MALARIA

(Last updated 07/23/2019: Reviewed by: Rahul Kashyap, MBBS)

PRESENTING COMPLAINT: Fever, chills and sweats

FINDINGS

- **A** Check Airway
- **B** ↑RR
- **C** ↓BP, ↑HR
- **D** Variable altered (V,P,U,D)*
- **E** Fever, mild jaundice, pallor, petechiae
- **L_{PC}** Thick and thin blood films, blood cultures, urine dipstick, Malaria Rapid antigen test ↓ Hb, ↓Platelet count, LFT (↑ transaminases, ↑bilirubin), renal function test- ↑BUN, ↑creatinine; hypoglycemia, ABG - ↓pH metabolic acidosis,
- **U_{PC}** Splenomegaly, hepatomegaly

***V** (verbal), **P (**pain), **U** (unconsciousness), **D** (delirious)

U_{PC} (point of care ultrasound) **L_{PC}** (point of care labs)

OTHER HISTORY

- **Symptoms:** Fatigue, malaise, arthralgia, myalgia, headache, cough
- Less common symptoms include: Anorexia, lethargy, nausea, vomiting, diarrhea, jaundice

DIFFERENTIAL DIAGNOSIS

- Community-acquired Gram-positive and Gram-negative bacterial sepsis, enteric fever, severe rickettsia infections, leptospirosis, dengue fever, chikungunya, zika virus, viral hemorrhagic fevers

OTHER INVESTIGATIONS

- Malaria rapid antigen test, urine dipstick, chest radiograph, haptoglobin, lactic dehydrogenase, leticulocyte count (suggestive of hemolysis)

THERAPEUTIC INTERVENTIONS

- **Medications**: Note that below are regimens intended for *P. falciparum* and empiric therapy for unknown malaria types; different treatment regimens may be indicated if a type other than *P. falciparum* is identified; treatment should be initiated in conjunction with an experienced provider, such as an infectious disease specialist
    - **Mild or moderate disease** (Presumed chloroquine resistant based on geography)
        - **Adult:** Atovaquone-proguanil: 5 tabs orally each day for 3 days, or Artemether-lumefantrine: 1 tab immediately, then at 8 hours, then twice daily for two days, or

Quinine: 650 mg TID for 7 days with doxycycline 100 mg PO BID for 7 days, or
Mefloquin: 750 mg PO once followed by 500 mg 12 hours later

- **Child:** Atovoquone-proguanil
    - Pediatric tabs are ¼ adult tabs (weight based)
        - 5 to 8 kg: 2 peds tabs orally every day for 3 days
        - 9 to 10 kg: 3 peds tabs orally every day for 3 days
        - 11 to 20 kg: 1 adult tab orally every day for 3 days
        - 21 to 30 kg: 2 adult tabs orally every day for 3 days
        - 31 to 40 kg: 3 adult tabs orally every day for 3 days
        - >40 kg: 4 adults tabs orally every day for 3 days
- **Artemether-lufefantrine**
    - First dose followed by a second dose 8 hours later, then an additional dose every 12 hours orally twice a day for 2 additional days
    - Dosing is weight based:
        - 5 to <15 kg: 1 tablet per dose
        - 15 to 25 kg: 2 tablets per dose
        - 25 to 35 kg: 3 tablets per dose
        - ≥35 kg: 4 tablets per dose
- Quinine sulfate: 10 mg/kg TID for 7 days with doxycycline 2.2 mg/kg BID for 7 days
- Mefloquine : 15 mg/kg once followed by 9.1 mg/kg 12 hours later
- Presumed Chloroquine sensitive based on geography
    - **Adult**: chloroquine phosphate 600 mg PO once, then 300 mg at 6, 24, and 48 hours
    - **Child**: 10 mg/kg immediately, then 5 mg/kg orally at 2, 24, and 48 hours

- **Severe/Complicated**
    - **Adult:** Quinidine gluconate: 10 mg/kg loading over 1-2 hours, then 0.02 mg/kg/min for 24 hours PLUS either doxycycline (100 mg PO/IV BID) or clindamycin (10 mg/kg IV once, followed by 5 mg/kg IV every 8 hours)
    - **Child:** Quinidine gluconate: 10 mg/kg loading over 1-2 hours, then 0.02 mg/kg/min for 24 hours PLUS either doxycycline (2.2 mg/kg PO/IV BID) or clindamycin (10 mg/kg IV once followed by 5 mg/kg IV every 8 hours)

- Dosing may require adjustment or monitoring based on renal dysfunction
- **Consult:** Infectious disease or tropical disease

MANAGEMENT AFTER STABILIZATION

- **Follow-Up**: Routine care, Watch for high fever and dehydration
- **Further Treatment**: **Contact infectious disease or tropical disease specialist**: Treatment beyond empiric is dependant on species identified and clinical response
- **Manage Complications**: Organ specific management and consider infectious disease consult

CAUTIONS

- **Complications**: ARDS, cerebral malaria, AKI, hypoglycemia, anemia, coagulopathy
- **Resistance**: In parts of Cambodia, Laos, Myanmar, Thailand, Vietnam, and Yunnan Province, China (Greater Mekong sub-region), in the presence of a mutation (kelch13), there are reports of a slow-clearance phenotype: *Artemisinin-resistant falciparum malaria*

TABLE

MILD	MODERATE	SEVERE
<1% Parasitemia	<5% parasitemia	>5% Parasitemia
Mild anemia/thrombocytopenia Hemodynamically stable	Mild anemia/thrombocytopenia Hemodynamically stable	DIC Organ failure (any organ or system)
Host from endemic area (presumed some degree of immunity)	Non-immune host	Lab abnormalities: Hemoglobin <7 g/dL Creatinine >3 mg/dL Bilirubin >3 mg/dL Bicarbonate <5 mmol/L Infiltrates on chest radiography Urine positive for hemoglobin Blood sugar <40 mg/dL

REFERENCES AND ACKNOWLEDGMENTS

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