I. INTRODUCTION

A. Background

Dengue fever (DF) and Dengue Hemorrhagic Fever (DHF)/Dengue Shock Syndrome (DSS) continue to be significant causes of morbidity and mortality in the Philippines. Dengue is considered to be endemic in the Philippines with clustering of cases and outbreaks occurring at unpredictable intervals due to inability to control and prevent this arthropod-borne disease.

In 2008, the first Evidence-based Guidelines on Dengue Fever and Dengue Hemorrhagic Fever\(^1\) were released. This accomplishment was made possible through the initiative of the previous leadership of the Philippine Pediatric Society, starting from Dr. Estrella Paje-Villar who convened the Technical Working Group to draft the evidence-based guidelines, continuing under the guidance of Dr. Jocelyn Yamboa-Franco, and finally realizing completion during the term of Dr. Victor Doctor. The guidelines were developed and written by a group of dedicated and hard working individuals who comprised the Technical Working Group, chaired by Dr. Jaime Santos and guided by Dr. Jacinto Blas Mantaring III and Dr. Leonila Dans as chairpersons of the Committee on Clinical Practice Guidelines. The invaluable contributions of the Expert Panel, Editors, UMED and many others who helped in one way or another in the preparation of the document are also recognized.

Since the release of the first Evidence-based Guidelines on Dengue Fever/Dengue Hemorrhagic Fever in 2008 by the Philippine Pediatric Society, the World Health Organization (WHO) published a document entitled "Dengue Guidelines for Diagnosis, Treatment, Prevention and Control- New edition 2009."\(^2\) This new document, referred to hereafter as the 2009 WHO Dengue Guidelines, is a joint publication of the WHO and the Special Programme for Research and Training in Tropical Diseases (TDR) and was meant to supersede the recommendations in the 1997 WHO Dengue Guidelines.\(^3\)

The two most important differences between the 2008 PPS Dengue evidence-based guidelines and the 2009 WHO Dengue Guidelines were identified to be on Dengue Case Classification and on Clinical Management. Due to the urgent need to provide guidance on clinical management for pediatricians and other practitioners, this update primarily focuses on the fluid management of patients with dengue hemorrhagic fever presenting with or without shock. A section comparing the existing case classification used in the 2008 PPS guidelines with the 2009 proposed WHO dengue case classification will also be included. However, until results of the validation studies of the WHO using this classification is released, no definite recommendations can be made on use of the new dengue case classification.

A Clinical Practice Guideline to update the 2008 PPS evidence-based guidelines of DF/DHF is being planned because additional data from new randomized controlled trials, systematic reviews and meta-analysis has become available since the release of the 2008 PPS guidelines. However, while new studies are being retrieved and evaluated, the updated CPG will have to await results of the validation studies being conducted by the WHO on their proposed dengue case classification and management guidelines. This will be crucial in order to come up with more comprehensive data on which to base recommendations for best practices on the management of dengue. The results of the validation studies are expected to be available before the end of 2010.
B. Objectives

The main objectives of these 2010 Interim Guidelines on Fluid Management of DF/DHF are the following:

1. To compare the Dengue Case Classification used in the 2008 PPS Dengue evidence-based guidelines and the proposed 2009 WHO Dengue Guidelines
2. To update the section on fluid management of the 2008 PPS Dengue evidence-based guidelines
3. To develop clinical algorithms on fluid resuscitation of patients with dengue based on presenting clinical features and based on the presence of compensated or uncompensated shock

C. Target Population

These 2010 Interim Guidelines on Fluid Management for DF/DHF have been developed for use by pediatricians, family physicians, general practitioners, and other healthcare professionals of various specialties both in the private and government settings who are involved in the diagnosis and management of patients with dengue. It provides a stepwise approach on the fluid management of dengue patients where treatment and subsequent referral to hospitals and to facilities with intensive care units is based on the severity of illness.

II. DENGUE CASE CLASSIFICATION

Dengue is disease with a wide spectrum of clinical presentation often with unpredictable clinical progression and outcome. It is often difficult to predict the subset of patients who will progress from non-severe to severe disease. Early recognition of patients who may rapidly develop more severe clinical disease is crucial in order to facilitate hospital admission or referral and institute urgent management.

