA in order to recapture value or dispose properly. It may include planning, implementation, and control of the process flow in order to ensure efficiency and cost-effectiveness.

Reverse logistics may be applied for suspected poor-quality medicinal products and long-lasting insecticidal nets at the peripheral facilities. KEMSA has a well-defined process for this.

Expired commodities should be disposed off by the county authorities in accordance with the relevant laws and guidelines. In the event that funds are available at national level to support reverse logistics, KEMSA will liaise with the National Malaria Program and the various county pharmacists to implement this.

8.5.4 M&E Indicators

- National reporting rate
- Proportion of health facilities having no stock-out of all ACTs in a month
- Number of patients treated with ACTs
- Proportion of health facilities having no stock-out of RDTs in a month

8.6 Use

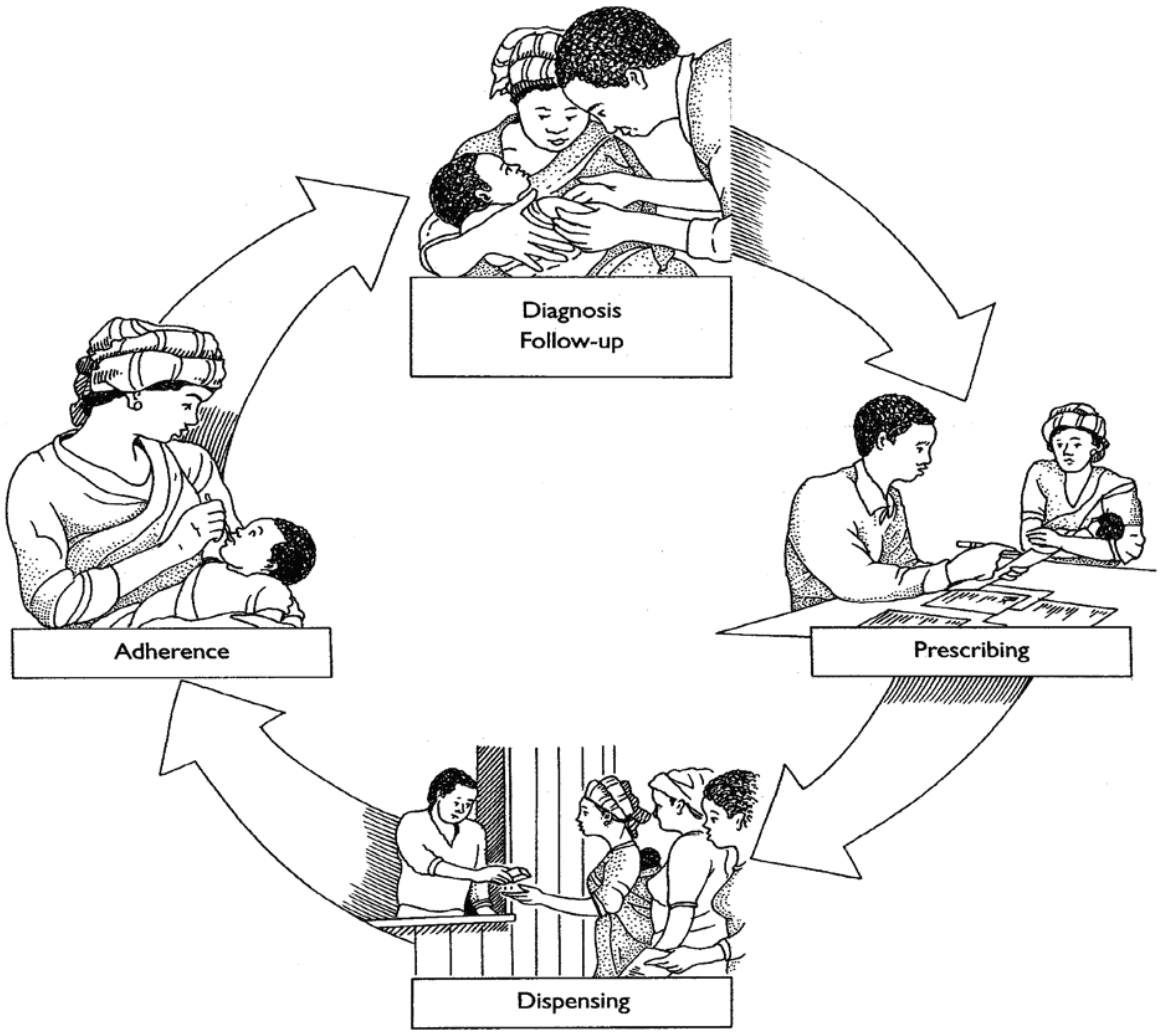
8.6.1 Definition of rational use

The rational use of medicines requires that patients receive medicines appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and the community.

8.6.2 Factors affecting rational use of medicines

- **Diagnosis** – correct diagnosis based on parasitological confirmed diagnosis.
- **Prescribing** – prescribing /administering the recommended medicine based on the correct diagnosis. For example, injectable artesunate should only be prescribed for severe malaria cases.
- **Dispensing –** correct dispensing (quantity, packaging and labelling) of the prescribed medicine.
- **Patient compliance** - patients' adherence to health worker instructions and label instructions.

Figure 5: THE MEDICINE USE CYCLE (WHO 1988)



8.6.3 Implications of irrational use of medicines

- This can destroy the benefits of a good pharmaceutical management system and also reduce the therapeutic useful life of an effective medicine.
- Resources spent on procurement are lost if the correct medicines are not prescribed and dispensed to the right patient.

8.6.4 Minimum dispensing information

- Directly observed treatment for first dose of AL and SP.
- Instructions on how long to take the medicine.
- Instructions on what to do if the patient vomits within 30 minutes of taking the medication.
- The common adverse drug reactions (ADRs) and instructions to report any suspected ADRs.
- Clear label with appropriate patient and medicine information.

8.6.5 M&E Indicators

- Proportion of patients with fever presenting to health facilities who are managed in accordance with national malaria guidelines.
- Proportion of patients presenting to health facilities with fever and ACT prescribed, to whom counselling, and ACT dispensing tasks are performed according to national guidelines.

