CASE MANAGEMENT

Dengue infection is a systemic and dynamic disease and has a wide clinical spectrum that includes both severe and non-severe clinical manifestations. For a disease that is complex in its manifestations, management is relatively simple, inexpensive and very effective in saving lives so long as correct and timely interventions are instituted. The key is early recognition and understanding of the clinical problems during the different phases of the disease, leading to a rational approach to case management and a good clinical outcome.

Early notification of dengue cases seen in primary and secondary care is crucial for identifying outbreaks and initiating an early response.

4.1. Step wise approach for case management

TABLE 10: Steps for dengue case management

Step 1 Overall Assessment	1.1	History, including symptoms, past medical and family history
	1.2	Physical examination, including full physical and mental assessment
	1.3	Investigation, including routine laboratory tests and dengue-specific laboratory tests
Step 2 Diagnosis, Assessment of Disease Phase and Severity	2	Clinicians will diagnose whether the disease is dengue and assess its phase and severity
Step 3 Clinical Management	3.1	Disease notification
	3.2	Management decisions Depending on the clinical manifestations and other circumstances, patients may - be sent home **(Group A)** - be referred for hospital management **(Group B)** - require emergency treatment and urgent referral **(Group C)**

4.1.1. Step 1

TABLE 11: Step 1 Overall assessment for Dengue management

Step 1 Overall Assessment
History
■ date of onset of fever/illness
■ quantity of oral fluid intake
■ diarrhea
■ urine output (frequency, volume and time of last voiding)
■ assessment of warning signs
■ change in mental state/seizure/dizziness
■ other important relevant history, such as family or neighborhood dengue, travel to dengue-endemic areas, co-existing medical conditions.
Physical examination
■ assessment of mental state
■ assessment of hydration status
■ assessment of hemodynamic status
■ checking for quiet tachypnoea/acidotic breathing/pleural effusion
■ checking for abdominal tenderness/hepatomegaly/ascites
■ examination for rash and bleeding manifestations
■ tourniquet test (repeat if previously negative or if there is no bleeding manifestation).
Investigation
Details on investigation is provided in chapter 3
■ **CBC:** A complete blood count should be done at the first visit (it may be normal), CBC should be repeated daily until the critical phase is over. Decreasing white blood cell and platelet counts make the diagnosis of dengue very likely.
■ **Hematocrit:** The hematocrit in the early febrile phase could be used as the patient's own baseline.

Note
- Leukopenia usually precedes the onset of the critical phase and has been associated with severe disease.
- A rapid decrease in platelet count, concomitant with a rising hematocrit compared to the baseline, is suggestive of progress to the plasma leakage/critical phase of the disease. These changes are usually preceded by leukopenia (≤ 4000 cells/mm^3).
- In the absence of the patient's baseline, age-specific population hematocrit levels could be used as a surrogate during the critical phase.
- Dengue-specific laboratory tests can be performed to confirm the diagnosis. However, it is not necessary for the acute management of patients, except in cases with unusual manifestations.
- Additional tests should be considered in patients with co-morbidities and severe disease as indicated. These may include tests of liver function, glucose, serum electrolytes, urea and creatinine, bicarbonate or lactate, cardiac enzymes, electrocardiogram (ECG) and urine specific gravity.

4.1.2. Step 2

Diagnosis, assessment of disease phase and severity

On the basis of evaluations of the overall assessment as described above, clinicians should determine whether the disease is dengue, which phase it is in (febrile, critical or recovery), whether there are warning signs, the hydration and hemodynamic state of the patient, and whether the patient requires admission or not.

