STANDARD OPERATING PROCEDURE

Diagnosis and Management of Severe Malaria in Adults

Special Region (1)

Union of Myanmar

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Approved by: **Internal Medicine**

1. Purpose

This SOP provides a standardized clinical protocol for the early recognition and treatment of severe malaria in Special Region-1 health facilities.

2. Scope

Applicable to emergency departments, internal medicine wards, rural hospitals, primary healthcare facilities, and malaria treatment centers within SR-1.

3. Principle of Management

In malaria-endemic areas such as SR-1, treatment of suspected severe malaria should not be delayed while waiting for laboratory confirmation of severe malaria. Fever with severe systemic illness should be treated empirically as severe malaria until proven otherwise.

4. Clinical Suspicion of Malaria

- Fever or recent history of fever
- Chills or rigors
- Residence in or travel to malaria-endemic area

5. Clinical Features of Severe Malaria

Severe falciparum malaria is defined as one or more of the following:

1. Impaired consciousness: A Glasgow coma score < 11 in adults or a Blantyre coma score < 3 in children
2. Prostration: Generalized weakness so that the person is unable to sit, stand or walk without assistance
3. Multiple convulsions: More than two episodes within 24h
4. Acidosis: A base deficit of > 8 mEq/L or, if not available, a plasma bicarbonate level of < 15 mmol/L or venous plasma lactate ≥ 5 mmol/L. Severe acidosis manifests clinically as respiratory distress (rapid, deep, laboured breathing).

5. Hypoglycemia: Blood or plasma glucose < 2.2 mmol/L (< 40 mg/dL)
6. Severe malarial anemia: Hemoglobin concentration ≤ 5 g/dL or a hematocrit of ≤ 15% in children < 12 years of age (< 7 g/dL and < 20%, respectively, in adults) with a parasite count > 10000/µL
7. Renal impairment: Plasma or serum creatinine >265 µmol/L (3 mg/dL) or blood urea > 20 mmol/L
8. Jaundice: Plasma or serum bilirubin >50 µmol/L (3 mg/dL) with a parasite count > 100000/µL
9. Pulmonary edema: Radiologically confirmed or oxygen saturation < 92% on room air with a respiratory rate > 30/min, often with chest in-drawing and crepitations on auscultation
10. Significant bleeding: Including recurrent or prolonged bleeding from the nose, gums or venipuncture sites; hematemesis or melaena
11. Shock: Compensated shock is defined as capillary refill ≥ 3 s or temperature gradient on leg (mid to proximal limb), but no hypotension. Decompensated shock is defined as systolic blood pressure < 80 mmHg in adults, with evidence of impaired perfusion (cool peripheries or prolonged capillary refill).
12. Hyperparasite: *P. falciparum* parasitemia > 10%.

5.1 Laboratory Features of Severe Falciparum Malaria

Parameter	Threshold
Parasitaemia	> 10% (non-immune)
Haemoglobin	< 7 g/dL (adults)
Blood glucose	< 40 mg/dL
Serum creatinine	> 3 mg/dL
Blood urea	> 20 mmol/L
Serum bilirubin	> 3 mg/dL
Serum Bicarbonate	< 15 mmol/L
Serum Lactate	> 5 mmol/L

Severe vivax malaria: Defined as for falciparum malaria but with no parasite density thresholds.

Severe knowlesi malaria: Defined as for falciparum malaria but with two differences: knowlesi hyperparasitaemia: parasite density > 100000/µL; Jaundice and parasite density > 20000/µL.

6. Initial Emergency Management

- Airway: ensure airway patency and recovery position
- Breathing: provide oxygen if available
- Circulation: establish IV access and start cautious fluid management
- Check random blood sugar immediately and correct hypoglycemia if present

7. Antimalarial Treatment

Start empirical IV artesunate immediately if a patient with confirmed malaria develops ANY ONE of the following severe clinical features while waiting for the laboratory result.

Clinical Features
1. GCS <11
2. Severe pallor
3. Respiratory distress
4. Prostration (Unable to sit/walk)
5. Multiple convulsions (≥2 episodes in 24 hrs)
6. Systolic BP <80 mmHg (adults)
7. Abnormal bleeding
8. Jaundice
9. Dark/black urine

First line: Intravenous Artesunate dosing: 2.4 mg/kg at 0 hour, 12 hours, and 24 hours, then once daily until the patient can tolerate oral therapy.