8.7 Quality Assurance

Quality assurance is a wide-ranging concept covering all matters that individually or collectively influence the quality of a product. With regard to pharmaceuticals, quality assurance can be divided into major areas: development, quality control, production, distribution, and inspections.

Several activities are carried out to ensure that the quality of malaria commodities is maintained from the point of procurement through storage and distribution to the last point of use.

During procurement, all commodities should have documentation from the relevant regulatory authority e.g. Good Manufacturing Practices (GMP) from manufacturing sites, registration and retention certifications from PPB for medicines. At the point of delivery, inspection and testing is done at KEMSA to ensure that the commodities meet the specified quality criteria. At predetermined intervals, the commodities are sampled randomly during storage to ensure that they still meet the quality standards.

Once in a year, post marketing surveillance (PMS) is done jointly across the country in public health facilities as a collaborative exercise between PPB, KEMSA and the malaria program to sample malaria commodities for testing. Feedback is given by the PPB to health facilities thereafter and any findings used for improvement.

8.8 Pharmacovigilance

8.8.1 Definition of pharmacovigilance

Pharmacovigilance is defined as the science of collecting, monitoring, researching, assessing and evaluating information from healthcare providers and patients on the adverse effects of medicines, biological products, herbals and traditional medicines, with the view to identifying new information about hazards, and preventing harm to patients.

Goals of pharmacovigilance are:

- To minimize medicines' harm to the patients
- To control economic impact of managing Adverse drug reactions (ADRs) e.g. cost of hospitalization, cost of more medications

8.8.2 Adverse drug reactions (ADRs)

This is a response to a drug which is noxious and unintended, and which occurs at doses normally used in humans for the prophylaxis, diagnosis or therapy of disease.

Report ALL suspected ADRs which:

- Lead to death, disability (significant, persistent or permanent) or congenital anomalies
- Are life-threatening
- Require hospitalization (initial or prolonged) or intervention to prevent permanent impairment or damage

Report suspected ADRs even if:

- You are not certain if the drug caused the ADR.
- You do not have all the details.

8.8.3 Poor quality medicinal products (PQMPs)

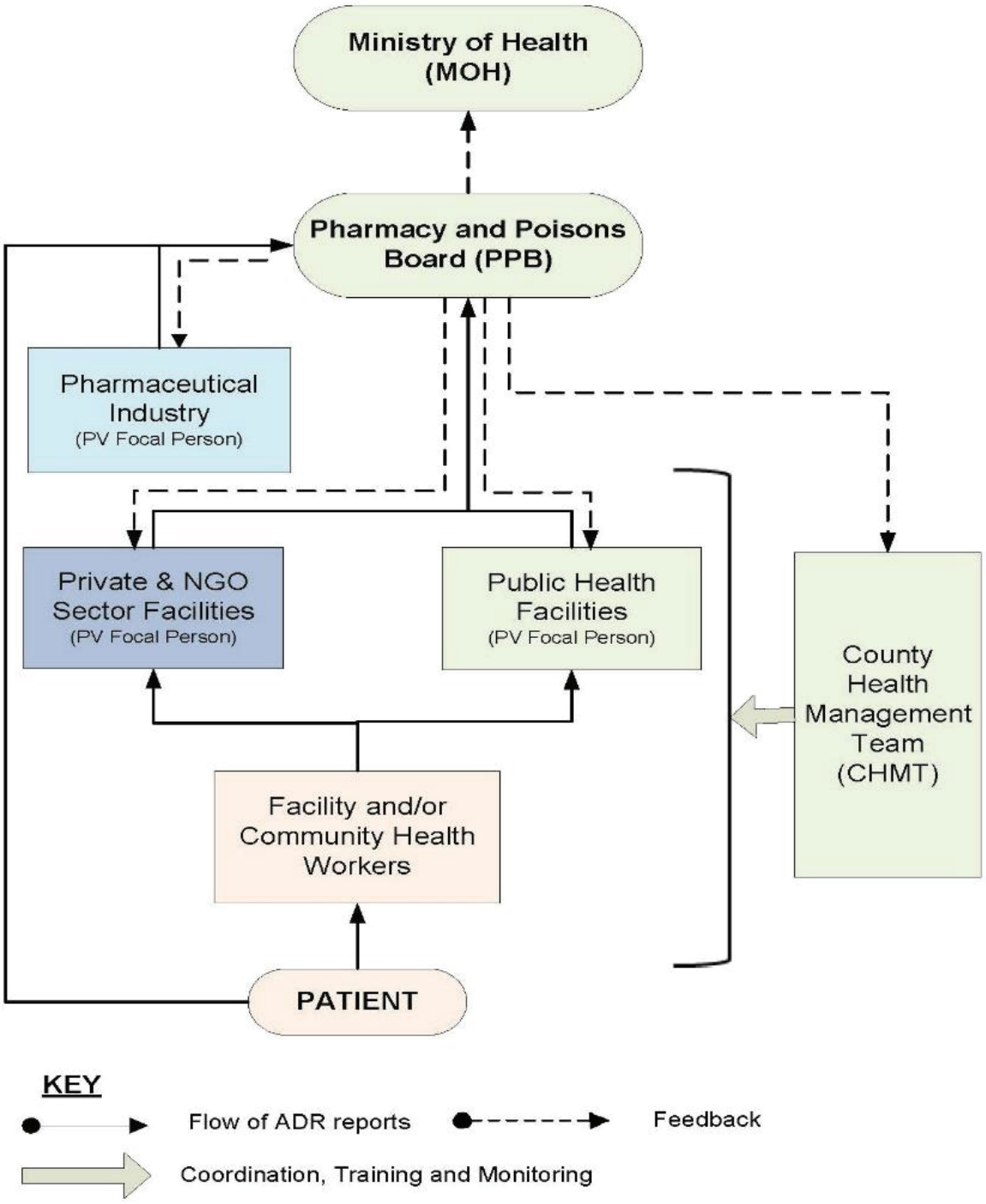
Substandard/ Spurious/ Falsely labelled/ Falsified and Counterfeits (SSFFCs) medicines are a global health problem. Any suspected poor-quality medicinal products should be reported to the Pharmacy and Poisons Board. Suspicion of poor quality may arise from physical examination of a product (e.g. discoloration, disintegration of tablets) or observation of lack of efficacy with a given batch of medicines.

