PAPUA NEW GUINEA
DEPARTMENT OF HEALTH

NATIONAL MALARIA
TREATMENT POLICY

September 2009
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Foreword

Malaria is one of the single most important public health problems in Papua New Guinea. Each year an average of 1.7 million cases (outpatient and inpatient cases) of clinical malaria cases are recorded through the National Health Information system (NHIS). The NHIS only accounts for information coming from the health centre level and so a large proportion of cases are not reported. *Plasmodium falciparum* accounts for about 60 – 70% while *Plasmodium vivax*, accounts for most of the rest. *Plasmodium malariae* and *Plasmodium ovale* is very rare.

Each year between 600 and 700 people are reported to die from malaria alone in our health facilities. The population at risk is increasing due to issues such as drug resistance, unavailability of treatment, inaccessibility to health services, large movements of populations from non-malarious areas to malaria endemic areas and global warming. Previously non-malarious areas in the highlands where the whole population is non-immune are now very high-risk epidemic prone areas. Malaria diagnosis is also based mostly clinical signs and symptoms resulting in over-diagnosis and over-treating.

The change in the treatment policy will address the key important issues of drug resistance, confirmation of diagnosis and prompt and effective treatment of all malaria cases. In PNG *Pf* is widely resistant to chloroquine, which is used as the first line of treatment for malaria cases. Resistance to chloroquine is now widespread in PNG and no longer effective against the species of malaria that is responsible for fatalities, so it has been decided that the first line treatment will be changed to an Artemisinin-based Combination Therapy (ACT), Artemether –Lumefantrine (AL). All suspected malaria cases will be confirmed parasitologically by microscopy or where there is no microscopy, it will be confirmed using the Rapid Diagnostic Test (RDT). Confirmation is important so that treatment can be administered based on the type of malaria infection.

Currently the main thrust in the malaria programme is on early diagnosis and prompt treatment that are the key components of malaria control. While preventing illness and deaths, it will also break the transmission cycle in the population.

The main purpose of the national anti-malaria drug policy is to provide a framework for the safe and effective treatment of uncomplicated and severe malaria as well as prevention of malaria in travellers and vulnerable groups, such as pregnant women and young children. All health care providers in both the public and private sectors must be aware of, understand the rationale for, and implement the national anti-malaria drug policy.

This treatment policy aims to:
- Reduce morbidity
- Prevent the progression of uncomplicated disease into severe and potentially fatal disease and thereby reduce malaria mortality
- Reduce the impact of placental malaria infection and maternal malaria-associated anaemia through chemoprophylaxis or Intermittent Preventive Treatment in Pregnancy
- Prevent or delay the development of antimalarial drug resistance by correct diagnosis and rational treatment of all malaria positive cases.

This policy will be reviewed periodically as situations change and information on newer and other antimalarial drugs become available. The present national drug policy for malaria has been framed keeping in view of proper deployment of effective anti malarial drugs and its judicious use for the treatment of clinically suspected and confirmed malaria cases.

Honourable Sasa Zibe, MP
Minister for Health and HIV/AIDS
September 2009
Acknowledgments

On behalf of the Department of Health, I wish to take this opportunity to acknowledge the individuals and the organizations that had contributed so much of their time and resources in the development of this new treatment policy for malaria treatment in Papua New Guinea. Malaria is a major public health problem in the country and the development of this treatment policy is yet another milestone in the efficient control of malaria to reduce the morbidity and mortality among our vulnerable community.

It has taken the efforts of many professionals to decide on the most appropriate and effective treatment based on the available evidence on the various treatment combinations. There was a series of meetings held in which there was very good participation from both the private sector and the public sector.

I wish to thank the contributions made by the World Health Organization from the PNG office, the Regional Office in Manila through Dr Eva-Maria Christophel and the Headquarter Geneva office through Dr Peter Olumese. Their support had been invaluable. The PNG Institute for Medical Research through Dr Peter Siba, Director and Dr Ivo Mueller who provided much of the evidence of malaria treatment in PNG, All the professional organizations in PNG contributed immensely through Professor Glen Mola, Dr David Mokela, Dr Goa Tau and all the others that participated in the various meetings, the Director for medical Supplies and his staff, Oil Search through the participation of Ross Hutton, Lihir Mines through Dr Billy Selvy.

I would like to make a special mention to Professor Timothy Davis from the University of Western Australia for sharing his vast experiences in malaria treatment in Asia and Africa and as a collaborator of the malaria work done in PNG with PNG IMR.

I would also like to acknowledge Mr Leo S Makita, Principal Advisor for Malaria and Vector-borne Diseases, and his staff for so efficiently coordinating the process and initiating the change in the malaria treatment policy for the country. I am sure that all the hours spent has paid off with the finalization of this important policy document.

I am confident that this treatment policy has been designed using the best information available locally as well as internationally to make it appropriate for the people of PNG. I thank you all for a job well done and I also look forward to our continuing cooperation and collaboration in rolling out this new treatment policy to address the huge malaria burden in PNG.

