Incorporating the Revised Dengue Guidelines in General Pediatric Practice

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Dr. Rosario Z. Capeding (Pediatric Infectious Disease)

Moderator: Dr. Fatima Gimenez (Pediatric Infectious Disease)
Case 1

- A 4-year old boy, previously healthy
- Brought to the ER for the following:
  - High grade fever (T max 39.5 °C) for 2 days
  - Poor appetite, vomiting and body malaise
- Pertinent PE:
  - Vital Signs: CR = 128/min, RR = 28/min, T= 39.2 °C, BP = 90/60  Weight= 15 kgs
  - (+) Flushed skin
  - Hyperemic throat but (-) exudates
  - Rest of the PE findings normal.
  - (-) Tourniquet test

Initial CBC:
- Hgb 110 g/L
- Hct 0.33
- WBC count 4.0 x 10^9,
- seg 0.35, lym  0.70,
- platelet cnt 160,000 U/L
Is this patient a Dengue Suspect?

- [x] YES
- [ ] NO
References


PPS Revised Guidelines on Fluid Management of Dengue Fever and Dengue Hemorrhagic Fever 2012

New Dengue Case Classification

Probable Dengue Fever

Lives in or travels to dengue-endemic area, with fever, plus any two of the following:

- Headache ✓
- Body malaise ✓
- Myalgia
- Arthralgia
- Retro-orbital pain
- Nausea, Vomiting ✓

AND

- Laboratory test, at least CBC (leukopenia *with or without* thrombocytopenia) ✓
- *and/or* Dengue NS1 antigen test or dengue IgM antibody test (optional tests)

DOH / PPS Revised Dengue Clinical Case Management Guidelines 2011
New Dengue Case Classification

Confirmed Dengue Fever

- Viral culture isolation
- PCR
New Dengue Case Classification

Dengue with Warning Signs

Live in or travels to dengue-endemic area, with fever lasting for 2-7 days, plus any one of the following:

- Abdominal pain or tenderness
- Mucosal bleeding
- Clinical signs of fluid accumulation
- Persistent vomiting
- Lethargy, restlessness
- Liver enlargement
- Decreased or no UO within 6 hours
- Laboratory: increase in Hct and/or decreasing platelet count

DOH/PPS Revised Dengue Clinical Case Management Guidelines 2012
Severe Dengue

Lives in or travels to a dengue-endemic area with fever of 2–7 days and any of the above clinical manifestations for Dengue with or without warning signs, \textit{plus} any of the following:

**Severe plasma leakage**, leading to:
- Shock
- Fluid accumulation with respiratory distress

**Severe organ impairment**
- Liver: AST or ALT $\geq 1000$
- CNS: e.g., seizures, impaired consciousness
- Heart: e.g., myocarditis
- Kidneys: e.g., renal failure

**Severe bleeding**
How should the patient be classified?

A. Dengue without warning signs
B. Dengue with warning signs
C. Nonsevere dengue
D. Severe Dengue
PROBABLE DENGUE FEVER:
An acute febrile illness with ≥ 2 of the following:
- Headache
- Retro-orbital pain
- Arthralgia
- Rash
- Hemorrhagic manifestations
- Leukopenia;
AND
Supportive serology (a reciprocal HI antibody titer >1280, a comparable IgG assay ELISA titer or (+) IgM antibody test on a late or acute convalescent phase serum specimen

DENGUE HEMORRHAGIC FEVER (DHF)
The following must ALL be present:
1. Fever, or history of fever, lasting for 2-7 days
2. Hemorrhagic tendencies evidenced by at least one of the following:
   - (+) Tourniquet Test
   - Petechiae, ecchymosis, purpura
   - Bleeding from the mucosa, GIT, injection sites or other locations
   - Hematemesis or melena
3. Thrombocytopenia (≤ 100,000 cells/mm³)
4. Evidence of plasma leakage due to increased vascular permeability, manifested by at least one of the following:
   - ↑Hct ≥ 20% above average for age, sex, and population
   - ↓Hct following volume replacement treatment ≥ 20% of baseline
   - Signs of plasma leakage, i.e. pleural effusion, ascites and hypoproteinemia

Challenges in Using the WHO Case Classification for DHF

- Rigidity of definitions - all four DHF criteria must be present
  - Dengue with severe hemorrhage, without plasma leakage\(^1,2\)
  - Dengue with Shock without fulfilling all four DHF criteria
    - 14-22\% of those with shock did not fulfill all four criteria considered necessary for a diagnosis of DHF by the WHO \(^3,4,5\)
  - Dengue with organ dysfunction

- Low sensitivity of criteria in detecting DHF
  - Many DSS do not have platelet count <100,000 \(^1\)
  - Hemorrhagic tendency do not reliably differentiate DF and DHF\(^2\)
  - ↑HCT not seen after IVF therapy, in patients with poor perfusion, severe bleeding, anemia \(^1\)

Challenges in Using the WHO Case Classification for DHF

- Many cases cannot be classified using the WHO 1997 classification
  - Many cases that could not be classified by the previous WHO classification system are classified as having unusual manifestations \(^1,^2\)

- Assumption that DF means mild disease \(^2\)
  - DF may present with unusual hemorrhage

Consequences of Inconsistency of WHO Case Classification

- Does not consistently capture cases of severe and life-threatening dengue which do not fulfil all criteria for DHF
- Classifies all patients in whom the requisite four criteria are not demonstrated as having DF by default
  - If fever and significant plasma leakage are documented, patients are classified as DHF even without bleeding or thrombocytopenia
- A formal DHF diagnosis is often only possible late in the evolution of the infection
- Clinicians develop a variety of loose and incommensurable interpretations to allow prompt institution of appropriate management
- Underdiagnosis and under-reporting of DHF cases where DHF misclassified as DF
- Poor case management resulting in fatal outcomes

Bandyopadhyay S et al. Trop Med Int Health 2006;11:1238-1255
Multicentre prospective study on dengue classification in four South-east Asian and three Latin American countries

- Prospective observational study conducted from 2006-07 by the DENCO Study Group sponsored by the WHO-TDR

- Included patients with clinically suspected dengue recruited at 11 hospitals in 7 countries in SE Asia and Latin America

- 1734 dengue cases: 1568 (90%) confirmed and 166 (10%) highly suggestive

- Applying the existing WHO system, 47/210 (22%) of patients with shock did not fulfil all the criteria for DHF: 27 classified as DF and 20 unclassifiable

- However, no three-tier revision could adequately described the different severity groups

- Inclusion of readily discernible complications (shock/severe vascular leakage/severe bleeding/severe organ dysfunction) was necessary to devise a system that identified patients requiring major intervention with sufficient sensitivity and specificity to be practically useful.