8.8.4 Tools for reporting side effects, adverse drug reactions and poor-quality medicines

Reporting of ADRs is done using the forms below: (These forms are also available online at the Pharmacy and Poisons Board website www.pharmacyboardkenya.org)

- PV1: Yellow form-to capture all suspected adverse drug reactions.
- PV4: White alert card-to report life threatening drug reactions.
- PV6: Pink form-to report poor quality medicinal products.

Figure 6: FLOW OF INFORMATION ON ADVERSE DRUG REACTIONS



- Feedback to all levels of the system is the responsibility of the Pharmacy and Poisons Board (PPB).

- ADR reports may be submitted to the PPB Pharmacovigilance Center as follows:
  - Manually: Hard copies may be sent by courier or hand delivered to PPB.
  - Electronically: *either* via the PV Electronic Reporting System on the PPB website-http://www.pv.pharmacyboardkenya.org/; *or* via the mobile phone applications that can be downloaded from the same link.

8.8.5 M&E Indicators

- Number of ADR reports submitted to PPB
- Number of suspected poor-quality malaria medicines submitted to PPB

9. OTHER TOPICAL ISSUES IN MALARIA PREVENTION AND CONTROL

9.1 Vector Control

Integrated vector management is one of the recommended malaria preventive strategies. Its aim is to kill malaria vectors before they can transmit malaria parasites to humans. The method of choice is guided by malaria vector behavior and human behavior.

The two highly recommended methods are; Indoor Residual Spraying (IRS) and Long-Lasting Insecticide Treated Nets (LLITNs). IRS targets mosquitoes which bite and rest indoors and require good house coverage (above 80%) for impact. Distribution and use of LLITNs targets mosquitos which have high affinity for human blood meal and biting during the night and early morning. Both IRS and LLITNS are insecticide based and targets indoor biting mosquitoes

Other methods such as Larval Source Management (LSM) may be useful in reduction of number of adult mosquitos emerging from breeding sites. Outdoor biting mosquitoes may be targeted by personal protective measures such as use of repellents. Currently house screening is becoming popular in malaria endemic areas but its usefulness in malaria prevention is under evaluation

9.1.1 M&E Indicators

- Proportion of households who have achieved Universal coverage with LLIN (One net per 2 persons)
- Proportion of households in targeted areas sprayed in the last 12 months.
- Proportion of household members who uses LLIN the night before the survey (rate of net use)

9.2 Epidemic Preparedness and Response

Malaria interventions have contributed to the reduction of malaria prevalence in Kenya from 13% in 2010 to 8% in 2015 (KMIS 2015). This reduction increases the population predisposed to malaria epidemics which progressively have unstable malaria endemicity. In view of this there is need to:

- Strengthen routine surveillance of:
    - Epidemiological & entomological indicators, i.e. Parasite rates (sentinel facilities, community), malaria vectors
    - Meteorological data for prediction of malaria epidemics
- Ensure availability of adequate buffer stocks of all essential health commodities for addressing the epidemics.
- Ensure availability of insecticides, spray equipment, Personal Protective Equipment (PPEs) and trained spray teams for hotspot vector control activities.

- Plan for operational resources and logistics support for timely response to detected outbreaks.
- Conduct advocacy and social mobilization among affected communities including indoor residual spraying and net hang up campaigns.
- Mobilize health workers to conduct active surveillance and provide prompt diagnosis treatment and follow up.
- Alert referral facilities about potential patient influx and strengthen referral systems.

9.2.1 M&E Indicators

i. Proportion of targeted sub-counties with updated weekly sentinel thresholds
ii. Proportion of sub-counties with updated malaria EPR plans

9.3 Social Behaviour Change for Malaria

Social Behaviour Change (SBC) is a key intervention for the successful implementation of the guidelines for the diagnosis, treatment and prevention of malaria.

SBC seeks to increase awareness on the need to address the barriers for effective diagnosis and treatment of malaria due to the following delays;

- Seeking treatment by community members either due to initiation of self-remedies or traditional healers.
- Social cultural practices like male support, myths and misconceptions.
- Economic barriers like financial constraints.
- Poor infrastructure like poor transport networks and long distances.
- Access to quality of care including long waiting time and negative health care provider attitude.

In addressing these barriers, the application of effective strategic communication and counselling skills are important in enhancing a good healthcare provider-client relationship at health facility and community level.

Table 9 outlines the context, target audience, desired action and key messages for effective malaria diagnosis and treatment

