

# Dengue Case Management

## Presumptive Diagnosis

Live in / travel to (in the last 14 days) endemic area plus **fever** and **two of the following**:

- ▶ Nausea and vomiting
- ▶ Rash
- ▶ Aches and pains (headache, eye pain, muscle ache or joint pain)
- ▶ Any warning signs
- ▶ Positive tourniquet test
- ▶ Leukopenia

## Warning Signs

- ▶ Intense continuous abdominal pain or pain when palpating abdomen
- ▶ Persistent vomiting ( $\geq 3$  episodes in 1 hr or  $\geq 4$  in 6 hrs)
- ▶ Fluid accumulation (pleural effusion, ascites, or pericardial effusion)
- ▶ Mucosal bleeding (gums, nose, vagina [metrorrhagia or hypermenorrhoea], kidney [macroscopic hematuria])
- ▶ Altered mental status (irritability, drowsiness, Glasgow Coma Scale score  $< 15$ )
- ▶ Hepatomegaly ( $\geq 2$ cm below costal margin)
- ▶ Progressive increase of the hematocrit (in at least 2 consecutive measurements taken 6 hours apart)

**No warning signs**

**Group A**  
Outpatient management

**For patients with warning signs of severe dengue OR any of the following:**

- ▶ Pregnancy
- ▶ Acute renal failure
- ▶ Coagulopathy
- ▶ Shortness of breath
- ▶ Not tolerating oral fluids
- ▶ Co-existing conditions and social risk on a case-by-case basis\*

**Group B**  
Inpatient management

**For patients with any of the following:**

- ▶ Shock or respiratory distress due to plasma leakage
- ▶ Clinically significant bleeding
- ▶ Severe organ impairment (myocarditis, hepatitis [ALT or AST  $> 1000$  IU] encephalitis)

**Group C**  
Inpatient management

\*For co-existing conditions and social risk see page 6, item #9.

# Dengue Management DO's and DON'Ts

- X DON'T use corticosteroids routinely.** They are not routinely indicated and can increase the risk of GI bleeding, hyperglycemia, and immunosuppression.
  - X DON'T give prophylactic platelet transfusions or for a low platelet count.** Platelet transfusions do not decrease the risk of severe bleeding and may instead lead to fluid overload and prolonged hospitalization.
  - X DON'T give half normal (0.45%) saline.** It leaks into third spaces and may worsen ascites and pleural or pericardial effusions.
  - X DON'T assume that IV fluids are necessary.** First check if the patient can take fluids orally. Use only the minimum amount of IV fluid to keep the patient well-perfused. Decrease IV fluid rate as hemodynamic status improves or urine output increases.
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- ✓ DO tell outpatients when to return.** Teach them about warning signs and their timing, and the critical phase that follows defervescence.
- ✓ DO recognize the critical phase.** The critical phase begins with defervescence or an increasing hematocrit and lasts for 24-48 hours. During this phase some patient may deteriorate within hours and require close monitoring.
- ✓ DO closely monitor fluid intake and output, vital signs, and hematocrit levels.** Intake and output should be monitored according to hemodynamic status and severity of clinical presentation as outlined in the treatment algorithms.
- ✓ DO recognize and treat early shock.** Early shock (also known as compensated or normotensive shock) is characterized by narrowing pulse pressure (systolic minus diastolic BP  $\leq$  20 mmHg), increasing heart rate, and delayed capillary refill or cool extremities.
- ✓ DO administer colloids (such as albumin) for refractory shock.** Patients who do not respond to 2-3 boluses of isotonic saline should be given colloids instead of more saline.
- ✓ DO give pRBCs or whole blood for clinically significant bleeding.** If hematocrit is dropping with unstable vital signs or significant bleeding is apparent, immediately transfuse blood.

