Acknowledgements

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Patient assessment: four important steps

Step 1: History taking

Step 2: Clinical examination

Step 3: Investigations

Step 4: Diagnosis, phase of disease and severity
Step 1: History taking

What are important histories in dengue patients?

1. Date of onset of fever or illness

2. Symptoms and severity

3. The 3 golden questions:
   - How much oral fluid intake: quantity and quality?
   - How much urine output: frequency, volume and time of most recent voiding?
   - What activities could the patient do during the febrile illness?

4. Other fluid losses: diarrhoea, vomiting

5. Presence of warning signs
### Step 1: History taking

#### What are other relevant histories?

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<td>6</td>
<td>Family or neighbour with dengue, or travel to dengue-endemic areas</td>
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<td>7</td>
<td>Medications (including non-prescription or traditional medicine) in use?</td>
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<td>List of medications and last time they were taken.</td>
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<td>Risk Factors: infancy, pregnancy, obesity, diabetes mellitus,</td>
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<td>hypertension, etc.</td>
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<td>Why do we ask?</td>
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<td>Jungle trekking or swimming in waterfall</td>
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<td>Consider leptospirosis, typhus, malaria</td>
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<td>Recent unprotected sexual or drug use behaviour</td>
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<td>Consider acute HIV seroconversion illness</td>
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Step 2: Clinical examination

General assessment:
Mental state
Hydration state

**Haemodynamic state**

Clinical evidence of warning signs:
Bleeding manifestations: mucosal bleeding
Abdominal tenderness
Liver enlargement
Fluid accumulation: pleural effusion, ascites

Other important signs:
Rash
Tachypnoea/acidotic breathing: indicates shock
Tourniquet test: repeat if negative or if there is no bleeding manifestation
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# Hemodynamic Assessment - Stable Circulation

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<th>Parameters</th>
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<tbody>
<tr>
<td>Conscious level</td>
<td>Clear and lucid</td>
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<tr>
<td>Capillary refill time</td>
<td>Brisk (&lt;2 seconds)</td>
</tr>
<tr>
<td>Extremities (color, temp)</td>
<td>Warm and pink</td>
</tr>
<tr>
<td>Peripheral pulse volume</td>
<td>Good volume</td>
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<tr>
<td>Heart rate (HR)</td>
<td>Normal HR for age</td>
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<td>Normal</td>
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</table>

1. Normal Peripheral perfusion
2. Normal Cardiac output
3a. Normal Brain Perfusion
3b. Normal kidney perfusion
4. No Respiratory compensation
Hemodynamic Changes in Compensated Shock

- Normal or elevated systolic pressure
- Rising diastolic pressure
- Narrow pulse pressure – weak pulse
- Tachycardia
- Reduced peripheral perfusion
  - Cool/cold and pale extremities
  - Prolonged capillary refill time
- "Quiet" tachypnea
- LUCID conscious level
  - Decreased urine output

Evaluation of Dengue Patients
### Hemodynamic Assessment – Compensated Shock

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<td>Pulse pressure (PP)</td>
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<td><strong>Normal systolic</strong> pressure <strong>rising diastolic</strong> pressure</td>
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<td>Blood pressure (BP)</td>
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<td>Narrowing PP Postural hypotension</td>
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<td>Respiratory rate (RR)</td>
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<td>“Quiet” tachypnea</td>
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<tr>
<td>Urine output</td>
<td>Normal</td>
<td>Reducing trend</td>
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</tbody>
</table>

- **3a. Normal brain perfusion**
- **Reduced peripheral perfusion**
- **Reduced cardiac output**
- **Tissue acidosis**
- **Reduced kidney perfusion**

*Evaluation of Dengue Patients*
### Hemodynamic Assessment - Compensated Shock (cont.)

<table>
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<td>Clear and lucid</td>
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Note that changes are seen in all parameters except conscious level and systolic blood pressure.
Hemodynamic Changes in Hypotensive Shock

- Decreased level of conscious
- Oliguria or anuria
- Increasing tachycardia
- Feeble or absent peripheral pulse
- Systolic and diastolic pressures disappear suddenly
- Reduced peripheral perfusion
  - Very cold, clammy extremities
  - Mottled, peripheral cyanosis
  - Very prolonged capillary refill time
- Kussmaul breathing
- Decreased level of conscious
  - Oliguria or anuria

Blood pressure

Heart rate

Time

LCS Lum

Evaluation of Dengue Patients
**Hemodynamic Assessment – Hypotensive Shock**

**Key clinical signs of deterioration: Changes in Mental State**

- Restless, confused, extremely lethargic
- Seizures
- Agitation alternating with drowsiness

**Infants and young children:**
- Failure to recognize parents, focus or make eye contact
- Listen to parents: “Something is wrong with my child.”

Yet, some children and young adults continue to have **clear** mental state!

**Imminent total cardiorespiratory collapse**
Hemodynamic Assessment – Monitoring urine output

Why is monitoring of urine output crucial in haemodynamic monitoring?
Reflects renal blood flow - kidneys regulate intravascular volume.
In early shock state, kidneys conserve fluids by reducing urine volume.
In severe shock, no urine is produced.

What is considered adequate urine output?
In outpatient setting, the patient should drink enough fluids to pass urine about 4 to 6 times a day.
A patient with dengue shock should pass at least 0.5 ml/kg urine per hour.
An indwelling catheter will give an accurate measurement. If the urine volume exceeds this amount, consider reducing the IV fluid therapy.