Table 13: SBC guide for prompt and effective malaria diagnosis and treatment

<table>
<tr><th>At the health facility</th><th>At community level</th></tr>
<tr><td>• This is when a suspected malaria case presents or is presented to a health care provider at a health facility.
• Effective malaria diagnosis and treatment outcomes are dependent on the action of the health care provider hence effective communication and counselling.</td><td>• This is to encourage community members to seek prompt diagnosis and correct treatment of all fevers within 24 hours of onset of symptoms.
• CHEWs and CHVs should undertake household visits; attend community meetings/dialogues where they disseminate messages in support of malaria diagnosis, treatment and prevention.</td></tr>
<tr><th colspan="2">Target audience, key action and messages</th></tr>
<tr><td>Clients & caretakers
• Appreciate the client or caretaker for presenting themselves or their child to the health facility.
• Let them know that: for suspected malaria you will undertake a malaria test (specifying if it is through RDT or microscopy) and direct them accordingly.
• Upon testing POSITIVE for malaria; prescribe the recommended dose of ACT, advise them to:
1. Take and complete the drug dosage as directed.
2. Avoid sharing out the medication among other household members suspected to suffer from malaria instead encourage them to visit health facilities.
• Prevention: Advise them to always sleep under an LLIN to prevent malaria infection.</td><td>Community members
• FEVER is a key sign of malaria and if any community member has fever, they should seek treatment within 24 hours of onset at a health facility.
• At the health facility, a malaria test will be done to confirm if it is malaria.
• If the test is POSITIVE for malaria, give the recommended treatment for malaria.
• The malaria diagnosis and treatment is administered AT NO COST.
• Prevention: it is important to always sleep under an LLIN to prevent malaria</td></tr>
<tr><th colspan="2">Pregnant women living in malaria endemic areas</th></tr>
<tr><td>At the health facility
• Appreciate pregnant women for seeking ANC services.
• Let them know they are at the risk of malaria during pregnancy.
• For the prevention of malaria, you will:
1. Administer 3 tablets of SP. Assure them that the medicines are safe
2. Issue them with an LLIN to sleep under at all times.</td><td>Community level
• Let pregnant women know they are at the risk of malaria during pregnancy.
• They should visit the nearest health facility and receive:
1. IPTp at least 3 doses during the pregnancy.
2. An LLIN to sleep under at all times to prevent malaria.
• Let them know the services are offered at NO COST in public health facilities.
• If they suspect malaria, they should seek prompt and effective treatment at the nearest health facility.</td></tr>
</table>

Health workers should always remember the key steps in counselling patients, **GATHER**

1. **G**: Greet the patient
2. **A**: Ask what the problem is
3. **T**: Tell the patient what the diagnosis is
4. **H**: Help the patient act on the problem
5. **E**: Educate on what they should do
6. **R**: Refer for follow up

9.4 Malaria Elimination

9.4.1 Introduction

Malaria elimination is the interruption of local transmission (reduction to zero incidences of indigenous cases) of a specified malaria parasite species in a defined geographical area as a result of deliberate activities. Continued measures to prevent re-establishment of transmission are required.

In view of shrinking malaria burden, especially in low risk areas, the country, through DNMP will establish requisite structures necessary to guide the implementation of malaria elimination in targeted counties by 2023. This is in line with the Global Technical Strategy (GTS) to accelerate efforts towards elimination and attainment of malaria free status. The selection of counties for elimination will be based on malaria incidence in low transmission zones. The malaria elimination process will be coordinated by DNMP which will ensure strengthened surveillance, quality assurance for diagnosis, treatment and follow up.

9.4.2 M&E Indicator

1. Proportion of malaria cases notified
2. Proportion of malaria notifications investigated / followed up

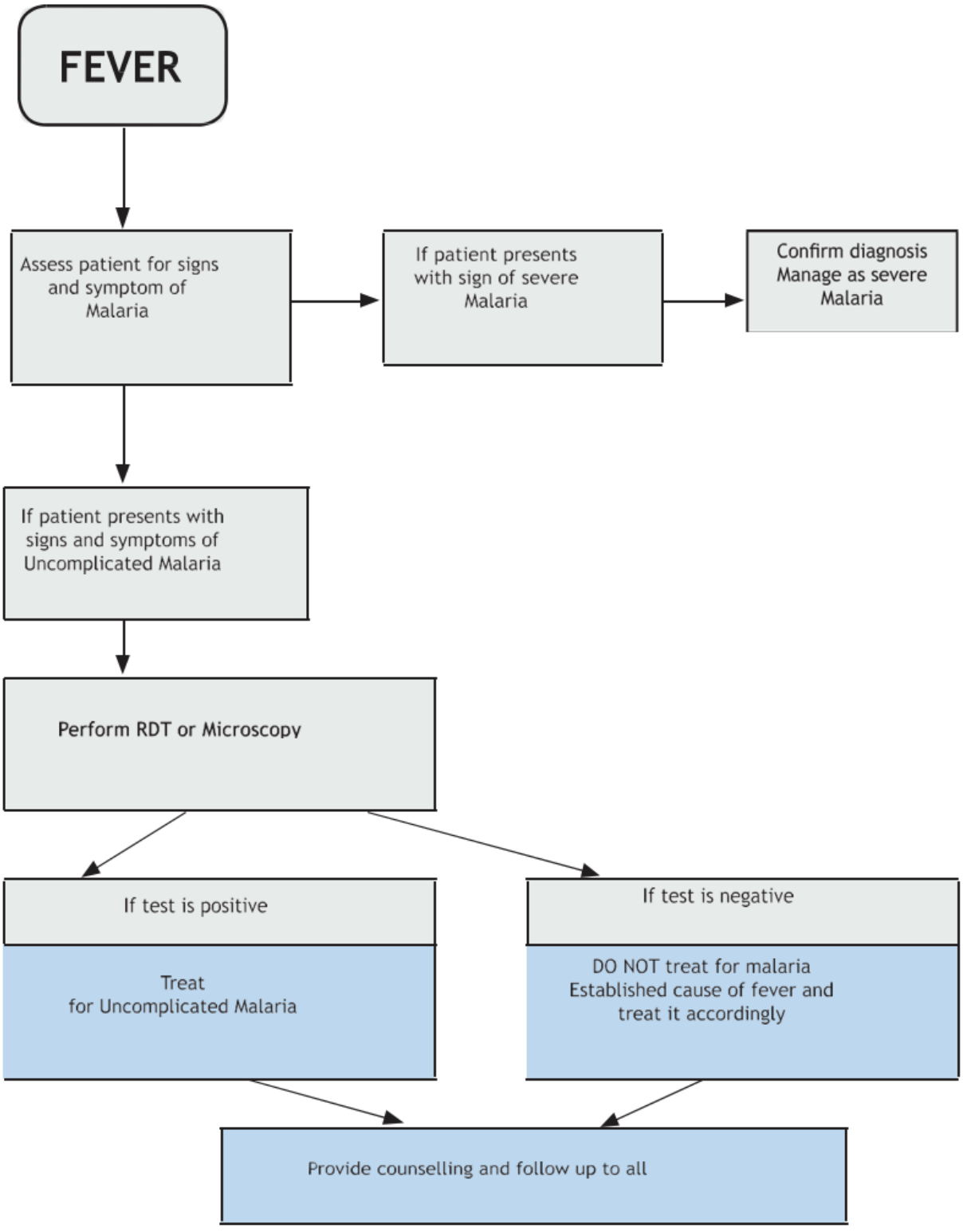
9.5 Malaria Vaccine

The malaria vaccine is one of the potential interventions intended to prevent malaria – specifically *P. falciparum* malaria, which is the most common and dangerous form of malaria in Kenya.