4.1.3. Step 3
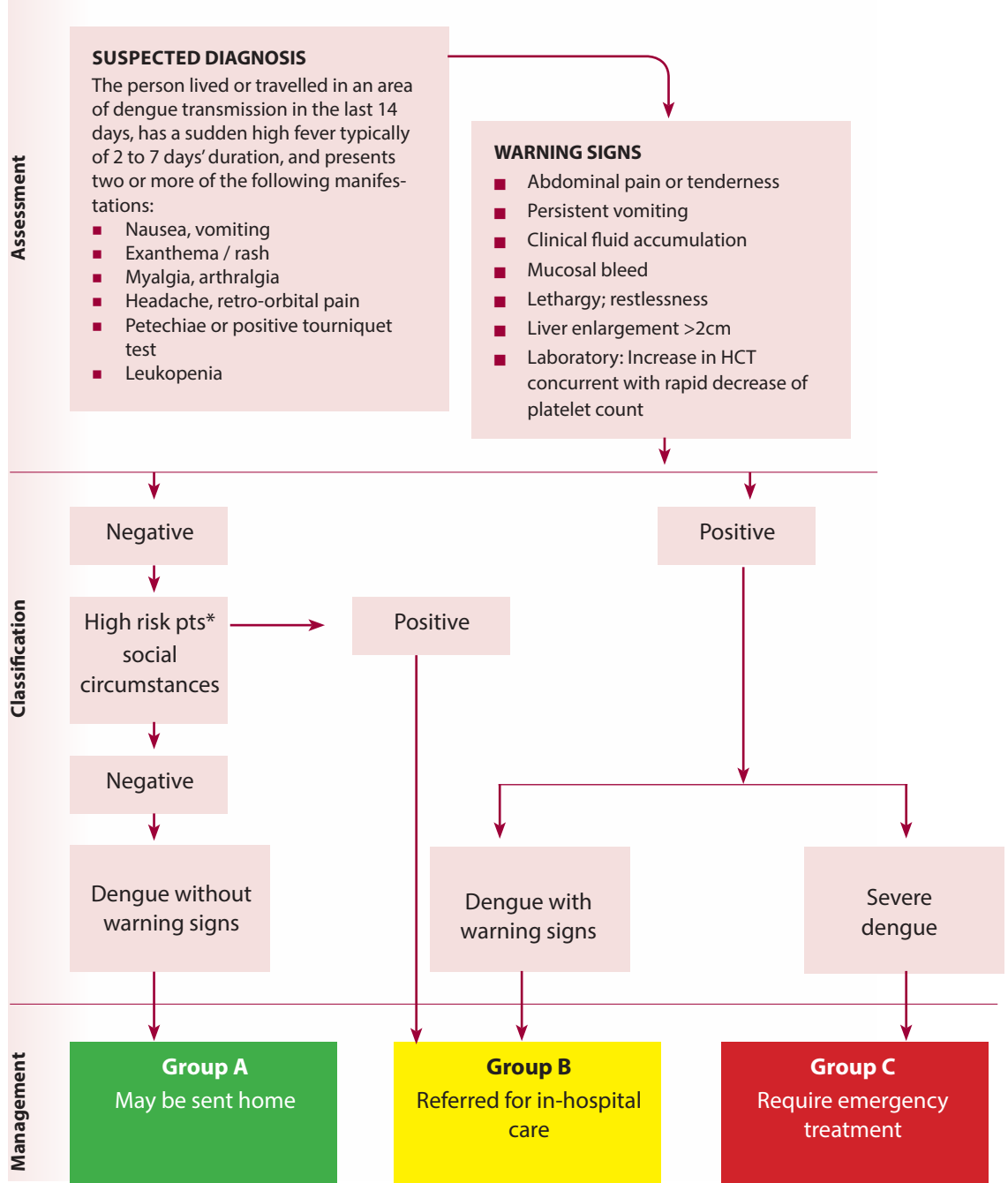
Disease notification and management decision

Disease notification
In dengue-endemic countries like Nepal, cases of suspected, probable/highly suggestive and confirmed dengue should be notified early so that appropriate public-health measures can be initiated. Laboratory confirmation is not necessary before notification, but if available should be reported. Notification of dengue is mandatory in Nepal. It is also a part of early warning and reporting system (EWARS) and should be reported accordingly.

Management decisions
Depending on the clinical manifestations and other circumstances, patients may either

- be sent home **(Group A)**
- be referred for in-hospital management **(Group B)** or
- require emergency treatment and urgent referral **(Group C)**

TABLE 12: Algorithm for Dengue case management

Assessment

SUSPECTED DIAGNOSIS

The person lived or travelled in an area of dengue transmission in the last 14 days, has a sudden high fever typically of 2 to 7 days' duration, and presents two or more of the following manifestations:

- Nausea, vomiting
- Exanthema / rash
- Myalgia, arthralgia
- Headache, retro-orbital pain
- Petechiae or positive tourniquet test
- Leukopenia

WARNING SIGNS

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical fluid accumulation
- Mucosal bleed
- Lethargy; restlessness
- Liver enlargement >2cm
- Laboratory: Increase in HCT concurrent with rapid decrease of platelet count