Pitfall?
In uncontrolled diabetes or hyperglycemia, inappropriately large quantities of urine are produced.
Shock becomes worse because of glycosuria.
## Hemodynamic Assessment – Hypotensive Shock (cont.)

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<td>Clear and lucid</td>
<td>Restless, combative</td>
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<tr>
<td>Capillary refill time</td>
<td>Brisk (&lt;2 sec)</td>
<td>Prolonged (&gt;2 sec)</td>
<td>Very prolonged, mottled skin</td>
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<td>Extremities</td>
<td>Warm and pink</td>
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<td>Cold, clammy</td>
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<td>Feeble or absent</td>
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<td>Heart rate (HR)</td>
<td>Normal HR for age</td>
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<td>Severe tachycardia or bradycardia in late shock</td>
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<td>Blood pressure (BP)</td>
<td>Normal BP for age</td>
<td>Normal systolic pressure, rising diastolic pressure</td>
<td>Hypotension</td>
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<td>Unrecordable BP</td>
<td>Narrowed pulse pressure (&lt;20 mmHg)</td>
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- Reduced brain perfusion
- Reduced peripheral perfusion
- Reduced cardiac output
- Severe tissue acidosis
- No kidney perfusion
Definition of hypotension

Adults:

- Systolic blood pressure of <90 mm Hg or
- Mean arterial pressure <70 mm Hg in adults or
- Systolic blood pressure decrease of >40 mm Hg or <2 SD below normal for age (Hypertensive patients)

Children up to 10 years of age:

- The 5th centile for systolic blood pressure:

  \[ 70 + (\text{age in years} \times 2) \text{ mm Hg} \]
Pearls in clinical examination of dengue patients

The “5-in-1 maneuver” magic touch – CCTV-R

Hold the patient’s hand to evaluate peripheral perfusion.

Save life in 30 seconds by recognizing shock

1. **Colour**
2. **Capillary refill**
3. **Temperature**
4. **Pulse Volume**
5. **Pulse Rate**

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# Hemodynamic Assessment – Holding patient’s hand

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Holding patient’s hand, 5-in1 Magic Touch, CCTV-R
Delayed capillary refill time.
The blood pressure was normal at this time.

The “5-in-1 maneuver” magic touch

Credit: WHO
Pitfalls in clinical examination of dengue patients

A patient with high fever (39°C) has tachycardia, cold extremities and delayed capillary refill time.

- Is he or she in shock?
- What other features do you need to consider?

* Reminder: Haemodynamic assessment is the foundation of dengue clinical management.
A wrong interpretation could lead to a wrong decision in fluid management.
Pitfalls in clinical examination of dengue patients

Always look at the **BIG picture** before “zooming in”.

**History:**
When was fever onset?
In which phase of disease is the patient?

**Intake/output:**
What was the patient’s fluid intake and urine output?

**Any warning signs?**

**What was the patient’s pulse volume?**

**Remember:**
Clinical features come as a “package”, not in isolation.
Step 3: Investigations

**Dengue investigation basics**

- Complete blood count (CBC) with haematocrit (HCT) are usually all that are necessary for monitoring.
- Of special importance are:
  - HCT;
  - white blood cell count (WBC) and;
  - platelet count.
- An HCT in the first 3 days of illness suffices for the baseline HCT; in acute cases, age-specific population HCT levels can substitute for a patient’s baseline.
- A steep drop in platelet count with a **rising HCT** compared to baseline suggests progression to the plasma leakage/critical phase of dengue.
- A falling WBC followed by falling platelet count by Day 3 or 4 of illness is almost surely dengue.
Step 3: Investigations

Who should get a complete blood count (CBC)?

- All patients with fever ≥3 days
- All patients with warning signs (urgently)
- All patients with shock (CBC and glucose check urgently)

  - If resources are available, all febrile patients should get baseline CBC at first visit. A normal CBC in the febrile phase does not exclude dengue.
  - **If resources are limited**, CBC for febrile patients with poor oral intake and/or poor urine output.

When should a patient be referred for immediate medical treatment?

- Rising HCT or high HCT
- Leucopenia and/or thrombocytopenia
- Presence of warning signs, shock
- Poor oral intake/not passing urine
**Step 3: Investigations**

**Dengue-specific diagnostic tests** *

- For confirmation, e.g. NS1/IgM rapid tests or nucleic acid detection (depending on resources of health facility)

- Not necessary for the acute management of patients but valuable in unusual manifestations, suspected dengue deaths in the area, or for patients who progress rapidly from mild to severe dengue or death

**Other tests?** *

- Blood chemistry tests (liver function, glucose, serum electrolytes, urea, creatinine

- Should be considered in patients with risk factors and severe disease

* If available
Patient assessment: Step 4

- Step 1: History taking
- Step 2: Clinical examination
- Step 3: Investigations
- Step 4: Diagnosis, phase of disease and severity
Step 4: Diagnosis, phase of disease and severity

1. Does the patient have dengue or other illnesses?
2. Which phase of dengue (febrile/critical/recovery)?
3. What is the hydration state?
4. Are dengue warning signs present?
5. What is the haemodynamic state?
6. What is the best medical plan for the patient?