Dr Clement Malau
Secretary of Health
September 2009
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACT</td>
<td>Artemisinin-based Combination Therapy</td>
</tr>
<tr>
<td>AL</td>
<td>Artemether-Lumefantrine</td>
</tr>
<tr>
<td>AP</td>
<td>Aid Post</td>
</tr>
<tr>
<td>AS</td>
<td>Artesunate</td>
</tr>
<tr>
<td>CQ</td>
<td>Chloroquine</td>
</tr>
<tr>
<td>ECG</td>
<td>Electrocardiogram</td>
</tr>
<tr>
<td>DP</td>
<td>Dihydroartemisin-piperaquine</td>
</tr>
<tr>
<td>G6PD</td>
<td>Glucose-6-phosphate dehydrogenase</td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
</tr>
<tr>
<td>HC</td>
<td>Health Center</td>
</tr>
<tr>
<td>HMS</td>
<td>Hyper-reactive Malarial Spleen</td>
</tr>
<tr>
<td>HSC</td>
<td>Health Sub-center</td>
</tr>
<tr>
<td>IM</td>
<td>Intramuscular Injection</td>
</tr>
<tr>
<td>IV</td>
<td>Intravenous Injection</td>
</tr>
<tr>
<td>LD</td>
<td>Loading Dose</td>
</tr>
<tr>
<td>IPTp</td>
<td>Intermittent Preventive Treatment during Pregnancy</td>
</tr>
<tr>
<td>MD</td>
<td>Maintenance Dose</td>
</tr>
<tr>
<td>NDoH</td>
<td>National Department of Health</td>
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<tr>
<td>NGO</td>
<td>Non Government Organization</td>
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<tr>
<td>NHIS</td>
<td>National Health Information System</td>
</tr>
<tr>
<td>Pf</td>
<td><em>Plasmodium falciparum</em></td>
</tr>
<tr>
<td>PLWH</td>
<td>People living with HIV</td>
</tr>
<tr>
<td>Pm</td>
<td><em>Plasmodium malariae</em></td>
</tr>
<tr>
<td>PNG</td>
<td>Papua New Guinea</td>
</tr>
<tr>
<td>Po</td>
<td><em>Plasmodium ovale</em></td>
</tr>
<tr>
<td>PQ</td>
<td>Primaquine</td>
</tr>
<tr>
<td>PR</td>
<td>Per Rectum</td>
</tr>
<tr>
<td>Pv</td>
<td><em>Plasmodium vivax</em></td>
</tr>
<tr>
<td>QN</td>
<td>Quinine</td>
</tr>
<tr>
<td>RDT</td>
<td>Rapid Diagnostic Test</td>
</tr>
<tr>
<td>SP</td>
<td>Sulphadoxine/pyrimethamine</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WPRO</td>
<td>Western Pacific Regional Office (WHO)</td>
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</tbody>
</table>
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1.0 INTRODUCTION

1.1 What is malaria?

Malaria is a disease caused by a parasite of the genus *Plasmodium* species infecting humans, i.e., *Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae* and *Plasmodium ovale*. It is common in tropical climates and is characterized by chills, fevers, an enlarged spleen, anaemia, headache, and muscle ache, which may recur in cycles after subsiding. 109 countries were endemic for malaria in 2008, and it affects 250 million people annually causing nearly one million deaths most of them children in sub-Saharan Africa [1].

The malaria parasite is transmitted by the bite of an infected female of the *Anopheles* species that are identified as malaria vectors.

1.2 Status of malaria in Papua New Guinea

The predominant species of malaria parasite is *Pf* accounting for 60% in the highlands to 80% in the coast, followed by *Pv* accounting for 15% to 35% and *Pm* about 2% to 10%. *Pm and Po* sometimes occur as mixed infections with *Pf* whilst *Po* is rare. Over 70% of *Pf* show varying degrees of resistance to chloroquine.

Malaria is one of most important public health problems in PNG with perennial transmission in most of the coastal and island regions and seasonal transmission of unstable malaria with outbreaks in the highlands [1]. Malaria affects over 90% of the population. The number of reported suspected malaria cases and deaths in 2007 are 1,598,944 and 534, respectively. The corresponding morbidity and mortality are 219.49/1000 and 8.54/100000, respectively which ranks the third among all the disease in PNG. The morbidity ranges from 10.6% to 13.8% of all hospital admissions, and mortality, accounts for 11% to 18% of hospital deaths.

Several species of *Anopheles* mosquitoes transmit malaria parasite in PNG. The main malaria vector, *Anopheles farauti*, belongs to the *Anopheles punctulatus* group. In the low-lying areas, the malaria mosquito breeds abundantly in riverbanks, marshes, lagoons and estuaries throughout the year, causing heavy transmission of malaria throughout the year. All malaria vectors in PNG prefer human blood, feed outside the houses as well as inside, and after feeding, rest mostly outside the houses.

1.2.1 Malaria endemicity in coastal areas and the islands

The coastal and islands areas of Papua New Guinea, which cover about three fourth of its land mass and almost two thirds of its population, has a malaria endemicity that varies from hyperendemic to holoendemic. This includes the whole country other than the highlands and the mountainous parts of the Northern Province and the West Sepik Province. In the malaria hyperendemic areas, such as the Trobriands and mountain slopes in Milne Bay, Morobe, Madang, East Sepik, and West Sepik, occasional epidemics occur over and above the existing endemicity.

People in these areas are continuously exposed to malaria, often contacting more than four episodes in a year. As a result, they have developed a partial immunity that protects them from serious illness and death due to malaria. Very young children, pregnant women, and new comers to the area, having no immunity to malaria, suffer the most consequences of the infection. Surveys have shown that 20% to 40% of seemingly healthy population carry malaria parasites (mostly *Pf*).
As far back as in early 70’s it has been shown that DDT spraying is of no value in this zone. Control of vector breeding sites may be helpful only in urban centres and developmental work sites. Until the introduction of insecticide-treated mosquito nets (ITN), there was no dependable vector control measure for these areas. Currently, the effective strategies for malaria control are the early treatment of cases and prophylactic drug administration to pregnant women, work forces in economic projects and immune suppressed persons and, ITN.

1.2.2 Malaria endemicity in the highlands

Malaria cases are reported in all parts of the highlands throughout the year due to the importation of the parasite from high endemic areas. However, malaria transmission does not occur in elevations above 1600 meters. In areas below 1300 meters such as the river basins, transmission of malaria may occur at very low levels throughout the year. Between 1300 meters and 1600 meters elevation malaria transmission occurs usually during warm humid period of the year (major peak in October to March and the minor peak in May - June).

In contrast to the high malaria endemic zone, people in the highlands infrequently experience malaria, and do not get the opportunity to develop immunity against malaria. When they contact malaria, the disease takes a virulent course, which may end in death.

Effective case management, with special emphasis on severe malaria, prophylactic drug administration to pregnant women and travellers to coastal areas, and houses insecticide residual spraying (IRS) in areas below 1600 meters elevation are the main strategies for malaria control in the highlands. ITN and control of vector breeding have their place in limited localities such as industrial sites, urban centres and new settlements. Insecticide spraying is effective because it shortens the life span and reduces the density of vector mosquitoes...