Multivariate analysis showed that the following were significantly increased risk for severe disease: abdominal pain or tenderness, lethargy, mucosal bleeding and a decrease in platelet count.

At the WHO-sponsored expert review meeting, there was general agreement that a new system based on these results and comprising two entities, ‘Dengue’ and ‘Severe Dengue’, should be incorporated into the new WHO guidelines (WHO 2009)

Further refinements remain necessary with respect to risk prediction and for application in specific areas of pathogenesis research.


<table>
<thead>
<tr>
<th>Classification</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO Standard Classification (1997)</td>
<td>76%</td>
<td>54%</td>
</tr>
<tr>
<td>Revised WHO Classification (2009)</td>
<td>95%</td>
<td>97%</td>
</tr>
</tbody>
</table>
Probable dengue
live in /travel to dengue endemic area.
Fever and 2 of the following criteria:
• Nausea, vomiting
• Rash
• Aches and pains
• Tourniquet test positive
• Leukopenia
• Any warning sign
Laboratory-confirmed dengue
(important when no sign of plasma leakage)

Warning signs*
• Abdominal pain or tenderness
• Persistent vomiting
• Clinical fluid accumulation
• Mucosal bleed
• Lethargy, restlessness
• Liver enlargement >2 cm
• Laboratory: increase in HCT concurrent with rapid decrease in platelet count

*(requiring strict observation and medical intervention)

Severe plasma leakage leading to:
• Shock (DSS)
• Fluid accumulation with respiratory distress

Severe bleeding as evaluated by clinician

Severe organ involvement
• Liver: AST or ALT >=1000
• CNS: Impaired consciousness
• Heart and other organs
Revised Dengue Classification  
(DOH 2011)

**Dengue ± Warning**

**Without Warning Signs**

**With Warning Signs**

Severe

1. Severe plasma leakage
2. Severe hemorrhage
3. Severe organ impairment

**Probable Dengue**

Lives in or travels to dengue-endemic area, with fever, plus any two of the following:
- Headache
- Body malaise
- Myalgia
- Arthralgia
- Retro-orbital pain
- Anorexia
- Nausea
- Vomiting
- Diarrhea
- Flushed skin
- Rash (petechial, Hermann’s sign)

**AND**

- Laboratory test, at least CBC (leukopenia with or without thrombocytopenia) and/or dengue NS1 antigen test or dengue IgM antibody test (optional).

**Warning Signs**

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical signs of fluid accumulation
- Mucosal bleeding
- Lethargy, restlessness
- Liver enlargement
- Laboratory: increase in hematocrit and/or decreasing platelet count

**Lab-confirmed Dengue**

- Viral culture isolation
- PCR

DOH Revised Dengue Clinical Case Management Guidelines 2011
### WHO Case Definition of Dengue and Levels of Severity (1997, 2011)

**Case Definition for DENGUE FEVER**

**Probable:**
- An acute febrile illness with ≥ 2 of the following:
  - Headache
  - Retro-orbital pain
  - Arthralgia
  - Rash
  - Hemorrhagic manifestations
  - Leukopenia
  - AND
- Supportive serology (a reciprocal HI antibody titer >1280, a comparable IgG assay ELISA titer or (+) IgM antibody test on a late or acute convalescent phase serum specimen)

### NEW Case Classification and Levels of Severity (DOH 2011)

**Case Definition for DENGUE W/O WARNING SIGNS**

**Probable dengue:**
Lives in or travels to dengue-endemic area, with fever, plus any two of the following:
- Headache
- Anorexia
- Body malaise
- Diarrhea
- Myalgia
- Flushed skin
- Arthralgia
- Rash (petechial rash, Hermann’s sign)
- Retro-orbital pain
- Rash (petechial rash, Hermann’s sign)
- Nausea, Vomiting
- Tourniquet test positive

**AND**
- Laboratory test, at least CBC (leukopenia with or without thrombocytopenia)
- and/or Dengue NS1 antigen test or dengue IgM antibody test (optional tests)
WHO Dengue Case Definition (1997) compared with the New PPS/DOH Dengue Case Definition and Classification


**NEW Case Classification and Levels of Severity (DOH 2011)**

**Case Definition for DENGUE HEMORRHAGIC FEVER (DHF)**

The following must ALL be present:

1. Fever/ history of fever, lasting for 2-7 days, occasionally biphasic
2. Hemorrhagic tendencies evidenced by at least one of the following:
   - (+) TT
   - Petechiae, ecchymosis, purpura
3. Thrombocytopenia (≤100,000 cells/mm³)
4. Evidence of plasma leakage due to increased vascular permeability, manifested by at least one:
   - \( \uparrow \text{Hct} \geq 20\% \) above average for age, sex, popn
   - \( \downarrow \text{Hct} \geq 20\% \) of baseline ff volume replacement
   - Signs of plasma leakage, i.e. pleural effusion, ascites and hypoproteinemia

**Case Definition for DENGUE WITH WARNING SIGNS**

Lives in or travels to dengue-endemic area, with fever lasting for 2-7 days, plus any one of the following:

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical signs of fluid accumulation
- Mucosal bleeding
- Lethargy, restlessness
- Liver enlargement
- Laboratory: increase in Hct \textit{and/or} decreasing platelet count
- Decreased or no UO within 6 hours
WHO Dengue Case Definition (1997) compared with the New PPS/DOH Dengue Case Definition and Classification

NEW Case Classification and Levels of Severity (DOH 2011)

- **Case Definition for SEVERE DENGUE**
  - Lives in or travels to a dengue-endemic area with fever of 2–7 days and any of the above clinical manifestations for Dengue with or without warning signs, *plus* any of the following:
    - **Severe plasma leakage**, leading to:
      - Shock
      - Fluid accumulation with respiratory distress
    - **Severe bleeding**
    - **Severe organ impairment**
      - Liver: AST or ALT \( \geq 1000 \)
      - CNS: e.g., seizures, impaired consciousness
      - Heart: e.g., myocarditis
      - Kidneys: e.g., renal failure


- **DHF Grade 1**
  - Fever accompanied by non-specific constitutional signs and symptoms such as anorexia, vomiting, abdominal pain; the only hemorrhagic manifestation is a (+) tourniquet test and/or easy bruising

- **DHF Grade 2**
  - Spontaneous bleeding in addition to manifestations of grade 1 patients usually in the form of skin or other hemorrhages (mucocutaneous, gastro-intestinal)

- **DHF Grade 3 (DSS)**
  - Circulatory failure manifested by rapid, weak pulse and narrowing of PP or hypotension, with the presence of cold clammy skin and restlessness

- **DHF Grade 4 (DSS)**
  - Profound shock with undetectable BP or pulse
Manifestations of Dengue Virus Infection

Severe Dengue with severe organ impairment
- Liver: AST or ALT $\geq 1000$
- CNS: e.g., seizures, impaired consciousness
- Heart: e.g., myocarditis
- Kidneys: e.g., renal failure

2,103 Patients enrolled
1,809 (86%) Lab-confirmed dengue
## Age distribution of laboratory-confirmed dengue cases

<table>
<thead>
<tr>
<th>Pediatric Age</th>
<th>N = 137</th>
<th>N=657</th>
<th>N=1015</th>
<th>N=1809</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agegroup (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1</td>
<td>0 (0.0)</td>
<td>8 (1.2)</td>
<td>25 (2.5)</td>
<td>33 (1.8)</td>
</tr>
<tr>
<td>1 - 2</td>
<td>2 (1.5)</td>
<td>18 (2.7)</td>
<td>90 (8.9)</td>
<td>110 (6.1)</td>
</tr>
<tr>
<td>* 3 – 5</td>
<td>20 (14.6)</td>
<td>107 (16.3)</td>
<td>275 (27.1)</td>
<td>402 (22.2)</td>
</tr>
<tr>
<td>* 6 – 10</td>
<td>53 (38.7)</td>
<td>215 (32.7)</td>
<td>401 (39.5)</td>
<td>669 (37.0)</td>
</tr>
<tr>
<td>* 11 – 15</td>
<td>61 (44.5)</td>
<td>191 (29.1)</td>
<td>224 (22.1)</td>
<td>476 (26.3)</td>
</tr>
<tr>
<td>16 - 18</td>
<td>1 (0.7)</td>
<td>118 (18.0)</td>
<td>0 (0.0)</td>
<td>119 (6.6)</td>
</tr>
<tr>
<td>Median</td>
<td>10.54</td>
<td>10.46</td>
<td>7.29</td>
<td>8.70</td>
</tr>
</tbody>
</table>

* 85.5% of dengue cases from these age group
### Duration from onset of fever to admission

<table>
<thead>
<tr>
<th>Duration of Fever</th>
<th>JBL N = 137</th>
<th>WVMC N = 657</th>
<th>DMC N = 1015</th>
<th>Total N = 1809</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>1 day</td>
<td>4 (2.9)</td>
<td>54 (8.2)</td>
<td>17 (1.7)</td>
<td>75 (4.1)</td>
</tr>
<tr>
<td>2 days</td>
<td>10 (7.3)</td>
<td>87 (13.2)</td>
<td>32 (3.2)</td>
<td>129 (7.1)</td>
</tr>
<tr>
<td>3 days</td>
<td>38 (27.7)</td>
<td>158 (24.1)</td>
<td>216 (21.3)</td>
<td>412 (22.8)</td>
</tr>
<tr>
<td>4 days</td>
<td>42 (30.7)</td>
<td>143 (21.8)</td>
<td>314 (30.9)</td>
<td>499 (27.6)</td>
</tr>
<tr>
<td>5 days</td>
<td>27 (19.7)</td>
<td>99 (15.1)</td>
<td>241 (23.7)</td>
<td>367 (20.3)</td>
</tr>
<tr>
<td>6 days</td>
<td>5 (3.7)</td>
<td>54 (8.2)</td>
<td>113 (11.1)</td>
<td>172 (9.5)</td>
</tr>
<tr>
<td>1 week</td>
<td>8 (5.8)</td>
<td>41 (6.2)</td>
<td>61 (6.0)</td>
<td>110 (6.1)</td>
</tr>
<tr>
<td>&gt; 1 week</td>
<td>3 (2.2)</td>
<td>21 (3.2)</td>
<td>21 (2.1)</td>
<td>45 (2.5)</td>
</tr>
</tbody>
</table>

70% were admitted to the hospital when fever was on its 3\textsuperscript{rd} to 5\textsuperscript{th} day of illness.
## Lab-confirmed dengue cases

