Guidelines for Treatment of Dengue Fever/Dengue Haemorrhagic Fever in Small Hospitals

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Foreword

In the past 15 years, we have witnessed a dramatic increase in the global incidence of dengue and its severe manifestations such as dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS). The epidemics in endemic countries are occurring more frequently with increasing magnitude. More than 2.5 billion people are at risk of infections in over 200 countries worldwide. There are probably tens of millions of cases of dengue each year, and at least five hundred thousand cases of DHF with a mortality of about five per cent in most countries. The vast majority of cases, nearly 95 per cent, are among children of less than 15 years of age. Clearly this infection, which is already the most widespread mosquito -borne disease in humans, is of major public health importance.

The present guidelines on treatment of DF/DHF in small hospitals have been developed by WHO, in consultation with the leading experts in the field of clinical management of DHF. I am sure, these guidelines will be a proper tool for physicians working in small hospitals to conduct appropriate treatment of patients with DF/DHF, and would help in achieving our common target to reduce case fatality rate of DHF to less than one per cent in all endemic countries.

Dr Uton Muchtar Rafei
Regional Director

Acknowledgement

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Guidelines for Treatment of Dengue Fever/
Dengue Haemorrhagic Fever in Small Hospitals

Dengue is the most important emerging tropical viral disease of humans in the world today. It is estimated that there are between 50 and 100 million cases of dengue fever (DF) and about 500,000 cases of dengue haemorrhagic fever (DHF) each year which require hospitalization. Over the last 10-15 years, DF/DHF has become a leading cause of hospitalization and death among children in the South-East Asia Region of WHO, following diarrhoeal diseases and acute respiratory infections.

Standard treatment of DF/DHF has many advantages. Deaths due to DHF can be reduced to less than 1% among hospitalized patients by the widespread use of standard treatment. It also rationalizes hospitalization, reduces the pressure of admissions, and prevents unnecessary blood transfusions.

A large number of DF/DHF patients first visit small hospitals in their countries. Small hospitals vary from country to country and within each country. There are common features which will help in categorization of health facilities into small hospitals and referral hospitals. A small hospital is a health facility where doctors are responsible for treatment of patients and where there are facilities to admit sick individuals. It is possible to give intravenous fluids and blood transfusion. Essential drugs are available. Blood haematocrit, haemoglobin and platelet counts can be done. In some small hospitals, basic intensive care can also be provided. Examples of small hospitals in countries of the Region include district hospitals in Bhutan, Nepal, Sri Lanka and Thailand; thana health centres in Bangladesh; community health centers and subdistrict hospitals in India; health centers (*puskesmas*) in Indonesia, and township hospitals in Myanmar. Small hospitals which are privately run including nursing homes and other hospitals which admit patients and have the above mentioned facilities should also be encouraged to use these guidelines.

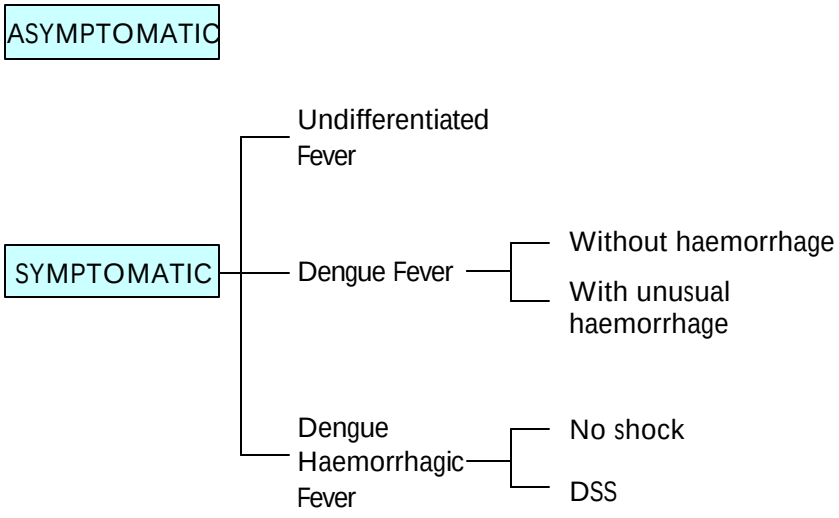
The present guidelines on treatment of DF/DHF in small hospitals were adapted from the WHO document, *Dengue Haemorrhagic Fever – Diagnosis, Treatment, Prevention and Control, 1997 (2nd Edition).* These guidelines do not address details of prevention of the disease (Staff in small hospitals should refer to specific guidelines on the prevention and control of DF/DHF). These guidelines are intended to help the staff working in small hospitals to treat uncomplicated cases of DF/DHF. However, detailed instructions on intensive care are not included. It is possible that an occasional patient may develop complications. In such cases, if it is not feasible to refer the patient, the guidelines given in this document should be used and other materials for providing intensive care should also be used. These simplified, and practical guidelines can be further adapted by Member States. Wherever English is not commonly known in small hospitals, the guidelines should be translated into the local language for effective use at country level.

For additional information, comments and suggestions, please contact the WHO Regional Office for South-East Asia (Attn. Dr Vijay Kumar/Dr A.G. Andjaparidze), Division of Integrated Control of Diseases, World Health House, New Delhi – 110 002, India. Telephone: 91 11 331 7804 to 7823, Fax: 91 11 3318412 and 3318607, and Email address: andjaparidzea@whosea.org.

1. Manifestation of Dengue Infection

All four dengue virus (Den 1, 2, 3 and 4) infections may be asymptomatic or may lead to undifferentiated fever, dengue fever (DF), or dengue haemorrhagic fever (DHF) with plasma leakage that may lead to hypovolemic shock, dengue shock syndrome (DSS).