2.0 CLASSIFICATION OF MALARIA

2.1 Classified by parasite-based confirmation

2.1.1 Confirmed malaria

Clinically suspected malaria cases are confirmed by parasite-based tests, either microscopy or RDT.

Mass coverage of microscopy and RDT for malaria is implemented in most of the health facilities in PNG, so accurate classification of malaria cases by the species of malaria parasites is possible and necessary for classified treatment. Based on the species of parasites that infect patients, it can be further classified into

2.1.1.1 Falciparum malaria

Malaria caused by parasite Pf and marked by regular or irregular recurrence of paroxysms and usually prolonged or continuous fever. It is also called malignant tertian malaria.

2.1.1.2 Vivax malaria

Malaria in which the paroxysms recur every third day and are induced by parasite Pv. It is also called tertian malaria.
2.1.1.3 Malariae malaria

Malaria with paroxysms that recur every fourth day caused by \( Pm \). It is also called quartain malaria.

2.1.1.4 Ovale malaria

A relatively mild form of malaria caused by \( Po \) and characterized by tertian chills and febrile paroxysms and that usually ends spontaneously.

2.1.2 Suspected malaria

It refers to the feverish cases where the reason for fever is unconfirmed but there is a strong clinical suspicion of malaria. The reasons for the non-confirmation are the health facilities have not been provided the capacity of parasite-based tests by health managers.

When classified by clinical manifestation of malaria, there are two types of suspected malaria, i.e., suspected uncomplicated malaria and severe malaria

2.2 Classified by clinical manifestation

Clinical manifestation presents as either uncomplicated or severe malaria. When classified by species of malaria parasites, there are at least two types of uncomplicated malaria, i.e., uncomplicated falciparum malaria and vivax malaria, and at least two types of severe malaria, i.e., severe falciparum malaria and vivax malaria. It is necessary to differentiate them due to the treatments are different.

2.2.1 Uncomplicated malaria

This is usually characterized by fever in the presence of peripheral parasitemia. 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.

The classic symptom of malaria is cyclical occurrence of sudden coldness followed by \textit{rigor} and then fever and sweating lasting four to six hours, occurring every two days in \( Pv \) and \( Po \) infections, while every three days for \( Pm \). Falciparum malaria can have recurrent fever every 36–48 hours or a less pronounced and almost continuous fever.

2.2.2 Severe malaria

2.2.2.1 Severe falciparum malaria

This is the life threatening manifestation of malaria, and is defined as the detection of \( Pf \) asexual parasitemia in the peripheral blood and no other obvious cause of their symptoms in the presence of one or more of the clinical or laboratory features (singly or in combination) listed below:\[^2^]

- Prostration (inability or difficulty to sit upright, stand or walk without support in a child normally able to do so, or inability to drink in children too young to sit)
- Alteration in the level of consciousness (ranging from drowsiness to deep coma)
- Cerebral malaria (unrousable coma not attributable to any other cause in a
• patient with falciparum malaria
• Respiratory distress (acidotic breathing)
• Multiple generalized convulsions (2 or more episodes within a 24 hour period)
• Circulatory collapse (shock, septicaemia)
• Pulmonary oedema
• Abnormal bleeding (disseminated Intravascular coagulopathy)
• Jaundice
• Haemoglobinuria (black water fever)
• Acute renal failure – presenting as oliguria or anuria
• Severe anaemia (Hb <5g/dl or Hct < 15%)
• Hypoglycaemia (blood glucose level < 2.2 mmol/l)
• Hyperparasitaemia (parasitaemia of >200,000/µl - in high transmission area, or
  100,000/µl in low transmission area)
• Hyperlactataemia

2.2.2.2 Severe vivax malaria

The vivax malaria may cause a severe and debilitating febrile illness. It can also very occasionally result in severe disease as falciparum malaria. The reported severe vivax malaria manifestations are [3]:

• Cerebral malaria
• Severe anaemia
• Severe thrombocytopenia and pancytopenia
• Jaundice
• Spleen rupture
• Acute renal failure
• Acute respiratory distress syndrome
• Severe anaemia
• Acute pulmonary oedema

2.2.2.3 General danger signs of severe illness

In the facilities without lab tests of biochemical indicators, if children < 5 years old with confirmed or suspected malaria have one of the following general danger signs of severe illness[4], they should be regarded as severe malaria patients and treated accordingly:

• Inability to drink or breastfeed
• Vomiting everything
• Recent history of convulsions
• Lethargy or unconsciousness
• Inability to sit or stand up

3.0 PARASITOLOGICAL DIAGNOSIS OF MALARIA

The commonly used confirmatory tests to detect the presences of malaria parasites are microscopy or rapid diagnostic tests (RDTs). Quality assurance of microscopy and RDTs is vital for the sensitivity and specificity of the tools.

Important decision criteria
If you have available microscopy or the RDT kit – “test and treat” according to finding
If you do not have microscopy or the RDT kit – use the 10-step checklist for childhood illness to make diagnosis

### 3.1 Microscopy

Microscopy is the operational gold standard for parasitological diagnosis of malaria. This is done by examining a stained thick or thin blood smear 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.

Microscopic examination of stained blood films has a sensitivity range of 86-98% with a lower sensitivity in detecting low parasitaemia ($\leq 320/\mu l$). Various factors such as the stage of the malaria infection and previous medication may result in a parasitaemia below the detectable threshold by microscopy and necessitate repeating examination.

Parasites are quantified by counting ring forms against white blood cells. The results are expressed as parasite count/200WBCs or parasite counts/µl of blood (assuming a WBC count of 8000/µl or using the measured WBC counts of the patient where available).