Classification

Negative

High risk pts* social circumstances → Positive

Positive

Negative

Dengue without warning signs

Dengue with warning signs

Severe dengue

Management

Group A
May be sent home

Group B
Referred for in-hospital care

Group C
Require emergency treatment

*High risk dengue patients

- Infant
- Elderly
- Pregnant
- Obese patients
- Bleeding
- Underlying disease
- Confusion

Group A- MANAGEMENT

TABLE 13: Case management for Group A dengue patient

Case Management Group A* (May be sent home)	
Group criteria	■ Patients who do not have warning signs AND who are able: ■ To tolerate adequate volumes of oral fluids ■ To pass urine at least once every 6 hour
Laboratory tests	■ Complete blood Count (CBC) ■ Hematocrit (Hct)
Treatment	Advice for: ■ Adequate bed rest ■ Adequate fluid intake ■ Paracetamol, 4 gm max. per day in adults & accordingly in children Patients with stable Hct can be sent home

Monitoring	■ Daily review for disease progression:
	   o Decreasing WBC
	   o Defervescence
	   o Warning signs (until out of critical period)
	■ Advice for immediate return to hospital if development of any warning signs
	■ Written advice of management (e.g. home care card for dengue)

Box 2: * Details on case management for Group A dengue patient

- These are patients who may be sent home. They are able to tolerate adequate volumes of oral fluids, pass urine at least once every six hours and do not have any of the warning signs (particularly when fever subsides).

- Clear, definitive advice on the care that the patient needs to receive at home: i.e. bed rest and frequent oral fluids should be given.

- Patients with ≥ 3 days of illness should be reviewed daily for disease progression (indicated by decreasing white blood cell and platelet counts and increasing hematocrit, defervescence and warning signs) until they are out of the critical period.

- Those with stable hematocrit can be sent home but should be advised to return to the nearest hospital immediately if they develop any of the warning signs and to adhere to the following action plan.

  - **Adequate oral fluid intake.** Encourage oral intake to replace fluid loss from fever and vomiting. Small amounts of oral fluids should be given frequently for those with nausea and anorexia. Oral rehydration solution or soup and fruit juices may be given to prevent electrolyte imbalance. Sufficient oral fluid intake should result in a urinary frequency of at least 4 to 6 times per day. A record of oral fluid and urine output could be maintained and reviewed daily in the ambulatory setting.

  - **Give paracetamol for high fever.** The recommended dose is 10 mg/kg/dose, not more than 3–4 times in 24 hours in children and not more than 3 g/day in adults. Sponge with tepid water if the patient still has a high fever. "Do not give acetylsalicylic acid (aspirin), ibuprofen or other non-steroidal anti-inflammatory agents (NSAIDs) or intramuscular injections, as these aggravate gastritis or bleeding".

  - **Patient should be brought to hospital immediately if any of the following occur:**
    - no clinical improvement
    - deterioration around the time of defervescence
    - severe abdominal pain/persistent vomiting
    - cold and clammy extremities
    - lethargy or irritability/restlessness
    - bleeding (e.g. black stools or coffee ground vomiting)
    - shortness of breath
    - not passing urine for more than 6 hours.

- Admission during the febrile period should be reserved for those who are unable to manage adequate oral hydration at home, infants, and those with co-existing conditions.

- Ambulatory patients should be monitored daily for temperature pattern, volume of fluid intake and losses, urine output (volume and frequency), warning signs, signs of plasma leakage and bleeding and CBC.