Manifestation of dengue virus infections:



2. Recognition of Dengue Fever/Dengue Haemorrhagic Fever (DF/DHF)

Dengue Fever is an acute febrile illness of 2-7 days duration (sometimes with two peaks) with **two or more** of the following manifestations:

- headache
- retro-orbital pain
- myalgia/arthralgia
- rash
- haemorrhagic manifestation (petechiae and positive tourniquet test[1]) and,
- leukopenia.

In children, DF is usually mild. In some adults, DF may be the classic incapacitating disease with severe bone pain and recovery may be associated with prolonged fatigue and depression.

Dengue Haemorrhagic Fever is a probable case of dengue and haemorrhagic tendency evidenced by one or more of the following:

- Positive tourniquet test
- Petechiae, ecchymosis or purpura
- Bleeding from mucosa (mostly epistaxis or bleeding from gums), injection sites or other sites
- Haematemesis or melena

[1] The tourniquet test is performed by inflating a blood pressure cuff to a point mid-way between the systolic and diastolic pressures for five minutes. A test is considered positive when 10 or more petechiae per 2.5 cm^2 (1 inch) are observed. In DHF, the test usually gives a definite positive result (i.e. >20 petechiae). The test may be negative or mildly positive during the phase of profound shock.

- Thrombocytopaenia (platelets 100,000/cu.mm or less) and
- Evidence of plasma leakage due to increased capillary permeability manifested by **one or more** of the following:
  - A >20% rise in haemotocrit for age and sex
  - A >20% drop in haemotocrit following treatment with fluids as compared to baseline
  - Signs of plasma leakage (pleural effusion, ascites or hypoproteinaemia).

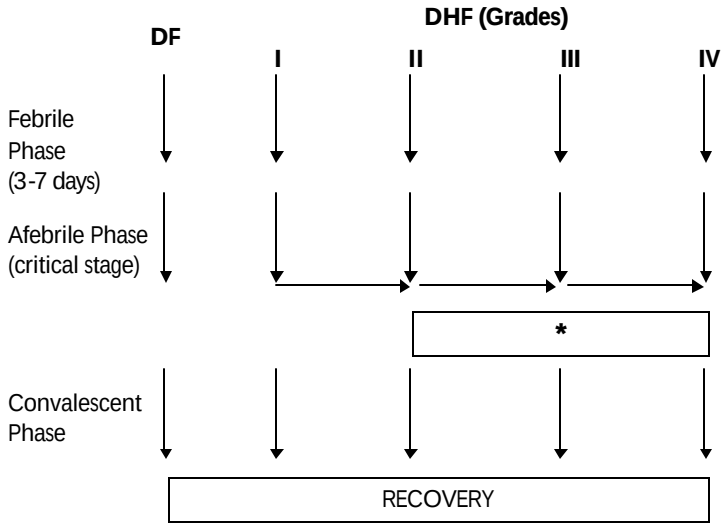
Dengue Shock Syndrome (DSS) All the above criteria of DHF plus signs of circulatory failure manifested by rapid and weak pulse, narrow pulse pressure (< or equal to 20 mm Hg); hypotension for age, cold and clammy skin and restlessness.

The above descriptions of DF/DHF/DSS are adequate for guiding doctors to treat the disease. However, for reporting of the disease, cases should be classified as suspected DF/DHF/DSS on the basis of above the criteria. Added serological evidence would categorize them into probable and confirmed cases. Serological and virological diagnosis is not possible in most small hospitals. It is recommended that blood samples of patients be sent to a laboratory according to the guidelines provided at Annex 1.

There are difficulties in categorizing the disease. A patient can progress from DHF to DSS, and depending on the stage of the disease when the patient reports, a mixed picture can be seen. However, as long as the patient evaluation is done systematically, there should be no difficulties in providing treatment, or in decision making about admission to a hospital, or in referring patients for specialised care.

3. Disease Course

DF/DHF has an unpredictable course. Most patients have a ***febrile phase*** lasting 2-7 days. This is followed by a ***critical phase*** which is of about 2-3 days duration. During this phase, the patient is afebrile, and is at risk of developing DHF/DSS which may prove fatal if prompt and appropriate treatment is not provided. Since haemorrhage and or shock can occur rapidly, arrangements for rapid and appropriate treatment should be always available. By doing this, the case fatality rate can be substantially reduced. The disease course of DF/DHF is summarised below:



* If appropriate treatment is not provided, there is a high risk of death.

4. Grading the Severity of Dengue Infection

To decide about where to treat the patient, it is important to classify the severity of dengue infection. The severity of dengue infection is classified into the grades described in Table 1 below.

Table 1

DF/DHF	Grade*	Symptoms	Laboratory
DF		Fever with two or more of the following signs: headache, retro-orbital pain, myalgia, arthralgia	Leukopenia occasionally. Thrombocytopenia, may be present, no evidence of plasma loss
DHF	I	Above signs plus positive tourniquet test	Thrombocytopenia $<100,000$, Hct rise $\geq 20\%$
DHF	II	Above signs plus spontaneous bleeding	Thrombocytopenia $<100,000$, Hct rise $\geq 20\%$
DHF	III	Above signs plus circulatory failure (weak pulse, hypotension, restlessness)	Thrombocytopenia $<100,000$, Hct rise $>20\%$
DHF	IV	Profound shock with undetectable blood pressure and pulse	Thrombocytopenia $<100,000$, Hct rise $\geq 20\%$

* DHF Grade III and IV are also called as Dengue Shock Syndrome (DSS)

5. Treatment of DF and DHF

5.1 Febrile Phase

In the early febrile phase, it is not possible to distinguish DF from DHF. Their treatments during the febrile phase are the same, i.e. symptomatic and supportive:

- Rest.
- Paracetamol (not more than 4 times in 24 hours) according to age for fever above 39°C.

