SHORT GUIDELINE ON DENGUE CASE MANAGEMENT

World Health Organization
Nepal

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ABBREVIATIONS

AR:	Acetate Ringer's Solution
ALT:	Alanine Transaminase
AST:	Aspartate Aminotranferase
BP:	Blood pressure
BUN:	Blood Urea Nitrogen
CBC:	Complete Blood Count
Cr:	Creatinine
DIC:	Disseminated Intravascular Coagulation
RL:	Ringer's Lactate
ETU:	Emergency Treatment Unit
FWB:	Fresh Whole Blood
FU:	Follow Up
G6PD:	Glucose-6-Phosphate Dehydrogenase
HCT:	Hematocrit
HDU:	High Dependency Unit
ICU:	Intensive Care Unit
IV:	Intravenous
KVO:	Keep Vein Open
NCPAP:	Nasal continuous positive airway pressure
NS1 Ag:	Nonstructural protein-1 Antigen
NS:	Normal Saline Solution
OPD:	Out Patient Department
PLT:	Platelets
PP:	Pulse Pressure
PR:	Pulse Rate
PRC:	Packed Red Cells
PV:	Pulse Volume
RR:	Respiratory Rate
RRT:	Renal Replacement Therapy
SaO2:	Oxygen Saturation
WBC:	White Blood Cells
WS:	Warning Signs

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Dengue is one of the re-emerging arboviral diseases transmitted mainly by *Aedes* mosquitoes.

The hallmark features of severe dengue include plasma leakage, bleeding, and severe organ impairment which can lead to severe complications and death.

Case definition of probable dengue

Patients having acute febrile illness with at least 2 of the following symptoms and signs:

- Headache, Retro-orbital pain
- Myalgia, Arthralgia
- Rash/Exanthema
- Hemorrhagic manifestations as indicated by positive tourniquet test, cutaneous bleeding and mucosal bleeding
- Leukopenia as indicated by white blood cells count ≤4,000 cells/mm^3
- Hematocrit 5-10% increased from baseline
- Platelets count ≤100,000/mm^3

Note: Patients who presented with acute fever, positive tourniquet test and leukopenia had positive predictive value of 70-83% for dengue diagnosis.

Diagnosis of plasma leakage

If patients with diagnosis of dengue or probable dengue develop at least 1 of the following:

- Hemoconcentration ≥20%
- Pleural effusion and/or ascites and/or thickening of gallbladder wall
- Serum albumin ≤3.5 g/dl in normal weight or ≤4.0 g/dl in obesity

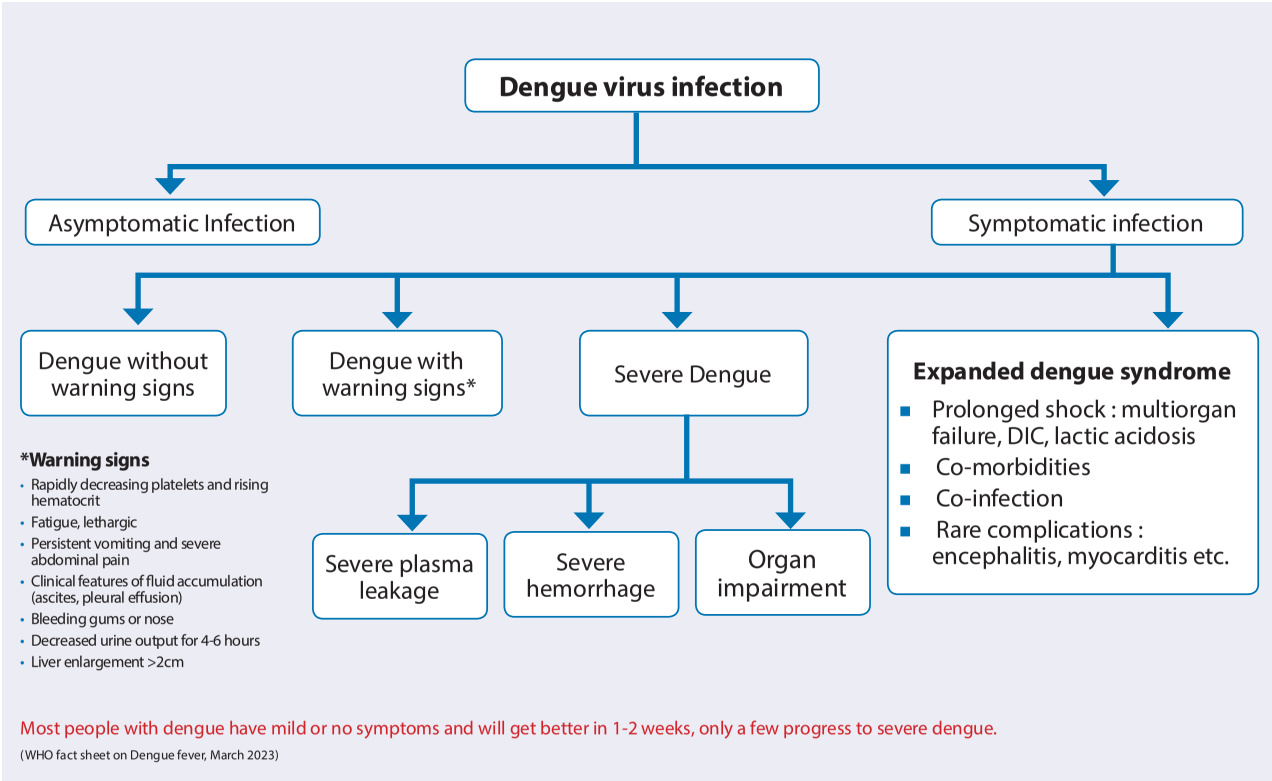


Figure 1. Classification of Dengue

Clinical symptoms and signs of severe dengue

If patients with diagnosis of dengue or probable dengue develop at least one of the following symptoms and signs of severe dengue:

- Severe plasma leakage evidenced by high or progressively rising hematocrit leading to shock or fluid accumulation (pleural effusion or ascites) with respiratory distress.
- Circulatory failure indicates as rapid and weak pulse, cold clammy skin particularly cold extremities, and pulse pressure _≤20 mmHg
- Hypotension with tissue hypoperfusion indicate as dizziness, fainting, syncope, decrease urine output, restlessness, altered sensorium, and capillary refill time >2 seconds

Warning signs for development of severe disease in dengue

- No clinical improvement and/or weakness when fever subside
- Abdominal pain or vomiting >3 times/day (persistent vomiting)
- Mucosal bleeding
- Altered sensorium, drowsiness, irritable, restlessness
- Refuse to eat or drink, crying infants
- Dizziness, fainting, syncope, cold clammy skin or sweating
- Decrease urine volume in 4-6 hours

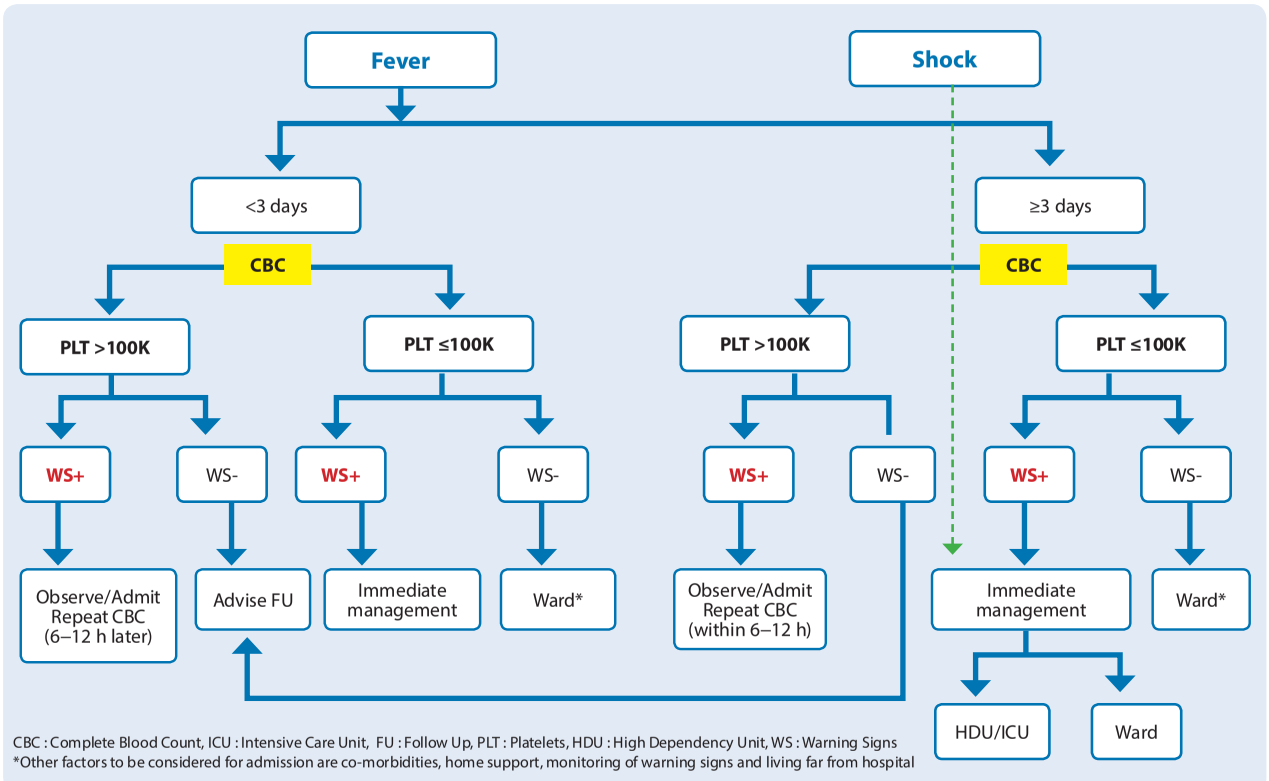


Figure 2. Dengue Case Management (i)

