Clinical Guidelines on the Management of Suspected Malaria

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Contents

Emergency Contact Numbers

Emergency Hospital Contact		Contact Numbers
Beaumont Hospital	*Exchange*	01 809 3000
	St John's Infectious Diseases Dept	01 809 3006
Our Lady of Lourdes Hospital, Drogheda		041 987 4600
St James's Hospital Dublin 8		01 410 3000
St Vincent's University Hospital Dublin 4		01 221 4000
Mater Misericordiae University Hospital Dublin 7		01 803 2000
University Hospital Limerick		061 301111
University College Hospital Galway		091 544544
Sligo General Hospital		071 917 1111
Cork University Hospital		21 492 2000

1: Introduction

Malaria is a common and extremely serious tropical infection caused by the Plasmodium parasite. More than 200 species of the Plasmodium genus have been identified, 11 of which are known to infect humans. Malaria is a vector-borne infection; the vector is usually a mosquito, infection being transmitted through the bite of an infected female mosquito. All Plasmodium species responsible for human disease are transmitted by mosquitoes of the genus Anopheles. Mosquito genera including Culex and Aedes can also transmit malaria, but none have been demonstrated to do so to humans. The parasite has two hosts involved in its life cycle: the vector, and a vertebrate host. Non-human forms of malaria can infect other vertebrates including monkeys, apes, rodents, birds, and reptiles.

2: Epidemiology

Malaria is a major public health problem in more than 100 countries; an estimated 3.4 billion people are at risk of malaria, of which 1.2 billion are at high risk.[1] WHO estimated that, in 2013 there were more than 200 million cases of malaria globally, resulting in an estimated 620,000 deaths, primarily in Sub-Saharan Africa. Three quarters of these deaths were in children under the age of five.[1] Malaria is concentrated densely in a small number of countries; taken together, the Democratic Republic of the Congo and Nigeria account for over 40% of the estimated total of malaria deaths globally.

While the great majority of cases occur in tropical Africa, malaria is also found on the Indian subcontinent, Southeast Asia, Central and South America, Hispaniola (Haiti and the Dominican Republic), the Middle East, and Oceania.[2]