Age	Dose (tablet 250 mg)	Mg/Dose
< 1 year	¼ tablet	60
1-4 years	½ tablet	60-120
5 years and above	1 tablet	240

- **Do not** give Aspirin or Brufen. Aspirin can cause gastritis and/or bleeding. In children, Reye's syndrome (encephalopathy) may be a serious complication.
- Do not give antibiotics as these do not help.
- Oral rehydration therapy[2] is recommended for patients with moderate dehydration caused by vomiting and high temperature.
- Food should be given according to appetite.

[2] ***In Children***, with signs of some dehydration, oral rehydration solution which is commonly used in the treatment of diarrhoeal diseases and/or fresh juices are preferable(50ml/kg bodyweight fluids should be given during the first 4-6 hr)s. After correction of dehydration, the child should be given maintenance fluids orally at the rate of 80-100 ml/kg bodyweight in the next 24 hrs . Children who are breastfed should continue to be breasfed in addition to ORS administration. ***In adults***, oral fluid intake of 2.5-4.0 litres should be given per day.

All dengue patients must be carefully observed for complications for at least 2 days after recovery from fever. This is because life threatening complications often occur during this phase. ***Patients and households should be informed that severe abdominal pain, passage of black stools, bleeding into the skin or from the nose or gums, sweating, and cold skin are danger signs. If any of these signs is noticed, the patient should be taken to the hospital***. Detailed information which should be provided to all patients and households by the doctor is given in Annex 2. The patient who does not have any evidence of complications and who has been afebrile for 2-3 days does not need further observation.

5.2 Afebrile Phase

(1) Dengue Fever

Constitutional symptoms in patients with DF after the fall of fever are as during the febrile stage. Most patients will recover without complication. Treatment should be carried out as indicated in Chart 1.

(2) Dengue Haemorrhagic Fever (DHF) Grades I and II

As in DF, during the afebrile phase of DHF Grades I and II, the patient has the same symptoms as during the febrile phase. The clinical signs plus thrombocytopenia and haemoconcentration or rise in haematocrit are sufficient to establish a clinical diagnosis of DHF. During this phase, the patients should be observed for at least 2-3 days after the fall in temperature, for rashes on the skin, bleeding from nose or gums, blue spots on the skin or tarry stools. If any of these signs are observed, the patients should be brought to the hospital without delay. The only difference between the DF and DHF Grade I is the presence of thrombocytopenia and rise in haematocrit (>20%). Patients with DHF Grade I do not usually require intravenous fluid therapy and ORT is sufficient. Intravenous fluid therapy may need to

Chart 1. ***DF/DHF Management Charts***

Dengue Fever

Febrile phase	Manifestation	Management
Duration 2-7 days	– Temp 39-40ºC – Headache – Retro-orbital pain – Muscle pain – Joint/bone pain – Flushed face – Rash – Skin haemorrhage, bleeding from nose, gums – Positive tourniquet test – Liver often enlarged – Leucopenia – Platelet/haematocrit normal	– At home* – Bed rest – Keep the body temperature below 39º – Paracetamol-Yes** – Aspirin-No – Brufen-No – Oral fluids and electrolyte therapy – Follow-up for any change in platelet/haematocrit

Afebrile phase (critical stage)	Manifestation	Management
Duration – 2-3 days after febrile stage	– Same as during febrile phase – Improvement in general condition – Platelet/haematocrit normal – Appetite rapidly regained	– Bed rest – Check platelets/haematocrit – Oral fluids and electrolyte therapy

Convalescence Phase	Manifestation	Management
Duration – 7-10 days after critical stage	– Further improvement in general condition and return of appetite – Bradycardia – Confluent petechial rash with white centre/ itching – Weakness for 1 or 2 weeks	– No special advice. – No restrictions. – Normal diet

* Patients and household members should be informed by the doctor that abdominal pain, passing of black stools, bleeding, sweating, and cold skin are danger signs, and if any of these signs is noticed, the patient should be taken to the hospital immediately.

** Paracetamol should be administered not more than 4 times in a 24-hour period. Paracetamol (250mg): <1yr-1/4 tablet; 1-4 years – ½ tablet; 5 yrs and above – one tablet.

be administered only when the patient is vomiting persistently or severely, or refusing to accept oral fluids. Patients with DHF Grade I who live far away from the hospital or those who are not likely to be able to follow the medical advice should be kept in the hospital for observation.

During the afebrile phase of DHF Grade II, the complications usually seen, in addition to those observed during the DHF Grade I phase, are abdominal pain, black tarry stools, epistaxis, bleeding from the gums, and continued bleeding from injection sites. Immediately after hospitalization, haematocrit and platelet count must be carried out to assess the patient's condition. A reduction in the platelet count to $\leq 100,000/mm^3$ or less than 1-2 platelets/oil field (average of 10 oil field counts) usually precedes a rise in haematocrit. A rise in haematocrit of 20% or more (e.g. increase from 35% to 42%) reflects a significant plasma loss and indicates the need for intravenous fluid therapy. Early volume replacement of lost plasma with Crystalloid[3] solution (e.g. isotonic saline solution) can reduce the severity of the disease and prevent shock. Intravenous fluid therapy before leakage is not recommended. In mild to moderate cases of DHF Grade II, intravenous fluid therapy may be given for a period of 12-24 hours in a small hospital or short stay unit (OPD) of a large hospital. This is an important life saving measure. Patients should be monitored on an hourly basis by medical personnel. Based on periodic haematocrit/platelet count determinations and vital signs, the treatment should be reviewed and revised. Treatment should be performed as indicated in Chart 2. Graphical presentation of the treatment of DHF is given in Figure 1.