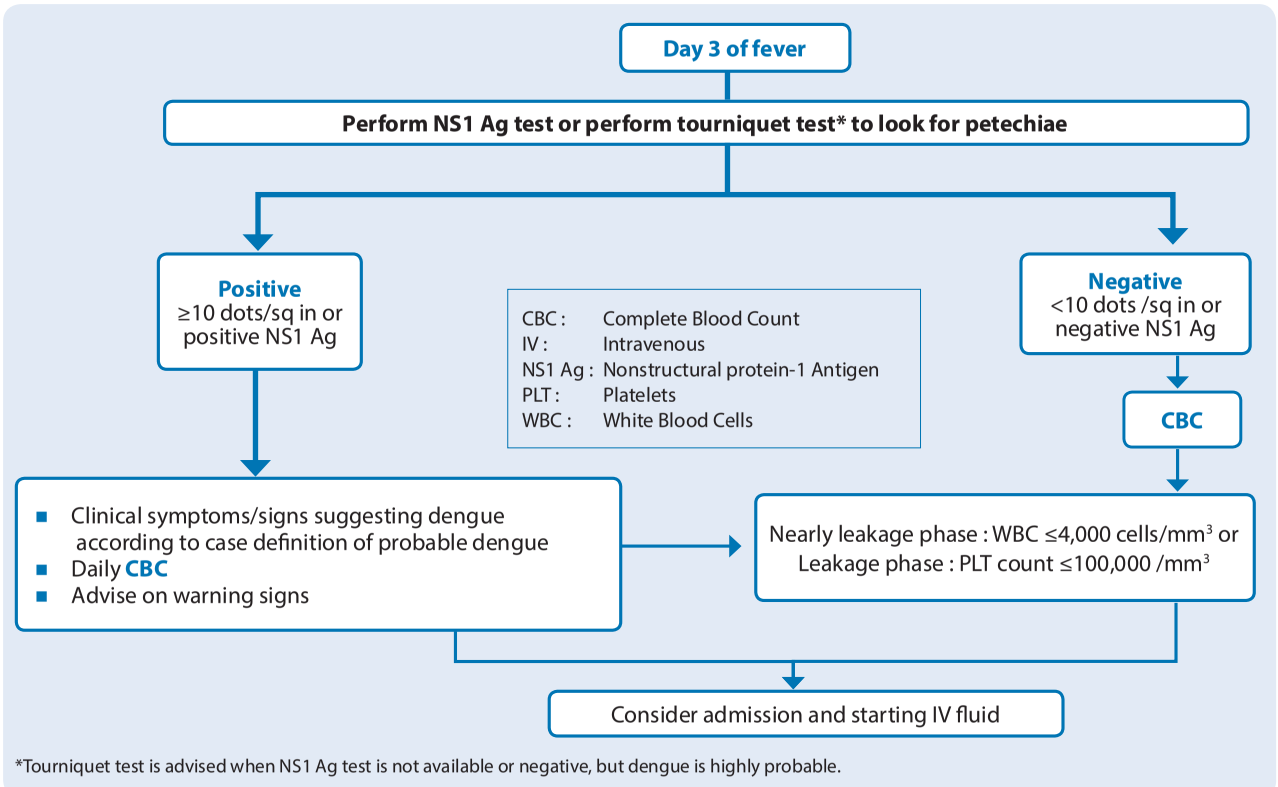


Figure 3. Dengue case management (ii)

Tourniquet test

- Take the patient's BP and record it, example 120/80 mm Hg
- Inflate the BP cuff to a point midway between the systolic and diastolic pressure (120+80) /2= 100 mm Hg
- Wait for 5 minutes
- The test is considered positive when 10 or more petechiae per sq. inch are observed.
- The test may be negative or only mildly positive in obese patients and during the phase of profound shock. It usually becomes positive, sometimes strongly positive after recovery from shock.

Figure 4. **Positive tourniquet test in a dengue patient, PC: Dr S Kalyanarooj**

Indications for Admission

If patients with diagnosis of dengue or probable dengue have at least 1 of the following:

- No clinical improvement and/or weakness when fever subside
- Abdominal pain, persistent vomiting and/or poor appetite with moderate to severe dehydration
- Significant bleeding as indicated by blood loss >6–8 ml/kg (children) or > 300 ml (adults), and hematocrit decrease >10 % or below baseline after Dextran-40 infusion
- Decreased urine volume in 4-6 hours
- White blood cells count ≤4,000 cells/mm^3 in high risk groups (infants, elderly, pregnant women, prolonged shock, abnormal bleeding, underlying diseases and neurological manifestations)
- Platelets count ≤100,000/mm^3 with weakness and/or poor appetite
- Rising hematocrit ≥10%

Indications for transferring dengue patients to referral hospitals/Require emergency treatment

- Prolonged shock
- Clinical symptoms and signs of severe dengue
- Clinical symptoms and signs of fluid overload
- Significant bleeding
- High risk groups (Infant, Elderly, Pregnant, Obese patients, bleeding, Underlying disease)
- Organ(s) involvement such as AST/ALT >500 U/l, altered sensorium, cardiac arrhythmia, etc.
- Beyond potential of hospital to patient care such as health care staffing shortages, unavailable laboratory investigations, shortages of intravenous fluid or blood products etc.

Indications for starting intravenous fluid

- Patients with persistent vomiting
- Patients with signs of moderate to severe dehydration
- Patients having plasma leakage in the critical phase with hematocrit rising ≥10%* or refuse to eat or drink
- Patients with dengue shock syndrome

Note: *Patients with bleeding may not have hematocrit rising.