The Dengue case classification adopted by the PPS evidence-based guidelines on dengue was based on the 1997 WHO classification which is still in current use. This case classification was formulated by the Technical Advisory Committee at its meeting in Manila, Philippines in 1974 and was largely based on the pioneering studies in Thailand in the 1960’s. Few modifications have evolved through the years but the case definition and classification remained to be essentially the same. In the current classification based on the 1997 WHO case classification, symptomatic dengue virus infections are grouped into three categories: undifferentiated fever, dengue fever (DF), and dengue hemorrhagic fever (DHF). Dengue hemorrhagic fever is further classified into four severity grades, with grades III and IV being classified as dengue shock syndrome (DSS). According to these WHO Guidelines, which were adopted by the 2008 PPS guidelines, DHF cases must fulfil all the following four criteria: (1) Fever or a history of acute fever lasting 2-7 days; (2) hemorrhagic tendencies evidenced by at least one of the following: a positive tourniquet test (TT); petechiae, purpura, ecchymoses; bleeding from mucosa, gastrointestinal tract, injection sites, or other location; (3) thrombocytopenia, defined a platelet count \( \leq 100,000/\mu l \); (4) hemoconcentration defined as \( \geq 20\% \) rise is hematocrit relative to baseline or evidence of plasma leakage (i.e. pleural effusion, ascites, and/or hypoproteinemia).

Diversity in and the changing dengue epidemiology in different countries in recent years led to problems with the use of the existing WHO classification. Several authors have reported difficulties and inconsistencies in this classification with failure to fulfil all four criteria for the definition of DHF in severe dengue cases.\(^4,5,6\) The findings are summarized in a systematic review.\(^7\) This has led to reassessment of the WHO case classifications.
In the proposed 2009 WHO case classification, patients with dengue are classified according to levels of severity as having Severe Dengue and Non-severe Dengue based on a set of clinical and/or laboratory parameters. The large group of patients with Non-severe Dengue was further subdivided into two subgroups: patients with warning signs and those without warning signs. This classification was proposed by an expert group in Geneva, Switzerland in 2008 as a potential solution to determine where and how intensively the patients should be observed and treated and to develop more consistency in reporting. This classification is being tested in 18 countries by comparing its performance in practical settings to the existing WHO case classification. Results of the validation study through a prospective multicenter study using this new classification is expected to be available before the end of 2010. Therefore, there is no recommendation yet to adapt this proposed 2009 case classification of dengue.

For the purpose of information, the existing and the proposed dengue case classification and its level of severity will be presented and compared in this document. However, it is reiterated that at present, we still follow the current WHO case classification of dengue.

The two case classifications for dengue infections are presented in the following table for comparison purposes. (see Table 1).

Table 1. Comparison of the Current WHO/PPS Case Definition and Case Classification for Dengue with the Proposed 2009 WHO Case Classification

<table>
<thead>
<tr>
<th>CURRENT WHO Case Definition of Dengue and Levels of Severity (1997) as adapted by the PPS Clinical Practice Guidelines on Dengue 2008</th>
<th>PROPOSED WHO Classification and Levels of Severity 2009</th>
</tr>
</thead>
</table>
| **Case Definition for Dengue Fever**  
**Probable:** an acute febrile illness with 2 or more 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)  
**Confirmed:** A case confirmed by laboratory criteria | **Nonsevere Dengue without Warning signs**  
**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  
**Laboratory-confirmed dengue** (important when no sign of plasma leakage) |
| **Case Definition for Dengue Hemorrhagic Fever (DHF)**  
The following must all be present:  
1. Fever, or history of fever, lasting for 2-7 days, occasionally biphasic  
2. Hemorrhagic tendencies evidenced by at least one of the following:  
   a. (+) tourniquet test  
   b. Petechiae, ecchymosis, purpura  
   c. Bleeding from the mucosa, GIT, injection sites or other locations |  |
<table>
<thead>
<tr>
<th>Case Definition for Dengue Shock syndrome (DSS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the four criteria for DHF must be present, plus evidence of circulatory failure manifested by:</td>
</tr>
<tr>
<td>- Rapid and weak pulse, AND</td>
</tr>
<tr>
<td>- Narrow pulse pressure (&lt; 20mmHg [2.7kPa]) OR manifest by:</td>
</tr>
<tr>
<td>- Hypotension for age, AND</td>
</tr>
<tr>
<td>- Cold clammy skin and restlessness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grading of Severity of DHF/DSS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DHF Grade 1</strong></td>
</tr>
<tr>
<td>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</td>
</tr>
</tbody>
</table>