<table>
<thead>
<tr>
<th>Diagnostic test</th>
<th>PCR, number tested</th>
<th>Positive</th>
<th>Subtype of RT-PCR Positive Cases&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>182 (100.0)</td>
<td>123 (67.6)</td>
<td>Dengue-1 36 (29.3) 28 (22.8) * 54 (43.9) 4 (3.3)</td>
<td>1323 (63.0)</td>
</tr>
<tr>
<td></td>
<td>798 (100.0)</td>
<td>530 (66.4)</td>
<td>Dengue-2 * 346 (65.1) 57 (8.5) 122 (23.0) 24 (4.5)</td>
<td>431 (32.5)</td>
</tr>
<tr>
<td></td>
<td>1121 (99.8)</td>
<td>670 (59.8)</td>
<td>Dengue-3 220 (32.8) * 311 (46.4) 70 (10.5)</td>
<td>487 (36.8)</td>
</tr>
<tr>
<td></td>
<td>2101 (99.9)</td>
<td>1323</td>
<td>Dengue-4 276 (20.9) 431 (32.5) * 487 (36.8) 98 (7.4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Number Tested</th>
<th>Positive</th>
<th>IgM</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>182 (100.0)</td>
<td>105 (57.7)</td>
<td>81 (44.5)</td>
<td>1466 (70.0)</td>
</tr>
<tr>
<td></td>
<td>797 (99.9)</td>
<td>447 (56.1)</td>
<td>411 (51.6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1116 (99.4)</td>
<td>914 (81.9)</td>
<td>761 (68.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2095 (99.6)</td>
<td>* 1466</td>
<td>* 1253</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Subtype of RT-PCR Positive Cases: Dengue-1, Dengue-2, Dengue-3, Dengue-4.
## RITM Lab-confirmed cases 2010-2011

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PCR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total no of samples/No of samples tested</td>
<td>182/165</td>
<td>210/178</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of positive</td>
<td>101</td>
<td>87</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>61.2%</td>
<td>48.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of negative</td>
<td>64</td>
<td>91</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>38.8%</td>
<td>51.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Serotype</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>30.7%</td>
<td></td>
<td>48.3%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>19.8%</td>
<td></td>
<td>11.5%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>43.6%</td>
<td></td>
<td>37.9%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3.0%</td>
<td></td>
<td>2.3%</td>
<td></td>
</tr>
</tbody>
</table>
What laboratory tests confirm the diagnosis of Dengue?

A. Dengue viral culture  
B. Dengue NS1 test  
C. Dengue PCR  
D. Dengue serology
Laboratory Diagnosis of Dengue Infection

The right test at the right time!

- viral culture
- RT-PCR
- NS1 Ag test

<table>
<thead>
<tr>
<th>Incubation Period</th>
<th>Days of fever</th>
<th>Defervescence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

- Anti Dengue IgM / IgG Antibodies
- Dengue IgM/IgG (EIA, Dot blot, Dipstick, Immunoblot, Immunochromotography)
How should patients with Dengue without warning signs but with signs of dehydration be managed?

A. Send home on oral rehydration fluids
B. Admit for oral rehydration fluids
C. Admit to the wards for IV fluid therapy
D. Admit to the ICU for IV fluids
GROUP A: Patients Who May Be Sent Home

- Patients with ALL of the following:
  - Able to tolerate adequate volumes of oral fluids
  - Pass urine at least once every 6 hours
  - Do not have any of the warning signs, particularly when fever subsides
  - Normal hematocrit (≤40%) and normal platelet count (≥150,000)

- Ambulatory patients should be monitored daily for disease progression decreasing WBC, defervescence, warning signs until out of the critical period

- Advice to return immediately to the hospital if they develop any of the warning signs.
<table>
<thead>
<tr>
<th>ACTION PLAN : GROUP A (Home Care)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ORS</td>
<td>- Reduced osmolarity ORS (contains Na 50-75 mmol/L)</td>
</tr>
<tr>
<td></td>
<td>- No sports drinks or fluids containing high sugar/glucose</td>
</tr>
<tr>
<td></td>
<td>- Plain water will cause electrolyte imbalance</td>
</tr>
<tr>
<td>Paracetamol</td>
<td>- Use appropriate dosages for children</td>
</tr>
<tr>
<td></td>
<td>- Not more than 4g for adults</td>
</tr>
<tr>
<td></td>
<td>- Do not give aspirin, ibuprofen or other NSAIDs</td>
</tr>
<tr>
<td></td>
<td>- Tepid sponging</td>
</tr>
<tr>
<td></td>
<td>- Antibiotics are not necessary</td>
</tr>
<tr>
<td>Dengue Home Care Card &amp; Advice on when to return to hospital</td>
<td>- Bed rest</td>
</tr>
<tr>
<td></td>
<td>- Fluids</td>
</tr>
<tr>
<td></td>
<td>- Fever management</td>
</tr>
<tr>
<td></td>
<td>- Warning signs: bleeding, freq vomiting, abdominal pain, drowsiness, mental confusion or seizures, pale, cold or clammy hands and feet, difficulty in breathing, decreased or no UO within 6 hours</td>
</tr>
</tbody>
</table>
GROUP B: Patients Who Should Be Referred For In-hospital Management

- Patients with any warning sign present
- No warning sign present but with any of the following:
  - Co-existing conditions that may make dengue or its management more complicated, i.e. pregnancy, infancy, old age, obesity, DM, renal failure, chronic hemolytic diseases
  - Social circumstances, i.e. living alone, living far from a health facility without reliable means of transport
ACTION PLAN: DENGUE WITHOUT WARNING SIGNS (In-Hospital Mx)

- Encourage ORS

- IVF 0.9% saline or LR at maintenance rate, if ORS not tolerated

- ORS after a few hours of IVF therapy
Fluid Management for Patients Admitted Without Warning Signs and Without Shock

- IVF (Isotonic solutions): D\textsubscript{5} LRS, D\textsubscript{5} Acetated Ringers, D\textsubscript{5} NSS/ D\textsubscript{5} 0.9 NaCl

- For infants < 6 mos old, D\textsubscript{5} 0.45 NaCl* is preferred if available. **Do NOT use hypotonic fluids (e.g. D\textsubscript{5} 0.3NaCl)**

- Computation of Maintenance IVF
  - Caloric-expenditure method (Holliday-Segar Method)
  - Calculation Based on Weight

- If the patient shows signs of mild dehydration but is NOT in shock, the volume needed for mild dehydration is added to the maintenance fluids to determine the total fluid requirement (TFR).