[3] **Crystalloid Solutions** :
(a) 5% dextrose in isotonic normal saline solution (5% D/NSS)
(b) 5% dextrose in half-strength normal saline solution (5% D/1/2/NSS)
(c) 5% dextrose in lactated Ringer's solution (5% D/RL)
(d) 5% dextrose in acetated Ringer's solution (5% D/RA).

Chart 2. ***Dengue Haemorrhagic Fever (Grades I and II)***

(The manifestations and management of DF and DHF during the febrile phase are the same)

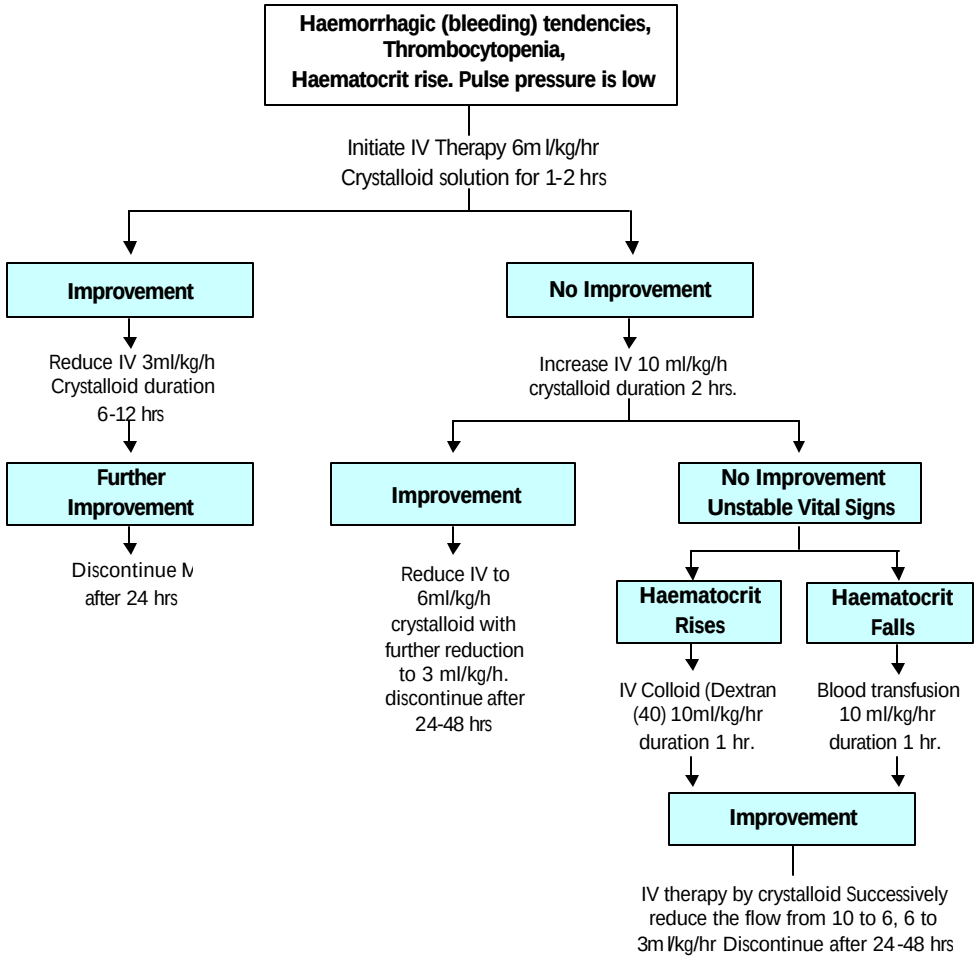
Afebrile Phase (critical stage)	Manifestation	Management
Duration 2-3 days	– Same as during febrile phase. – Thrombocytopenia and rise in haematocrit level (more than 20%)	– OPD or hospital – ORS – Check platelets/haematocrit. If haematocrit is more than 20%: – Initiate IV therapy (5% D/NSS) 6 ml/kg/hr (for 3 hours) – Check haematocrit/vital signs/urine output after 3 hours, and in case of improvement[4] – Reduce IV therapy to 3ml/kg/hr (for 3 hours) – In case of further improvement, continue IV therapy at 3ml/kg/hr (6-12 hours) and then discontinue IV therapy – In case of no improvement[5] increase IV therapy to 10 ml/kg/hr (for 1 hr). In case of improvement now, reduce the volume of IV from 10ml/kg/hr to 6ml/kg/hr and further to 3ml/kg/hr accordingly. – Generally, DHF Grades I and II do not give complications

Convalescence Phase	Manifestation	Management
Duration 2-3 days after critical stage	– Further improvement in general condition and return of appetite – Bradycardia – Confluent petechial rash with white centre/ itching – Asthenia and depression (sometimes for a few weeks, common in adults)	– Normal diet – No need for any medication

[4] **Improvement:** Haematocrit falls, pulse rate and blood pressure stable, urine output rises

[5] **No Improvement:** Haematocrit or pulse rate rises, pulse pressure below 20 mm Hg, urine output falls

Figure 1. ***Volume Replacement Flow Chart for Patients with DHF Grades I and II***



Improvement: Haematocrit falls, pulse rate and blood pressure stable, urine output rises
No improvement: Haematocrit or pulse rate rises, pulse pressure falls below 20mmHg (2.7kPa), urine output falls
Unstable vital signs:Urine output falls, signs of shock

(3) DHF Grades III and IV

Common signs of complications observed during the afebrile phase of DHF Grade III include circulatory failure manifested by rapid and weak pulse, narrowing of the pulse pressure and hypotension, characterised by high diastolic pressure relative to systolic pressure (for example 90/80) and the presence of cold clammy skin and restlessness. These complications occur because of thrombocytopenia, abnormal haemostasis and plasma leakage, or also from substantial blood loss. Immediately after hospitalization, the haematocrit, platelet count and vital signs should be examined to assess the patient's condition and intravenous fluid therapy should be started. The patient requires regular and sustained monitoring. If the patient has already received about 1,000 ml of intravenous fluids and the vital signs are still not stable, the haematocrit should be repeated and: (a) if the haematocrit is increasing, intravenous fluid should be changed to colloidal solution preferably Dextran, or (b) f haematocrit is decreasing, fresh whole blood transfusion 10ml/kg/dose should be given.