# Outpatient Management

## Patients without warning signs, coexisting conditions or social risk (see page 6)

During the febrile phase (2–7 days) and subsequent critical phase (1–2 days) you should evaluate your patients daily

- » Order and review complete blood cell counts
- » Monitor for dehydration, warning signs, and defervescence (indicating the beginning of the critical phase)

## Advise patient or their family to do the following

### Control the fever

- Give acetaminophen at 6 hour intervals if the patient is febrile (no more than 4 doses per day). Do not give ibuprofen or aspirin-containing drugs.
- Sponge patient's skin with tepid water when temperature is high.

**Prevent dehydration** which occurs when a person loses too much fluid (from high fever, vomiting, or poor oral intake). Give plenty of fluids (not only water) and watch for signs of dehydration. Bring patient to clinic or emergency room if any of the following signs develop:

- Decrease in urination (check number of wet diapers or trips to the bathroom)
- Few or no tears when child cries
- Dry mouth, tongue or lips
- Sunken eyes
- Listlessness, agitation, or confusion
- Fast heartbeat (>100/min)
- Cold or clammy fingers and toes
- Sunken fontanel in an infant

### Prevent spread of dengue within your house

- The patient should sleep under a bed net. Everyone in the house should use EPA\*-registered insect repellent.
- Empty and scrub containers that hold water in and around the home.
- Place screens on windows and doors to prevent mosquitoes from entering the home.

### Fever usually lasts 2-7 days and warning signs commonly appear as the fever starts to decline.

Return **immediately** to clinic or emergency department if any of the following warning signs appear:

- Severe abdominal pain or persistent vomiting
- Bleeding from nose or gums
- Abnormal vaginal bleeding
- Vomiting blood
- Black, tarry stools
- Drowsiness or irritability
- Pale, cold, or clammy skin
- Difficulty breathing

\*EPA: Environmental Protection Agency

# Group B Inpatient Management

Does the patient have any dengue warning signs? (See page 1)

NO

YES

**B1. Patient with coexisting conditions or social risk\***  
Is the patient tolerating oral intake?

YES

NO

▶ Encourage oral fluid intake

▶ Monitor vital signs, urine output, and for warning signs and compensated shock<sup>†</sup>  
▶ Manage coexisting conditions

▶ Obtain IV access  
▶ Administer IV crystalloid solution at 2-4 mL/kg/hr<sup>‡</sup>  
▶ Encourage oral fluid intake  
▶ Stop IV crystalloid solution once oral fluids are tolerated

Development of dengue warning signs?

NO

YES

Monitor vital signs, urine output, and clinical improvement until 4-6 hrs after the end of the critical phase

**Manage as B2**

**B2. Dengue with warning signs**

- ▶ Obtain IV access and CBC
- ▶ Monitor vital signs, intake, and output
- ▶ Watch for signs of compensated shock<sup>†</sup>

Administer IV crystalloid solution at 10mL/kg in 1 hr and reevaluate<sup>§</sup>

Improvement in clinical status and urine output >1mL/kg/hr, stable or minimal change in hematocrit?<sup>¶</sup>

YES

NO

Reduce IV crystalloid solution progressively<sup>§</sup>

- 5-7mL/kg/hr for 2-4 hrs
- if improving decrease to 3-5mL/kg/hr for 2-4 hrs
- if improving decrease to 2-4mL/kg/hr

Repeat IV crystalloid solution at 10mL/kg up to two times<sup>§</sup>

YES

NO

Improvement in clinical status, urine output >1mL/kg/hr, stable or minimal change in hematocrit?<sup>¶</sup>

**Treat as group C (dengue with shock)**  
**Transfer to a higher level of care**

Improvement of clinical status and minimal change in hematocrit?<sup>¶</sup>

NO

Continue IV crystalloid solution at current rate and consider need for 10mL/kg dose

YES

Continue IV crystalloid solution at 2-4mg/kg/hr  
OR  
If tolerating oral fluids then can stop IV fluids and **manage as B1**

\* In the absence of coexisting conditions or social risk and if the patient is tolerating oral intake they can be treated as outpatient (see Group A). See page 6 for co-existing conditions and social risk.

<sup>†</sup> For children, follow Holliday-Segar formula (see page 6).

