# Management of Dengue Infection in Adults

## (Revised 2nd Edition)

**Quick Reference for Healthcare Providers**

## Course of Dengue Illness

<table>
<thead>
<tr>
<th></th>
<th>FEBRILE</th>
<th>CRITICAL</th>
<th>RECOVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Days of illness</strong></td>
<td>1 2 3</td>
<td>4 5</td>
<td>6 7 8 9 10</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
<td>-40</td>
<td></td>
</tr>
<tr>
<td><strong>Potential clinical issues</strong></td>
<td>Dehydration</td>
<td>Shock / Bleeding</td>
<td>Reabsorption / Fluid overload</td>
</tr>
<tr>
<td><strong>Laboratory changes</strong></td>
<td>Hematocrit</td>
<td>Platelet</td>
<td></td>
</tr>
<tr>
<td><strong>Serology and virology</strong></td>
<td>Viraemia</td>
<td></td>
<td>IgM/IgG</td>
</tr>
</tbody>
</table>

## Quick Reference for Healthcare Providers

[Image of a mosquito and the table above]
KEY MESSAGES

- Dengue is a dynamic disease and presented in three phases - febrile phase, critical phase and recovery phase.
- Clinical deterioration often occurs in the critical phase and is marked by plasma leakage and rising haemotocrit (HCT).
- Look out for warning signs which may indicate severe dengue or high possibility of rapid progression or shock.
- Recognition of shock in its early stage and prompt fluid resuscitation with close monitoring of fluid adjustment will give a good clinical outcome.
- There is no evidence to support prophylactic use of platelet transfusion.

*SUSPECT A CASE OF DENGUE*

A patient has an acute febrile illness with two or more features:
- Rash
- Myalgia
- Headache
- Arthralgia

OR

Dengue endemic/hot spot/outbreak area

**LABORATORY INTERPRETATION**

- In the absence of baseline HCT, a HCT value of >40% in adult female and >46% in adult male should raise the suspicion of plasma leakage.

**DENGUE SEROLOGY TESTS**

- If the dengue IgM is negative before day 7, a repeat sample must be taken in the recovery phase.
- Dengue non-structural protein -1 (NS1 Antigen) can be helpful in early phase (< day 5) of dengue infection.

*All suspected dengue cases* must be notified by telephone to the nearest health office within 24 hours of diagnosis, followed by written notification within one week using the standard notification form.

Details of the evidence supporting these recommendations can be found in the above CPG, available on the following websites:
- Ministry of Health Malaysia : http://www.moh.gov.my
- Academy of Medicine Malaysia : http://www.acadmed.org.my
**WARNING SIGNS**

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical fluid accumulation (pleural effusion/ascites)
- Mucosal bleed
- Restlessness or lethargy
- Tender enlarged liver
- Laboratory: Increase in HCT concurrent with rapid decrease in platelet

Table 1:

**STEPWISE APPROACH IN OUT PATIENT MANAGEMENT**

**Step 1: Overall assessment**

1. **History**
   - Date of onset of fever/illness
   - Oral intake
   - Assess for warning signs
   - Diarrhoea
   - Bleeding
   - Change in mental state/seizure/dizziness
   - Urine output (frequency, volume and time of last voiding)
   - Pregnancy or other co-morbidities

2. **Physical examination**
   Refer to clinical parameters for disease monitoring (Table 3)

3. **Investigations**
   - i. FBC and dengue serology should be taken (as soon as possible)
   - ii. If no facility for HCT, refer patient to the nearest hospital

**Step 2: Diagnosis, disease staging and severity assessment**

Based on the above, the clinician should be able to determine:

1. Dengue diagnosis (provisional)
2. Phase of dengue illness if dengue is suspected (febrile/critical/recovery)
3. Hydration and haemodynamic status of patient (in shock or not)
4. Whether the patient requires admission

**Step 3: Plan of management**

1. Notification is required
2. If admission is indicated, refer to prerequisites for transfer
3. If admission is not indicated:
   - Daily or more frequent follow up is necessary especially from day 3 onwards until the patient becomes afebrile for at least 24-48 hours without antipyretics
   - Serial FBC/HCT must be monitored as disease progresses (Table 3)
Table 2: WHEN TO REFER FOR ADMISSION

1. Symptoms:
   - Warning signs
   - Bleeding manifestations
   - Inability to tolerate oral fluids
   - Reduced urine output
   - Seizure

2. Signs:
   - Dehydration
   - Shock
   - Bleeding
   - Any organ failure

3. Special Situations:
   - Patients with co-morbidity e.g. diabetes, hypertension, ischaemic heart disease, morbid obesity, renal failure, chronic liver disease
   - Elderly (>65 years old)
   - Pregnancy
   - Social factors that limit follow-up e.g. living far from health facility, patient living alone

4. Laboratory Criteria:
   - Rising HCT accompanied by reducing platelet count

Prerequisites for transfer to hospital
1. All efforts must be taken to optimise the patient’s condition before and during transfer.
2. The Emergency & Trauma Department and/or Medical Department of the receiving hospital must be informed prior to transfer.
3. Adequate and essential information must be sent together with the patient and this includes the fluid chart, monitoring chart and investigation results.