**Nonsevere Dengue without Warning signs OR Dengue with (mild) warning signs** |
Fever and 2 of the following criteria: |
- Nausea, vomiting |
- Rash |
- Aches and pains |
- Tourniquet test positive |
- Leukopenia |
- Any mild warning sign, e.g. mild abdominal pain or tenderness, mild liver enlargement |

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

| **DHF Grade 3 (DSS)** |
| Circulatory failure manifested by rapid, weak pulse and narrowing of pulse pressure or hypotension, with |

**Severe dengue** |
should be considered if the patient is from an area of dengue risk presenting with fever of 2–7 days plus any of
the presence of cold clammy skin and restlessness

<table>
<thead>
<tr>
<th>DHF Grade 4 (DSS)</th>
<th>Profound shock with undetectable blood pressure or pulse</th>
</tr>
</thead>
</table>

the following features:
- **Severe plasma leakage**, leading to:
  - Shock
  - Fluid accumulation with respiratory distress
- **Severe bleeding**, as evaluated by clinician
- **Severe organ impairment**
  - Liver: AST or ALT ≥ 1000
  - CNS: impaired consciousness
  - Heart and other organs

### III. FLUID MANAGEMENT OF DENGUE FEVER AND DENGUE HEMORRHAGIC FEVER

A. **Fluid management for patients with DF/DHF [Dengue without warning signs] who are not admitted.**

- In patients with DF/DHF Grade I who are not admitted, oral rehydration solution should be given as follows based on weight, using currently recommended ORS:

<table>
<thead>
<tr>
<th>Body Weight (kg)</th>
<th>ORS to be given</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>

- Reduced osmolarity ORS containing sodium 45 to 60 mmol/liter.
- Sports drinks [Na] <20 meqs/should not be given.

B. **Fluid management for patients who are admitted, without shock (DF/DHF Grade I-II or Dengue without warning signs).**

- Isotonic solutions (D₅ LRS, D₅ Acetated Ringers D₅ NSS/ D₅ 0.9 NaCl) are appropriate for DHF patients who are admitted but without shock. Maintenance IVF computed using the caloric-expenditure method (Holliday Segar Method) or Calculation Based on Weight (Barnes and Young Method).

<table>
<thead>
<tr>
<th>Body Weight (kg)</th>
<th>Total Fluid Requirement (ml/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 -10</td>
<td>100 ml/kg</td>
</tr>
<tr>
<td>&gt; 10-20 kg</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>
Alternative Method (Barnes and Young Method):

Table 4. Calculation of Total Intravenous Fluids Based on Weight

<table>
<thead>
<tr>
<th>Body Weight (kg)</th>
<th>Total Fluid Requirement 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>

- If the patient shows signs of **mild dehydration**, the volume needed for mild dehydration is **added** to maintenance fluids over the next 6 – 8 hours. The following formula may be used to calculate the required volume of intravenous fluid to infuse:

  Maintenance IVF + Fluids as for Mild dehydration

  Where volume of fluids for mild dehydration is computed as follows (to be added to the maintenance fluid volume):

  - Infant: 50 ml/kg/ 6-8 hours
  - Older Child or Adult: 30 ml/kg/ 6-8 hours

- Periodic reassessment is needed so that fluid rate may be adjusted accordingly.
- After 6-8 hours, fluid rate is computed at maintenance rate over 16-18 hours.
- Clinical parameters should be monitored closely and correlated with hematocrit. This will ensure adequate hydration, avoiding under and over hydration. The IVF rate may be decreased anytime as needed.
C. Fluid management for patients admitted to the hospital with DHF Grade III (Compensated Shock)