Disease phase in dengue

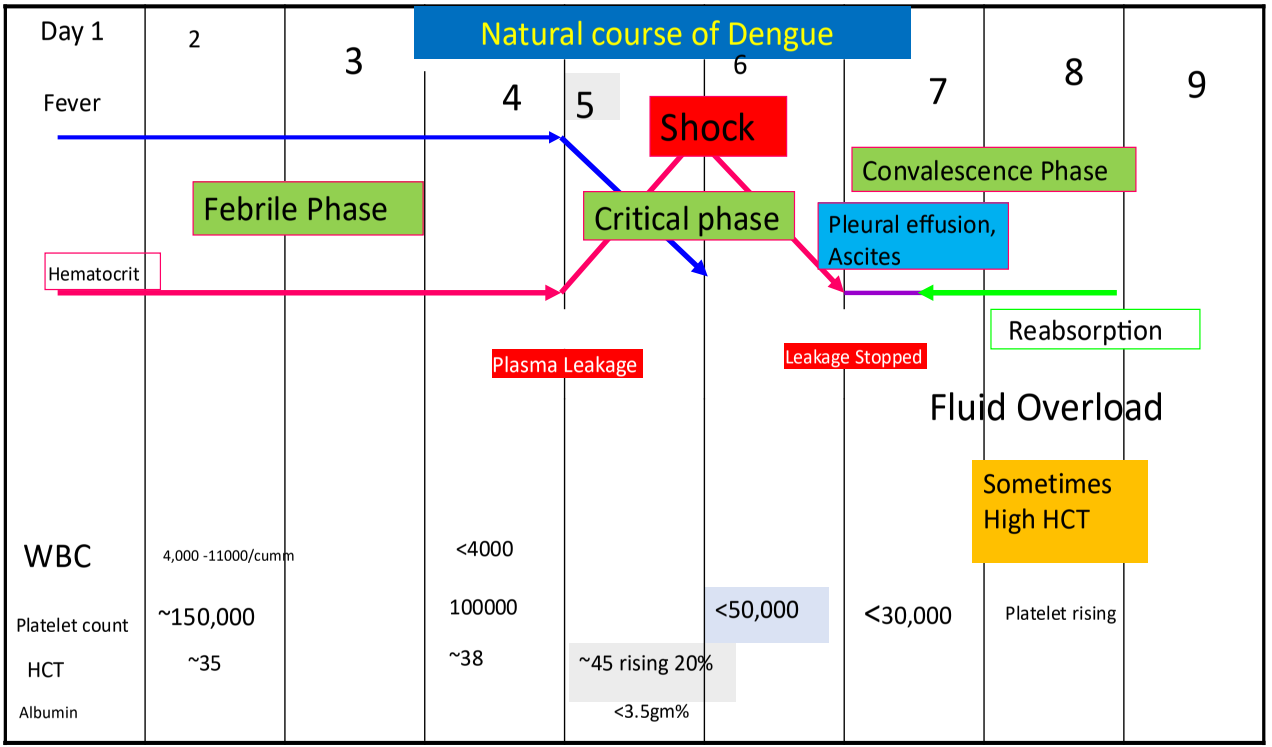
There are 3 phases of disease in dengue.

1. Febrile phase: 2–7 days with mean duration of 4 days (Encourage for oral intake as much as possible and avoid i/v fluids
2. Critical/Leakage phase: 24–48 hours after febrile phase
   a. A practical indicator for determining critical phase is platelets count ≤100,000/mm^3.
3. Reabsorption/Recovery phase: 3–5 days after critical phase
   a. Clinical symptoms and signs of recovery: A–Appetite, B–Bradycardia, C–Convalescence rash or itching, D–Diuresis
   b. Be aware of fluid overload as reabsorption of extravasated plasma occurs in 36 hours after starting shock or 60 hours after platelets count ≤100,000/mm^3

Clinical and laboratory parameters for monitoring critical phase of dengue

Parameters for monitoring critical phase of dengue are as follows:

- **Clinical:** consciousness, appetite, bleeding, abdominal pain, vomiting
- **Vital signs:**
  a. Temperature: every 4–6 hours
  b. BP, PR, PV, RR, capillary refill time, cold clammy skin/cold extremities: every 1–3 hours in non-shock patients
  c. BP, PR, PV, RR, SpO2, capillary refill time, cold clammy skin/cold extremities: every 15 minutes – 1 hour in shock patients or until stable
- **Hematocrit:** every 6 -12 hours or more frequent in cases of suspected bleeding and after blood transfusion
- **Urine output:** every 6–8 hours in non-shock patients and every 1–4 hours in shock patients (keep urine output 0.5–1 ml/kg/h except infants, obese patients and pregnant women keep urine output 0.5 ml/kg/h)



The values shown in chart are to demonstrate the trend of rise and fall in severe dengue

Figure 5. Natural course of dengue

Monitoring Chart for Dengue Patients

Instructions - Do CBC daily/bd and PCV 6 hrly. Monitor other parameters 3-4 hrly and when leaking detected monitoring every hour.

Case	☐ Refer	☐ Walk in
OPD	☐ Shock	☐ Non shock
IPD	☐ Shock	☐ Non Shock

Indications to call for immediate advice

1. Pulse rate > 120/min with fever or >100/min without fever.
2. Pulse Pressure 25-20 mmHg or less (in supine position)
3. Postural drop of SEP >20mmHg.
4. Significant bleeding (Haemetemesis, Malena, Bleeding PV etc.)
5. UOP <0.5ml / Kg/hr
6. CRFT >2 sec

Date	Time	BP	Temp	PR	RR	PP	RR	HCT (%)	Clinical/ Lab/ Treatment	Nursing Care / Signs	INTAKE				OUTPUT		
											Blood/ rate & Amount	IV Amount	Oral	Total	Urine/ Stool	Vomit / Bleed	Total

CBC Day of Admission **Hct =** **WBC =** **Pit =** **Lym =** **PMN =**	**BW =** **kgs.** **Hight =** **cms** **IBW =** **Kgs.** **Maintenance fluid =** **M+ 5% Deficit =**		**Date of Fever** **Day of Illness** **TT** **Liver** **Bleeding** **Epistaxis** **Abdomen**
Name	**Age**	**HN** **AN**	**Pulse : F =Full M=Moderate W=Weak N=Not Palpable**
	Ward	**Attending Physician**	