Group B- MANAGEMENT

TABLE 14: Case management for Group B dengue patient

Case Management Group B* (Referred for in hospital care)		
Group criteria	Patients with any of the following features: ■ Co-existing conditions- pregnancy, infancy, old age, diabetes mellitus ■ Social circumstances o living alone, living far from hospital	OR Existing warning signs: ■ Abdominal pain or tenderness ■ Persistent vomiting ■ Clinical fluid accumulation ■ Mucosal bleeding ■ Lethargy/ restlessness ■ Liver enlargement >2cm ■ Laboratory: increase in Hct
Laboratory tests	■ Complete blood Count (CBC) ■ Hematocrit (Hct)	■ Complete blood Count (CBC) ■ Hematocrit (Hct)
Treatment	■ Encourage oral fluids ■ If not tolerated, start intravenous fluid therapy 0,9% saline or Ringer Lactate at maintenance rate	■ Obtain reference Hct before fluid therapy ■ Give isotonic solutions - 0.9% saline or Ringer lactate start with 5-7 ml/kg/hr. for 1-2 hours, then reduce to 3- 5 ml/kg/hr. for 2-4 hr. then reduce to 2-3 ml/kg/hr. or less based on clinical response **Reassess clinical status and repeat Hct** ■ If Hct remains the same or rises only minimally continue with 2-3 ml/kg/hr. for another 2-4 hrs. ■ If worsening of vital signs and rapidly rising Hct increase rate to 5-10 ml/kg/hr. for 1-2 hours **Reassess clinical status, repeat Hct and review fluid infusion rates accordingly** ■ Reduce IV fluids gradually when the rate of plasma leakage decreases towards the end of the critical phase. This is indicated by: ■ Adequate urine output and/or fluid intake ■ Hct decreases below baseline in a stable patient
Monitoring	■ Temperature pattern ■ Volume of fluid intake and losses ■ Urine output – volume and frequency ■ Warning signs ■ Hct, WBC and platelet	■ Vital signs and peripheral perfusion (1-4 hourly until patient is out of critical phase) ■ Urine output (4-6 hourly) ■ Hct (before & after fluid replacement, then 6-12 hourly) ■ Blood glucose ■ Other organ functions (renal profile, liver profile, coagulation profile, as indicated)

Box 3: * Details on case management for Group B dengue patient

- These are patients who should be admitted for in-hospital management for close observation as they approach the critical phase. These include
  - o   patients with warning signs
  - o   patients with co-existing conditions (pregnancy, infancy, old age, obesity, diabetes mellitus, hypertension, heart failure, renal failure, chronic hemolytic diseases such as sickle-cell disease and autoimmune diseases)
  - o   patients with certain social circumstances (living alone or far from a health facility).
- Rapid fluid replacement in patients with warning signs is the key to prevent progression to the shock state. If the patient has dengue with warning signs or signs of dehydration, judicious volume replacement by intravenous fluid therapy from this early stage may modify the course and the severity of disease. The action plan should be as follows and applies to infants, children and adults
  - o   **Obtain a reference hematocrit before IV fluid therapy begins.** Give only isotonic solutions such as 0.9% saline, Ringer's lactate or Hartmann's solution (if available). Start with 5–7 ml/kg/hour for 1–2 hours, then reduce to 3–5 ml/kg/hour for 2–4 hours, and then reduce to 2–3 ml/kg/hour or less according to the clinical response.
  - o   **Reassess the clinical status and repeat the hematocrit.** If the hematocrit remains the same or rises only minimally, continue at the same rate (2–3 ml/kg/hour) for another 2–4 hours. If the vital signs are worsening and the hematocrit is rising rapidly, increase the rate to 5–10 ml/kg/hour for 1–2 hours. Reassess the clinical status, repeat the hematocrit and review fluid infusion rates accordingly.
  - o   **Give the minimum IV fluid volume required to maintain good perfusion and an urine output** of about 0.5 ml/kg/hour. IV fluids are usually needed for only 24–48 hours. Reduce IV fluids gradually when the rate of plasma leakage decreases towards the end of the critical phase. This is indicated by urine output and/or oral fluid intake improving, or the hematocrit decreasing below the baseline value in a stable patient.
  - o   **Patients with warning signs should be monitored by health-care providers until the period of risk is over.** A detailed fluid balance should be maintained. Parameters that should be monitored include vital signs and peripheral perfusion (1–4 hourly until the patient is out of the critical phase), urine output (4–6 hourly), hematocrit (before and after fluid replacement, then 6–12 hourly), blood glucose and other organ functions profile.
- If the patient has dengue with co-existing conditions but without warning signs, the action plan should be as follows
  - o   Encourage oral fluids. If not tolerated, start IV fluid therapy of 0.9% saline or Ringer's lactate with or without glucose at appropriate maintenance rate. Use ideal body weight for calculation of fluid infusion for obese /overweight patients. Patients may be able to take oral fluids after a few hrs. of IV fluid therapy. Thus, it is necessary to revise the fluid infusion frequently. Give the minimum volume required to maintain good perfusion and urine output. IV fluids are usually needed only for 24–48 hours.

