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# DENGUE FEVER

ETD HWKKS DEPARTMENT CME

Epidemiology

Classification

Clinical Course

Diagnosis

Assessment

Management

Complications of dengue

Dengue in Pregnancy

Dengue in Paediatric

# Outline

# Common Issues in Mortality Meeting

Delay in identifying diagnosis of dengue

Inability to recognize the severity of dengue (over/under)

Fluid management

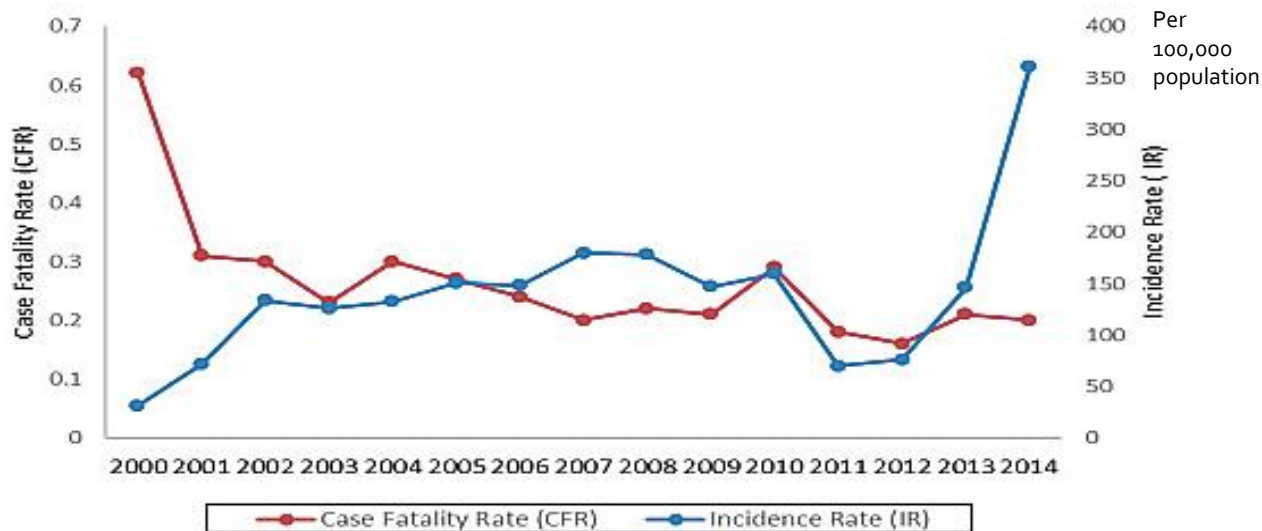
Insufficient monitoring

Delay in referral

Gaps in continuity of care

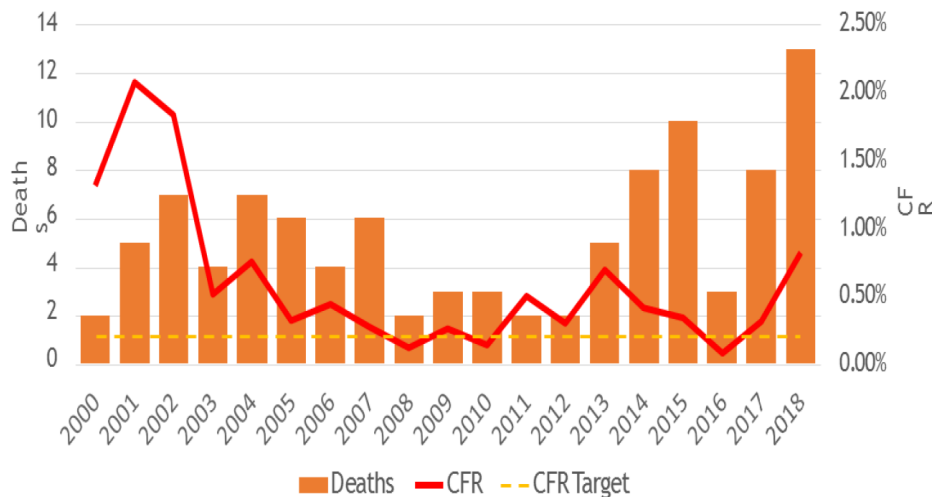
# Epidemiology

- Dengue is a high morbidity and mortality arthropod borne viral disease
- Has a steady increase of incidence globally
- Most cases reported were from urban areas (70-80%)