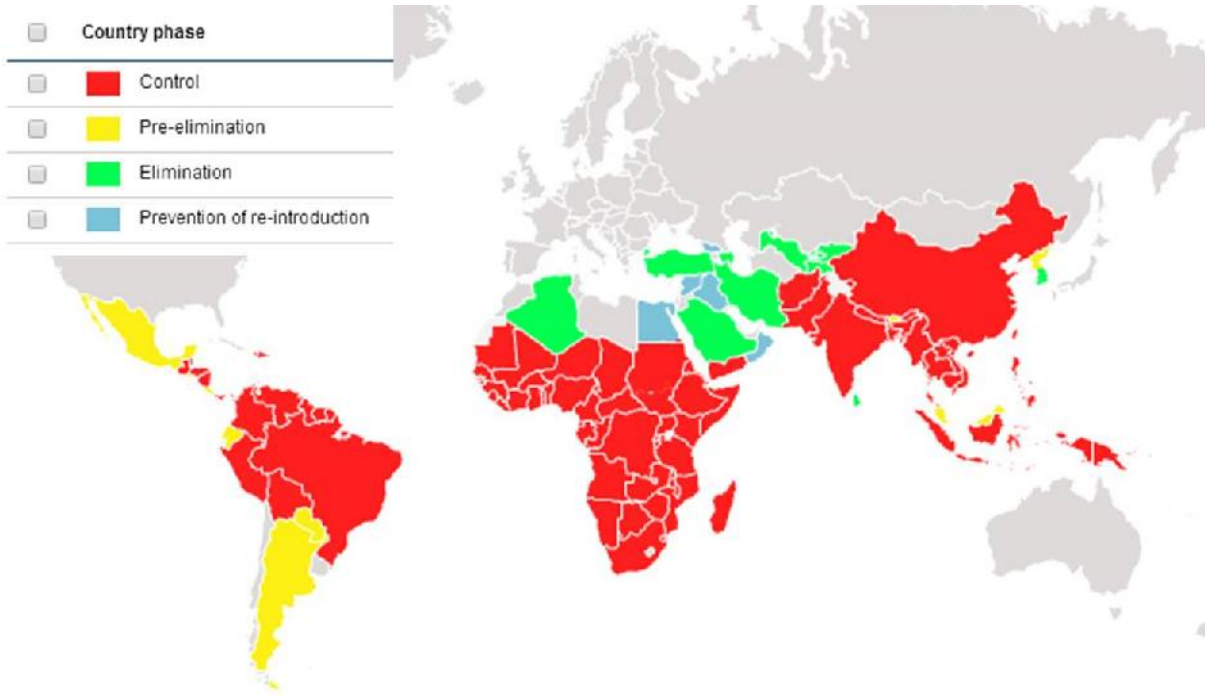

Figure 1: Global Distribution of Malaria (2014)[2]

In developed countries, malaria is commonly encountered. Between 2007 and 2011, an average of 77 cases of malaria was notified annually in Ireland (range 61-90) (CIDR data, 2014). In Ireland and the UK, the case fatality rate for malaria is about 0.5%.[3,4] In developed countries, a majority of malaria patients admit to not taking their chemoprophylaxis at all or incompletely (in Ireland three quarters of notified malaria cases took no malaria prophylaxis while travelling, and, of those who did, less than a quarter reported took as directed).[4] Furthermore, in Ireland, between 2001 and 2009, where recorded,75% of all malaria cases were acquired in Sub-Saharan Africa, while about 5% were acquired in Southeast Asia. Eighty-five percent of notified malaria cases were Plasmodium falciparum.[4]

Malaria in humans is caused by five species of Plasmodium: falciparum, ovale, vivax, malariae and, more recently, knowlesi (a variant that causes malaria in monkeys, chiefly in South-East Asia). P. falciparum is the most severe form of malaria, and along with P. vivax, the most commonly encountered. More than 90% of malaria deaths are as a result of falciparum infection.

About 20 different Anopheles species are key malaria vectors around the world. All of the important vector species bite at night (hence the need for bed nets). Anopheles mosquitoes breed in water. Transmission is more intense in regions where the mosquito lifespan is longer (giving the parasite more time to complete its development within the vector), and where it has a preference for human rather than non-human biting (i.e. African vector species have the longest lifespan, and strongest human-biting predisposition which is the primary reason that >90% of global malaria deaths are in Africa).

Severe malaria is usually caused by P. falciparum and is generally fatal in the absence of a reasonable standard of medical care. Even with treatment, about 1% of patients die; this can rise as high as 14% among children in parts of Sub-Saharan Africa.[5] Overall, 11% of children in Africa who develop cerebral malaria are discharged with gross neurological deficits.[6] P. ovale, vivax and malariae usually have a more benign course. P. falciparum owes its virulence to its ability to affect the behaviour of red blood cells. Erythrocytes infected with P. falciparum become 'sticky', and adhere to capillary endothelial cells. This process – sequestration - leads to progressive reduction in blood flow and ischaemia, primarily in the brain, lungs and kidneys. When sequestration occurs in the brain, it produces cerebral malaria, which results from blockage of the microvasculature caused by clumping of sequestered erythrocytes coupled with inflammatory exudation from capillaries.[7]

All cases of malaria are notifiable to the local Medical Officer of Health

Malaria is a notifiable disease in Ireland (all medical practitioners, including clinical directors of diagnostic laboratories, are required to notify the Medical Officer of Health (MOH)/Director of Public Health (DPH) of certain diseases, including malaria).[8]

In travellers returned from or anyone from malaria-endemic areas (Africa, the Middle East, South Asia, South-East Asia, East Asia, Central America, South America and Caribbean), with an influenza-like illness (fever, headache, myalgia, arthralgia) or pyrexia, malaria should be considered.