* D\textsubscript{5} 0.45 NaCl is prepared by mixing equal volumes of D\textsubscript{5} 0.9 NaCL and D\textsubscript{5}W
### Calculation of Maintenance IVF Infusion

#### Holliday-Segar Method

<table>
<thead>
<tr>
<th>ABW (Kg)</th>
<th>TFR (ml/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 10</td>
<td>100 ml/kg</td>
</tr>
<tr>
<td>&gt; 10-20</td>
<td>1,000 ml + 50 ml/kg for each kg &gt; 10 kg</td>
</tr>
<tr>
<td>&gt; 20</td>
<td>1,500 ml + 20 ml/kg for each kg &gt; 20 kg</td>
</tr>
</tbody>
</table>

#### Ludan Method

<table>
<thead>
<tr>
<th>ABW (Kg)</th>
<th>TFR (ml/kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3-10</td>
<td>100 ml/kg/day</td>
</tr>
<tr>
<td>&gt; 10-20</td>
<td>75 ml/kg/day</td>
</tr>
<tr>
<td>&gt; 20-30</td>
<td>50-60 ml/kg/day</td>
</tr>
<tr>
<td>&gt; 30-60</td>
<td>40-50 ml/kg/day</td>
</tr>
</tbody>
</table>

Calculation of Total Fluid Requirement (TFR) in Patients with Mild Dehydration but Not in Shock

Total Fluid Requirement

Maintenance IVF

PLUS

Fluids for Mild Dehydration *

*Volume of Fluid for Mild Dehydration

<table>
<thead>
<tr>
<th>Age</th>
<th>Volume (ml/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant (≤12 mos)</td>
<td>50 ml/kg</td>
</tr>
<tr>
<td>Older Child or Adult (age &gt;12 mos)</td>
<td>30 ml/kg</td>
</tr>
</tbody>
</table>

- The computed TFR is given over 24 hours
- Constant, periodic reassessment is needed.
- Fluid rate should be adjusted according to the clinical condition, vital signs, urine output and hematocrit levels
ACTION PLAN: DENGUE WITHOUT WARNING SIGNS (In-Hospital Mx)

- Periodic assessment needed for appropriate fluid adjustment
- Monitor clinical parameters and correlate with Hct
- Avoid over- and under hydration
- Decrease IVF anytime based on clinical assessment
- If with signs of deterioration ⇒ see Mx for Compensated or Hypotensive Shock

Monitor:
- Temperature pattern
- Volume of fluid intake and losses
- Urine output (volume and frequency)
- Warning signs
- CBC (HCT, WBC, platelet count), HGT or capillary blood glucose (CBG)
Case 2

A 15-year old adolescent girl

Brought to the ER for the following:
- High grade fever (T max 40.0°C)
- Weakness, headache, poor appetite, vomiting, poor appetite

Pertinent PE:
- Flushed skin, weak-looking, dry lips
- CR = 120/min, RR = 32/min, T = 37.4°C, BP = 90/60; Weight = 40 kg
- (+) Hepatomegaly w/ tenderness on right subcostal area
- On auscultation: ↓ breath sounds on right lower lung field
- CRT 4 seconds

Initial CBC:
Hgb 110 g/L
HCT 0.33
WBC count 4.0 x 10^9
seg 0.35, lympho 0.70
platelet cnt 160,000 U/L
What is the most probable diagnosis for this patient?

A. Dengue without warning signs
B. Dengue with warning signs
C. Severe dengue with compensated shock
D. Severe dengue with uncompensated shock
**Hemodynamic Assessment: Continuum of Hemodynamic Changes**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Stable Circulation</th>
<th>Compensated shock</th>
<th>Hypotensive shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensorium</td>
<td>Clear and lucid</td>
<td>Clear and lucid</td>
<td>Change of mental state – restless, combative</td>
</tr>
<tr>
<td>Capillary refill time</td>
<td>Brisk (&lt;2 sec)</td>
<td>Prolonged (&gt;2 sec)</td>
<td>Very prolonged, mottled skin</td>
</tr>
<tr>
<td>Extremities</td>
<td>Warm and pink extremities</td>
<td>Cool peripheries*</td>
<td>Cold, clammy extremities</td>
</tr>
<tr>
<td>Peripheral pulse volume</td>
<td>Good volume</td>
<td>Weak &amp; thready</td>
<td>Feeble or absent</td>
</tr>
</tbody>
</table>

*Note: shock can be missed if you do not touch the patient*
**Hemodynamic Assessment: Continuum of Hemodynamic Changes**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Stable Circulation</th>
<th>Compensated shock</th>
<th>Hypotensive shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate</td>
<td>Normal heart rate for age</td>
<td>Tachycardia</td>
<td>Severe tachycardia with bradycardia in late shock</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Normal blood pressure for age</td>
<td>Normal systolic pressure but rising diastolic pressure</td>
<td>Narrowed pulse pressure (&lt;20 mmHg)</td>
</tr>
<tr>
<td></td>
<td>Normal pulse pressure for age</td>
<td>Narrowing pulse P</td>
<td>Hypotension Unrecordable BP</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>Normal respiratory rate for age</td>
<td>Tachypnea</td>
<td>Metabolic acidosis/ hyperpnea/ Kussmaul’s breathing</td>
</tr>
</tbody>
</table>
How should patient with Dengue and shock be managed?