Figure 6. **Monitoring chart for dengue patients**

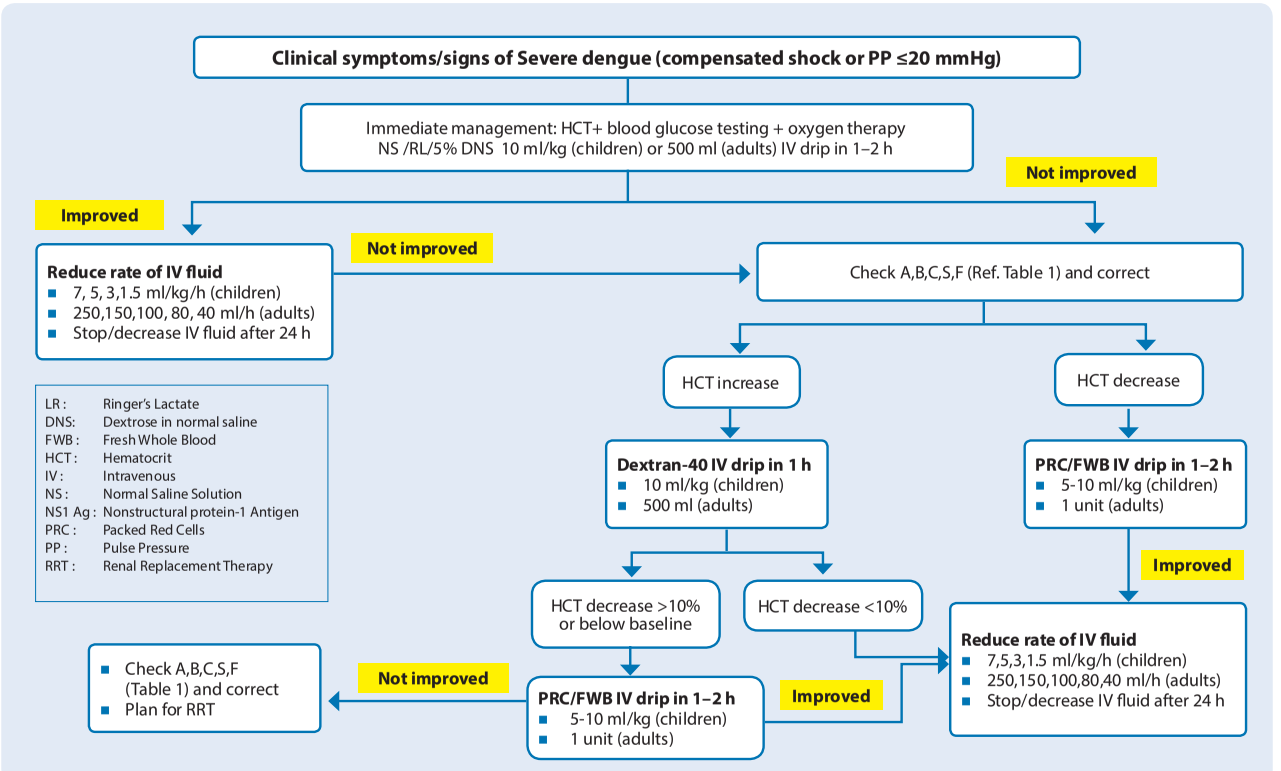


Figure 7. Rates of IV Fluid infusion for Severe dengue in compensated shock

Management of common complications in dengue

Practical investigations (ABCSF) in the following cases:

- Dengue patients with prolonged shock
- Complicated cases: organs impairment (liver, kidney etc.), bleeding, fluid overload
- Dengue shock syndrome patients with no clinical improvement after receiving adequate fluid resuscitation.

Table 1. Management of common complications in dengue

Abbreviations	Laboratory investigations	Notes
A–Acidosis	Blood gas (Capillary or venous)	▪ Metabolic acidosis indicates prolonged shock with organ impairment such as acute liver failure and acute kidney injury. ▪ AST, ALT, BUN, Cr, Electrolytes ▪ 7.5%NaHCO3 IV • 1–2 mEq/kg (children) • 50–100 ml (adults)
B–Bleeding	Hematocrit	▪ If hematocrit decreases lower than baseline, or not rising ≥20% when shock develops. It indicates bleeding or intravascular hemolysis. ▪ Cross match for PRC transfusion
C–Calcium	Serum calcium or ionized calcium	▪ Hypocalcemia is common in DHF patients, but asymptomatic. ▪ Calcium supplement is indicated in complicated cases. ▪ 10% calcium gluconate IV dilute and push slowly in 3–5 min or IV drip in 10–15 min • 1 ml/kg (children) • 10 ml (adults)
S–Blood sugar	Blood sugar	▪ Patients with impaired liver function may have hypoglycemia. ▪ Diabetes patients may have hyperglycemia. ▪ Random blood glucose or glucostix test
F–Fluid overload	Physical examination Chest radiography, Ultrasound	▪ Furosemide IV • 1 mg/kg/dose (children) • 40 mg (adults)