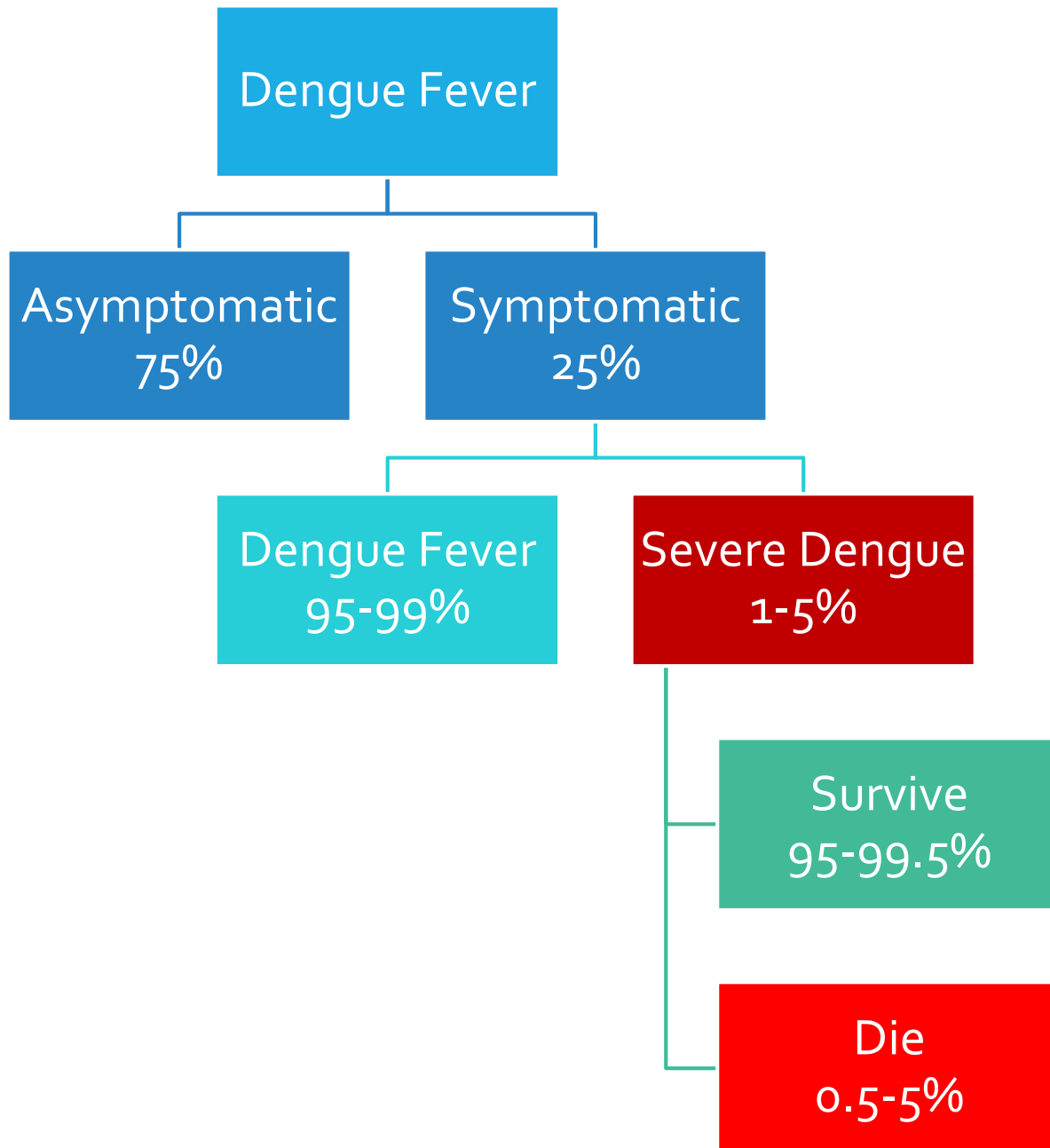
# Sabah Dengue Season

## Dengue Deaths & Case Fatality Rate (CFR), 2000- JUNE 2018, Sabah

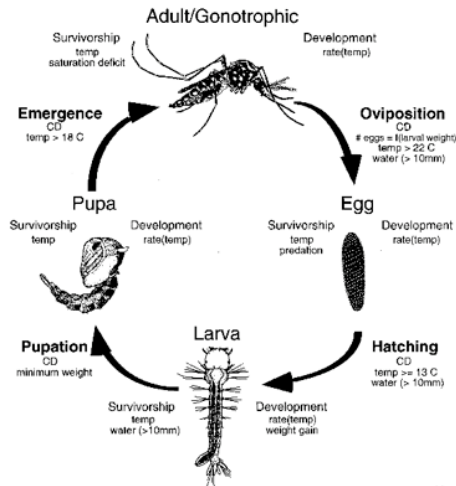
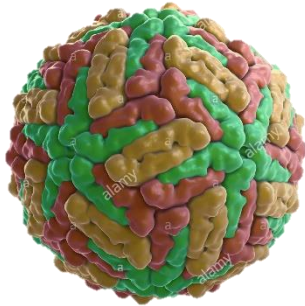


Source: Vector-borne Diseases Unit, Department of Health Sabah  
CFR: Case Fatality Rate

- 1791 dengue cases recorded up to July 21<sup>st</sup> 2018 as compared to 1125 dengue cases reported in corresponding period of last year.\*