During the afebrile phase of DHF Grade IV, vital signs are unstable. The patient, in the early stage of shock, has acute abdominal pain, restlessness, cold and clammy skin, rapid and weak pulse. The patient should be administered intravenous fluid therapy immediately. In case of continued or profound shock when pulse and blood pressure are undetectable, the patient should be given colloidal fluid following the initial fluid bolus.

However, in the case of persistent shock when, after initial fluid replacement and resuscitation with plasma or plasma expanders, the haematocrit continues to decline, internal bleeding should be suspected. It may be difficult to recognize and estimate the degree of internal blood loss in the presence of haemoconcentration. It is thus recommended to give fresh whole blood in small volumes of 10ml/kg bodyweight at one time. Blood grouping and matching should be done for all patients in shock as a routine precaution. Oxygen should be given to all patients in shock. The detailed treatment for patients with DHF Grades III and IV is given in Chart 3. The graphical presentation of treatment of DHF Grades III and IV is given in Figure 2.

Chart 3. ***Dengue Haemorrhagic Fever (Grades III and IV)***

The patient in this category should be admitted to a hospital where trained personnel can manage shock and blood transfusion facilities are available (referral hospital).

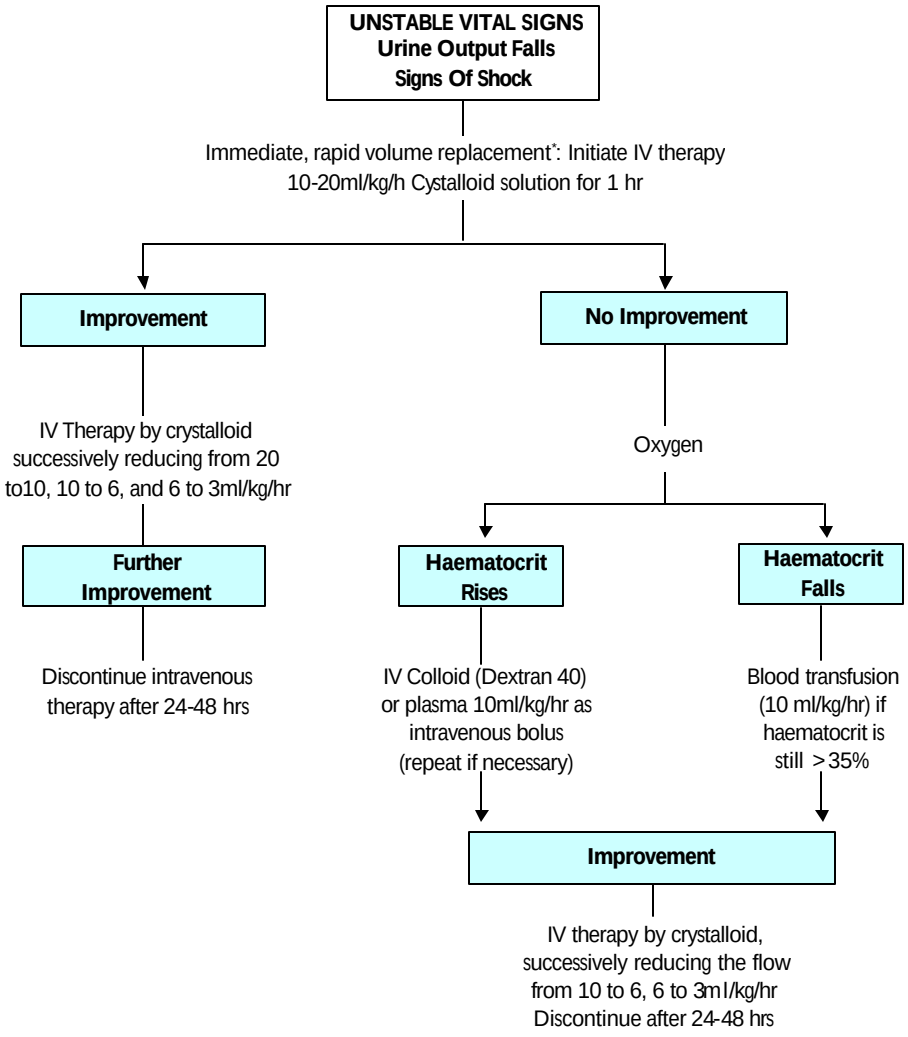
Afebrile phase	Manifestation	Management
Duration two days after febrile stage	In addition to the manifestations of DHF Grade II: – Circulatory failure manifested by rapid and weak pulse, narrowing of pulse pressure (20 mmHg or less) or hypotension with the presence of cold clammy skin and restlessness – Capillary relief time more than two seconds	– Check haematocrits/platelet – Initiate IV therapy (5% D/NSS) 10 ml/kg/h – Check haematocrit, vital signs, urine output every hour – If patient improves, IV fluids should be reduced every hour from 10 to 6, and from 6 to 3 ml/kg/h which can be maintained up to 24 to 48 hours – If patient has already received one hour treatment of 20 ml/kg/hr of IV fluids and vital signs are not stable, check haematocrit again and – If haematocrit is increasing, change IV fluid to colloidal solution preferably Dextran or Plasma at 10 ml/kg/h every hr. – If haematocrit is decreasing from initial value, give fresh whole blood transfusion, 10 ml/kg/h and continue fluid therapy at 10 ml/kg/h and reducing it stepwise bring down the volume to 3 ml/kg/h and maintain it up to 24-48 hours
	Profound shock with undetectable pulse and blood pressure	– Initiate IV therapy (5% D/NSS) 20 ml/kg as a bolus one or two times – Oxygen therapy should be given to all patients[6] – In case of continued shock, colloidal fluids (Dextran or Plasma) should be given at 10-20 ml/kg/hr.