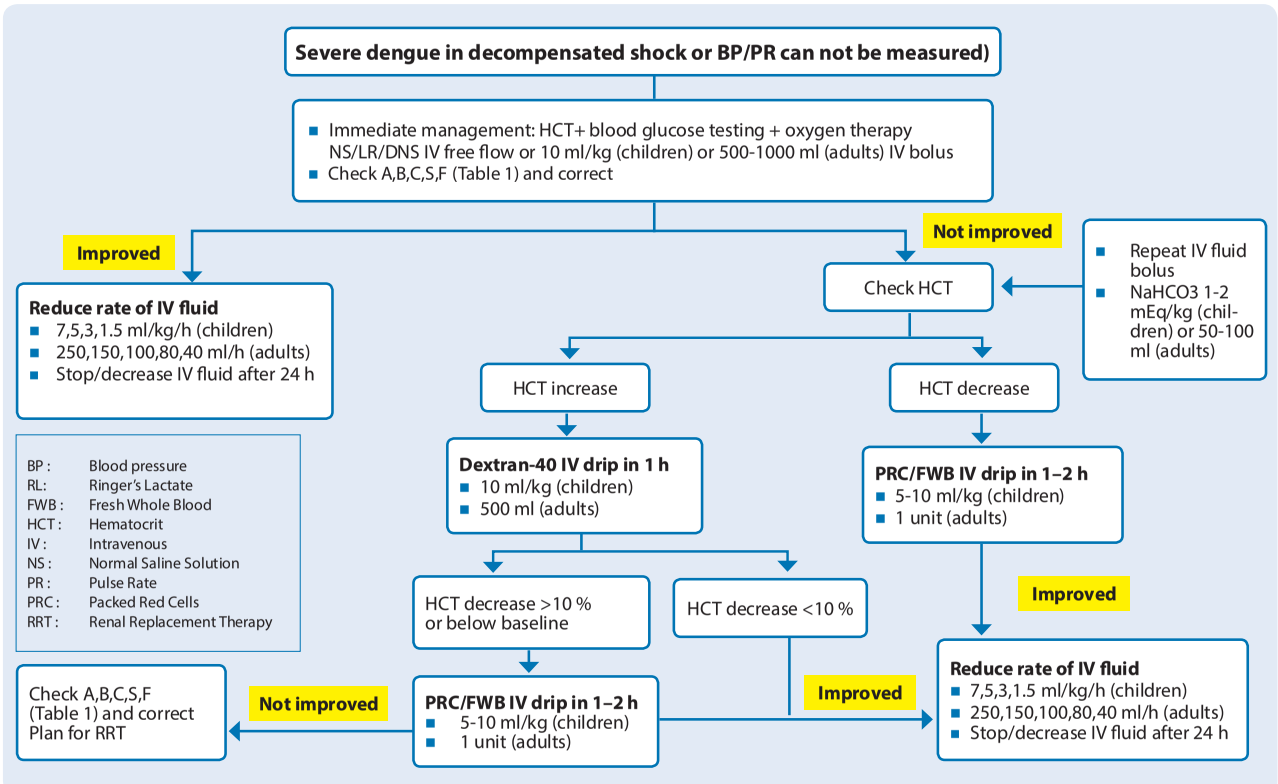


Figure 8. **Rates of intravenous fluid infusion for Severe dengue in decompensated shock**

Rates of intravenous fluid infusion in dengue shock syndrome

- In Severe dengue or decompensated shock, starting with 0.9% NS (RL) IV free flow or 10 ml/kg in 15 minutes. If blood pressure is restored, reduce IV fluid to 10 ml/kg (children) or 500 ml (adults) in 1-2 hours
- In Severe dengue or compensated shock, starting with NS / RL/5%DNS 10 ml/kg (children) or 500 ml (adults) in 1-2 hours
- 6 hours after shock, reduce rate of IV fluid to 5 ml/kg/h (children) or 100-120 ml/h (adults) [Maintenance + 5% deficit]
- 12 hours after shock, reduce rate of IV fluid to 3 ml/kg/h (children) or 80 ml/h (adults) [Maintenance]
- 18 hours after shock, reduce rate of IV fluid to 1.5 ml/kg/h (children) or 40 ml/h (adults) [Maintenance/2]
- 24 hours after shock, reduce rate of IV fluid to 5-10 ml/h (children) or 20 ml/h (adults)

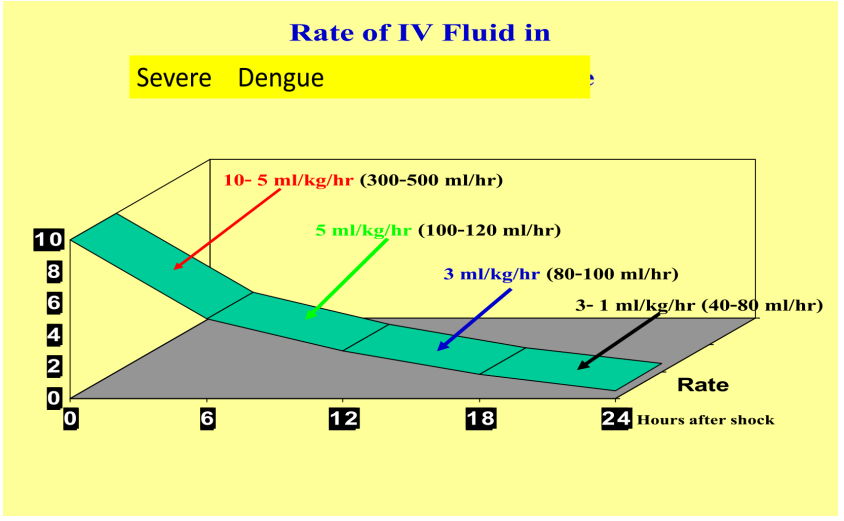


Figure 9. **Rates of intravenous fluid infusion in severe dengue**

Rates of intravenous fluid infusion in non-shock dengue

For non-shock cases, rate of intravenous fluid depends on two parameters as follows:

- **Degree of thrombocytopenia:** If platelets count range is 50,000–100,000/mm^3, it indicates dengue patients are in the first 24 hours of plasma leakage. However, approximately 50% of patients with dengue fever have mild thrombocytopenia.

- **Degree of hematocrit rising:**
  a. If hematocrit rises <20% from baseline, start IV fluid less than maintenance rate
  b. If hematocrit rises ≥20% from baseline, start IV fluid at maintenance rate of 3 ml/kg/h (children) and 80 ml/h (adults)
  c. If hematocrit rises >25% from baseline, start IV fluid at rate of 8–10 ml/kg/h (children) or 250–500 ml/h (adults)

Note: Doses of intravenous fluid indicated above also includes oral fluid intake.