The objective of the vaccination is to provide protection to populations at risk as a complementary and potentially new intervention that will help reduce mortality and serious morbidity due to malaria.

10. ANNEXES

ANNEX 10.1: OUTPATIENT ALGORITHM FOR DIAGNOSIS AND MANAGEMENT OF MALARIA FOR CHILDREN AND ADULTS



ANNEX 10.2: THE PHARMACOLOGY OF ANTIMALARIALS

Antimalarials can be classified according to their chemical composition and mode of action. In this guideline, classification based on the mode of action is used.

Table 14: Classification of antimalarials

Class	Definition	Examples
Blood schizonticidal drugs	Act on (erythrocytic) stage of the parasite thereby terminating clinical illness	Quinine, artemisinins, amodiaquine, chloroquine, lumefantrine, tetracycline, atovaquone, sulphadoxine, clindamycin, proguanil
Tissue schizonticidal drugs	Act on primary tissue forms of plasmodia which initiate the erythrocytic stage. They block further development of the infection	Primaquine, pyrimethamine, proguanil, tetracycline
Gametocytocidal drugs	Destroy sexual forms of the parasite thereby preventing transmission of infection to mosquitoes	Primaquine, artemisinins, quinine
Hypnozoitocidal drugs	These act on persistent liver stages of *P.ovale* and *P.vivax* which cause recurrent illness	Primaquine, tafenoquine
Sporozontocidal drugs	These act by affecting further development of gametocytes into oocytes within the mosquito thus abating transmission	Primaquine, proguanil, chlorguanil

a Slow acting, cannot be used alone to avert clinical symptoms

b Weakly gametocytocidal

ANNEX 10.3: ADDITIONAL INFORMATION ON ANTIMALARIALS

Only fixed dose ACTs should be used for the treatment of uncomplicated malaria. Not all the medicines in this reference section are recommended for use in Kenya.

1. Artemether-lumefantrine (AL)

For information on regular tablets and child friendly dispersible tablets, see Section 5.2.1. AL may also be presented as a powder for suspension. Once reconstituted, the suspension must be used as directed and discarded after 3 days.

Table 15: DOSING SCHEDULE FOR AL POWDER FOR RECONSTITUTION

Body weight in kg	Dosage (in ml) to be administered once a day for three days
3	4.5
4	6
5	7
6	8
7-8	10
9-10	13
11-12	15
13-14	18
15-17	22
18-20	25
21-23	29
24-26	33
27-29	37
30	40

Side effects

Dizziness and fatigue, lack of appetite, nausea, vomiting, abdominal pain, palpitations, muscle pain, joint pain, headache and rash.

Contraindications

- There is limited data on the safety of use in the first trimester pregnancy.
- Persons with known hypersensitivity to either of the components.

2. Dihydroartemisinin-piperaquine(DHA-PPQ)

This DHA-PPQ is available as both adult and paediatric tablets administered once a day for three days. See section 5.3.2 for dosing information.

Side effects

Nausea, diarrhoea, loss of appetite, rash, pruritus.

Contraindications

- Hypersensitivity to any of the components of the combination.
- There is limited data on the safety of use in the first trimester pregnancy.

3. Amodiaquine-artesunate(ASAQ)

Is available as fixed dose combination tablets containing amodiaquine and artesunate dose

Dose

Amodiaquine 10mg/kg daily for three days plus artesunate 4mg/kg given daily for 3 days.

Side effects

Pruritus, rash, and with higher doses, syncope, spasticity, convulsions and involuntary movements.

Contraindications

- Hypersensitivity to any of the component medicines.
- Not recommended during the first trimester of pregnancy.

4. Primaquine

Dose

Primaquine is available as tablets containing 5.0, 7.5 or 15mg primaquine diphosphate. Dose 0.25-0.5mg/kg once daily for 14 days.

Side effects

The most important adverse effects are haemolytic anaemia in patients with G6PD deficiency. Therapeutic doses may also cause abdominal pain if administered on an empty stomach. Larger doses can cause nausea and vomiting. Methaemoglobinaemia may occur. Other uncommon effects include mild anaemia and leukocytosis. Overdosage may result in leukopaenia, agranulocytosis, gastrointestinal symptoms, haemolytic anaemia and methaemoglobinaemia with cyanosis.

5. Quinine

Quinine is presented as the following tablet strengths:

- 300 mg quinine dihydrochloride
- 300 mg quinine hydrochloride
- 300 mg quinine bisulphate
- 300 mg quinine sulphate
- 200 mg quinine sulphate

Table 16: QUININE TABLETS EQUIVALENCE TABLE

Quinine salt	Number of tablets
300 mg Quinine Dihydrochloride	1
300 mg Quinine Hydrochloride	1
300 mg Quinine Bisulphate	1.5
300 mg Quinine Sulphate	1.5

Dose

Quinine is administered in severe malaria as a seven-day dose of 10mg/kg salt three times a day every 8 hours.

Table 17: DOSING SCHEDULE FOR QUININE 200MG TABLETS

Weight in kg	No of 200mg tablets
4 – 7	¼
8 – 11	½
12 – 15	¾
16 – 23	1
24 – 31	1½
32 – 39	2

Table 18: DOSING SCHEDULE FOR QUININE 300MG TABLETS

Weight in kg	No of 300mg tablets
6 – 11	¼
12 – 17	½
18 – 23	¾
24 – 35	1
36 – 47	1½
48+	2

For children below the lowest weight category, the dosage of quinine is 10mg/kg and the tablets should thus be reconstituted into a suspension and given based on the weight of the patient. It is important to note that this is not an accurate method for quinine dosing and the reconstitution must be done prior to each dose as the stability of quinine in the liquid used is not known.