A. IV fluid bolus using isotonic crystalloid 20 cc/kg x 10 minutes

B. IV fluid bolus using isotonic crystalloid 10 ml/kg/hour over 1 hour

C. IV fluid bolus using albumin 20 cc/kg x 10 minutes

D. IV fluid bolus using colloid solution 10 ml/kg/hour over 1 hour
Compensated shock (systolic BP maintained but has signs of plasma leakage (hemoconcentration or reduced perfusion)

BOX A. Obtain baseline CBC (a). Fluid resuscitation with plain isotonic crystalloid 10 ml/kg/hour over 1 hour. Give oxygen support.

Improvement (b) (See Table 6)

Yes

BOX B. 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. Fluids should not exceed 3 liters per day to avoid fluid overload (see Appendix A and B).
If feasible, monitor HCT every 8-12 hours or as necessary (a)
Reassess hemodynamic status frequently (see Table 6) including urine output (f)
Monitor for signs of bleeding

HLI ↑ or High

BOX C
Administer 2nd bolus of fluid, colloid/crystalloid (c) 10 ml/kg/hr in 1 hour

Patient is stable
HCT decreases

Patient is unstable
HCT increases
Perform ABCS (see Table 5)

No
Repeat CBC [a]

HLI ↓

BOX D
If there are signs of occult/overt bleeding initiate transfusion with fresh whole blood 20 ml/kg or PRBC 10 ml/kg

Reassess hemodynamic status and bleeding parameters

1. If improved go to Box B.
The use of inotropes (dopamine, epinephrine, norepinephrine) should be decided on carefully; should be started only after adeq fluid volume has been administered.
Hypotensive shock (e)

BOX A. Obtain baseline CBC (a). Fluid resuscitation with 10ml/kg plain isotonic crystalloid or colloid over 15 minutes (c). Give oxygen support.

Improvement (b) (See Table 6)

Yes

BOX B. Crystalloid/colloid 10 ml/kg/hr for 1 hour, then continue with:
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.
Fluids should not exceed 3 liters per day to avoid fluid overload (see Appendix A and B).
If feasible, monitor HCT every 6 hours or as necessary.
Reassess hemodynamic status frequently (see Table 6) including urine output (f)
Monitor for signs of bleeding

HCT ↑ or High

BOX C. Administer 2nd bolus fluid (colloid) 10 ml/kg. Check hemodynamic parameters (see Table 6)

Patient is stable
HCT decreases
Patient is unstable
HCT increases
Perform ABCS

BOX D
If there are signs of occult/overt bleeding initiate transfusion with fresh whole blood 20ml/kg or PRBC 10ml/kg
Reassess hemodynamic status and bleeding parameters

1. If improved go to Box B.
No Improvement after Fluid Resuscitation with Plain Isotonic Crystalloid

Colloids recommended for patients who primarily present with hemodynamic instability and as rescue fluids in those whose cardiovascular status do not improve after the initial fluid resuscitation.
<table>
<thead>
<tr>
<th>Crystalloids vs Colloids</th>
<th>Crystalloids (Ringer’s lactate or 0.9 NaCl solutions)</th>
<th>Colloids (gelatin-, dextran-, and starch-based)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Should be used as first line in fluid resuscitation in Moderately Severe (Compensated) Dengue Shock.</td>
<td>• Associated with ↑risk of allergic reactions &amp; new bleeding manifestations; more expensive.</td>
<td></td>
</tr>
<tr>
<td>• Safe and as effective as colloid solutions (dextran, starch, or gelatin) in reducing recurrence of shock and mortality.</td>
<td>• Insufficient data to ascertain advantage of one type of fluid in cases of Severe Dengue Shock (DHF grade IV) or Hypotensive (Uncompensated) Shock</td>
<td></td>
</tr>
<tr>
<td>• Comparable to colloids in terms of total amount of fluids used in resuscitation and rescue fluid</td>
<td>• May be used in patients who primarily present with HEMODYNAMIC INSTABILITY and as RESCUE FLUIDS in those whose cardiovascular status do not improve after the initial fluid resuscitation.</td>
<td></td>
</tr>
</tbody>
</table>
## Crystalloids

<table>
<thead>
<tr>
<th>Crystalloid</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
</table>
| 0.9% saline [“normal” saline]/NSS | • Suitable option for initial fluid resuscitation                         | • Repeated large vol of 0.9% NaCl may lead to hyperchloremic acidosis \  
• Hyperchloremic acidosis may aggravate or be confused w/ lactic acidosis from prolonged shock \  
• When se Cl- level exceeds N range, change to LR advised |
| Ringer’s Lactate                  | • Lower Na+ (131mmol/L) and Cl- (115mmol/L) contents and osm( 273mOsm/L) \  
• Not suitable for resuscitation of patients w/ severe hypoNa+ \  
• Suitable solution after 0.9 NaCl has been given and the se Cl-I has exceeded the N range. | • LR should be avoided in liver failure and patients taking metformin where lactate metabolism may be impaired. |
<table>
<thead>
<tr>
<th>Colloid</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
</table>
| Dextran-based    | • Less risk of allergic reaction               | • Dextrans may bind to von Willebrand factor/Factor VIII complex and impair coagulation the most  
|                  |                                                | • Dextran 40 can potentially cause an osmotic renal injury in hypovolemic patients  
|                  |                                                | • Allergic reactions, e.g. fever, chills and rigors been observed in Dextran 70 |
| Gelatin-based    | Least effect on coagulation among all the colloids | • Highest risk of allergic reactions,                                         |
Findings

- Hypoalbuminemia in 67% of adults and 87% of children.

Findings

- Hypoalbuminemia in 76% of adult patients with DHF.

Itha, Nat J Ind 2005
Clinical Implication

- Increases the sensitivity in the diagnosis of DHF.

Brito, Braz J Trop Med 2007
Clinical Implication

- May be a sign of hemoconcentration.

Shepherd, 2012
No advantage of colloids vs crystalloids in the management of shock.

Perel, P. WHO Sec. 2010
Patient became unstable and did not respond after 1 dose of crystalloids and 2 doses of colloids. What laboratory test should be done for a patient with Dengue with shock?