- KK-491, Tawau-357, Kunak-202, LD-178
- 15 dengue deaths up to July 2018

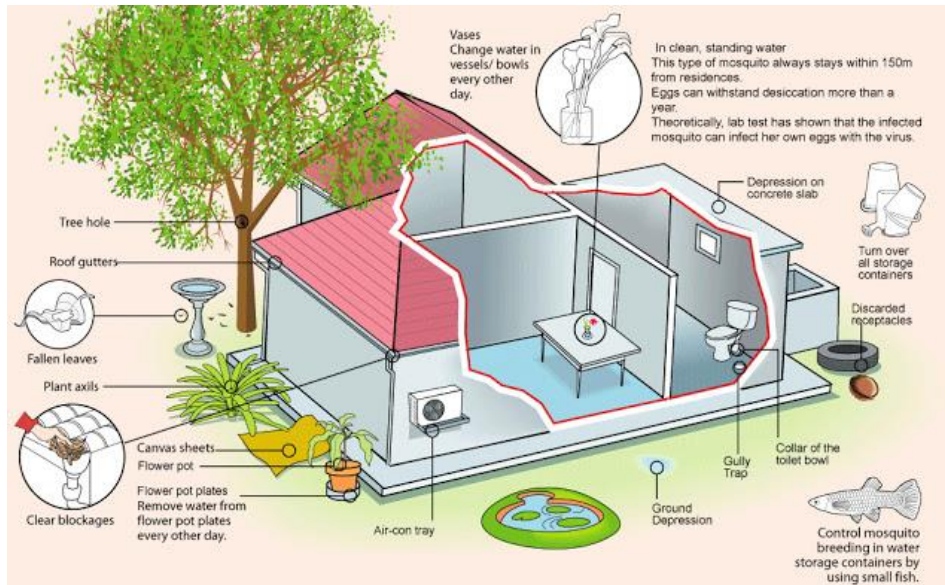


## Aedes Mosquito Life Cycle




## Dengue Virus

- Caused by DENV1-4, Family Flaviviridae; genus Flavivirus
- Endemic in tropical and subtropical area
- Vectorborne arthropod disease – Aedes Aegypti
- Human infection from bite of vector