Injectable quinine

- Quinine hydrochloride (82% quinine base).
- Quinine dihydrochloride (82% quinine base).
- Quinine sulphate (82.6% quinine base) respectively.

The ampoules contain 300mg/ml and come as 2 ml or 1 ml ampoules.

Quinine for intramuscular injection

The dosage of IM quinine injection for pre referral treatment is a loading dose of 20mg/kg up to a maximum of 1,200mg.

How to give the intramuscular injection

- Weigh the patient (if he/she cannot be weighed the following formula can be used to estimate the weight of children under 5 years:

(Age (in years) x 2) + 8 = wt in kg)

- Use a 10ml sterile syringe. Draw up 5ml of sterile water for injection. Then into the same syringe, draw up 300mg (1ml) from an ampoule of quinine. The syringe now contains 50mg quinine per ml. Mix the drug by shaking the syringe before injection.

*For the formulation of 600mg/2ml, only one ml is drawn out into the syringe. For the 300mg/ml the whole vial is drawn out while for the 150mg/ml, two vials will be required to make 300mg.

- In all situations a maximum of 3ml should be injected into one injection site. If the amount to be injected exceeds 3ml, half the amount should be injected into each injection site (refer to table below for number of sites).

Table 19: DOSING SCHEDULE FOR IM INJECTIONS OF QUININE

Dilute quinine to 50mg/ml – and give based on 10mg/kg doses.

Body weight	Volumes of diluted quinine injection (ml) to be administered	Number of injection sites
≤5 kg	1.0ml	1
5.1 - 7.5 kg	1.5ml	1
7.6 –10kg	2.0ml	1
10.1 - 12.5 kg	2.5ml	1
12.6 - 15 kg	3.0ml	1
15.1 - 17.5 kg	3.5ml	2
17.6 – 20 kg	4.0ml	2
20.1 - 22.5kg	4.5ml	2
22.6 – 25 kg	5.0ml	2
25.1 - 27.5 kg	5.5ml	2
27.6 –30 kg	6.0ml	2
30.1 - 32.5 kg	6.5ml	3
32.6 – 35 kg	7.0ml	3

Quinine intravenous infusion

Intravenous quinine is administered in isotonic fluid; either 5% dextrose or dextrose - saline as follows. See section on treatment of severe malaria.

Adults

- The first dose is 20mg/kg in 500mls of isotonic fluid given over 4 hours (maximum 1,200 mg).
- Use the formula to calculate number of drops per minute:

$$\frac{\text{Drop factor(from infusion set) x vol. to be given}}{\text{time in mins (240)}}$$

- Then 8 hours after commencing the initial dose give 10mg/kg in 500mls of isotonic fluid over 4 hours (maximum 600mg).
- Repeat 10mg/kg 8 hourly until the patient can take orally.
- Then preferably, give a full treatment course of artemether-lumefantrine or quinine may be continued orally at 10mg/kg three times a day to complete a total of 7 days treatment of quinine.

- Assessment of fluid status should be monitored regularly including urine output.
- If the patient cannot be weighed – IV quinine loading dose should be 900mg. Followed by 600 mg 8 hourly.

Children

- Put up IV quinine drip (20mg/kg body weight loading dose in 15ml/kg of isotonic fluid) to run over 4 hours.
- Fluid intake should be calculated according to weight, bolus 20ml/kg (minimum 10ml/kg) and maintenance 4-6 ml/kg/hr.
- 8 hours after commencing the initial dose of quinine, give 10mg/Kg in 10mls/kg of isotonic fluid.
- Repeat 10mg/kg 8 hourly until the patient can take medication orally.
- Then preferably, give a full treatment course of artemether-lumefantrine or quinine may be continued orally at 10mg/kg three times a day to complete a total of 7 days treatment of quinine.

Side effects

The triads of quinine toxicities comprise cinchonism, hypoglycaemia and hypotension. Careful attention should be paid to these and adequate measures taken to correct them.

Cinchonism is characterized by tinnitus, high tone deafness, visual disturbances, headache, dysphoria, nausea and vomiting and postural hypotension all of which disappear on withdrawal of the drug. It is usually mild.

Hypotension is often associated with excessively rapid IV infusion or bolus injection. Hypoglycaemia is due to the stimulative effect of quinine on the cells of the pancreas which produce insulin. It is common in pregnancy and very prolonged and severe infection.

Other side effects include nausea, vomiting, diarrhoea, blurred vision, distorted colour perception, photophobia, diplopia and night blindness, cutaneous flushing, pruritus, rashes, fever and dyspnoea.

Black water fever is seen in patients with G6PD enzyme deficiency and malaria treated with quinine. It is characterized by haemolysis, Haemoglobinuria and in severe forms renal failure.

Artesunate injection

Description: Artesunate is a white crystalline powder. It is a rapidly acting blood schizonticide active against all *plasmodium* species. It is active against asexual parasites killing all stages from young rings to schizonts. In *P. falciparum* malaria, it also kills the gametocytes including stage 4 gametocytes.

Administration

- Artesunate can be administered IV or IM after reconstitution with sodium bicarbonate and dilution with normal saline or 5% dextrose.

Intravenous

- Intravenous route is preferred.
- Weigh the patient to determine the dosage needed and therefore the number of vials required.
- Dissolve each vial of artesunic powder with all the 5% sodium bicarbonate solution provided with each vial. Shake gently until the resultant solution is clear.
- Dilute resultant solution with 5 ml normal saline or 5% dextrose*.
- The final solution has a strength of 10mg/ml.
- Calculate the volume containing the required amount of drug to be given (mg) required x vol in vials/amount in mg in vials = volume containing required drug.
- Administer by slow IV over 3-5 minutes.