<sup>‡</sup> See page 7 for signs of compensated shock.

<sup>§</sup> Check hematocrit before and after IV fluid administration and then every 12-24 hrs (if unavailable base next steps on the patient's clinical status).

<sup>¶</sup> Less volume of IV crystalloids may be required for patients >65 years, pregnant, or with volume sensitive conditions (see page 6).

## Group C

# Inpatient Management for Patients with Shock

- Obtain IV access, CBC, and blood type and screen<sup>†</sup>
- Strictly monitor intake and output
- Monitor vital signs every 5-30 minutes

Administer 1st dose of IV crystalloid solution at 20mL/kg in 15-30 min and reevaluate<sup>§</sup>

Improvement in clinical status and urine output >1mL/kg/hr, and **stable or minimal change in hematocrit?**<sup>¶</sup>

YES ↓

Reduce IV crystalloid solution to 10mg/kg for 1-2 hrs

Improvement in clinical status, urine output >1mL/kg/hr, and **stable or minimal change in hematocrit?**<sup>¶</sup>

YES ↓

Progressive reduction in IV crystalloid solution<sup>§¶</sup>

- 5-7mL/kg/hr for 2-4 hrs
- if improving decrease to 3-5mL/kg/hr for 2-4 hrs
- if improving decrease to 2-4mL/kg/hr for 24-48 hrs

Continue IV crystalloid solution at current rate and consider need for 20mL/kg dose

Improvement of clinical status and tolerating oral fluid intake then transition to **B1**

NO ↓

Administer up to 2 additional doses of IV crystalloid solution at 20mL/kg in 15-30 min<sup>§</sup>

Improvement in clinical status, urine output >1mL/kg/hr, and **stable or minimal change in hematocrit?**<sup>¶</sup> after 2nd or 3rd dose of IV crystalloid solution?

NO ↓

If hematocrit is elevated relative to baseline consider administering **up to two doses of IV colloid solution**. Consider hemorrhage if there is a rapid decrease in hematocrit and persistent shock<sup>\*\*</sup>

Improvement in clinical status, urine output >1mL/kg/hr, and **stable or minimal change in hematocrit?**<sup>¶</sup> after first or second dose of IV colloid solution?

NO ↓

**Treat for persistent shock**

- Manage in an intensive care unit
- Consider the use of vasopressors to maintain mean arterial pressure >60-70mmHg and assess heart function
- Evaluate other causes of shock, including coexisting conditions or coinfections
- Assess for acidosis and occult bleeding
- If additional IV fluid boluses are needed within 24hrs, the dose will depend on the clinical response
- Treatment with steroids or immunoglobulins is NOT routinely recommended

<sup>§</sup>Less volume of IV crystalloids may be required for patients >65 years, pregnant, or with volume sensitive conditions (see page 6).

<sup>¶</sup>Check hematocrit before and after IV fluid administration and then every 12-24 hrs (if unavailable base next steps on the patient's clinical status).

<sup>\*\*</sup>See page 6 for treatment of hemorrhagic shock.

# Clinical Criteria for Hospitalization and Discharge, and Recommendations for Fluid Management and Hemorrhagic Shock

## Criteria for Hospitalization

- Presence of any warning sign
- Shortness of breath
- Pregnancy, acute renal failure or coagulopathy
- Compensated or hypotensive shock (see pg7)
- Signs and symptoms of plasma leakage:
  - Pleural or pericardiac effusions
  - Ascites or Gallbladder wall edema
- Severe hemorrhage or spontaneous bleeding
- Organ dysfunction
  - Hepatitis (AST or ALT  $\geq 1000$  IU) or painful hepatomegaly
  - Altered mental status
  - Myocarditis
- Co-infection requiring inpatient management
- Co-existing conditions or social risk (on a case-by-case basis):
  - Conditions: hypertension, diabetes, asthma, chronic kidney disease, chronic liver disease, peptic ulcer disease or other gastritis, body-mass index  $\geq 30\text{kg/m}^2$ , receiving anticoagulation medications
  - Social risk: Age  $< 1$  year or  $> 65$  years, living alone or has poor access to healthcare facilities, lack of transportation, unstable housing, extreme poverty

## Clinical Improvement Criteria

- Progressive waning of warning signs and general symptoms
- Stable vital signs
- Normal urine output ( $> 0.5 - 1.5$  mL/kg/hr)
- Adequate oral intake
- Increase in appetite

## Discharge Criteria for Groups B1, B2, and C

All clinical and laboratory criteria must be met.