Group C- MANAGEMENT

TABLE 15: Case management for Group C dengue patient

Case Management Group C*(Require emergency treatment)	
Group criteria	Patients with any of the following features. ■ Severe plasma leakage with shock and/or fluid accumulation with respiratory distress ■ Severe bleeding ■ Severe organ impairment
Laboratory tests	■ Complete blood Count (CBC) ■ Hematocrit (Hct) and other organ function tests as indicated
Treatment Compensated shock	■ Start I.V. fluid-isotonic crystalloid solutions at 5-10 ml/kg/hr. over 1 hr. ■ Reassess patient's condition **If patient improves** ■ I.V. fluids should be reduced gradually to 5-7 ml/kg/hr. for 1-2 hr. then 3-5 ml/kg/hr. for 2-4 hr. then 2-3 ml/kg/hr. for 2-4 hr. then reduced depending on hemodynamic status ■ I.V. fluids can be maintained for up to 24 - 48 hours **If patient still unstable** ■ Check Hct after first bolus-If **Hct increases/ still high** (>50%) Repeat a second bolus of crystalloid solution at 10-20 ml/kg/hr. for 1 hr. If improvement, reduce to 7-10 ml/kg/hr. for 1-2 hr. then reduce as above. **Hct decreases**-indicates bleeding & need to crossmatch & transfuse blood
Treatment Hypotensive shock	■ Initiate I.V. fluid -crystalloid /colloid solution, 20 ml/kg as a bolus for 15 min **If patient improves** ■ Give a crystalloid / colloid solution, 10 ml/kg/hr. for 1 hr. then reduce gradually as above **If patient still unstable** ■ Review the Hct taken before the first bolus-If **Hct was low** (<40% in children/adult females, < 45% in adult males) This indicates bleeding, the need to crossmatch and transfuse **Hct was high** compared to the baseline value, change to I.V. colloids at 10-20 ml/kg as a second bolus over to 1 hour; reassess after second bolus If improving reduce the rate to 7-10 ml/kg/hr. for 1-2 hours, then back to I.V. crystalloids and reduce rates as above. If condition still unstable, repeat Hct after second bolus **If Hct decreases,** this indicates bleeding, see above **If Hct increases/ remains high** (> 50%), continue colloid infusion at 10-20 ml/kg as a third bolus over 1 hr., then reduce to 7-10 ml/kg /hr. for 1-2 hours, then change back to crystalloid solution and reduce rate as above
Treatment Hemorrhagic complication	■ Give 5-10 ml/kg of fresh packed red cells or 10-20 ml/kg fresh whole blood

Box 4: * Details on case management for Group C dengue patient

- These are patients with severe dengue who require emergency treatment and urgent referral because they are in the critical phase of the disease and have
  o severe plasma leakage leading to dengue shock and/or fluid accumulation with respiratory distress
  o severe hemorrhages
  o severe organ impairment
- These patients should be admitted to a hospital with access to blood transfusion facilities. Judicious intravenous fluid resuscitation is the essential and usually sole intervention required. Please refer to above table for treatment for compensated and hypotensive shock.
- The goal of the resuscitation include
  o improving central and peripheral circulation – i.e. decreasing tachycardia, improving BP and pulse volume, warm and pink extremities, a capillary refill time < 2 seconds
  o improving end-organ perfusion – i.e. achieving a stable conscious level (more alert or less restless), and urine output ≥ 0.5 ml/kg/hour or decreasing metabolic acidosis