# Dengue Fever



Systemic  
and  
Dynamic in  
nature



# Symptoms of Dengue fever

## Febrile phase

sudden-onset fever

headache

mouth and nose  
bleeding

muscle and  
joint pains

vomiting

rash

diarrhea

## Critical phase

hypotension

pleural effusion

ascites

gastrointestinal  
bleeding

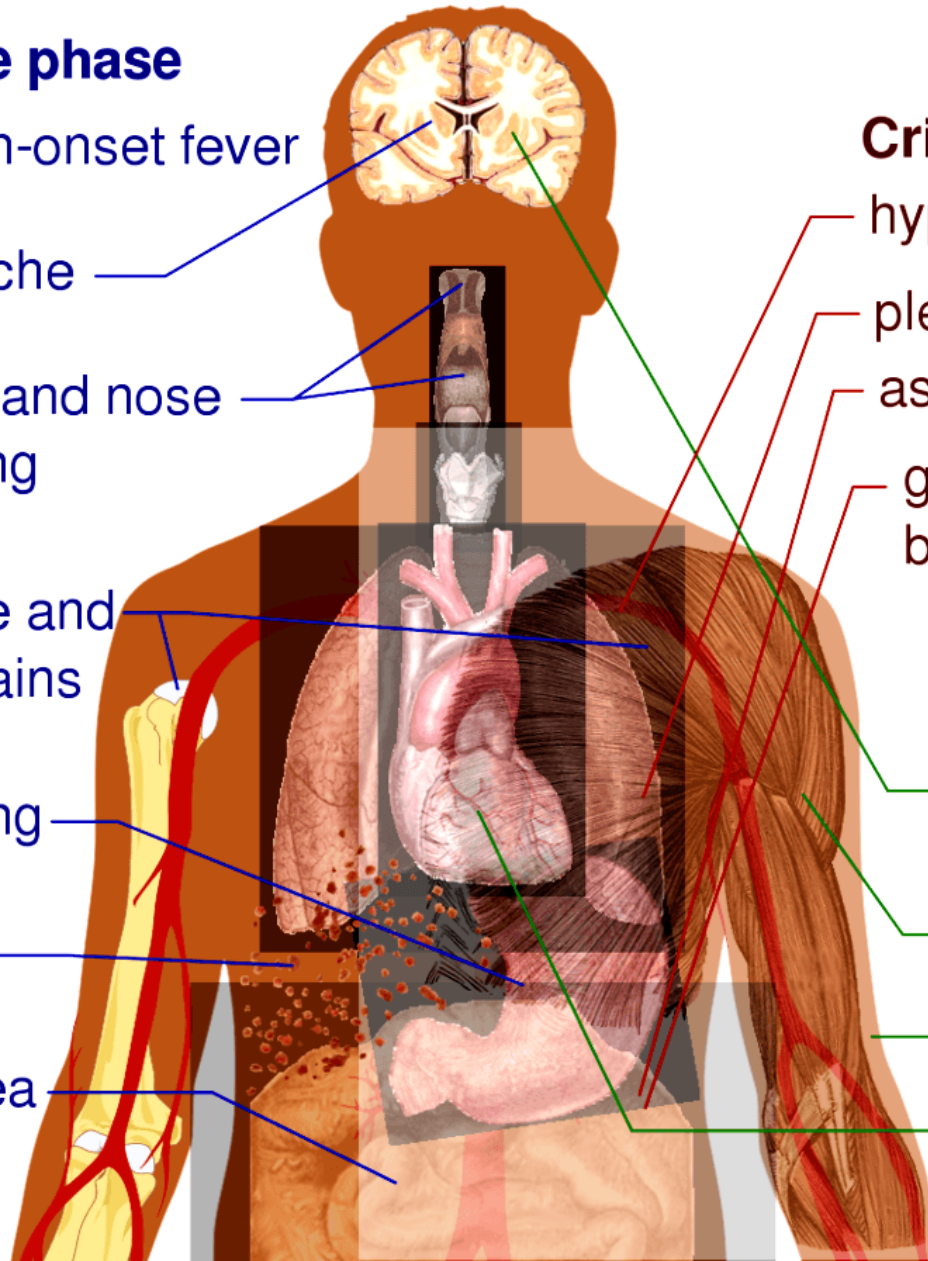
## Recovery phase

altered level of  
consciousness

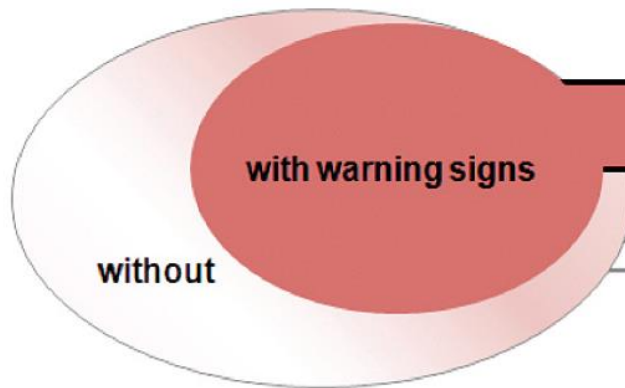
seizures

itching

slow heart rate



## DENGUE ± WARNING SIGNS



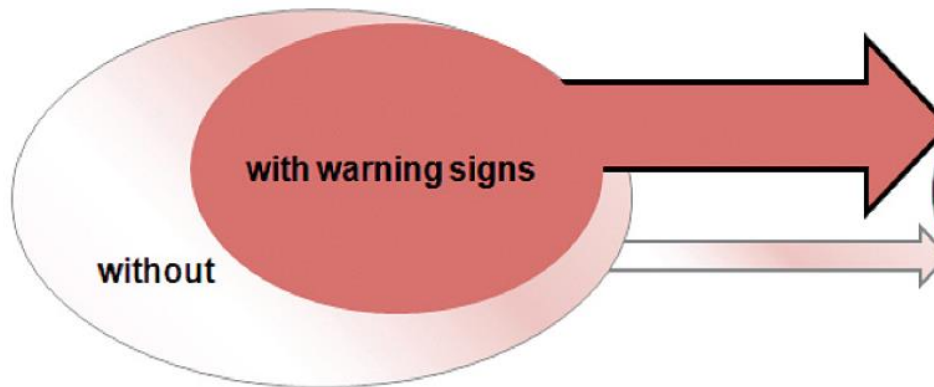
## SEVERE DENGUE

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

## CRITERIA FOR DENGUE ± WARNING SIGNS

**Adapted:** World Health Organization. Dengue Guidelines for Diagnosis, Treatment, Prevention and Control - New Edition 2009. WHO: Geneva; 2009

## DENGUE ± WARNING SIGNS



## SEVERE DENGUE

1. Severe plasma leakage
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### CRITERIA FOR DENGUE ± WARNING SIGNS

#### Probable dengue

- Live in/travel to dengue endemic/hotspot/outbreak area.
- Fever and 2 of the following criteria:
  - Nausea, vomiting
  - Rash