### Clinical criteria:

- Absence of fever for 48 hrs without administering antipyretics
- Improved appetite
- Vital signs within normal range
- Urine output  $0.5 - 1.5\text{mL/kg/hr}$
- Normal work of breathing
- No evidence of bleeding

### Laboratory criteria:

- Increasing trend in platelet counts
- Stable hematocrit without administration of intravenous fluids

## Oral Fluid Management

### Basal fluid requirements

- Adults:
  - 18–65 years: 30-35 mL/kg
  - $> 65$  years: 25 mL/kg
- Children:
  - 1–10 years: 100-150 mL/kg or
  - 11–18 years: 1,000L + 50mL for every kg over 10kg
- Account for increases in oral fluid requirements due to diarrhea, vomiting, sweating, fever (basal needs increase by 13% for every degree over 38.0°C), and dehydration

## Choice of Initial Intravenous Fluid

### Crystalloids

- Lactated Ringers — contains 131mmol/L sodium and 115mmol/L chlorine; avoid in patients with severe hyponatremia
- 0.9% Normal Saline — large volumes can exacerbate acidosis; contains elevated sodium and chlorine levels (154mmol/L each); avoid when chlorine levels exceed 105 mmol/L

### Colloids

- Use with up to two doses is recommended only in refractory shock after crystalloid solutions have been administered
- Dependent on local availability
- Albumin (20-25%) is the most studied colloid
- Dextrans can exacerbate hemorrhage

## Maintenance fluid rates (Holliday & Segar formula)

Use ideal body weight (IBW) in patients who are overweight

- 4ml/kg/hr for the first 10kg of IBW
- 2ml/kg/hr for the next 10kg of IBW
- 1ml/kg/hr for every additional kg of IBW
- Lower IV fluid rates than those recommended may be used for patients who are  $> 65$  years, pregnant, or have volume-sensitive conditions such as heart failure, chronic liver disease, and end-stage renal disease

## Treatment of Hemorrhagic Shock

- 5-10mL/kg packed red blood cells
- 10-20mL/kg of whole blood
- Transfusion of platelets or fresh frozen plasma is not recommended

# Normal Vital Signs

Age	Estimated Weight	Normal Heart Rate Range	Average HR	Normal Respiratory Rate Range	Hypotension Level (Systolic BP)
1 month	4 kg	110-180	145	40-60	<70
6 months	8 kg	110-170	135	25-40	<70
12 months	10 kg	110-170	135	22-30	<72
2 years	12 kg	90-150	120	22-30	<74
3 years	14 kg	75-135	120	22-30	<76
4 years	16 kg	75-135	110	22-24	<78
5 years	18 kg	65-135	110	20-24	<80
6 years	20 kg	60-130	100	20-24	<82
8 years	26 kg	60-130	100	18-24	<86
10 years	32 kg	60-110	85	16-22	<90
12 years	42 kg	60-110	85	16-22	<90
14 years	50 kg	60-110	85	14-22	<90
≥15 years		60-100	80	12-18	<90