In most patients, **3 doses over 24 hours** are sufficient to bring parasitemia below 1% (median ~93.5% of patients achieve ≤1% after the 3rd dose according to CDC data). Patients with very high initial parasitemia (>10%) may need **additional daily doses** beyond 24 hours until the density drops below the 1% threshold.

7.1 Artesunate Treatment Guidance

Parasite Density	Patient Status	Action
≤1%	Can tolerate oral meds	Switch to full 3-day oral ACT
≤1%	Cannot tolerate oral meds	Continue IV artesunate once daily until oral intake possible (max 7 days total)
>1%	Regardless	Continue IV artesunate once daily until density falls to ≤1% (max 7 days total)

7.2 Alternative Treatment if Artesunate Not Available

- Artemether IM: 3.2 mg/kg initial dose followed by 1.6 mg/kg daily
- Quinine IV infusion: loading dose 20 mg/kg over 4 hours followed by 10 mg/kg every 8 hours

8. Follow-On Oral Therapy

Once the patient can swallow, complete treatment with a full 3-day course of ACT (Artemether-Lumefantrine or Dihydroartemisinin-Piperaquine).

8.1 Artemether-Lumefantrine Dosage Table (20-120 mg per tablet)

Body Weight	Age Group	Dose	Total
5 to < 15 kg	2 months to < 3 years	1 BD x 3 days	6
15 to < 25 kg	3 to < 8 years	2 BD x 3 days	12
25 to < 35 kg	8 to < 12 years	3 BD x 3 days	18
≥ 35 kg	≥ 12 years (Adults)	4 BD x 3 days	24

Note: 1st dose and 2nd dose interval is 8 hours, and remaining doses are 12 hours apart.

8.2 Dihydroartemisinin-Piperaquine Dosage Table

Weight	Age	Tablet	Dosage
5 to < 7 kg	6-12 months	20/160 mg	1/2 tab BD x 3 days
7 to < 13 kg	1-3 years	20/160 mg	1 tab BD x 3 days
13 to < 24 kg	3-8 years	40/320 mg	1 tab BD x 3 days
24 to < 36 kg	8-13 years	40/320 mg	2 tabs BD x 3 days
36 to < 75 kg	13+ / Adults	40/320 mg	3 tabs BD x 3 days
75 to 100 kg	Adults	40/320 mg	4 tabs BD x 3 days
>100 kg	Adults	40/320 mg	5 tabs BD x 3 days

8.3 Severe Vivax Malaria

After finishing parenteral artesunate or artemether therapy, primaquine should be followed to complete radical treatment (to kill hypnozoite in liver). The total dose has been increased to **7 mg/kg** (up from the older 3.5 mg/kg), given as either:

- **0.5 mg/kg/day for 14 days**, or
- **1.0 mg/kg/day for 7 days** (only for patients with **G6PD activity ≥70%**)

Check G6PD level before prescribing primaquine, if possible.

8.4 Primaquine for Gametocidal Action

Primaquine is indicated to kill the gametocides. Dose is 0.75 mg per kg (45 mg single dose). For the single dose of primaquine, G6PD screening is not necessary.

8.5 Post Artesunate Delayed Hemolysis (PADH)

PADH is a self-limiting hemolytic complication occurring in 5-25% of patients treated with parenteral artesunate, typically presenting 7-30 days post-treatment. Hyperparasitemia (>5%) and non-immune status are the strongest risk factors. No fatal cases have been reported, and the mortality benefit of artesunate far exceeds the risks of PADH. All patients treated with parenteral artesunate must undergo weekly monitoring of CP (auto), for 4 weeks post-treatment. Transfusion should be given as clinically indicated. Patients must

be counselled on warning signs (fatigue, pallor, jaundice, dark urine) and the importance of follow-up attendance prior to discharge.

9. Monitoring

- Consciousness level
- Blood pressure
- Pulse rate
- Respiratory rate
- Urine output
- Blood glucose
- Parasite density
- Creatinine, liver function, CP (auto) and urine RE.

10. Key Clinical Message

In SR-1 malaria endemic settings: Fever plus ANY severe clinical feature should prompt immediate treatment with IV artesunate without waiting for laboratory confirmation.

11. References

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