PATIENT TRIAGING AT EMERGENCY AND TRAUMA / OUTPATIENT DEPARTMENT

It is recommended to triage all suspected cases of dengue in order to avoid critically ill patients being missed upon arrival.

Triage Checklist:
1. History of fever
2. Abdominal Pain
3. Vomiting
4. Dizziness/fainting
5. Bleeding

Vital parameters to be taken:
- Mental state, blood pressure, pulse, temperature, cold or warm peripheries
### Table 3: Disease Monitoring for Different Phases of Dengue Illness

<table>
<thead>
<tr>
<th>Parameters for monitoring</th>
<th>Frequency of monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Febrile phase</strong></td>
<td><strong>Critical phase</strong></td>
</tr>
<tr>
<td>General well being</td>
<td>Daily or more frequently towards late febrile phase</td>
</tr>
<tr>
<td>Appetite/oral intake</td>
<td></td>
</tr>
<tr>
<td>Warning signs</td>
<td></td>
</tr>
<tr>
<td>Symptoms of bleeding</td>
<td></td>
</tr>
<tr>
<td>Neurological/mental state</td>
<td></td>
</tr>
<tr>
<td>Haemodynamic status</td>
<td>4-6 hourly depending on clinical status</td>
</tr>
<tr>
<td>• Pink/cyanosis</td>
<td></td>
</tr>
<tr>
<td>• Extremities (cold/warm)</td>
<td></td>
</tr>
<tr>
<td>• Capillary refill time</td>
<td></td>
</tr>
<tr>
<td>• Pulse volume</td>
<td></td>
</tr>
<tr>
<td>• Pulse rate</td>
<td></td>
</tr>
<tr>
<td>• Blood pressure</td>
<td></td>
</tr>
<tr>
<td>• Pulse pressure</td>
<td></td>
</tr>
<tr>
<td>Respiratory status</td>
<td>4-6 hourly depending on clinical status</td>
</tr>
<tr>
<td>• Respiratory rate</td>
<td>4-6 hourly depending on clinical status</td>
</tr>
<tr>
<td>• SpO₂</td>
<td>4-6 hourly depending on clinical status</td>
</tr>
<tr>
<td>Signs of bleeding, abdominal tenderness, ascites and pleural effusion</td>
<td>4-6 hourly depending on clinical status</td>
</tr>
<tr>
<td>Urine output</td>
<td>4 hourly</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CLINICAL PARAMETERS**

**LABORATORY PARAMETERS**

<table>
<thead>
<tr>
<th>Parameters for monitoring</th>
<th>Frequency of monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily or more frequently if indicated</td>
<td>4-12 hourly depending on clinical status</td>
</tr>
<tr>
<td>FBC</td>
<td>Daily or more frequently if indicated</td>
</tr>
<tr>
<td>BUSE/Creatinine</td>
<td>As indicated</td>
</tr>
<tr>
<td>Liver function test</td>
<td>As indicated</td>
</tr>
<tr>
<td>Random blood sugar</td>
<td>As indicated</td>
</tr>
<tr>
<td>Coagulation profile</td>
<td>As indicated</td>
</tr>
<tr>
<td>HCO₃⁻/TCO₂⁻/Lactate</td>
<td>As indicated</td>
</tr>
</tbody>
</table>
**COMMON PITFALLS IN FLUID THERAPY**
- Treating patient with unnecessary fluid bolus based on raised HCT as the sole parameter without considering other clinical parameters
- Excessive and prolonged fixed fluid regime in stable patients
- Infrequent monitoring and adjustment of infusion rate
- Continuation of intravenous fluid during the recovery phase

**FLUID MANAGEMENT**

**Dengue with warning signs**
All patients with warning signs should be considered for monitoring in hospitals:
- Obtain a baseline HCT before fluid therapy
- Give crystalloids solution (such as 0.9% saline)
- Start with 5 - 7 ml/kg/hour for 1-2 hours, then reduce to 3 - 5 ml/kg/hr for 2 - 4 hours, and then reduce to 2 - 3 ml/kg/hr or less according to the clinical response
- If the clinical parameters are worsening and HCT is rising, increase the rate of infusion
- Reassess the clinical status, repeat the HCT and review fluid infusion rates accordingly

**Non-shock patient**
- Encourage adequate oral intake
- Intravenous fluids are indicated in patients who are vomiting, unable to tolerate oral fluids or an increasing HCT despite increasing oral intake.
- Crystalloid is the fluid of choice.

<table>
<thead>
<tr>
<th>Estimated ideal body weight or IBW (kg)</th>
<th>Normal maintenance fluid (ml/hour) based on Holiday Segar formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>35</td>
<td>80</td>
</tr>
<tr>
<td>40</td>
<td>90</td>
</tr>
<tr>
<td>45</td>
<td>100</td>
</tr>
<tr>
<td>50</td>
<td>110</td>
</tr>
<tr>
<td>60</td>
<td>120</td>
</tr>
</tbody>
</table>

Notes:
- For adults with IBW > 50 kg, 1.5 - 2ml/kg can be used for quick calculation of hourly maintenance fluid regime.
- For adults with IBW < 50kg, 2 - 3 ml/kg can be used for quick calculation of hourly maintenance fluid regime.