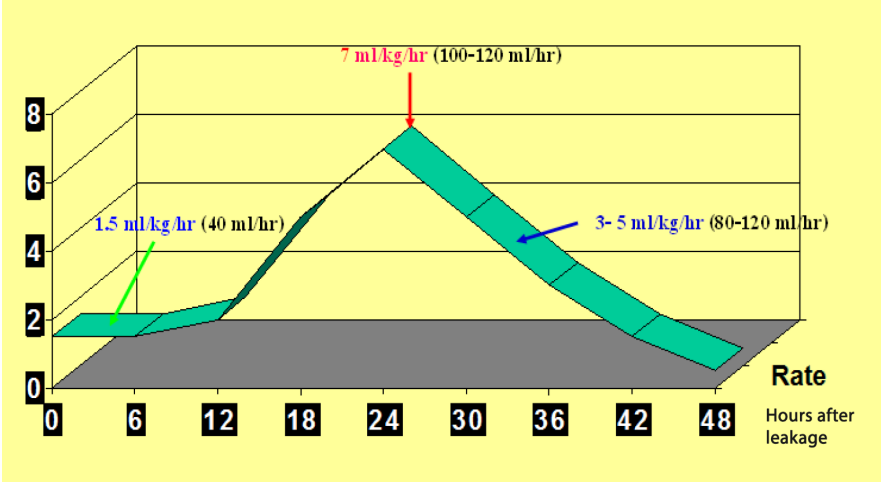


Figure 10. Rates of intravenous fluid infusion in non-shock dengue

Table 2. Rates of intravenous fluid infusion in children and adults

Amount of IV fluid	Children (ml/kg/h)	Adults (ml/h)
Maintenance/2	1.5	40
Maintenance	3	80
Maintenance + 5% deficit	5	100–120
Maintenance + 7% deficit	7	150
Maintenance + 10% deficit	10	300–500

Management of Fluid Overload

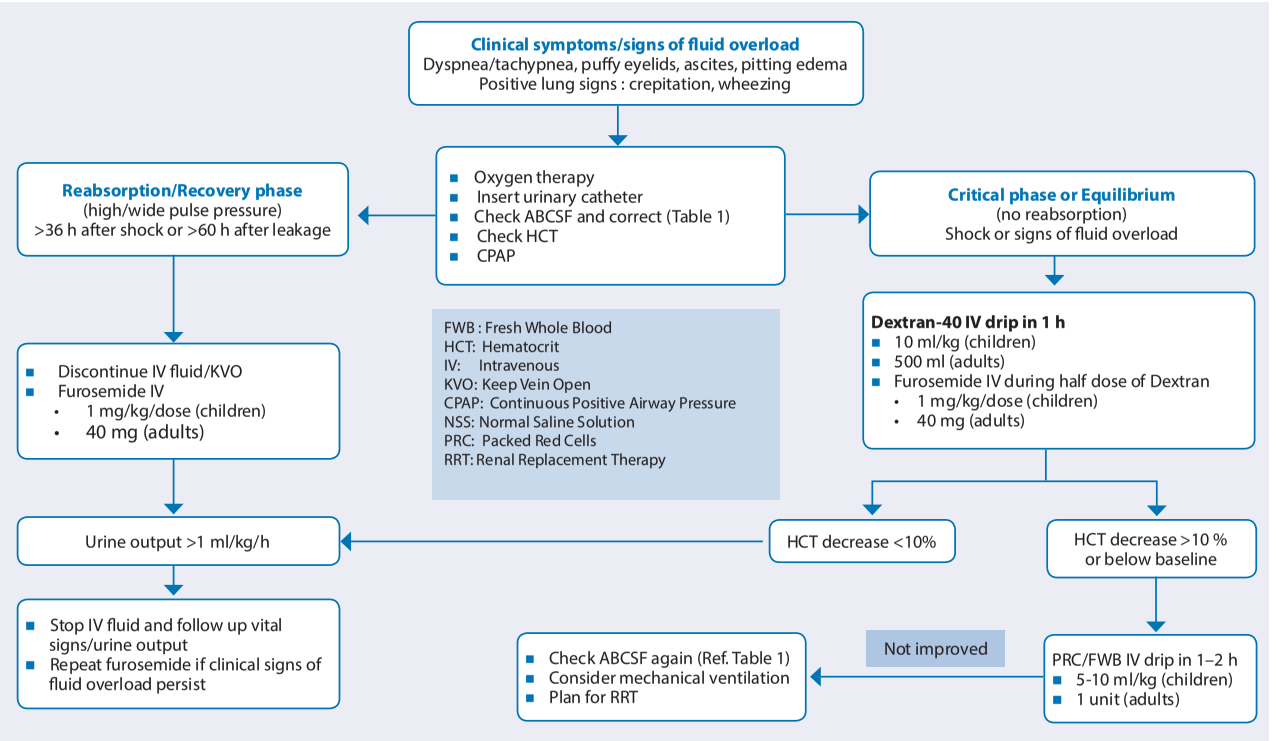


Figure 11. Management of fluid overload

Signs of fluid overload

- Dyspnea/tachypnea, puffy eyelids, ascites, pitting edema
- Positive lung signs: crepitation, rhonchi, wheezing
- Persistent high hematocrit level: hematocrit rising 25–30% >4 hours

For Dextran-40 infusion

- 10 ml/kg (children) or 500 ml (adults) IV drip in 1 h as a bolus dose
- Check hematocrit before and immediately after Dextran-40 infusion
- If hematocrit decreases >10% or below baseline indicate significant bleeding

Indications for blood transfusion

In critical phase, hematocrit level would rise 10-20% above baseline due to plasma leakage. In patients with DSS, hematocrit would rise at least 20% above baseline. However, the majority of patients with DSS have hematocrit rising 30% from baseline during the critical phase. In patients with profound shock or decompensated shock, hematocrit would rise >40% from baseline during the critical phase.