  - Aches and pains
  - Leucopaenia
  - Any warning sign

#### Laboratory-confirmed dengue

(important when no sign of plasma leakage)

#### Warning signs\*

- Abdominal pain or tenderness
- Persistent vomiting (  $\geq 3$  times per day)
- Persistent diarrhoea (  $\geq 3$  times per day)
- Clinical fluid accumulation
- Mucosal bleed
- Lethargy, confusion, restlessness
- Tender liver
- Laboratory: increase in HCT concurrent with rapid decrease in platelet count

\*(requiring strict observation & medical intervention)

### CRITERIA FOR SEVERE DENGUE

#### Severe plasma leakage leading to :

- Shock (DSS)
- Fluid accumulation with respiratory distress

#### Severe bleeding

As evaluated by clinician

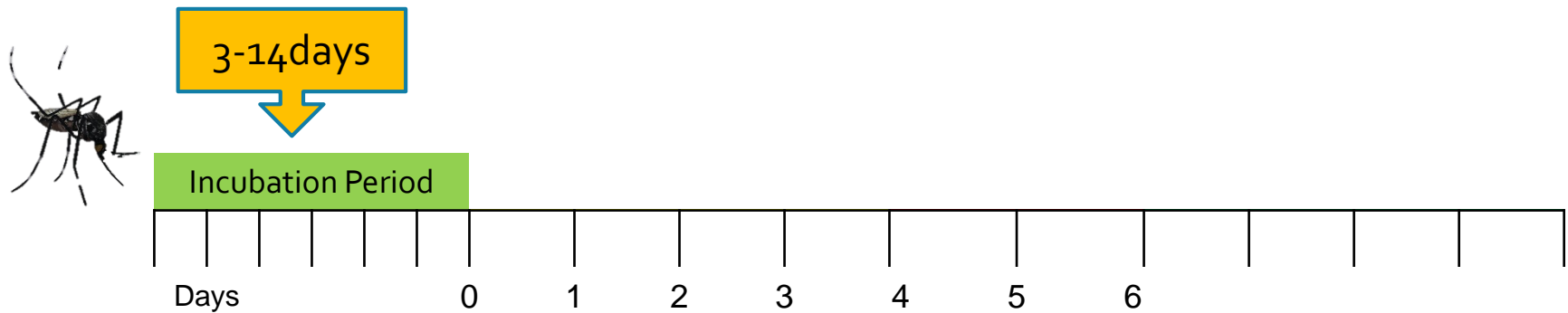
#### Severe organ involvement

Liver : AST or ALT  $\geq 1000$

CNS : Impaired consciousness

Heart and other organs

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- After incubation period, the illness begins abruptly
- 3 phases
  - Febrile – time of symptom onset
  - Critical phase – time of defervescence ( $T < 38$ ), significant plasma leakage
  - Recovery phase