It is essential to obtain the following information:

- Travel history (up to 1 year): places travelled, dates and durations of stay
- History of malaria chemoprophylaxis
- Previous history of exposure to malaria infection

If malaria is suspected, ALWAYS ask the following:
- Travel history
- Chemoprophylaxis
- Past history of malaria
- Co-morbidities

- Co- morbidities such as HIV, renal disease, diabetes

The incubation period for malaria, following a bite from an infected Anopheles mosquito, typically varies from seven to 30 days (but can extend to up to 12 months). The incubation period is generally shortest in the case of falciparum malaria and rather longer in the case of P. malariae. The incubation period can be considerably extended in instances where the subject has taken anti-malarial prophylaxis. In some cases, this can be delayed for weeks or even months (particularly in the case of infection with P. vivax and P. ovale, both of which can produce dormant liver-stage parasites). Since this possibility exists, it is crucial that any medical assessment of a febrile patient considers the possibility of malaria in those who have travelled to/through malarious areas in the preceding 12 months, to reduce the potential for missed diagnosis.

3: Diagnosis

Malaria generally presents as a febrile illness, characterised by rigors and sweating. Classical malaria (which is, incidentally, rarely observed) consists of paroxysms or attacks lasting less than half a day (generally 6-10 hours), comprising:

Suspected malaria in Ireland is a medical emergency

- An initial ‘cold’ stage (sensation of cold, shivering)
- Followed by a ‘hot’ stage (fever, headaches, vomiting; seizures in young children) and
- Finally a ‘sweating stage’ (profuse sweating)

followed by temporary resolution with return to normal temperature and lassitude.

These attacks occur every second day with the "tertian" parasites (Plasmodia falciparum, vivax, and ovale) and every third day with the "quartan" malaria (P. malariae).

More commonly, the patient presents with a variable combination of symptoms:

- Fever
- Chills
- Sweating
- Headache
- Nausea/ vomiting
- Myalgia and
- General malaise and lassitude

Unfortunately, in those countries where malaria is uncommon, these symptoms may be attributed to influenza, upper respiratory, or other common infections, particularly if the diagnosis is not suspected.
Physical examination commonly reveals:

- Pyrexia
- Perspiration
- Splenomegaly
- Hepatomegaly

- Tachycardia
- Mild icterus (occasionally)

3.1: Symptoms and Signs

Although the following are common symptoms and signs, malaria can have very atypical presentations. Return from an endemic area should raise the index of suspicion.

Table 1: Common Clinical Features of uncomplicated and complicated malaria

Uncomplicated malaria	Severe malaria (mainly in falciparum)
• Pyrexia • Flu-like illness • Myalgia • Arthralgia • Lassitude • Headache • Anorexia • Vomiting • Abdominal pain • Lower back pain • tachycardia	• Impaired consciousness / coma • Convulsion • Hypoglycaemia • Severe normocytic anaemia • Metabolic acidosis • Coagulopathy with DIC • Hyperparasitaemia >5% (Death may occur with parasitaemia <1%) • Pulmonary oedema • ARDS • Acute renal failure • Haemoglobinuria • Circulatory shock • Splenic rupture (in vivax)

4: Differential Diagnosis

Malaria will often present as undifferentiated fever and can present in ways that may mimic a range of conditions including:

- Dengue Fever
- Typhoid Fever
- Pneumonia
- Influenza
- African Trypanosomiasis (Sleeping Sickness)
- Ehrlichiosis (tick-borne)

The differential diagnosis of malaria includes:

- Dengue Fever
- Typhoid Fever
- Pneumonia
- Influenza
- Severe sepsis
- UTI
- Meningitis
- Leptospirosis
- Skin infection,
- Soft tissue infections
- VHFs
- **Any** cause of sepsis

A high index of suspicion is necessary, to ensure that a diagnosis of malaria is not missed. Meningitis, leptospirosis, viral haemorrhagic fevers and babesiosis may present in a way that can mimic malaria. Virtually any febrile illness can, potentially, mimic malaria, including sepsis (especially severe sepsis), urinary tract infection, and skin and soft tissue infections.

NB: Viral Haemorrhagic Fevers: In the case of patients who presents with fever and a history of travel to a VHF endemic area in the last three weeks, there is a risk assessment algorithm and clinical risk assessment form available on the HPSC website, to assist in diagnosis. The assessment tools for assessing possible cases of VHF are available at http://www.hpsc.ie/A-Z/Vectorborne/ViralHaemorrhagicFever/Assessingapossiblecase.

A patient presenting with fever (however low) with a history of travel to a malarious area or any previous history of malaria, must be considered to be infected with malaria until proven otherwise.

Differentiating malaria from other infective conditions is dependent upon careful history taking, examination and laboratory diagnostics.