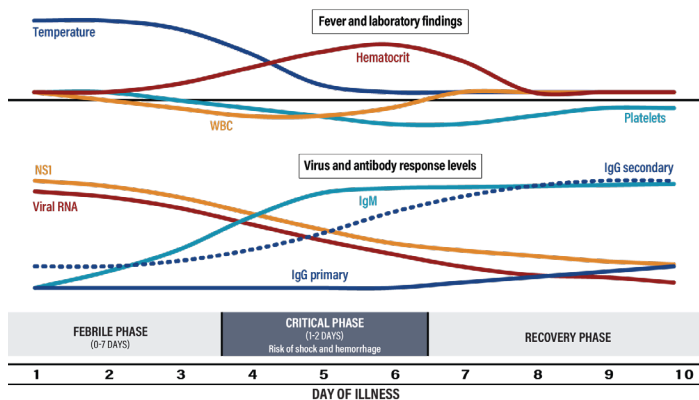
## Hemodynamic Assessment

Hemodynamic Parameters	Stable Circulation	Compensated Shock	Hypotensive Shock
<b>Conscious level</b>	Clear and lucid	Clear and lucid	Restless, combative
<b>Capillary refill</b>	Brisk ( $\leq 2$ sec)	Prolonged ( $> 2$ sec)	Very prolonged, mottled skin
<b>Extremities</b>	Warm and pink	Cool peripheries	Cold, clammy
<b>Peripheral pulse volume</b>	Good volume	Weak and thready	Feeble or absent
<b>Heart rate</b>	Normal heart rate for age	Tachycardia for age	Severe tachycardia or bradycardia in late shock
<b>Blood pressure</b>	<ul style="list-style-type: none"> <li>▶ Normal blood pressure for age</li> <li>▶ Normal pulse pressure for age</li> </ul>	<ul style="list-style-type: none"> <li>▶ Normal systolic pressure, but rising diastolic pressure</li> <li>▶ Narrowing pulse pressure</li> <li>▶ Postural hypotension</li> </ul>	<ul style="list-style-type: none"> <li>▶ Narrow pulse pressure (<math>\leq 20</math> mmHg)</li> <li>▶ Hypotension</li> <li>▶ Unrecordable blood pressure</li> </ul>
<b>Respiratory rate</b>	Normal respiratory rate for age	Tachypnea	Hyperpnea or Kussmaul's breathing (metabolic acidosis)
<b>Urine output</b>	Normal	Reducing trend	Oliguria or anuria

## Clinical signs and symptoms and laboratory findings to differentiate dengue, Zika, and chikungunya

Certainty of the evidence	Signs and Symptoms		
	Dengue	Chikungunya	Zika
<b>HIGH</b> (findings that differentiate them)	<ul style="list-style-type: none"> <li>- Thrombocytopenia</li> <li>- Progressive increase in hematocrit</li> <li>- Leukopenia</li> </ul>	Arthralgias	Pruritus
<b>MODERATE</b> (findings that probably differentiate them)	<ul style="list-style-type: none"> <li>- Anorexia or hyporexia</li> <li>- Vomiting</li> <li>- Abdominal pain</li> <li>- Chills</li> <li>- Hemorrhages (includes bleeding on the skin, mucous membranes, or both)</li> </ul>	<ul style="list-style-type: none"> <li>Rash</li> <li>Conjunctivitis</li> <li>Arthritis</li> <li>Myalgias or bone pain</li> </ul>	<ul style="list-style-type: none"> <li>Rash</li> <li>Conjunctivitis</li> </ul>
<b>LOW</b> (findings that may differentiate them)	<ul style="list-style-type: none"> <li>- Retro-ocular pain</li> <li>- Hepatomegaly</li> <li>- Headache</li> <li>- Diarrhea</li> <li>- Dysgeusia</li> <li>- Cough</li> <li>- Elevated transaminases</li> <li>- Positive tourniquet test</li> </ul>	Hemorrhages (includes bleeding on the skin, mucous membranes, or both)	<ul style="list-style-type: none"> <li>Adenopathies</li> <li>Pharyngitis or odynophagia</li> </ul>

Guidelines for the Clinical Diagnosis and Treatment of Dengue, Chikungunya, and Zika. Washington, D.C.: Pan American Health Organization; 2022  
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Paz-Bailey G, Adams LE, Deen J, Anderson KB, Katzelnick LC. Dengue. Lancet. 2024;403(10427):667-682. doi:10.1016/S0140-6736(23)02576-X