Box 5: When to stop intravenous fluid therapy

- Recognizing when to decrease or stop intravenous fluids as part of the treatment of severe dengue is crucial to prevent fluid overload.
- When any of the following signs are present, intravenous fluids should be reduced or discontinued:
  o signs of cessation of plasma leakage
  o stable BP, pulse and peripheral perfusion
  o hematocrit decreases in the presence of a good pulse volume
  o apyrexia (without the use of antipyretics) for more than 24–48 hours
  o resolving bowel/abdominal symptoms;
  o improving urine output.
- Continuing intravenous fluid therapy beyond the 48 hours of the critical phase will put the patient at risk of pulmonary edema and other complications such as thrombophlebitis.
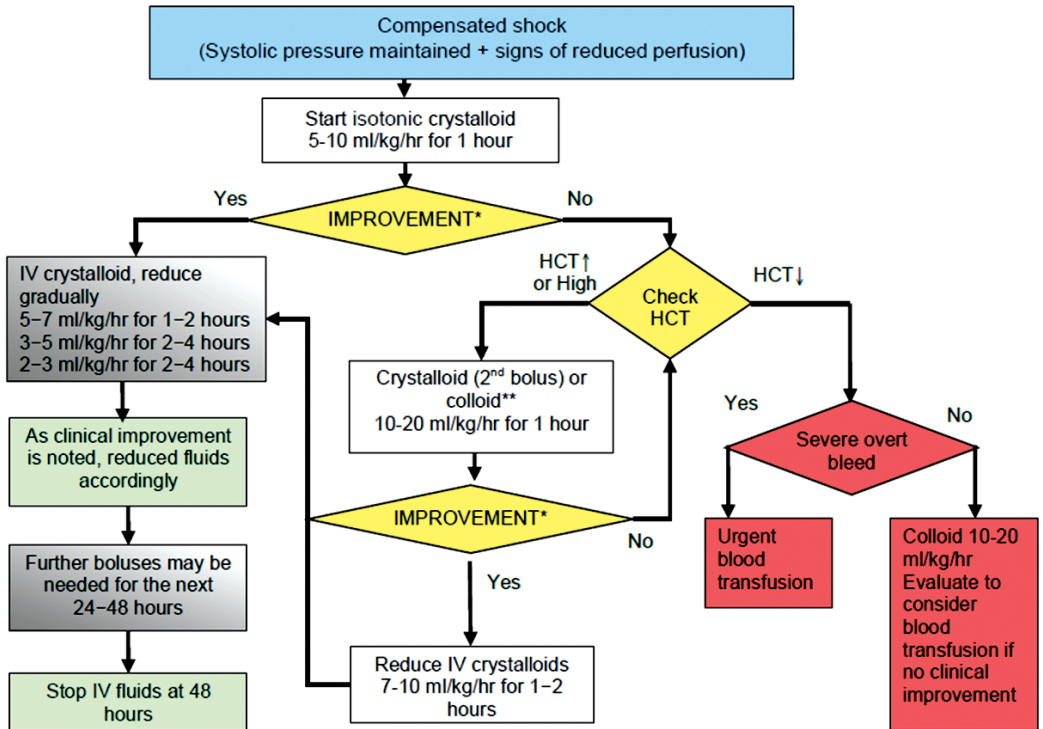
Box 6: Discharge criteria for a hospitalized dengue patient

- No fever for 48 hours
- Improvement in clinical picture
- Increasing trend of platelet count
- Stable hematocrit without intravenous fluids
- No respiratory distress

Algorithm for fluid management of compensated shock in adults

TABLE 27: Algorithm for fluid management of compensated shock in adults
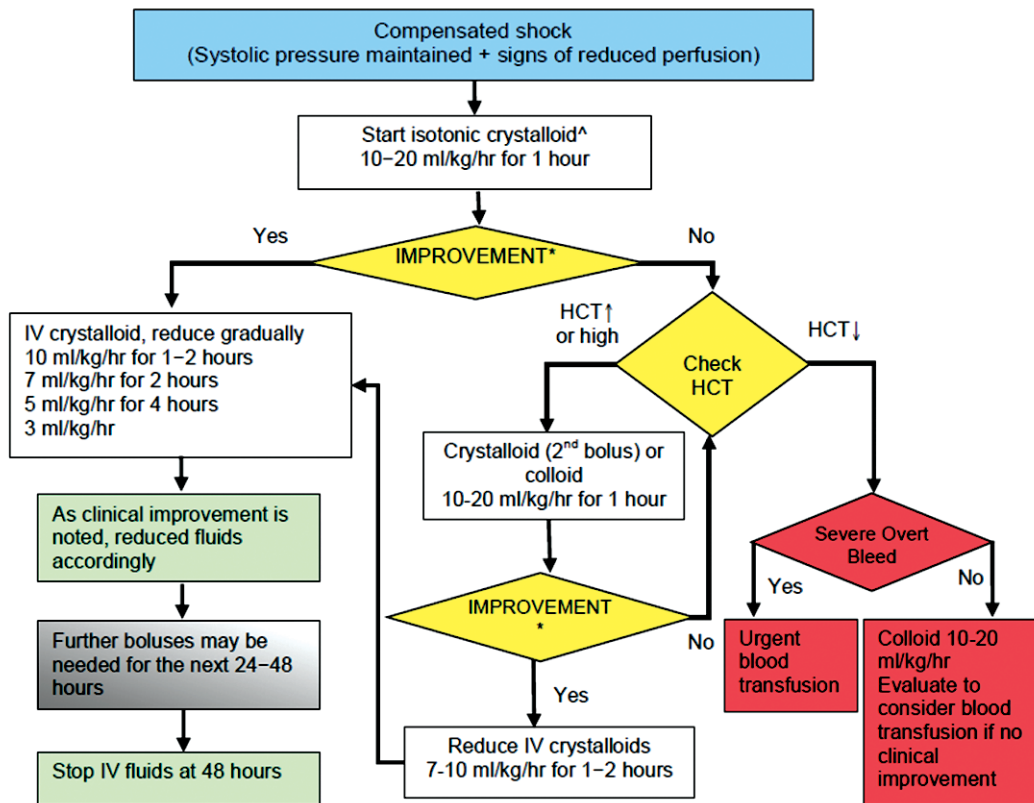