Days of Illness	0	1	2	3	4	5	6	7	8	9	10
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Phases of dengue

1. Temperature

Potential  
Clinical Issues

2. Oral intake

3. Urine Output

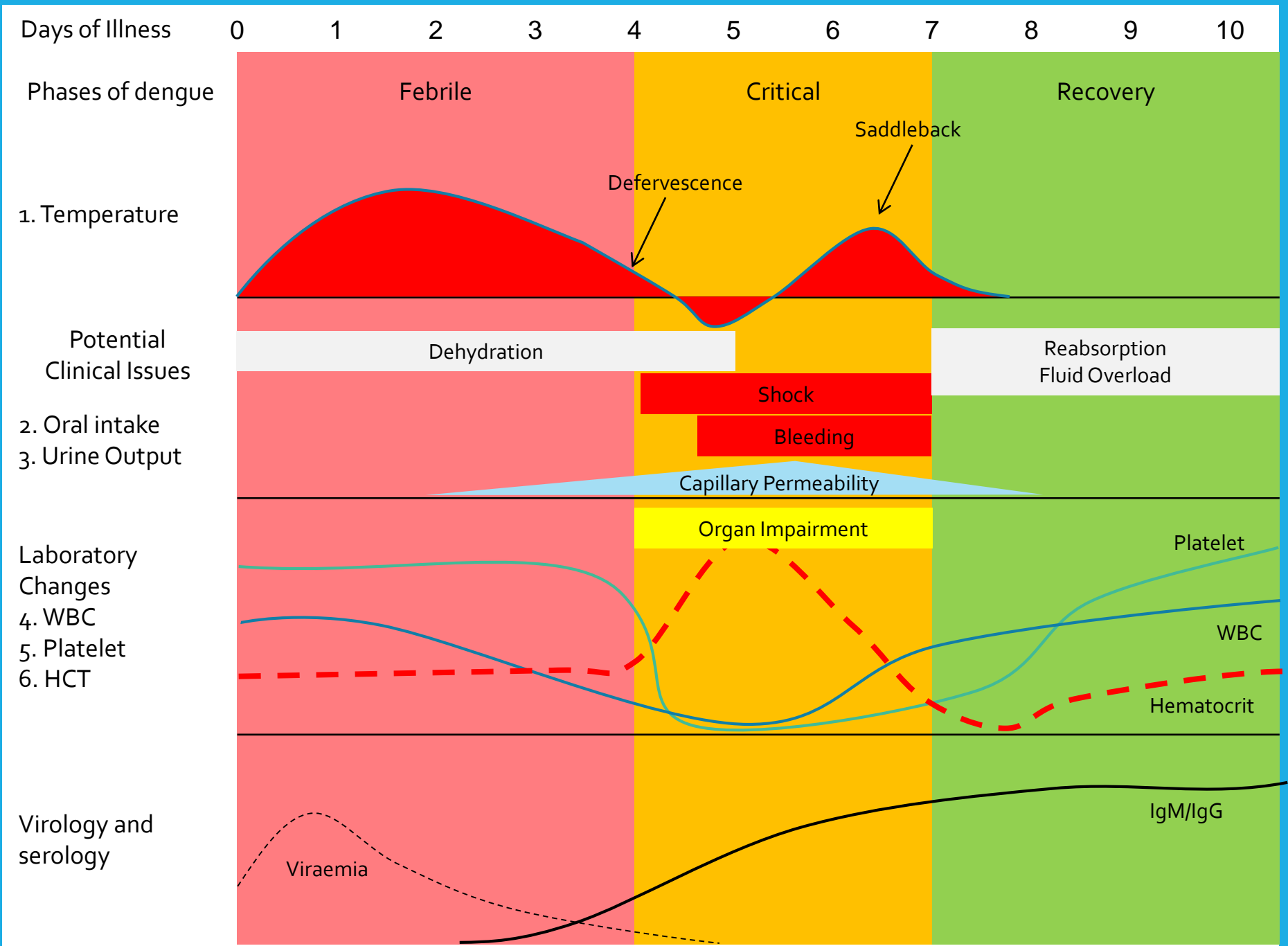
Laboratory  
Changes

4. WBC

5. Platelet

6. HCT

Virology and  
serology





# WE ARE LEAKING

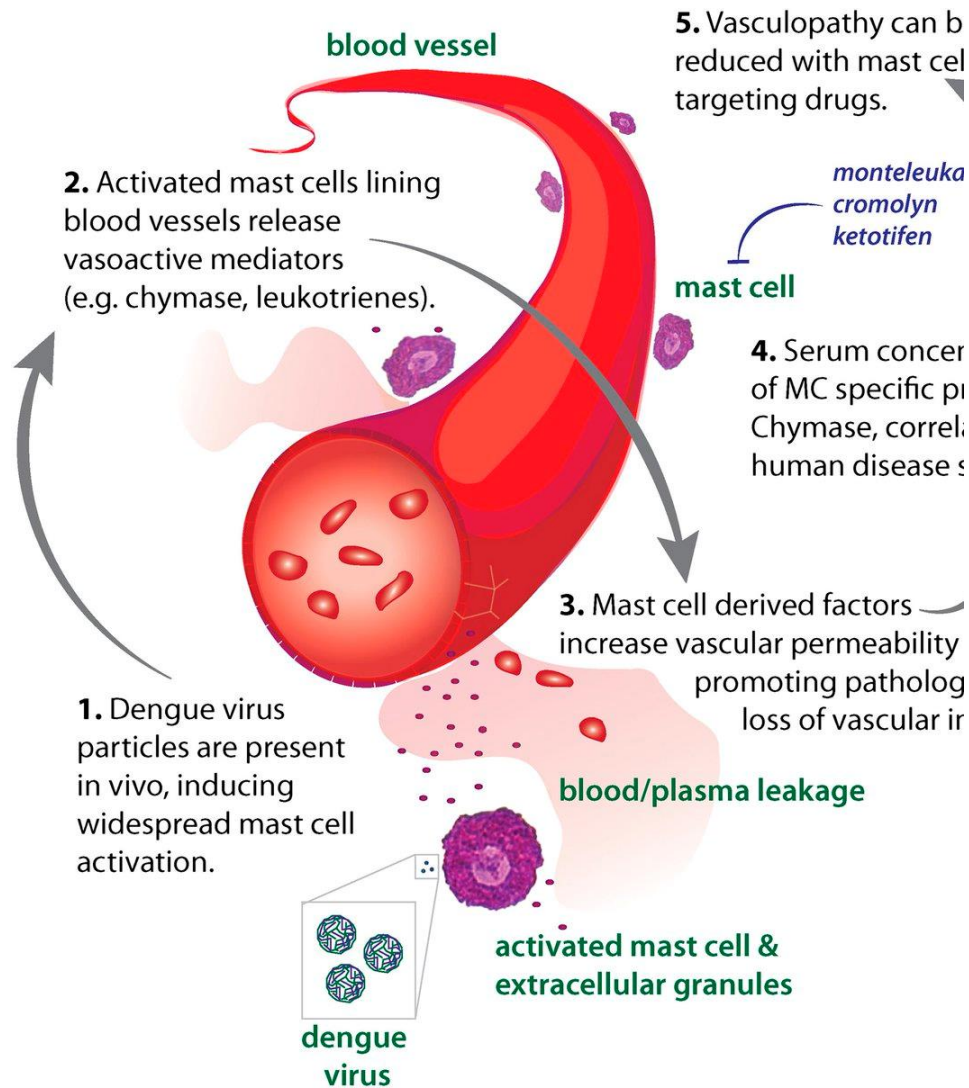
The pathophysiology of increased vascular permeability is still poorly understood

Hemoconcentration

Hypovolemia/Shock

Bleeding

Multiple organ dysfunction



# Anamnesis

- History
  - Exact onset of fever
  - Oral intake
  - Urine output (frequency, volume and time of last voiding)
  - What activities can the patient do during febrile illness
  - Warning signs
- Relevant histories
  - Family/neighbourhood history of dengue
  - Jungle trekking, waterfall swimming
  - Travelling
  - Co morbidities