Differential History Taking:

a) Suggestive: Features that strongly suggest malaria include:

- Cyclical episodic rigors
- High fever
- Profuse sweating (especially during episodes of rigors)

Any febrile patient with:
- a history of travel to, or through, a malarious area or
- A previous history of malaria

must be considered as having malaria, until proven otherwise

b) Non-suggestive: Features not suggestive of malaria:

- Bleeding diatheses
- Productive cough
- Profuse diarrhoea
- Allergic symptoms and signs

c) Travel history: The patients travel history may provide important confirmatory or exclusion pointers:

- Travel to malarious areas
- Exposure to local water (especially if of poor hygiene quality)
- Exposure to local food

d) Antimalarial prophylaxis: It must be borne in mind that no antimalarial drug is 100% protective and must be taken in combination with the use of personal protective measures. Occasionally, even when taken in the correctly prescribed way, with the use of nets, etc, malaria can still occur.

Has the patient taken:

1. The appropriate antimalarial prophylaxis?
2. The correctly prescribed dose?
3. For the correctly prescribed timescale?

No antimalarial drug is completely effective – fever in a returning patient who has taken prophylaxis correctly, can still be caused by malaria

e) Travel Vaccination History: is the patient vaccinated against other infections that could mimic malaria (NB it is important to remember that even if vaccinated, no vaccine is completely efficacious, and a history of vaccination does not rule out these conditions)?

- Yellow Fever
- Typhoid vaccination
- Influenza vaccination

5: Acute Clinical Approach

Urgent: malaria parasitaemia testing is essential for all who have both suggestive symptoms and a relevant travel history. Contact the haematology laboratory for an urgent test.

Rapid Diagnostic test: These are reliable in inexperienced hands, and some can speciate the infection.

Stained thick and thin blood films: The thick blood film has high sensitivity in experienced hands, while the thin film is more useful in species identification and quantification of infection. Diagnosis cannot be excluded without three negative blood tests each 12h apart.

5.1: General Management of Malaria

Suspected malaria (irrespective of species) in Ireland is a medical emergency and patients should be urgently referred to the nearest Emergency Department. All such patients should be admitted to hospital and have an immediate septic screen (urine for microscopy and culture, chest X ray, blood culture) prior to antibiotic therapy.

Haematological and biochemical screens (FBC, U&E, LFTs), blood glucose, coagulation screen, malaria parasite screen, Type & Screen and ECG should be performed. Malaria diagnostic tests should be repeated 8 – 12 hours after the initial screen.

Treatment should be started after laboratory confirmation, except in the case of severe disease where there is strong clinical suspicion. Treatment should then be initiated while waiting for confirmation. A laboratory result should be available within a couple of hours.

All patients who are diagnosed with P. falciparum should be admitted under the care of a physician. Patients who appear well, may deteriorate rapidly even after initial treatment. The patient can be transferred to the infectious diseases team on the next working day.

All admitted patients will require 4-hourly monitoring until they have shown significant clinical improvement: Glasgow Coma Scale, blood pressure, heart rate, temperature, respiratory rate, O_2 saturation, blood sugar level, fluid input/output, colour/volume of urine and serum pH.

5.2: General Management of Patients with *P. falciparum* Infection

- Adequate rehydration: 5% Dextrose infusion can be given at the same time as fluid replacement and prevent hypoglycaemia induced by malaria or quinine
- Blood sugar should be monitored 4-hourly to identify early hypoglycaemia
- Monitoring fluid input and output is essential; rehydration is required in most cases
- Acidosis is an ominous sign: daily (at a minimum) monitoring of FBC, U/E, calcium, magnesium, phosphate, LFTs, coagulation screen, and malaria parasitaemia screen until negative

- Telemetry is essential in patients with cardiac history, especially cardiac arrhythmias on quinine
- Regular antipyretics; paracetamol or ibuprofen
- Regular anti-emetics
- Subsequent blood culture is not necessary with pyrexia unless co-infection is suspected, or patient deteriorates or is septic
- Intensive care facilities may be required if the patient has respiratory failure, cerebral malaria, fluid balance difficulties which require central venous pressure or arterial pressure monitoring, or if exchange transfusions are performed.
- If evidence of quinine resistance or failure, artesunate could be used as an alternative agent.