[6] Oxygen is obligatory until shock has been overcome. Pulse, blood pressure, and temp should be recorded every 15-30 minutes.

Afebrile phase	Manifestation	Management
	Profound shock with undetectable pulse and blood pressure	– If shock still persists and the haematocrit level continues declining, give fresh whole blood 10 ml/kg as a bolus – Vital signs should be monitored every 30-60 minutes – In case of severe bleeding, give fresh whole blood 20 ml/kg as a bolus – Give platelet rich plasma transfusion exceptionally when platelet counts are below 5,000–10,000/ mm^3. – After blood transfusion, continue fluid therapy at 10 ml/kg/h and reduce it stepwise to bring it down to 3 ml/kg/h and maintain it for 24-48 hrs

Con. Phase	Manifestation	Management
Duration 2-3 days after recovery from critical/shock stage	– 6-12 hours after critical/shock stage, some symptoms of respiratory distress (pleural effusion or ascites) – 2-3 days after critical stage, strong pulse, normal blood pressure – Improved general condition/return of appetite – Good urine output – Stable haematocrit – Platelet count >50,000 per mm^3 – Patient could be discharged from hospital 2-3 days after critical stage – Bradycardia/arrhythmia – Asthenia and depression (few weeks) in adults	– Rest for 1-2 days – Normal diet – No need for medication

Figure 2. ***Volume Replacement Flow Chart for patient with DHF Grades III and IV***



* In cases of acidosis, hyperosmolar or Ringer's lactate solution should ***not*** be used

6. Fluids Required for Intravenous Therapy

Fluids Recommended

Crystalloid:

(a) 5% dextrose in isotonic normal saline solution (5% D/NSS)

(b) 5% dextrose in half-strength normal saline solution (5% D/1/2/NSS)

(c) 5% dextrose in lactated Ringer's solution (5% D/RL)

(d) 5% dextrose in acetated Ringer's solution (5% D/RA)

Colloidal: Dextran 40; Plasma:

In order to ensure adequate fluid replacement and avoid over-fluid infusion, the rate of intravenous fluid should be adjusted throughout the 24 to 48 hour period of plasma leakage by periodic haematocrit determinations and frequent assessment of vital signs. ***The volume of fluid replacement should be just sufficient to maintain effective circulation during the period of plasma leakage***. Excessive fluid replacement and continuation for a longer period after cessation of leakage will cause respiratory distress from massive pleural effusion, ascites, and pulmonary congestion/ oedema. This can be dangerous.

The required regimen of fluid should be calculated on the basis of bodyweight and charted on a 1-3 hourly basis, or even more frequently in the case of shock. The regimen of the flow of fluid and the time of infusion are dependent on the severity of DHF. The schedule given below is recommended as a guideline. It is calculated for moderate dehydration of about 6% deficit (plus maintenance).

Ml/lb Bodyweight/day	Weight on admission		Ml/kg Body weight/day
	Lbs	Kgs	
100	< 15	< 7	220
75	16-25	7-11	165
60	26-40	12-18	130
40	> 40	> 18	90

In older children who weigh more than 40 kgs, the volume needed for 24 hours should be calculated as twice that required for maintenance (using the Holliday and Segar formula). The maintenance fluid should be calculated as follows:

Body weight (kgs)	Maintenance volume (ml) administered over 24 hrs
< 10	100/Kg
10-20	1000 + 50 for each kg in excess of 10
> 20	1500 + 20 for each kg in excess of 20

For a child weighing 40 kgs, the maintenance is: 1500 + (20x20) = 1900 ml. This means that the child requires 3800 ml IV fluid during 24 hours.

For intravenous fluid therapy of patients with DHF, *four regimens* of flow of fluid are suggested.: *3ml/kg/hr; 6ml/kg/hr; 10ml/kg/hr, and 20ml/kg/hr.*

For ready reference, the calculation of fluid requirements, based on bodyweight and rate of flow of fluid volume for the four regimen are given in Table 2.

Table 2. ***Requirement of fluid based on bodyweight***

Bodyweight (in kgs)	Volume of fluid to be given in 24 hrs	Rate of fluid (ml/hour)			
		R*1	R*2	R*3	R*4
10	1500	30	60	100	200
15	2000	45	60	150	300
20	2500	60	90	200	400
25	2800	75	120	250	500
30	3200	90	150	300	600
35	3500	105	180	350	700
40	3800	120	210	400	800
45	4000	135	240	450	900
50	4200	150	270	500	1000
55	4400	165	300	550	1100
60	4600	180	360	600	1200

* Regimen 1 – 3ml/kg/hr; 2 – 6ml/kg/hr; 3 – 10ml/kg/hr, and 4 – 20ml/kg/hr

- The fluid volumes mentioned are approximations.
- Normally change should not be drastic. Do not jump from R-2 to R-4 since this can overload the patient with fluids. Similarly, reduce the volume of fluid from R-4 to R-3, from R-3 to R2, and from R-2 to R-1 in a stepwise manner.
- *REMEMBER* that *ONE ML* is equal to 20 *DROPS.* In case of *MACRO* system, one ml is equal to 15 drops. (if needed adjust fluid speed in drops according to equipment used)
- It is advised to procure only a bottle of 500 ml initially, and order more as and when required. The decision about the speed of IV fluid should be reviewed every 1-3 hours. The frequency of monitoring should be determined on the basis of the condition of the patient.