Intramuscular

- Weigh the patient to determine the dosage needed and therefore the number of vials required.
- Dissolve each vial of artesunic powder with all the 5% sodium bicarbonate solution provided with each vial. Shake gently until the resultant solution is clear.
- Dilute resultant solution with 2ml normal saline or 5% dextrose*.
- The final solution has a strength of 20mg/ml.
- Calculate the volume containing the required amount of drug to be given: (mg) required x vol in vials/amount in mg in vials = volume containing required drug.
- Administer by IM route.
- Spread the doses of more than 2ml over different sites for babies and 5ml for adults.

* This refers to 60mg artesunate. For all other strengths refer to product insert for diluent volume.

Precautions

- Inject immediately after reconstitution and discard if not used within 1 hour.
- Discard if the solution isn't clear.
- Do not use in an intravenous drip.
- Water for injection isn't suitable for dilution of artesunate injection.
- Sodium artesunate MUST be reconstituted with sodium bicarbonate solution to activate it.

Side effects

Dizziness, vomiting, headache, insomnia, cough, altered taste, abdominal pain, diarrhea, rash, pain at the injection site.

6. Uncommon: Anaemia

Contraindications

Oral artesunate should not be used during the 1st trimester of pregnancy.

Dosing schedule

Artesunate is administered at 0hrs, 12hrs, 24hrs then daily until the patient can take orally. A patient should receive a minimum of 3 doses of IV/IM artesunate before being transitioned to oral ACTs. If the patient cannot take orally, continue the artesunate injection for a maximum of 7 days then given a three day course of ACT as appropriate. **All attempts should be made to allow patients who can take orally to take a full course of AL.**

- Discard after 1 hour of reconstitution.

ANNEX 10.4: COMA MONITORING SCALES

The Glasgow coma scale

Table 20: THE GLASGOW COMA SCALE (for adults and children over 5 yrs)

Behaviour	Response	Score
Eye Opening Response	Spontaneous: open with blinking at baseline	4
	Opens to verbal command, speech, or shout	3
	Opens to pain, not applied to face	2
	None	1
Verbal Response	Oriented	5
	Confused conversation, but able to answer questions	4
	Inappropriate responses, words discernible	3
	Incomprehensible speech	2
	None	1
Motor Response	Obeys commands for movement	6
	Purposeful movement to painful stimulus	5
	Withdraws from pain	4
	Abnormal (spastic) flexion, decorticate posture	3
	Extensor (rigid) response, decerebrate posture	2
	None	1

It is recommended to use the simpler Blantyre coma score for children. However, if the GCS is used for children under 5, adjust the verbal response according to the Table 21 overleaf.

Table 21: ADJUSTED VERBAL RESPONSE FOR CHILDREN <5YRS

	For Intravenous Route			For intramuscular Route		
	Concentration 10gm/ml			Concentration 20mg/ml		
	(3.0 mg x body weight) Concentration (10mg/ml)			(3.0 mg x body weight) Concentration (10mg/ml)		
	Example					
	Dose needed for 8kg child					
	(3.0x 8)/10= 2.4 ml rounded to 3 ml			(3.0x 8)/20= 1.2 ml rounded to 2 ml		
Less than 20 Kg	Weight	Dose				
	Kg	mg	ml	Kg	mg	ml
	6-7	20	2	6-7	20	1
	7-10	30	3	7-10	30	2
	11-13	40	4	11-13	40	2
	14-16	50	5	14-16	50	3
	17-20	60	6	17-20	60	3
	(2.4x 26)/10= 6.24 ml rounded to 7 ml			(2.4 x 26)/20 = 3.12 rounded to 4 ml		
More than 20kgs	20-25	60	6	20-25	60	3
	26-29	70	7	26-29	70	4
	30-33	80	8	30-33	80	4
	34-37	90	9	34-37	90	5
	38-41	100	10	38-41	100	5
	42-45	110	11	42-45	110	6
	46-50	120	12	46-50	120	6
	51-54	130	13	51-54	130	7
	55-58	140	14	55-58	140	7
	59-62	150	15	59-62	150	8
	63-66	160	16	63-66	160	8
	67-70	170	17	67-70	170	9
	71-75	180	18	71-75	180	9
	76-79	190	19	76-79	190	10
	80-83	200	20	80-83	200	10
	84-87	210	21	84-87	210	11
	88-91	220	22	88-91	220	11
	92-95	230	23	92-95	230	12
	96-100	240	24	96-100	240	12

To obtain the Glasgow coma score obtain the score for each section and add the three figures to obtain a total out of 15.

Interpretation of symptoms: (Severe: 8 or less; Moderate: 9-12; Mild: 13 or more).

The Blantyre coma scale

The Blantyre coma scale[9] is a modification of the Glasgow coma scale suitable for use in children not yet able to speak. The scale uses motor and crying responses to pain and includes the ability to watch. It can be used to assess young children with cerebral malaria.

Table 22: THE BLANTYRE COMA SCALE FOR CHILDREN <5 YEARS

Behaviour	Response	Score
Eye Opening Response	Spontaneous: open with blinking at baseline	4
	Opens to verbal command, speech, or shout	3
	Opens to pain, not applied to face	2
	None	1
	Oriented	5
	Confused conversation, but able to answer questions	4
Verbal Response	Inappropriate responses, words discernible	3
	Incomprehensible speech	2
	None	1
	Obeys commands for movement	6
Motor Response	Purposeful movement to painful stimulus	5
	Withdraws from pain	4
	Abnormal (spastic) flexion, decorticate posture	3
	Extensor (rigid) response, decerebrate posture	2
	None	1

It is recommended to use the simpler Blantyre coma score for children. However, if the GCS is used for children under 5, adjust the verbal response according to the Table 20 below.

Table 23: ADJUSTED VERBAL RESPONSE FOR CHILDREN <5YRS

Score	2 to 5 years	0 to 23 months
5	Appropriate words or phrases	Smiles or coos appropriately
4	Inappropriate words	Cries and consolable
3	Persistent cries and/ or screams	Persistent inappropriate crying and/ or screaming
2	Grunts	Grunts or is agitated or restless
1	No response	No response

To obtain the Glasgow coma score obtain the score for each section and add the three figures to obtain a total out of 15.