### 3.2 Rapid diagnostic tests

Rapid diagnostic tests (RDTs) are immunochromatographic tests based on detection of specific parasite antigens, either *Plasmodium* lactate dehydrogenase (pLDH) activity or the presence of Histidine-Rich Protein (HRP). Most of the RDT tests available are specific for *Pf*, however, there are a few tests with the ability to differentiate between *Pf* and non-*Pf* malaria (*vivax, malariae and ovale*). RDTs are simple to use and are sensitive in detecting low parasitaemia. Use of RDTs is not recommended for follow-up, as most of the tests remain positive for up to two weeks following effective antimalarial treatment and clearance of parasites. They also cannot be used to determine parasite density.

### 4.0 Key principles of the new protocol

#### 4.1 Fever and confirmation of malaria infection

All fever and suspected malaria cases should be tested for malaria infection by microscopy or the Rapid Diagnostic Test (RDT).

#### 4.2 First and second line antimalarial drugs

Resistance of *Pf* to chloroquine is widespread in Papua New Guinea [5] and monotherapy of artemisinin and its derivatives or any of the combination partners medicines is not recommended for the treatment of falciparum malaria as it increases the risk of development of resistance of *Pf* to this efficient antimalarial drug (for summary see Table 1).

- The first line treatments are
  - artemether-lumefantrine (AL) tablets, a fixed dose combination ACT for uncomplicated falciparum malaria and suspected malaria,
  - artesunate injection followed by AL for severe malaria (both falciparum and vivax),
  - AL plus primaquine (PQ) for uncomplicated vivax malaria, and
- Quinine (QN) plus sulphadoxine/pyrimethamine(SP) for 1st trimester and AL for 2nd trimester of pregnancy
- The second line treatment is
  - dihydroartemisinin-piperaquine (DP), a fixed dose combination ACT for uncomplicated falciparum malaria and presumptive malaria,
  - QN plus doxycycline for severe malaria (both falciparum and vivax),
  - DP plus PQ for uncomplicated vivax malaria, and
  - QN tablets for 1st trimester and QN plus SP for 2nd trimester of pregnancy
- Never treat malaria with only one drug – monotherapy.
- Confirmatory parasitological diagnosis by microscopy or RDT should be undertaken before treatment. AL compliance and treatment completion must be ensured for the treatment to be effective.

### Table 1 Summary of first and second line treatment of malaria in PNG

<table>
<thead>
<tr>
<th>Conditions</th>
<th>First line treatment</th>
<th>Second line treatment</th>
</tr>
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<tbody>
<tr>
<td>Uncomplicated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Uncomplicated falciparum malaria and suspected malaria</td>
<td>AL tablets</td>
<td>DP tablets</td>
</tr>
<tr>
<td>2 Malariae malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Uncomplicated vivax malaria</td>
<td>AL plus PQ tablets</td>
<td>DP plus PQ tablets</td>
</tr>
<tr>
<td>4 Ovale malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Mixed infection of Pf/Pv/Po/Pm</td>
<td>Same as treatment of uncomplicated falciparum malaria, treat with PQ for 14 days if Pv infection</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Severe malaria (both falciparum and vivax)</td>
<td>Artesunate injection, followed by AL when patients can swallow</td>
<td>QN injection, followed by QN and doxycycline tabs when patients can swallow</td>
</tr>
<tr>
<td>Pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 1st trimester of pregnancy</td>
<td>QN tablets plus SP tablets</td>
<td></td>
</tr>
<tr>
<td>8 2nd and 3rd trimesters of pregnancy</td>
<td>AL tablets</td>
<td>QN tablets plus SP tablets</td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 1st trimester of pregnancy</td>
<td>artesunate injection</td>
<td>QN injection</td>
</tr>
<tr>
<td>10 2nd and 3rd trimesters of pregnancy</td>
<td>QN injection</td>
<td>Artesunate, QN or artemether injection</td>
</tr>
</tbody>
</table>

*: If the diagnostic results are “others” indicated by RDTs instead of *Pm, Pv or Po*, then treat those patients with AL plus PQ.

### 4.3 Early diagnosis and treatment

Early diagnosis and treatment of malaria is very important:
- To prevent deterioration and severe life-threatening complications e.g. severe malaria
- To return the patient quickly to health
- To reduce malaria transmission

Patients with malaria should also be advised to avoid mosquito bites (use bed nets, LLINs, personal protection, mosquito coils, insecticide treated materials, screened housing, environment vector control where possible) to reduce malaria transmission.

4.4 Increased diagnostic capability and targeted malaria treatment

The clinical and parasite-based diagnostic capability must be improved and increased to confirm either Pf or Pv to allow for appropriately targeted treatment for the type of malaria that the patient has. This is achieved by:
- Good quality microscopy expanded to all health centers. This is the gold standard and the most definitive diagnostic technique.
- Rapid diagnostic tests (RDTs) are introduced, especially to health facilities where microscopes or microscopists are not available or during emergencies.

4.5 Treatment of suspected malaria

Treatment of suspected malaria should be only given when:
- Blood tests are not available
- Clinical evidence for malaria is strong
- Severely sick patients where a parasitological confirmation is not immediately possible

The use of treatment of suspected malaria will be reduced along with the increasing coverage of AL. Better diagnosis will mean that the need to prescribe antimalarials based purely on clinical grounds will be reduced.

If clinical signs warrant, clinicians should have the option to treat suspected cases.

4.6 Targeting vivax malaria and G6PD deficiency

Vivax malaria has been steadily increasing in PNG.
- Good quality testing will diagnose vivax malaria and allow targeted treatment
- PQ is continued in this protocol for vivax malaria. PQ eliminates tissue forms of the parasite, reducing relapses and transmission.

Precautions on treatment of vivax malaria patients with G6PD deficiency
- PQ should NOT be given to patients with known G6PD deficiency.
- Patients taking PQ must be advised, that if their urine becomes dark, they must stop taking the PQ and return to the clinic.

4.7 Timing of doses and adherence by patients

Effective treatment depends on patients taking their medicines at the correct times.
- Particular attention to timing is important, as AL combinations have an unusual timing pattern in the first three doses.
- This combination is a twice a day (bd) regimen.
4.8 Health worker responsibilities

Health workers must pay very close attention to the drug labelling and patient counselling requirements of this protocol.