5.3: Chemotherapy

NB: Patients who have taken chemoprophylaxis should not receive the same drug for treatment.

Patients who have taken chemoprophylaxis, should not receive the same drug for treatment

Uncomplicated Falciparum Malaria – or species unidentified.

Patients with uncomplicated malaria who are not vomiting should be started on one of following:

1. Artemether-Lumefantrine (Riamet [Novartis] or Co-artem 20mg/120mg fixed-dose) - four tablets at 0h, 8h, 24h, 36h, 48h and 60h
2. Artesunate 200mg once daily p.o. for 3 days plus Mefloquine 500mg once daily orally x 3 days
3. Quinine sulphate 600mg three times daily p.o. for 7 days (may be used in pregnancy despite concerns of potential foetal toxicity as benefit outweighs risk) plus either:
    - Doxycycline 100mg twice daily p.o. x 7 days (contraindicated in pregnancy)
    - or Clindamycin 20mg/kg in 3 divided doses p.o. for 7 days (if pregnant)
4. Proguanil-Atovaquone (Malarone 100/250mg fixed-dose)– 4 tablets daily p.o. for 3 days

Daily repeat blood film for malaria can be used to monitor treatment response. Patients responding to treatment with uncomplicated malaria can be discharged and reviewed in clinic.

Uncomplicated Malaria in Pregnancy

Doxycycline is **contraindicated** in pregnancy

- First trimester:
    - Quinine and Clindamycin for 7 days or
    - Artesunate and Clindamycin
- Second and Third trimester :
    - Artesunate Combination therapy (see 1 or 2 above) or
    - Artesunate and Clindamycin for 7 days or
    - Quinine and Clindamycin for 7 days.

5.4: Complicated Malaria

Patients with moderate or severe malaria should receive intravenous therapy for the first 24 hours

Patients with moderate or severe malaria should be commenced upon intravenous anti-malarial therapy for at least 24 hours irrespective of their ability to retain oral tablets:

1. Artesunate: 2.4mg/kg IV/IM at 0hr, 12hr, 24hr, then daily.
   Switch to oral therapy once patient is improving and able tolerate oral medicines. Dose of Artesunate 200mg daily p.o. (Total duration of Artesunate therapy = seven days).

2. Quinine dihydrochloride: Loading dose of 20mg/kg (up to maximum of 1.4g) (dilution in 0.9% Normal Saline) over 4 hours intravenous infusion, followed by maintenance dose 8 hours later with 10mg/kg (up to maximum dose of 700mg) over 4 hours infusion, three times daily. (The loading dose should not be given if patient has taken oral quinine/mefloquine/ quinidine within the preceding 24 hours).

   Switch to oral therapy once patient is able to tolerate oral medication.

3. Quinine sulphate 600mg (or 10mg/kg) three times daily p.o. (Duration: total of 7 days of Quinine treatment). If patient develops significant cinchonism (tinnitus, impaired high tone hearing, dizziness, nausea, vertigo, blurred vision), Quinine sulphate may be reduced to 600mg twice daily orally.

4. And add Doxycycline 100mg b.d. p.o. to quinine or artesunate, if not contraindicated, when patient is able to tolerate oral medication. (Duration: total of 7 days).

NB: Warn the patient of the temporary side effects of quinine that cause cinchonism improve with dose reduction and resolve upon discontinuation of treatment. Hypoglycaemia and cardiac arrhythmias may occur due to quinine therapy. Optic atrophy is a rare adverse event.

5.5: Management of Complications of *P. falciparum*

In **Severe Malaria** remember:

- Dehydration
- Exhaustion
- Acidosis
- Seizures
- Blood sugar
- Kidney function
- Anaemia
- ECG
- Coagulation
- Respiratory function
- Antipyretics
- Monitor vitals

5.5.1: Cerebral Malaria

Definition: Coma, seizures, focal neurological signs, malaria infected erythrocytes in peripheral smear and no other potential causes of coma

- CT brain scan should be requested in patient with focal neurological signs to diagnose intra-cerebral haemorrhage
- Exhaustion is inevitable – the patient may require ITU admission: seek specialist intensivist assistance promptly
- Comatose patients may require elective intubation and ventilation
- Start IV Artesunateor available second line treatment as described above.
- Seizure control:

    - Diazepam IV/PR prn or Lorazepam IV prn.
    - In status epilepticus, begin Phenytoin infusion with cardiac monitoring
- Start 5% dextrose infusion
- Adequate fluid replacement guided by central venous pressure monitoring and urinary output
- General anti-pyretic measures (a recent Cochrane review found that fever management in malaria remains a common practice in both mild and severe disease. There is currently insufficient evidence to recommend a change in the practice)[9]
- If suspected co-infection: start on broad spectrum antibiotics i.e. piperacillin/tazobactam
- Monitor Vital Signs (Glasgow Coma Scale, BP, HR, RR, O_2 Sat, and Temperature)
- Check BM 1-2 hourly
- Monitor input and urinary output
- Malaria parasitaemia screen, FBC, U/E, Coagulation screen, LFTs 6-8 hourly

5.5.2: Hypoglycaemia

- Caused by P. falciparum or induced by quinine
- 50mls of 50% dextrose followed by 5% dextrose infusion and glucose-rich drinks if possible
- BM 2 hourly until stable, then 4 hourly.

5.5.3: Metabolic Acidosis

- Correct hypovolaemia
- Treat hypoglycaemia
- Treat co-infection such as Gram-negative septicaemia with broad-spectrum antibiotics.
- Assess for other causes of acidosis

5.5.4: Haematological Disorders

Anaemia:

- Very common – all have some intravascular haemolysis. (Check haptoglobin, LDH, reticulocyte count).
- For RBC transfusion usually if haemoglobin falls <7 g/dl.

Thrombocytopenia:

- Very common phenomenon (without other coagulopathy)
- Self-limiting
- No treatment unless evidence of bleeding, or platelet counts <20 or associated with coagulopathy.

5.5.5: Coagulopathy with DIC

- Rare
- May precipitate bleeding.
- Give Vitamin K, 10mg IV, if no bleeding.
- Fresh frozen plasma, platelets and Vitamin K if bleeding

5.5.6: Acute Renal Failure

- Can be precipitated by severe dehydration or anaemia, acute tubular necrosis or haemoglobinuria (precipitated by malaria and associated with anaemia due to intravascular haemolysis)
- Appropriate fluid management
- Fluid input / output monitoring
- Monitor colour of urine (darkening suggests haemoglobinuria)
- Regular U&E and intervention to maintain normal electrolytes
- Such patients commonly require temporary dialysis: seek help from a nephrologist

5.5.7: Pulmonary Oedema

- May be due to malaria or fluid overload
- Monitor O2 saturation, chest X-ray, blood gases and vital signs
- Administer oxygen
- Non-invasive or invasive ventilation and pressure support

5.5.8: ARDS

- Rare complication of malaria
- ITU monitoring and seek help from an intensivist
- Mechanical ventilation

5.5.9: Parasitaemia

- People with parasite counts >5% have an increased risk of developing severe complications and are associated with high mortality rate: seek urgent specialist help

5.6: Management of *P. vivax* and *P. ovale* Infection

- More benign course of illness, patients rarely develop severe complications
- Due to the presence of hypnozoite stage, patients may relapse weeks to months after initial infection.
- Remain sensitive to chloroquine in most countries. Except when acquired in Papua New Guinea, or in Indonesia. If in doubt, seek specialist help.
- Treatment regime for Chloroquine-Sensitive plasmodia:
    1. Chloroquine for 3 days, starting dose 600mg, followed by 300mg at 6hr, 24hr, and 48hr.

    Followed by Primaquine for radical treatment of hypnozoite

    Essential to screen for G6PD level before starting Primaquine, which may cause oxidative haemolytic anaemia.