Interpretation of symptoms: (Severe: 8 or less; Moderate: 9-12; Mild: 13 or more).

The Blantyre coma scale

The Blantyre coma scale9 is a modification of the Glasgow coma scale suitable for use in children not yet able to speak. The scale uses motor and crying responses to pain and includes the ability to watch. It can be used to assess young children with cerebral malaria.

Table 24: THE BLANTYRE COMA SCALE FOR CHILDREN <5 YEARS

Response	Findings	Score
Eyemovement	Directed (e.g. towards mother's face)	1
	Not directed	0
Best verbal response	Appropriate cry	2
	Inappropriate cry	1
	None	0
Best motor response	Localizes painful stimuli	2
	Withdraws limb from pain	1
	Non-specific or absent response	0

Blantyre coma scale = (best motor response score) + (best verbal response score) + (eye movement score).

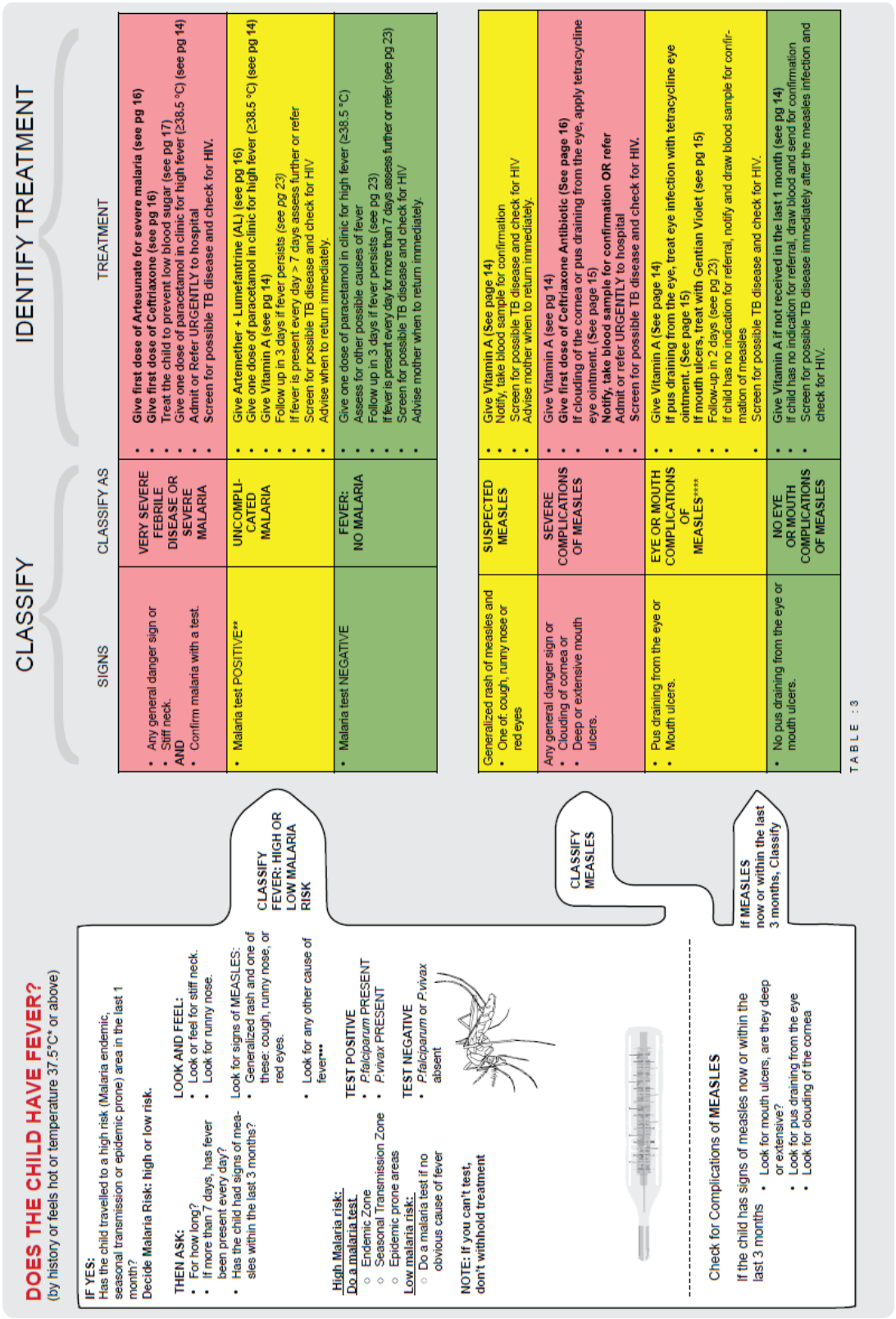
The score can range from 0-5. Any score < 4 is abnormal while 2 or less indicates unrousable coma. The score can be used repeatedly to assess improvement or deterioration.

Molyneux ME Taylor TE et al. Clinical features and prognostic indicators in paediatric cerebral malaria: A study of 131 comatose Malawian children. Q J Med. 1989; 71: 441-459.

ANNEX 10.5: UPDATED IMCI ALGORITHM

The integrated management of childhood illnesses (IMCI) algorithm has been updated to reflect their recommendation for confirmation of malaria diagnosis before treatment.

Table 25: IMCI ALGORITHM



ANNEX: 10.6 SCHEDULE FOR IPTp PROVISION

Table 26: IPTp provision schedule

Timing of Contact	Dose #
1: Up to 12 weeks	
1a: 13-16 weeks	**IPTp-SP dose 1**
2: 20 weeks	IPTp-SP dose 2
3: 26 weeks	IPTp-SP dose 3
4: 30 weeks	IPTp-SP dose 4
5: 34 weeks	IPTp-SP dose 5
6: 36 weeks	No SP, if last dose received <1 month ago
7: 38 weeks	IPTp-SP dose 6 (if no dose in past month)
8: 40 weeks	

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