4.9 Treatment failure

The criteria for treatment failure will be:

a. Patient has completed a full course of antimalarial drugs or combination of drugs,
b. Did not vomit within half an hour after taking drugs or diarrhoea whilst taking treatment
c. Positive results of malaria parasite tests (if microscopy available) within 14 days after finishing full course of antimalarial treatment

What to do when the first line treatment fails:

- All patients with treatment failure within 14 days must be referred to the nearest health facility that has a microscope for parasitological confirmation. Rapid diagnostic tests are not recommended for confirmation in this instance.
- Treatment failure within 14 days of receiving an AL is very unusual and should be confirmed by microscopy, documented and reported

4.10 Referral of severe malaria patients

All patients with indications of severe malaria must be referred to the nearest hospital as soon as possible after a pre-referral treatment.

5.0 TREATMENT SCHEDULE FOR CHILDREN AND ADULTS

5.1 Treatment of uncomplicated falciparum malaria and suspected cases

5.1.1 First line treatment

Dosage
Artemether (A) 20mg+lumefantrine (L) 120mg Tab (AL):

- 2mg/kg/dose(A) & 12mg/kg/dose(L)
- 6 doses over 3 days given at 0h, 8h, 24h, 36h, 48h & 60h
- Best taken after a meal

Timing

☀ When treatment is started before 4pm on day 1:
  o Day 1:
    - 1st dose at 0 hours
    - 2nd dose 8 hours after 1st dose
  o Day 2:
    - 3rd dose in the morning
    - Fourth dose in the night
  o Day 3:
    - 5th dose in the morning
    - 6th dose in the night.

няти When treatment is started after 4pm of day 1:
Day 1:
- 1<sup>st</sup> dose at 0 hours

Day 2:
- 2<sup>nd</sup> dose in the morning
- 3<sup>rd</sup> dose in the night.

Day 3:
- 4<sup>th</sup> dose in the morning
- Fifth dose in the night.

Day 4:
- 6<sup>th</sup> dose in the morning

AL is not recommended for use in the 1st trimester of pregnancy.

Table 2 Tablets of AL for uncomplicated falciparum and suspected malaria by weight<sup>[6]</sup>

<table>
<thead>
<tr>
<th>Timing</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5</td>
</tr>
<tr>
<td>Day 1 1st dose at 0 hours</td>
<td>$\frac{1}{2}$</td>
</tr>
<tr>
<td>Day 1 2nd dose after 8 hours</td>
<td>$\frac{1}{2}$</td>
</tr>
<tr>
<td>Day 1 3rd dose after 24 hours</td>
<td>$\frac{1}{2}$</td>
</tr>
<tr>
<td>Day 2 4th dose after 36 hours</td>
<td>$\frac{1}{2}$</td>
</tr>
<tr>
<td>Day 2 5th dose after 48 hours</td>
<td>$\frac{1}{2}$</td>
</tr>
<tr>
<td>Day 2 6th dose after 60 hours</td>
<td>$\frac{1}{2}$</td>
</tr>
</tbody>
</table>

*0 hours is the time when the first dose of AL treatment is given. The second dose must be given 8 - after the first dose. It must not be earlier than 8 hours.*

*If patients vomit within one hour, the dose should be repeated.*

*For babies less than 5 kg, it is recommended that the dose of 2mg/kg/dose (A) & 12mg/dose/kg (L) be used. This will amount to half of one tablet.*

Malaria is not a common cause of fever in this age group and so they should be properly investigated. Antimalarial should only be used after confirmatory diagnosis and if possible these small infants should be managed in a hospital and treatment supervised.

### 5.1.2 Second line treatment

Dosage

DP is a fixed formulation and contains 40 mg dihydroartemisinin and 320 mg piperaquine per tablet.

Administered with a dihydroartemisinin dose of 2.1 mg per kilogram and a piperaquine phosphate dose of 17.1 mg per kilogram daily for 3 days (total dose of dihydroartemisinin is 6.4 mg per/kg and total dose of piperaquine phosphate 51.2 mg/kg<sup>[7,8]</sup>). ,

<table>
<thead>
<tr>
<th>Table 3 dosage of DP</th>
</tr>
</thead>
</table>
### 5.2 Severe falciparum malaria treatment

#### 5.2.1 Pre-referral treatment

All patients with indications of severe malaria that be managed locally MUST be referred to the nearest hospital or referral centre, (wherever possible).

**5.2.1.1 At Aid Post and/or Health Sub-centre level**

- Give artesunate suppository 10mg/kg once
  - Artesunate suppositories are available in 50mg & 200mg strengths. They can be cut in half (see Annex 1)
  - To prevent expulsion, hold the buttocks of children together for 10 minutes after insertion. If suppository is expelled within 30 minutes, give another suppository.
  - All effort to refer the patient should be undertaken, however in the few occasions where referral may not be immediately possible, repeat the dose of AS suppository after 24 hours then
  - Continue the AS suppository daily until referral becomes possible OR patients are able to swallow oral medication, than start a full course of AL.

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-5.9</td>
</tr>
<tr>
<td>50mg</td>
<td>½</td>
</tr>
<tr>
<td>200mg</td>
<td>-</td>
</tr>
</tbody>
</table>

*After inserting 3 suppositories, wait at least 10 minutes before inserting another suppository.*

**For children with body weight lower than 3 kg, malaria is not common in this age group, other cause of fever must be fully looked for, and management/ care should be supervised in a hospital setting.**

**5.2.1.2 At Health Center level**

- If patient was referred from AP/ HSC and if AS suppository was administered as pre-referral treatment
  - Give first doses of AS injection (as per protocol for severe malaria) at least 12 hours after the time the last dose of artesunate suppository was administered.
  - Continue parenteral (IV/IM) AS until referral to a hospital is possible.
If patients’ condition does not improve, continue parenteral AS and refer to a hospital.

- If no treatment has been given as yet
  - Commence parenteral AS and refer to the nearest hospital
  - Give artesunate suppository if AS not available

- If patient markedly improves whilst waiting for referral
  - Continue AS to complete at least three doses of parenteral treatment then continues with AL to complete the 3-day course as in the treatment of uncomplicated malaria.