*Reassess the patient's clinical condition, vital signs, pulse volume, capillary refill time and temperature of extremities.
**Colloid is preferable if the patient has already received previous boluses of crystalloid
-IV: intravenous, HCT: haematocrit, ↑: increased, ↓: decreased.

Annexe 2

Algorithm for fluid management of compensated shock in infants and children

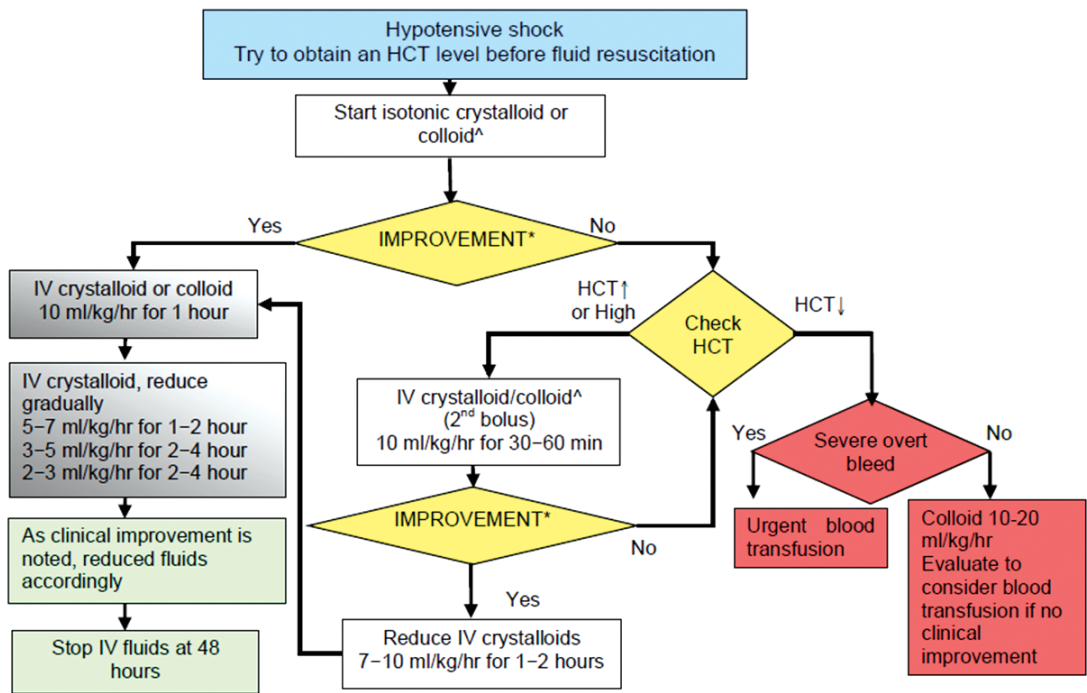**TABLE 28:** Algorithm for fluid management of compensated shock in infants and children

^Colloid is preferable if the patient has already received previous boluses of crystalloid
*Reassess the patient's clinical condition, vital signs, pulse volume, capillary refill time and temperature of extremities.IV = intravenous; HCT = haematocrit; ↑ = increased; ↓ = decreased

Algorithm for fluid management of hypotensive shock in infants, children and adults

TABLE 29: Algorithm for fluid management in hypotensive shock in infants, children and adults

^Colloid is preferable if the patient has already received previous boluses of crystalloid
*Reassess the patient's clinical condition, vital signs, pulse volume, capillary refill time and temperature of extremities.
IV = intravenous; HCT = haematocrit; ↑ = increased; ↓ = decreased