**Dengue Shock Syndrome**
Refer to algorithm for intravenous fluid management for DSS

**WHEN TO SUSPECT SIGNIFICANT OCCULT BLEEDING?**
- HCT not as high as expected for degree of shock to be explained by plasma leakage alone
- A drop in HCT without clinical improvement despite adequate fluid replacement (40 - 60 ml/kg)
- Severe metabolic acidosis & end organ dysfunction despite adequate fluid replacement

**MANAGEMENT OF BLEEDING**
- Patients with mild bleeding from the gums, per vagina, epistaxis or petechiae do not require blood transfusion.
- Transfusion of blood in patients with significant bleeding:
  - Transfused 5 - 10ml/kg of fresh packed red cells or 10 - 20 ml/kg of fresh whole blood at an appropriate rate and observe the clinical response
  - Consider repeating the blood transfusion if there is further blood loss or no appropriate rise in HCT after blood transfusion
Compensated Shock
(systolic pressure maintained but has signs of reduced perfusion)
- Fluid resuscitation with isotonic crystalloid 5 - 10 ml/kg/hr over 1 hour
- FBC, HCT, before and after fluid resuscitation, BUSEC, LFT, RBS, PT/APTT, Lactate/HCO₃⁻, GXM¹

**Algorithm A - Fluid Management in Compensated Shock**

**Compensated Shock**
- If patient continues to improve, fluid can be further reduced
- Monitor HCT 4 - 6 hourly
- If the patient is not stable, act according to HCT levels:
  - if HCT increases, consider bolus fluid administration or increase fluid administration
  - if HCT decreases, consider transfusion with fresh whole blood
- Consider to stop IV fluid at 48 hours of plasma leakage / defervescence

**Improvement**
- IV crystalloid 5 - 7 ml/kg/hr for 1 - 2 hours, then:
  - reduce to 3 - 5 ml/kg/hr for 2 - 4 hours;
  - reduce to 2 - 3 ml/kg/hr for 2 - 4 hours
- If patient improves, reduce to 7-10 ml/kg/hr for 1 - 2 hours
- Then reduce further

**Improvement**
- If patient continues to improve, fluid can be further reduced
- Monitor HCT 4 - 6 hourly
- If the patient is not stable, act according to HCT levels:
  - if HCT increases, consider bolus fluid administration or increase fluid administration
  - if HCT decreases, consider transfusion with fresh whole blood
- Consider to stop IV fluid at 48 hours of plasma leakage / defervescence

**Check HCT**
- HCT ↑ or high
  - Administer 2nd bolus of fluid
    - 10-20 ml/kg/hr for 1 hr
  - Improve

**Check HCT**
- HCT ↓
  - Consider significant occult/overt bleed
    - Initiate transfusion with fresh blood² (whole blood/packed cell)
  - Improve

HCT = haematocrit

¹GXM: require first stage cross match or emergency O
²fresh blood: less than 5 days
ALGORITHM B - FLUID MANAGEMENT IN DECOMPENSATED SHOCK

DECOMPENSATED SHOCK
- Fluid resuscitation with 20 ml/kg/hr isotonic crystalloid or colloid over 15 – 30 minutes
- Try to obtain a HCT level before fluid resuscitation
- FBC, HCT, before and after fluid resuscitation, BUSEL, LFT, RBS, PT/APTT, Lactate/HCO₃, GXM

IMPROVEMENT

YES

Review 1st HCT

HCT ↓ or high

- Administer 2nd bolus of fluid (colloid) 10–20 ml/kg over ½ to 1 hour
- Consider significant occult/overt bleed
  - Initiate transfusion with fresh blood¹
  - Whole blood/packed cell

NO

HCT ↓

IMPROVEMENT

NO

Repeat 2nd HCT

HCT ↓ or high

- Administer 3rd bolus of fluid (colloid) 10–20 ml/kg over 1 hour
- Consider to stop IV fluid at 48 hours of plasma leakage / defervescence

NO

Repeat 3rd HCT

IMPROVEMENT

YES

- Crystalloid/colloid 10ml/kg/hr for 1 hour, then continue with:
  - IV crystalloid 5 - 7/ml/kg/hr for 1-2 hours;
  - reduce to 3 - 5 ml/kg/hr for 2-4 hours;
  - reduce to 2 - 3 ml/kg/hr for 2-4 hours
- If patient continues to improve, fluid can be further reduced
- Monitor HCT 4 hourly or more frequent as indicated
- If the patient is not stable, act according to HCT levels:
  - if HCT increases, consider bolus fluid administration or increase fluid administration;
  - if HCT decreases, consider transfusion with fresh whole blood
- Consider to stop IV fluid at 48 hours of plasma leakage / defervescence

HCT = haematocrit ¹GXM: require first stage cross match or emergency O ²fresh blood: less than 5 days