A. Order for arterial blood gas (ABG)
B. Coagulation profile (PT, PTT)
C. Serum calcium
D. Blood glucose
Laboratory investigations (ABCS) for patients with profound shock, complications, or no clinical improvement in spite of adequate treatment.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Laboratory Investigation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Acidosis</td>
<td>Blood gas (capillary or venous)</td>
<td>Indicates prolonged shock. Organ involvement should also be looked into; liver function and BUN, creatinine.</td>
</tr>
<tr>
<td>B – Bleeding</td>
<td>Haematocrit</td>
<td>If HCT decreases in comparison with the previous value or not rising, do cross-match for possible blood transfusion</td>
</tr>
<tr>
<td>C – Calcium</td>
<td>Electrolyte, Ca++</td>
<td>Hypocalcemia is found in almost all cases of DHF but asymptomatic. In more severe/complicated cases, Ca supplement is indicated at a dosage of 1 ml/kg, dilute two times, IV push slowly; may be repeated every six hours, if needed (max. dose 10 ml of Ca gluconate).</td>
</tr>
<tr>
<td>D – Blood sugar</td>
<td>Blood Sugar</td>
<td>Most severe DHF cases have poor appetite together with vomiting. Those with impaired liver function may have hypoglycemia. Some cases may have hyperglycemia.</td>
</tr>
</tbody>
</table>

WHO-SEA Comprehensive guidelines for prevention and control of dengue and dengue haemorrhagic fever. Revised & expanded ed. 2011
Going back to the second case...

- After 6 hours, the patient suddenly developed abdominal enlargement, sudden pallor.
- Vital signs: CR 140/min, RR 40/min, T 36.8 °C, BP 80/60.
- On auscultation: (+) progression in the pleural effusion with decrease in breath sounds in both lung fields extending up to the interscapular area ( + ) occasional crackles.
- Laboratory tests:
  - CBC: Hgb 11 g/L, Hct 0.37, WBC 3.0 x 10^9, seg 0.28, lympho 0.70, platelet count 120,000 U/L.
  - PT: patient 13 seconds (control 12 seconds)
  - PTT: 65 seconds (control 37 seconds); INR not taken.
Is blood transfusion indicated for this patient? If blood transfusion is indicated, what blood component should be transfused?

A. Packed RBC
B. Fresh whole blood
C. Platelet concentrate
D. Fresh frozen plasma
Transfusions should be given only when there are definite and established indications and in practically all cases component therapy should be utilized.
What is happening ????

- Decrease in Hct
- Decrease in Platelet Count
- Prolonged PTT
What is happening ???

• Abdominal Enlargement and Pain
• Pallor

BLEEDING !!!
ABNORMAL HEMOSTASIS

- Consumptive coagulopathy is NOT the major cause of bleeding but rather the profound shock and intractable acidosis.

- Fibrinogen is the most severely affected clotting factor
BLOOD TRANSFUSION

- PRBC or FWB if with significant bleeding such as melena.
- PRBC or FWB if with decreasing Hct inspite of IVF
- Platelet concentrate if < 50,000 with bleeding
- DIC – cryoprecipitate (1 bag/5kg) or FFP (10-20 ml/kg)
In massive bleeding such as hematamesis, FWB, PRBC, and plasma may be used.

Once DIC sets in, cryoprecipitate, FFP, and platelet concentrate may be used.

Level of Evidence: Class 2
Grade of Recommendation: A
THROMBOCYTOPENIA

- Kavath et al – DHF with platelets of < 50,000 had a 6x higher mortality rate.

- Krishnamuti, S – bleeding without shock is due to platelet abnormalities rather than coagulopathy.
PLATELET RECOVERY AND SURVIVAL IN NORMALS AND THROMBOCYTOPENIC PATIENTS