Indications for PRC transfusion are as follows:

1. Significant bleeding
2. Hematocrit rising <20% from baseline if patients develop shock
3. Unable to reduce rate of intravenous fluid according to the guidelines and decrease hematocrit compared to prior hematocrit
4. Decrease hematocrit with no clinical improvement
5. Intravascular hemolysis indicates as black color urine in patients with hematologic disorders such as G6PD deficiency, thalassemia, and thalassemia trait etc.

Annex 1: Screening Checklist for Dengue

HN……..

Patient's profile

1. Name……Age……year(s)……month(s)
2. Gender: □ Male □ Female LMP……..(DD/MM/YYYY)
3. Underlying diseases: □ HT □ DM □ BMI>25 □ others, specify…….……..……
4. Medication(s):……
   ……

Clinical symptoms/signs and general laboratory tests

1.	Fever	□ Yes, specify…….day(s)	□ No
2.	Headache	□ Yes	□ No
3.	Retro-orbital pain	□ Yes	□ No
4.	Myalgia	□ Yes	□ No
5.	Arthralgia/bone pain	□ Yes	□ No
6.	Rash	□ Yes	□ No
7.	Hemorrhagic manifestation		
	a. Tourniquet test	□ Positive	□ Negative
	b. Cutaneous bleeding	□ Positive, specify……..…….	□ Negative
	c. Mucosal bleeding	□ Positive, specify……..	□ Negative
8.	Leukopenia: WBC ≤5,000	□ Yes	□ No
9.	Hemoconcentration 5-10%	□ Yes	□ No
10.	Platelets count <100,000	□ Yes	□ No
11.	Rapid diagnostic test	□ Yes	□ No
	a. Dengue NS1 Ag	□ Positive	□ Negative
	b. Dengue IgM	□ Positive	□ Negative
	c. Dengue IgG	□ Positive	□ Negative
12.	RT-PCR	□ Yes, □ Positive: serotype……... □ Negative	□ No
13.	ELISA	□ Yes, □ Positive: IgM……IgG…… □ Negative	□ No

Diagnosis □ Probable dengue □ Confirmed dengue □ Other……..…….

Risk(s) for severe disease □ Yes, specify…… □ No

Warning signs for development of severe disease

1.	No clinical improvement when no fever	□ Yes	□ No
2.	Abdominal pain or vomiting >3 times/day (persistent vomiting)	□ Yes	□ No
3.	Abnormal bleeding	□ Yes	□ No
4.	Altered sensorium, drowsiness, irritable, restlessness	□ Yes	□ No
5.	Refuse to eat or drink, crying infants	□ Yes	□ No
6.	Dizziness, fainting, syncope, cold clammy skin or sweating	□ Yes	□ No
7.	Decrease urine volume in 4-6 hours	□ Yes	□ No

Disease phase □ Febrile phase □ Critical phase □ Recovery phase

Annex 2: Useful Information about Dengue for Patients

- Not all dengue patients need to be admitted into a hospital during febrile phase
- Most of them are able to do self-care at home.
- Advise on outpatient follow up visits to a clinic/hospital and tell patients about benefits of blood tests such as CBC

Problems during the febrile phase

Signs/Symptoms: high fever, red face, myalgia/arthralgia, nausea/vomiting, petechiae, gum bleeding, nose bleeding, or bleeding from other sites

Management at home:

1. Allow patient to rest in a comfortable room with good ventilation
2. Use of bed nets
3. Take warm shower
4. Place tepid (luke warm) sponging for at least 15 minutes for reducing fever. If the patient is shivering, stop tepid sponging and take rest with a light sheet rather than a heavy blanket.
5. Take paracetamol if your fever is still over 39°C. The recommended doses of paracetamol should be given at least 4 hours apart. Overdose can cause liver related complications.
6. **Avoid taking aspirin, NSAIDs and steroids** due to increase in risk of severe bleeding, acute hepatitis and acute kidney injury
7. Do not give intramuscular injection
8. Advice to give soft, balanced and nutritious diet, ice cream, milk and fruit juice. Oral electrolyte solution (ORS) is recommended if the patient refuses to take oral food.
9. Timely outpatient follows up visits to a clinic/hospital.

Warning signs

If a patient has one or more of the following signs/symptoms, the patient should be brought to a hospital as soon as possible.

1. Clinical deterioration when fever subside (or lower peak of fever)
2. Drowsy, lethargy, refuse to eat and drink
3. Severe vomiting
4. Severe abdominal pain
5. Bleeding
6. Altered sensorium
7. Cold, clammy, mottling skin
8. No urine for 4-6 hours

Important message

- If patient looks weak, has a cold and mottled skin, it is a sign of serious illness. The patient should be brought to the hospital as soon as possible.
- During the transport of the patient to the nearest hospital, force oral electrolyte solution (ORS) to help alleviate shock condition.

Dengue prevention

1. Protect yourself from mosquito bite by:
   - Sleeping under mosquito nets
   - Wearing long-sleeved shirts and long pants
   - Playing or staying in an open air
   - Use mosquito repellents
2. Get rid of mosquito breeding places
   - Change/clean small water container e.g. vases every week
3. Get rid of unwanted containers, old tyres, around the houses