### 5.2.1.3 At HC/hospital level

- Take a malaria slide to confirm malaria infection
- Assess whether patient completed full course of AL therapy
  - If completed full course of AL
    - DP (see Table 3 for dosage)
  - If did not complete full course of AL
    - Give artesunate IV/IM followed by full course of AL under supervision.

### 5.2.2 First line treatment of severe malaria

Artesunate injection is first applied, and then followed by a full course of AL when patients can tolerate oral therapy (see Table 2).

- Artesunate 60mg Inj (AS), dose 2.4mg/kg per dose
  - Although the dosage in mg is the same for IV and IM use, the concentration of the mixtures is different because of the different ways in which the mixtures are prepared.
    - For IV use, the mixture is 60mg in 6ml
    - For IM use, the mixture is 60mg in 3ml
  - For preparation of artesunate injection, see Annex 2.
- Commence artesunate IV/IM, 2.4mg/kg per dose
  - Give a dose on admission, the next dose 12 hours later and then one dose daily
  - Give for a minimum of 2 doses and continue until the patient can take swallow, then complete full course of AL (see Table 2)
- If artesunate is not available, QN injection should be given using the doses indicated in Table 6
- When the patient can tolerate oral treatment, give a full cause of AL (see Table 2).

**Dosage of artesunate:** See Table 5.

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Days and doses</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60mg in 6ml</td>
<td>Day 1: 1st dose &amp; 2nd dose (12h)</td>
<td>3-5</td>
</tr>
<tr>
<td></td>
<td>1ml</td>
<td>2ml</td>
</tr>
</tbody>
</table>
What is implied here are
1. Oral medication when patient is able to take oral medication
2. Even when patients are able to tolerate oral medication within 24 hours of treatment, they should receive at least 24 hours of parenteral treatment before switching to oral. This is particularly important in such severe cases as severe malaria anaemia where the patient is able to tolerate oral medication from the onset, they should still receive at least 24 hours of parenteral treatment before the switch to oral medication.

### 5.2.3 Second line treatment for severe malaria

Indications for second line treatment:
1. Treatment failure of the artemisinin derivatives; or
2. Allergy to artemisinin derivatives.

The drugs for second line treatment are QN injection followed by QN tablets when patient is able to swallow.

**Dosage**

- QN 600mg in 10ml injection (QN)
  - **Loading Dose (LD):** IM 20mg/kg, or
    - IV 20mg/kg given over 4 hours
  - **Maintenance Dose (MD):** IM 10mg/kg, or
    - IV 10mg/kg given over 2 hours
    - **Children:** give MD 12 hours after START of LD
    - **Adults:** give MD 8 hours after START of LD
  - Continue giving MD at specified intervals (of 8 hours, WHO) after START of previous MD until patient can take oral treatment.
- When the patient can swallow, give QN tablets (QN) at 10mg/kg every 8 hours for 7 days (see Table 3) plus doxycycline tablets (3.5 mg/kg of body weight daily, 200mg/day for adults for 7 days).

<table>
<thead>
<tr>
<th>Table 6 Second line treatment for severe falciparum malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>QN</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>LD (20mg salt/kg)</td>
</tr>
<tr>
<td>1ml</td>
</tr>
<tr>
<td>MD (10mg salt/kg)</td>
</tr>
</tbody>
</table>

1. The formulation of QN is QN 600mg in 10ml ampoule.
2. If the total volume of QN injection for intramuscular use is more than 3ml, the volume should be halved and one-half injected in each thigh.
Notes on using QN injection
- If volume of QN injection for IM use is more than 3ml, the volume should be halved and one-half injected in each thigh.
- If giving IV, the amount needs to be infused slowly (LD over 4 hours, MD over 2 hours)
- The maintenance dose is given every 8 hours for adults and every 12 hours for children (commenced 8 hours after the LD in adults, 12 hours after the LD in children)

5.3 Treatment schedules of vivax malaria

5.3.1 First line treatment

Vivax malaria is treated with AL plus PQ
- Artemether 20mg & Lumefantrine 120mg Tab (AL): 2mg/kg(A) & 12mg/kg(L)
  - 6 doses over 3 days given at 0h, 8h, 24h, 36h, 48h, & 60h
- PQ: 0.25mg/kg daily for 14 days after 3 days of AL
<table>
<thead>
<tr>
<th>AL</th>
<th>Timing</th>
<th>Weight (kg)</th>
<th>PQ</th>
<th>Timing</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5-</td>
<td>15-</td>
<td>25-</td>
<td>34.9</td>
</tr>
<tr>
<td>5-</td>
<td>&lt;5</td>
<td>14.9</td>
<td>24.9</td>
<td>34.9</td>
<td>25-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15-</td>
<td>25-</td>
<td>34.9</td>
<td>&gt;35</td>
</tr>
<tr>
<td>25-</td>
<td>25-</td>
<td>34.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;35</td>
<td>&gt;35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Day 1
1st dose at 0 hours ½ 1 2 3 4
2nd dose after 8 hours ½ 1 2 3 4

Day 2
3rd dose after 24 hours ½ 1 2 3 4
4th dose after 36 hours ½ 1 2 3 4

Day 3
5th dose after 48 hours ½ 1 2 3 4
6th dose after 60 hours ½ 1 2 3 4

1. AL alone has a different weight band for its treatment schedule from the other drug, PQ.
2. PQ is for radical cure for patients with confirmed/suspected \( P_v \) and \( P_o \) infections (optional)

All patients prescribed PQ must be advised that if their urine becomes dark (reddish brown), they must stop taking PQ and return to the clinic. Other medication should be continuing if not completed. 1st dose of PQ must stay at clinic for minimum 1 hour.

PQ is not recommended in pregnant mothers (Give PQ after delivery), Infants less than one year or <10kg, and patients with severe G6PD deficiency.
5.3.2 Second line treatment

DP (see table 3 for dosage) is the second line treatment of vivax malaria.