Compensated shock (systolic pressure maintained but has signs of plasma leakage [hemoconcentration or reduced perfusion])

BOX A. Obtain baseline HCT (a)
Fluid resuscitation with plain isotonic crystalloid 10-15 ml/kg/hour over 1 hour
Give oxygen support

Improvement (b)
(See Table 5)

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 5) including urine output (f)
Monitor for signs of bleeding

1. If patient is stable and HCT increases by 10% from baseline, correlate clinically and assess need to increase fluid rate.

2. If patient is unstable and HCT increases, go to Box B.

3. If patient is unstable and there is a sudden drop in HCT, look for signs of bleeding. Consider transfusion with fresh whole blood 20ml/kg or PRBC 10 ml/kg.

4. If patient is stable for 48 hours, stop IVF or give maintenance fluids or ORS (refer to Table 3 or Table 4).

BOX C
Administer 2nd bolus of fluid, colloid/crystalloid (c)
10-20 ml/kg/hr in 1 hours

Patient is stable
HCT decreases
Go to Box B

Patient is unstable
HCT increases

Administer 3rd bolus of fluid (colloid/crystalloid)
10-20 ml/kg/hr for 1 hour

If patient improves, go to Box B

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.

2. If patient does not improve, go to Box E.

BOX E. If patient does not improve, consider inotropes (d) and refer to tertiary center
D. Fluid management for patients admitted to the hospital with shock DHF Grade IV/DSS (Hypotensive Shock)

**Hypotensive shock (e)**

**BOX A.** Obtain baseline HCT (a) Fluid resuscitation with 20ml/kg plain isotonic crystalloid or colloid over 15 minutes (c) Give oxygen support.

**Improvement (b)** (See Table 5)

- **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 5**) including urine output (f) Monitor for signs of bleeding
  1. If patient is stable and HCT increases by 10% from baseline, correlate clinically and assess need to increase fluid rate.
  2. If patient is unstable and HCT increases, go to **Box B**.
  3. If patient is unstable and there is a sudden drop of HCT, look for signs of bleeding. Consider transfusion with fresh whole blood 20 ml/kg or PRBC 10ml/kg.
  4. If patient is stable for 48 hours, stop IVF or give maintenance fluids or ORS (refer to **Table 3** or **Table 4**).

- **No**
  - **BOX C.** Administer 2nd bolus fluid (colloid) 10-20 ml/kg over ½ to 1 hour. Check hemodynamic parameters (see **Table 5**)  
  1. If patient improves, go to **Box B**.
  2. If patient does not improve, go to **Box E**.

**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

- **Patient is stable**
  - HCT decreases
  - Reduce IVF rate to 7-10 ml/kg/hr for 1-2 hrs
  - If patient remains stable, go to **Box B**.

- **Patient is unstable**
  - HCT increases
  - Administer 3rd bolus (colloid/crystalloid) 10-20 ml/kg for 1 hour (c)

**BOX E.** If patient does not improve, consider inotropes (d) and refer to tertiary center
Annotations:

a. If HCT is not readily available, assess hemodynamic status of patient using parameters in Table 5.

b. **Assessment of improvement should be based on 7 parameters:** mental status, heart rate, blood pressure, respiratory rate, capillary refill time, peripheral blood volume, extremities as described in Table 5.

c. **Crystalloids** (Ringer’s lactate or 0.9 NaCl solutions) have been shown to be safe and as effective as **colloid solutions** (dextran, starch, or gelatin) in reducing the recurrence of shock and mortality. Crystalloids are comparable to colloids in terms of total amount of fluids used in resuscitation and need for both rescue fluid and diuretics so they should be used as first line in fluid resuscitation in moderately severe (compensated) dengue shock.\(^8\)–\(^12\) Compared with crystalloids, colloids are associated with increased risk of allergic reactions and new bleeding manifestations\(^10,11\) and are more expensive. Although there is insufficient data to ascertain the advantage of one type of fluid in cases of severe dengue shock (DHF grade IV) or hypotensive (uncompensated) shock, colloids 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.