Platelet Transfusion Therapy

Figure 30-4

Hillman and Ault, Hematology in Clinical practice, pg. 330, 2002
The demographic characteristics, clinical and laboratory data on the day the platelet count decreased to <20×10^3 platelets/μL, and clinical outcomes for patients with acute dengue infection who did or did not receive prophylactic platelet transfusion.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients given platelet transfusion (n = 188)</th>
<th>Patients not given platelet transfusion (n = 68)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, years</td>
<td>40 (22-64)</td>
<td>39 (22-58)</td>
<td>.54</td>
</tr>
<tr>
<td>Male sex</td>
<td>144 (77)</td>
<td>45 (60)</td>
<td>.11</td>
</tr>
<tr>
<td><strong>Dengue diagnosis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dengue hemorrhagic fever</td>
<td>4 (2)</td>
<td>2 (9)</td>
<td>.66</td>
</tr>
<tr>
<td>Positive results of PCR</td>
<td>124 (66)</td>
<td>46 (68)</td>
<td>.65</td>
</tr>
<tr>
<td>Test results positive for IgG</td>
<td>60/96 (70)</td>
<td>24/22 (75)</td>
<td></td>
</tr>
<tr>
<td><strong>Preexisting medical conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>11 (6)</td>
<td>2 (9)</td>
<td>.52</td>
</tr>
<tr>
<td>Hypertension</td>
<td>18 (10)</td>
<td>5 (7)</td>
<td>.80</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>9 (5)</td>
<td>1 (1)</td>
<td>.30</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Clinical features</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>46 (24)</td>
<td>22 (32)</td>
<td>.25</td>
</tr>
<tr>
<td>Headache</td>
<td>13 (7)</td>
<td>3 (4)</td>
<td>.57</td>
</tr>
<tr>
<td>Myalgia/arthralgia</td>
<td>27 (14)</td>
<td>12 (18)</td>
<td>.56</td>
</tr>
<tr>
<td>Eye pain</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Anorexia</td>
<td>17 (9)</td>
<td>4 (6)</td>
<td>.51</td>
</tr>
<tr>
<td>Nausea</td>
<td>21 (11)</td>
<td>6 (9)</td>
<td>.82</td>
</tr>
<tr>
<td>Vomiting</td>
<td>17 (9)</td>
<td>5 (7)</td>
<td>.80</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>14 (7)</td>
<td>3 (4)</td>
<td>.57</td>
</tr>
<tr>
<td>Rash</td>
<td>27 (14)</td>
<td>8 (12)</td>
<td>.68</td>
</tr>
<tr>
<td>Temperature, °C</td>
<td>37.5 (36.6-39.6)</td>
<td>37.2 (36.5-39.4)</td>
<td>.09</td>
</tr>
<tr>
<td>Temperature &gt;38°C</td>
<td>62 (33)</td>
<td>12 (18)</td>
<td>.02</td>
</tr>
<tr>
<td>Systolic blood pressure, mm Hg</td>
<td>115 (95-140)</td>
<td>110 (95-130)</td>
<td>.01</td>
</tr>
<tr>
<td>Diastolic blood pressure, mm Hg</td>
<td>70 (50-87)</td>
<td>70 (50-85)</td>
<td>.12</td>
</tr>
<tr>
<td>Systolic blood pressure &lt;90 mm Hg</td>
<td>0 (0)</td>
<td>1 (1)</td>
<td>.27</td>
</tr>
<tr>
<td>Pulse pressure, mm Hg</td>
<td>45 (30-70)</td>
<td>40 (30-60)</td>
<td>.03</td>
</tr>
<tr>
<td>Pulse, beats/min</td>
<td>70 (55-90)</td>
<td>70 (60-94)</td>
<td>.84</td>
</tr>
<tr>
<td>Pulse &lt;60 beats/min</td>
<td>18 (10)</td>
<td>2 (3)</td>
<td>1.11</td>
</tr>
<tr>
<td>Abdominal tenderness</td>
<td>3 (2)</td>
<td>0 (0)</td>
<td>.57</td>
</tr>
<tr>
<td>Pleural effusion or ascites</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td><strong>Laboratory results</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hematocrit, %</td>
<td>45.7 (36.7-52.1)</td>
<td>44.9 (35.4-50.3)</td>
<td>.24</td>
</tr>
<tr>
<td>Hematocrit &gt;50%</td>
<td>23 (12)</td>
<td>4 (6)</td>
<td>.17</td>
</tr>
<tr>
<td>Leukocyte count, ×10^9 leukocytes/μL</td>
<td>3.4 (1.7-7.2)</td>
<td>3.6 (1.7-8.2)</td>
<td>.46</td>
</tr>
<tr>
<td>Leukocyte count &lt;3.3 ×10^9 leukocytes/μL</td>
<td>86 (46)</td>
<td>26 (38)</td>
<td>.32</td>
</tr>
<tr>
<td>Platelet count, ×10^12 platelets/μL</td>
<td>15 (7-19)</td>
<td>15 (8-19)</td>
<td>.87</td>
</tr>
<tr>
<td><strong>Clinical outcomes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any bleeding</td>
<td>1 (1)</td>
<td>2 (0)</td>
<td>.17</td>
</tr>
<tr>
<td>Platelet increment the next day, ×10^12 platelets/μL</td>
<td>7 (1-7 to 50)</td>
<td>11 (4-41)</td>
<td>.25</td>
</tr>
<tr>
<td>Time to platelet count =50 × 10^12 platelets/μL, days</td>
<td>3 (1-4)</td>
<td>3 (1-5)</td>
<td>.59</td>
</tr>
<tr>
<td><strong>Length of hospital stay days</strong></td>
<td>6 (4-8)</td>
<td>5 (4-7)</td>
<td>.09</td>
</tr>
<tr>
<td>Death</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**NOTE:** For dichotomous variables, data are no. (%) of patients; for continuous variables, data are median (25th-75th percentiles).

Preventive transfusion has NO ROLE in the treatment of DHF.

Level of Evidence: Class 2
Grade of Recommendation: A
### Points of Emphasis

<table>
<thead>
<tr>
<th>GOOD PRACTICE</th>
<th>BAD PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment and follow-up of patients with non-severe dengue and careful instruction of warning signs to watch out for</td>
<td>Sending patients with non-severe dengue home with no follow-up and inadequate instructions</td>
</tr>
<tr>
<td>Administration of paracetamol for high fever if the patient is uncomfortable</td>
<td>Administration of acetylsalicylic acid (aspirin) and ibuprofen</td>
</tr>
<tr>
<td>Obtaining HCT level before and after fluid boluses</td>
<td>Not knowing when HCT levels are taken w/ respect to fluid therapy</td>
</tr>
</tbody>
</table>
### Points of Emphasis

<table>
<thead>
<tr>
<th>GOOD PRACTICE</th>
<th>BAD PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical assessment of the hemodynamic status before and after each fluid bolus</td>
<td>No clinical assessment of patient with respect to fluid therapy</td>
</tr>
<tr>
<td>Interpretation of HCT levels in the context of fluid administered and hemodynamic assessment</td>
<td>Interpretation of HCT levels independent of clinical status</td>
</tr>
<tr>
<td>Giving IVF volume just sufficient to maintain effective circulation during the period of plasma leakage for severe dengue</td>
<td>Excessive or prolonged IVF administration for severe dengue</td>
</tr>
<tr>
<td>GOOD PRACTICE</td>
<td>BAD PRACTICE</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>IVF, frequency of monitoring and HCT measurement adjusted according to the patient’s condition</td>
<td>Fixed IVF rate, unchanged frequency of monitoring and HCT measurement during entire hospitalization for severe dengue</td>
</tr>
<tr>
<td>Close monitoring of blood glucose</td>
<td>Not monitoring blood glucose</td>
</tr>
<tr>
<td>Discontinuation or reducing fluid therapy once hemodynamic status stabilizes</td>
<td>Continuation and no review of intravenous fluid therapy once hemodynamic status stabilizes</td>
</tr>
</tbody>
</table>