5.4 Treatment of malariae malaria

The drug for treatment of malariae malaria is the same as that for vivax malaria treatment but excluding PQ see Table 6 for the doses and schedule of treatment.

5.5 Treatment of ovale malaria

The drugs for treatment of ovale malaria are the same as those for vivax malaria treatment. See Table 6 for the doses and schedule.

5.6 Treatment of mixed Pf and Pv/Pm/Po infections

If confirmed with microscopy, same as treatment of uncomplicated falciparum malaria (see Table 2). Treat with PQ for 14 days if Pv infection (see Table 7).

6.0 TREATMENT SCHEDULE OF FALCIPARUM AND VIVAX MALARIA IN PREGNANCY

6.1 Uncomplicated malaria

6.1.1 First line treatment of uncomplicated malaria in pregnancy

- 1st trimester:
  - QN plus SP: oral administration of QN tablets at 10mg/kg per dose every 8 hours for 7 days and SP a single dose on the first day (See Table 8 for dosage).
- 2nd and 3rd trimester:
  - AL: oral administration of AL (see Table 2 for treatment schedule).

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Formulation</th>
<th>QN Tabs/dose</th>
<th>Total Tabs/day</th>
<th>Duration</th>
<th>Formulation</th>
<th>SP Tabs/single dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>300 mg/tab</td>
<td>1.5</td>
<td>3</td>
<td>7 days</td>
<td>500 mg of sulfadoxine an 25 mg of pyrimethamine</td>
<td>2</td>
</tr>
<tr>
<td>&gt;=50</td>
<td></td>
<td>2</td>
<td>4</td>
<td>7 days</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

6.1.2 Second line treatment of uncomplicated malaria in pregnancy

- 1st trimester
  - QN tablets for seven days
- 2nd and 3rd trimester:
  - QN plus SP: oral administration of QN tablets (QN) at 10mg/kg per dose every 8 hours for 7 days and SP a single dose on the first day (See Table 8 for dosage).
6.2 Severe malaria in pregnancy

For severe malaria\[^9\] in pregnancy, the treatment is

- 1\(^{st}\) trimester:
  - Artesunate injection is first applied for 7 days (see Table 5) or
  - QN injection (see Table 6 for dosage) followed by QN tablets plus SP (See Table 8 for dosage) when patient is able to swallow.

- 2\(^{nd}\) and 3\(^{rd}\) trimester:
  - The first option: artesunate injection for 7 days (see Table 5)
  - The second option: artemether injection for 7 days\[^{10}\] (see Table 9)
  - The third option: QN injection (see Table 6 for dosage) and followed by QN and SP tablets (See Table 8 for dosage) when patient is able to swallow.

<table>
<thead>
<tr>
<th>Time</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-36.9</td>
<td>37-43.9</td>
</tr>
<tr>
<td>Day 1 (ml/day)</td>
<td>1.5</td>
</tr>
<tr>
<td>Day 2-7 (ml/day)</td>
<td>0.75</td>
</tr>
</tbody>
</table>

*Artemether (80mg/ml)

7.0 MALARIA PROPHYLAXIS

7.1 Prophylaxis in pregnancy

There are two options here for prophylaxis in pregnancy.

### 7.1.1 IPTp-SP

IPTp consists in the administration of a single curative dose of an efficacious anti-malarial drug at least twice during pregnancy regardless whether or not the woman is infected\[^{11}\].

IPTp-SP refers to administration of three tablets of SP (1500 mg sulphaadoxine/75 mg pyrimethamine) each time for 2 to 3 times to women in pregnancy\[^{12}\].

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Daily dose (tabs)</th>
<th>Duration of treatment</th>
<th>Total tablets /</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP</td>
<td>500-25mg tabs</td>
<td>3 tabs in single dose</td>
<td>repeated 3 times (2nd and 3rd trim.)</td>
</tr>
</tbody>
</table>

IPTp-SP should be given to women of all gravidities. The first dose should be administered at the first ANC visit after quickening or after 18-20 weeks. Following doses should be given at least one month apart. The delivery of IPTp-SP with each scheduled visit after quickening will
assure that a high proportion of women receive at least two doses. IPTp-SP doses should not be
given more frequently than monthly\textsuperscript{[14,15]}.

HIV-infected pregnant women in malaria endemic areas who are already receiving
cotrimoxazole prophylaxis should not also receive IPTp-SP\textsuperscript{[16]}.

\textbf{7.3 Prophylaxis for travellers}

Queries on malaria prophylaxis for travelling in PNG and abroad should be addressed to
Malaria and Vector borne Disease Control Unit, Disease Control Branch, and National
Department of Health.

For inbound travellers, the options are

\begin{itemize}
  \item \textbf{Malarone}:
    \begin{itemize}
      \item 1 adult tablet (fixed-dose combination of atovaquone 250 mg + proguanil hydrochloride
            100 mg) daily beginning 1–2 days before exposure, throughout exposure, and
            continuing for 7 days after departure from the malaria risk area\textsuperscript{[17]}.
    \end{itemize}

  \item \textbf{Doxycycline}:
    \begin{itemize}
      \item 100-mg daily tablet of a monohydrate doxycycline salt for adults. Take doxycycline 2
days prior to travel and 1 week after departure from malarious areas.
    \end{itemize}
\end{itemize}

Four outbound travellers, consult WHO website for more information.
8.0 GENERAL ANTIMALARIAL DRUG INFORMATION

8.1 Artemether/Lumefantrine tablets
- Dosage form and ingredients: each tablet for oral administration contains artemether 20mg and lumefantrine 120mg.
- Indications: as first line drugs for uncomplicated *Pf* & *Pv* malaria treatment.
- Available: APs, HSCs, HCs, hospitals.
- Precautions: prolonged ECG interval.
- Contraindication: allergy to artemether or lumefantrine; first trimester of pregnancy.
- Side effects: Headaches, dizziness, sleep disorder, palpitations, anorexia, nausea, vomiting, diarrhoea, itch, rash, and weakness.
- Patient counseling: best taken after fatty or oily food. Do not miss any doses. Finish the course.