**Crystalloids**

0.9% saline [“normal” saline]/ NSS

- Normal plasma chloride ranges from 95 to 105 mmol/L. 0.9% Saline is a suitable option for initial fluid resuscitation, but repeated large volumes of 0.9% saline may lead to hyperchloremic acidosis. Hyperchloremic acidosis may aggravate or be confused with lactic acidosis from prolonged shock. Monitoring the chloride and lactate levels will help to identify this problem. When serum chloride level exceeds the normal range, it is advisable to change the other alternatives such as Ringer’s Lactate.

**Ringer’s Lactate**

- Ringer’s Lactate has lower sodium (131mmol/L) and chloride (115mmol/L) contents and osmolality of 273mOsm/L. It may not be suitable for resuscitation of patients with severe hyponatremia. However, it is a suitable solution after 0.9 Saline has been given and the serum chloride level has exceeded the normal range. Ringer’s Lactate should probably be avoided in liver failure and patients taking metformin where lactate metabolism may be impaired.

**Colloids**

- The types of colloids are gelatin-based, dextran-based and starch-based solutions. One of the biggest concerns regarding their use is their impact on coagulation.
- **Dextrans** may bind to von Willebrand factor/Factor VIII complex and impair coagulation the most. However, this was not observed to have clinical significance in fluid resuscitation in dengue shock. Dextran 40 can potentially cause an osmotic renal injury in hypovolemic patients.
- **Gelatin** has the least effect on coagulation among all the colloids but the highest risk of allergic reactions. Allergic reactions such as fever, chills and rigors have also been observed in Dextran 70.

d. **Inotropes**

The use of inotropes should be decided on carefully and it should be started after adequate fluid volume has been administered.

   - To calculate the **AMOUNT** of Dopamine to be added to 100 ml of IV base solution:
mg of Dopamine = 6 \times \text{desired dose [mcg/kg/min]} \times \text{weight[kg]} \times \text{desired fluid rate [ml/hr]}

- To calculate the VOLUME of drug to be added to 100 ml of IV base solution:

\[ \text{Ml of Dopamine} = \frac{\text{mg of drug [determined using formula above]}}{\text{concentration of drug [mg/ml]}} \]

Preparation of Dopamine: 40 mg/ml, 80 mg/ml

e. **Hypotension** is defined as Systolic blood pressure of <90 mmHg or mean arterial pressure <70 mmHg in adults or a systolic blood pressure decrease of >40 mmHg of <2 standard deviation below normal for age; In children below 10 years of age the 5th centile for systolic blood pressure can be determined by the formula: Systolic Blood Pressure = 70 + [age in years X 2] mmHg

f. **Urine output**
A good urine output indicates sufficient circulatory volume and may be used as an index or guide for decreasing the amount of fluid administered. An adequate urine output is at least 1 ml/kg/hr and urine specific gravity of 1.020 is ideal. However in the WHO Dengue Guidelines 2009, a urine output of 0.5 cc/kg/hr is considered acceptable and may have been chosen to avoid congestion in the course of the disease. Monitor urine output hourly till the patient is out of shock, then 1-2 hourly Deliberate observation for a possible acute kidney injury/ acute renal failure must also be taken.

### Table 5: Hemodynamic Assessment: Continuum of Hemodynamic Changes

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Stable Condition</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 (shock can be missed if you do not touch the patient)</td>
<td>Change of mental status (restless and 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</td>
<td>Cool peripheries</td>
<td>Cold and clammy</td>
</tr>
<tr>
<td>Peripheral pulse</td>
<td>Good volume</td>
<td>Weak and thread</td>
<td>Feeble or absent</td>
</tr>
<tr>
<td>Heart rate</td>
<td>Normal for age</td>
<td>Tachycardia</td>
<td>Severe tachycardia with bradycardia in the late shock.</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Normal for age</td>
<td>Normal systolic pressure but rising diastolic pressure. Narrowing pulse pressure. Postural hypotension</td>
<td>Narrowed pulse pressure (&lt;20 mmHg) Hypotension (see definition below) Unrecordable BP Metabolic Acidosis,</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>Normal for age</td>
<td>Tachypnea</td>
<td>Hyperpnea, Kussmaul breathing</td>
</tr>
</tbody>
</table>