7. Important Instructions for Treatment of DHF

- Cases of DHF should be observed every hour.
- Serial platelet and haematocrit determinations, drop in plaelets and rise in haematocrits are essential for early diagnosis of DHF.
- Timely intravenous therapy – isotonic crystalloid solution – can prevent shock and/or lessen its severity.
- If the patient's condition becomes worse despite giving 20ml/kg/hr for one hour, replace crystalloid solution with colloid solution such as Dextran or plasma. As soon as improvement occurs replace with crystalloid.
- If improvement occurs, reduce the speed from 20 ml to 10 ml, then to 6 ml, and finally to 3 ml/kg.
- If haematocrit falls, give blood transfusion 10 ml/kg and then give crystalloid IV fluids at the rate of 10ml/kg/hr.
- In case of severe bleeding, give fresh blood transfusion about 20 ml/kg for two hours. Then give crystalloid at 10 ml/kg/hr for a short time (30-60 minutes) and later reduce the speed.
- In case of shock, give oxygen.
- For correction of acidosis (sign: deep breathing), use sodium bicarbonate[7].

For more details on management of DFH/DSS cases, the physician is advised to consult other appropriate references on their treatment. A list of references is provided in Section 12.

[7] In the case of acidosis, one-third of the total fluids should consist of 0.167 mol/litre of sodium bicarbonate (three-quarters of crystalloid solution plus glucose plus one-quarter sodium bicarbonate)

8. What not to do

- Do not give Aspirin or Brufen for treatment of fever.
- Avoid giving intravenous therapy before there is evidence of haemorrhage and bleeding.
- Avoid giving blood transfusion unless indicated, reduction in haematocrit or severe bleeding.
- Avoid giving steroids. They do not show any benefit.
- Do not use antibiotics
- Do not change the speed of fluid rapidly, i.e. avoid rapidly increasing or rapidly slowing the speed of fluids.
- Insertion of nasogastric tube to determine concealed bleeding or to stop bleeding (by cold lavage) is ***not*** recommended since it is hazardous.

9. Signs of Recovery

- Stable pulse, blood pressure and breathing rate
- Normal temperature
- No evidence of external or internal bleeding
- Return of appetite
- No vomiting
- Good urinary output
- Stable haematocrit
- Convalescent confluent petechiae rash

10. Criteria for Discharging Patients

- Absence of fever for at least 24 hours without the use of anti-fever therapy
- Return of appetite
- Visible clinical improvement
- Good urine output
- Minimum of three days after recovery from shock
- No respiratory distress from pleural effusion and no ascites
- Platelet count of more than 50,000/mm^3

11. Reporting

Based on case-definitions, all suspected, probable and confirmed cases of DF/DHF should be reported to the District Health Officer.

12. References (for further information)

(1) Suchitra Nimmannitya, "Clinical Manifestations of DF/DHF" in WHO Regional Publication No. 22 – Monograph on Dengue/DHF – pp 48-54, WHO/SEARO, New Delhi

(2) Suchitra Nimmannitya, "Management of DF/DHF" in WHO Regional Publication No. 22 – Monograph on Dengue/DHF– pp 55-61, WHO/SEARO, New Delhi

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(4) "Dengue Haemorrhagic Fever – diagnosis, treatment, prevention and control", 2nd Edition, WHO, Geneva, 1997.

(5) "Regional Guidelines for Prevention and Control of Dengue/DHF", WHO/SEARO, New Delhi, 1998 (in print).

Annex 1

Blood samples should be drawn from suspected DF/DHF/DSS cases

(1) In the acute stage – 0-5 days after onset (serum specimen S1), volume 0.5-1.0 ml;

(2) Shortly before discharge from the hospital – 6-10 days after onset (serum specimen S2), and

(3) If possible, 14-21 days after the onset of disease (serum specimen S3)

The serum should be separated from the red blood cells and stored frozen before examination.

If refrigeration is not possible for keeping blood samples, Whatman No.3 filter paper discs 12.7mm (1/2 inch) in diameter may be used. Collect the blood on the filter paper and fully saturate it through to the reverse side. Allow the filter paper to dry in a place that is protected from direct sunlight and insects. Place the dried strips in plastic bags and staple them to the laboratory examination request form (sample below). Store without refrigeration.

All collected samples should be adequately labelled with the name of the patient, their identification number and date of collection.

Laboratory Investigation Form for Dengue Infection
(Using Filter Paper Discs)

Hospital:_____ Regn.no. _____

Name of Patient:_____ Age:_____Sex: _____

Date of Admission:_____ Date of Onset:_____

Suspected Diagnosis _____

Clinical Findings:

1. Fever:_____^{0}C Duration:_____Days
2. Petechiae_____Epistaxis_____Melaena_____
   Other Bleeding:_____
3. Tourniquet Test:_____
4. Shock:_____

Specimen	**Date of Collection**	**Result of Serology**
Acute (S1)	_____	_____
Early Convalescent (S2) (before discharge from hospital)	_____	_____
Late Convalescent (S3)	_____	_____

Laboratory Diagnosis:_____

Haematocrit every two hours during the first six hours and later every four hours until stable. A fluid balance sheet, recording type, rate and quantity of fluids administered should be kept. Record urine output.

Annex 2

Handout for Patients with Dengue Fever

(Important information to be given to the parents or family members of outpatients with suspected dengue fever)

Your child or family member probably has dengue fever.

Since this disease can rapidly become very serious and lead to a medical emergency, it is important for you to carefully watch your child or relative for the next few days. The complications associated with dengue fever usually appear between the third and fifth day of illness. You should therefore watch the patient for two days after the fever disappears.