8.2 Artesunate suppositories
- Dosage forms and ingredients: there are two forms of suppositories for rectal administration; each contains 50mg or 200mg of artesunate.
- Indications: as the pre-referral treatment drug for severe malaria.
- Available: APs, HSCs & HCs.
- Side effects: dizziness, headache.

8.3 Artesunate injections
- Dosage forms and ingredients: there are two forms of artesunate injection. The form for intravenous administration contains artesunate 60mg in 6ml vial and the form for intramuscular administration contains artesunate 60mg in 3ml vial.
- Indications: as first line drugs for severe *Pf* & *Pv* malaria treatment.
- Available: HCs, hospitals.
- Side effects: dizziness, headache.

8.4 Quinine tablets and injections
- Dosage and ingredients: one tablet for oral administration contains QN (sulphate) 300mg; one ampoule for intravenous or intramuscular administration contains QN (dihydrochloride) 600mg in 10ml.
- Indication: as second line drug for severe *Pf* & *Pv* malaria treatment.
- Available: hospitals.
- Precautions: heart arrhythmias. Use with caution in patients with G6PD deficiency. QN can cause hemolysis in G6PD deficiency but again this risk is small and the physician should not hesitate to use QN in patients with G6PD deficiency when there is no alternative.
- Side effects: hypoglycaemia, gastrointestinal disturbances, CNS disturbances, tinnitus, headache, nausea, vertigo, fever, rash
- Patient counseling: May cause dizziness. Take regularly at the same times every day. Finish the course.

8.5 Primaquine
- Dosage forms and ingredients: Tablet 7.5mg
- Indications: as a partner drug for treatment of *Pv* malaria to prevent relapse and transmission.
- Available: APs, HCs, and hospitals
- Precautions: lupus erythematosus, rheumatoid arthritis, G6PD deficiency.
- Side effects: abdominal pain, nausea and vomiting (if taken on an empty stomach), dizziness, headache, haemolytic anaemia
- Patient counseling: take after food. Finish the course to eliminate all malaria parasites from the liver & stop relapse. If urine becomes dark stop taking PQ and return to the clinic.

8.6 Malarone
- Atovaquone-proguanil (AP) is a fixed dose combination of the antimalarial drugs atovaquone and proguanil hydrochloride and is marketed in North America under the trade name Malarone (GlaxoSmithKline, Inc.). The adult tablet combination consists of 250 mg atovaquone and 100 mg proguanil hydrochloride, whereas the paediatric formulation contains 62.5 mg atovaquone and 25 mg proguanil per tablet.
### 9.0 COMPARISON OF ANTIMALARIAL DRUGS AVAILABLE IN PNG

<table>
<thead>
<tr>
<th>Drug</th>
<th>Form</th>
<th>Indication</th>
<th>Treatment Duration</th>
<th>Half life</th>
<th>Safe for use in Pregnancy</th>
<th>BF</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$P_f$, $P_v$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>Tab</td>
<td>Yes, Yes</td>
<td>3 days</td>
<td>A-3h, L-4 days</td>
<td>Avoid in 1st trimester</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>AS</td>
<td>Inj.</td>
<td>Yes, Yes</td>
<td>1 to 6 days</td>
<td>30 min</td>
<td>Avoid in 1st trimester</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>AS</td>
<td>Supp.</td>
<td>Yes, Yes</td>
<td>1 to 6 days</td>
<td>2h</td>
<td>Avoid in 1st trimester</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PQ</td>
<td>Tab</td>
<td>No, Yes</td>
<td>14 days</td>
<td>3-6 h</td>
<td>No</td>
<td>Yes</td>
<td>&gt;10kg</td>
</tr>
<tr>
<td>QN</td>
<td>Inj/Tab</td>
<td>Yes, Yes</td>
<td>3, 7 or 10 days</td>
<td>11h</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

AL = Artemether-Lumefantrine; AS = artesunate; BF = Breastfeeding;
Wash hands
Put on gloves
Remove the suppository from its package and place onto a clean surface.
Using forceps, hold the suppository in the horizontal position
Using a clean/sterile blade cut on the long axis of the suppository (as shown by the arrow the illustration) to get equal halves of the suppository
Administer half of the suppository as required using gloved hands. Discard unused half
ANNEX 2 PREPARATION OF ARTESUNATE INJECTION

- Each pack of artesunate injection should contain
  - Artesunate 60mg vial;
  - Sodium bicarbonate 1ml;
  - Sodium chloride 5ml

- Preparation
  Artesunate powder for injection is difficult to dissolve and care must be taken to ensure that it is completely dissolved before IV or IM use.

  For Intravenous Use:
  - Add 1ml of sodium bicarbonate to the artesunate powder for injection and SHAKE WELL until the solution becomes clear.
  - Add 5 ml of sodium chloride and SHAKE WELL again.
  - This gives a concentration of 60mg in 6ml
  - The required amount should be given by slow IV injection over 2 - 3 minutes.

  For Intramuscular Use
  - Add 1ml of the sodium bicarbonate to the artesunate powder for injection and SHAKE WELL until the solution becomes clear.
  - Add 2ml of the sodium chloride and SHAKE WELL again.
  - This gives a concentration of 60mg in 3ml

Important points in using artesunate injection
- The prepared artesunate injection should always be used immediately
- Partially used vials should be discarded
- If the solution is cloudy or a lump is present, it should be discarded.

Artesunate injection will be available in HC, & hospitals.
- For severe malaria in AP and HC, give artesunate (AS) suppositories and refer to the nearest HC, or hospital.

ANNEX 3 PATIENT COUNSELING

Take after food.
- This may be problematic for malaria patients who are often not eating
- Encourage them to eat as much as they can.

Vomiting
- If vomiting occurs within 1 hour of taking a dose, another dose must be taken or given.

Drink plenty of fluids
- Water, coconut juice, or ORS (Oral Rehydration Solution) can be given.

Timing of doses
- This may be a problem for patients taking AL due to its unusual dosing pattern. It is important that patients be advised well on when to take their medicine according to the treatment schedule in this protocol (see Table 1).
- Take entire dose.