REFERENCES


15. The 1998 National Working Group Consensus on the Treatment of DHF [Department of Health]

Appendix A

Calculation of Fluids in Obese or Overweight Patients

For obese and overweight patients, use the ideal body weight for calculation of fluid infusion:

<table>
<thead>
<tr>
<th>Estimated body weight, or IBW (kg)</th>
<th>Normal maintenance fluid [ml/hour] based on Holliday-Segar formula</th>
<th>Fluid regimen based on 2-3 ml/kg/hour (ml/hour)</th>
<th>Regimen based on 1.5-2ml/hour (ml/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10</td>
<td>10-15</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>20-30</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>30</td>
<td>30-45</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>60</td>
<td>40-60</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>65</td>
<td>50-75</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>70</td>
<td>60-90</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>75</td>
<td>70-105</td>
<td></td>
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<tr>
<td>40</td>
<td>80</td>
<td>80-120</td>
<td></td>
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<tr>
<td>50</td>
<td>90</td>
<td>100-150</td>
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<tr>
<td>60</td>
<td>100</td>
<td></td>
<td>90-120</td>
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<tr>
<td>70</td>
<td>110</td>
<td></td>
<td>105-140</td>
</tr>
<tr>
<td>80</td>
<td>120</td>
<td></td>
<td>120-150</td>
</tr>
</tbody>
</table>

Estimated Ideal Body Weight for Overweight or Obese Adults

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>Estimated, IBW (kg) for adult males</th>
<th>Estimated IBW (kg) for adult females</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>50</td>
<td>45.5</td>
</tr>
<tr>
<td>160</td>
<td>57</td>
<td>52</td>
</tr>
<tr>
<td>170</td>
<td>66</td>
<td>61.5</td>
</tr>
<tr>
<td>180</td>
<td>75</td>
<td>70</td>
</tr>
</tbody>
</table>
Appendix B

Causes of fluid overload

- Excessive and/or too rapid intravenous fluids
- Incorrect use of hypotonic rather than isotonic crystalloid solution
- Inappropriate use of large volumes of intravenous fluids in patients with unrecognized severe bleeding
- Inappropriate transfusion of fresh-frozen plasma, platelet concentrates and cryoprecipitates
- Continuation of intravenous fluids after plasma leakage has resolved [24-48 hours from defervescence]
- Co-morbid conditions such as congenital or ischemic heart disease, chronic lung disease and renal disease

Early clinical features of fluid overload

- Respiratory distress, difficulty in breathing
- Rapid breathing
- Chest wall indrawing
- Wheezing rather than crepitant rales
- Large pleural effusions
- Tense ascites
- Increased jugular pressure
- Hypertension
Appendix C

Sample Monitoring Sheet for Dengue Patients

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Time and Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensorium</td>
<td></td>
</tr>
<tr>
<td>Body temperature</td>
<td></td>
</tr>
<tr>
<td>Respiratory rate</td>
<td></td>
</tr>
<tr>
<td>Heart rate</td>
<td></td>
</tr>
<tr>
<td>Blood pressure</td>
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<tr>
<td>Pulse pressure/volume</td>
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<tr>
<td>Capillary refill time</td>
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<tr>
<td>Temperature of extremities</td>
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<tr>
<td>Abdominal pain</td>
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<tr>
<td>Vomiting</td>
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<tr>
<td>Bleeding</td>
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<tr>
<td>IVF infusion rate</td>
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<tr>
<td>Urine Output</td>
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MEMBERS OF THE TECHNICAL WORKING GROUP ON THE 2010 PPS INTERIM GUIDELINES ON FLUID MANAGEMENT OF DF/DHF

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18 October 2010