"What should you do?"

Keep body temperature below 39°C. Give the patient paracetamol (not more than four times in 24 hours) as per the dose prescribed below:

Age	Dose (tablet 250 mg)	Mg/dose
< 1 year	¼ tablet	60
1-4 years	½ tablet	60-120
5 and above	1 tablet	240

Do not give the patient ***Aspirin*** or ***Brufen*** or ***Ibubrufen***

Give large amounts of fluids (water, soups, milk and juices) along with the patient's normal diet.

The patient should rest.

Immediately consult your physician if any of the following manifestations appear: Red spots or points on the skin; bleeding from the nose or gums; frequent vomiting; vomiting with blood; black stools; sleepiness; constant crying; abdominal pain; excessive thirst (dry mouth); pale, cold or clammy skin; or difficulty in breathing.

Do not wait. Immediately consult your physician. It is crucial to quickly treat anyone with these complications.

Annex 3

Information on Personal Protection against Dengue Fever and Dengue Haemorrhagic Fever

What is dengue infection?

Dengue is an acute flu-like fever caused by a virus. It occurs in two forms:

(a) Dengue fever (DF)
(b) Dengue haemorrhagic fever (DHF)

Dengue fever is marked by an onset of sudden high fever, severe headache, pain behind the eyes, and pain in the muscles and joints.

Dengue haemorrhagic fever (DHF) is a more severe form, in which bleeding and sometimes shock occurs. This can lead to death. It is most serious in children. Symptoms of bleeding usually occur after 2-3 days of fever.

The high fever continues for 5-6 days (103-105°F or 39–40°C). It comes down on the third or the fourth day but rises again. The patient feels a lot of discomfort and is very weak after the illness.

Dengue spreads rapidly and may affect large numbers of people during an epidemic, resulting in reduced work productivity. More importantly, it causes the loss of lives.

Recognition of Dengue Fever

(1) Sudden onset of high fever

(2) Severe headache (mostly in the forehead)

(3) Pain behind the eyes which worsens with eye movement

(4) Body aches and joint pains

(5) Nausea or vomiting

Recognition of Dengue Haemorrhagic Fever and Shock

Symptoms similar to dengue fever, plus any one or a combination of the following:

(1) Severe and continuous pain in the abdomen

(2) Bleeding from the nose, mouth and gums or skin bruising

(3) Frequent vomiting with or without blood

(4) Black stools like coal tar

(5) Excessive thirst (dry mouth)

(6) Pale, cold skin

Diagnosis

Confirmation of DF and DHF can be done by specific laboratory tests. However, specific diagnosis is not required for treatment of patients with DF/DHF.

Treatment

Patient(s) suspected of having DF or DHF must be examined by a doctor.

Proper and early treatment can relieve the symptoms and prevent complications and death. Aspirin and Brufen should be avoided in dengue fever, as they are known to increase the bleeding tendency and may lead to serious complications. Paracetamol can be given on medical advice. Severe abdominal pain (black stools); bleeding on the skin or from the nose or gums; sweating, and cold skin, etc. are danger signs. If any one of them is noticed, **take the patient to a hospital immediately. Give the patient fluids to drink while transferring him/her to the hospital.**

Basic facts on Dengue

(1) **How does dengue spread?** Dengue is spread through the bite of an infected *Aedes aegypti* mosquito. The mosquito gets the virus by biting an infected person. The first symptoms of the disease occur about 5-7 days after the infected bite.

There is no way to tell if a mosquito is carrying the dengue virus. Therefore, people must protect themselves from all mosquito bites.

(2) **Where does this mosquito live?** This mosquito rests indoors, in closets and other dark places. Outside, it rests where it is cool and shaded. The female mosquito lays her eggs in water containers in and around homes, schools and other areas in towns or villages. These eggs become adults in about 10 days.

(3) **Where does the mosquito breed?** Dengue mosquitoes breed in stored, exposed, water collection systems. The favoured breeding places are: barrels, drums, jars, pots, buckets, flower vases, plant saucers, tanks, discarded bottles/tins, tyres, water coolers, etc. and a lot more places where rainwater collects or is stored.

Prevention of Dengue

All control efforts should be directed against the mosquitoes. It is important to take control measures to eliminate the mosquitoes and their breeding places. Efforts should be intensified before the transmission season (during and after the rainy season) and during epidemics.

(1) Prevent mosquito bites:

(a) Dengue Mosquitoes Bite During the Daytime - Protect Yourself From the Bite

(b) Wear full-sleeve clothes and long dresses to cover the limbs.

(c) Use repellents – care should be taken in using repellents on young children and elders.

(d) Use mosquito coils and electric vapour mats during the daytime to prevent dengue.

(e) Use mosquito nets to protect babies, old people and others who may rest during the day. The effectiveness of such nets can be improved by treating them with permethrin (pyrethroid insecticide). Curtains (cloth or bamboo) can also be treated with insecticide and hung at windows or doorways, to repel or kill mosquitoes.

(f) Break the cycle of mosquito-human-mosquito infection. Mosquitoes become infected when they bite people who are sick with dengue. Mosquito nets and mosquito coils will effectively prevent more mosquitoes from biting sick people and help stop the spread of dengue.

(2) Prevent the multiplication of mosquitoes:

Mosquitoes which spread dengue live and breed in stagnant water in and around houses.

(a) Drain out the water from desert/window air coolers (when not in use), tanks, barrels, drums, buckets, etc.

(b) Remove all objects containing water (e.g. plant saucers, etc.) from the house.

(c) All stored water containers should be kept covered at all times.

(d) Collect and destroy discarded containers in which water collects, e.g. bottles, plastic bags, tins, tyres, etc.