        Dose: 15mg o.d. p.o. (0.25mg/kg) x 14 days

        Dose: 30mg o.d. p.o. (0.5mg/kg) x 14 days if returned from Indonesia /Oceania

        Contraindicated in pregnancy and severe G6PD deficiency
- In Chloroquine-resistant P. vivax; one of the following options may be initiated:
    1. Proguanil-Atovaquone (Malarone) 100mg/250mg: 4 tablets o.d. p.o. x 3 days or
    2. Mefloquine 10mg/kg (maximum 1.5g/24 hrs) twice orally at 0hr and 8hr or

3. Quinine sulphate 600mg tid p.o. x 7/7 + Doxycycline 100mg b.d. p.o. x 7/7

Followed by Primaquine dosed as for chloroquine-sensitive plasmodia

- Patient may discharged from Emergency Department if uncomplicated
- Patients require follow up if unwell, and for four weeks after diagnosis with repeat malaria blood films, FBC, U&E, and LFTs.

Patients may be referred to Infectious Diseases out-patient clinics for follow up.

5.7: Management of P. *malariae* Infection

- Usually benign course
- No hypnozoite stage
- Treatment:
    - Chloroquine 600mg starting dose, followed by 300mg at 6hr, 24hr and 48hr.

Patient may be discharged from Emergency Department if uncomplicated

Follow up if unwell or 4 weeks later with repeated blood film, FBC, U&E, and LFTs.

Appendix: Summary of Pharmacotherapy in Malaria Management

Plasmodium spp	Treatment
P. falciparum and Species not identified Uncomplicated malaria and able to retain tablets If "species not identified" is subsequently diagnosed as P. vivax or P. ovale: see P. vivax and P. ovale (below) re. treatment with Primaquine Admit medically	• Quinine sulphate 600mg tid p.o. x 7/7 with Doxycycline 100mg b.d. p.o. x 7/7 (or with Clindamycin 20mg/kg in 3 dividing doses p.o. x 7/7) OR • Proguanil-Atovaquone(Malarone) 100mg/250mg : 4 tablets o.d. p.o. for 3/7 OR • Artemether-Lumefantrine (Riamet or Co-artem) - 20mg/120mg: 4 tablets at 0h, 8h, 24h, 36h, 48h, 60h OR • Artesunate 200mg o.d. p.o. for 3/7 plus Mefloquine 500mg o.d. p.o. for 3/7
P. falciparum Severe malaria Admit medically	• Artesunate 2.4mg/kg IV at 0hr, 12hr, 24hr, then daily OR • Quinine (loading dose) 20mg/kg (up to max 1.4g) (dilution in 0.9% Normal Saline) over 4 hours infusion, followed by maintenance dose 8 hours later with 10mg/kg(up to max 700mg) over 4 hours infusion, TID. (Loading dose should not be given if patient has taken oral quinine/mefloquine/ quinidine within the preceding 12 hours). • Switch to oral therapy once patient is able tolerate orally. Quinine sulphate 600mg tid (Duration: total of 7 days for Quinine Rx) OR Artesunate 200mg o.d. p.o (Duration: total of 7 days of Artesunate Rx) AND Start Doxycycline or Clindamycin as above
P. vivax Chloroquine-sensitive Allow discharge in uncomplicated cases, follow up in 4 weeks	• Chloroquine 600mg at 0hr, then 300mg at 6hr, 24hr and 48hr Followed by Primaquine* 15mgp.oor 30mg o.d. p.o x 14/7 * Essential to Screen for G6PD deficiency
P. vivax Chloroquine-resistant Allow discharge in uncomplicated cases, follow up in 4 weeks	• Quinine Sulphate 600mg tid p.o. x 7/7 + Doxycycline 100mg b.d. p.o. x 7/7 • OR • Proguanil-Atovaquone(Malarone) 100mg/250mg: 4 tablets o.d. p.o. x 3/7 • OR • Mefloquine 10mg/kg (maximum 1.5g/24 hrs) b.d. p.o. x1/7 (0hr, 8 hr) Followed by Primaquine*15mg o.d. or 30mg o.d. p.o. x 14/7 * Essential to Screen for G6PD deficiency

Plasmodium spp	Treatment
P. ovale Allow discharge in uncomplicated cases, follow up in 4 weeks	• Chloroquine 600mg at 0hr, then 300mg at 6hr, 24hr and 48hr Followed by Primaquine* 15mg o.d. p.o. or 30mg o.d. p.o. for 14/7 *Essential to Screen for G6PD deficiency
P. malariae Allow discharge in uncomplicated cases, follow up in 4 weeks	• Chloroquine 600mg at 0hr, then 300mg at 6hr, 24hr and 48hr

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