# The magic touch

**C**

**Colour**

**C**

**Capillary  
Refill**

**T**

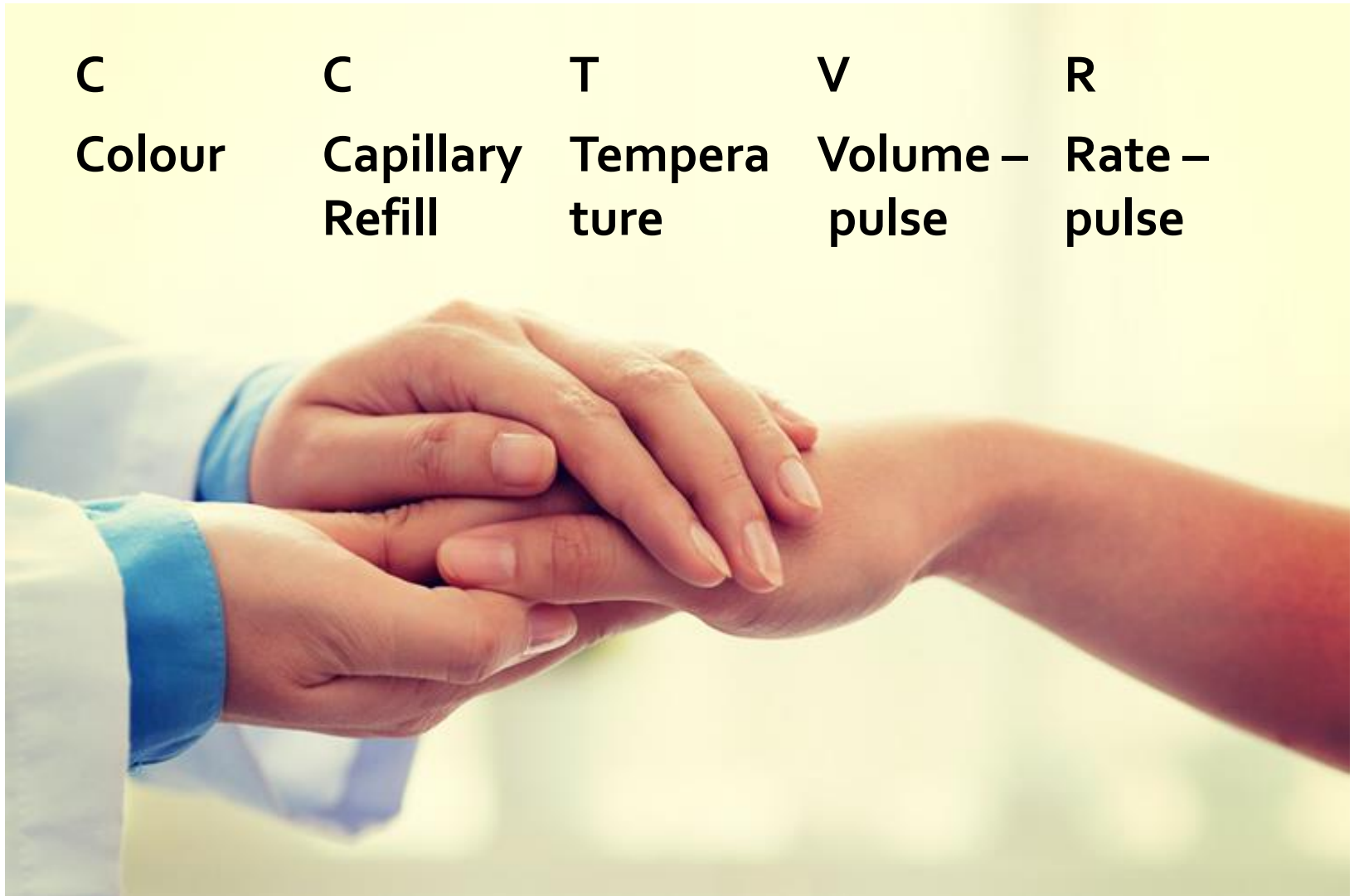
**Tempera  
ture**

**V**

**Volume –  
pulse**

**R**

**Rate –  
pulse**



Parameters	Stable Circulation	Compensated Shock	Hypotensive
Consciousness	Clear and Lucid	Clear and lucid	Restless
Capillary Refill Time	<2 sec	>2 sec	Very prolonged, mottled skin
Extremities	Warm and pink	Cool peripheries	Cold, clammy
Peripheral pulse volume	Good Volume	Weak and thread	Feeble or absent
Heart Rate	Normal HR	Tachycardia	Severe tachycardia or bradycardia
Blood Pressure	Normal BP	Normal systolic pressure, Rising diastolic pressure	Hypotension
Pulse Pressure	Normal PP	Narrowing PP	Narrowed pulse pressure
Respiratory Rate	Normal RR	Quiet Tachypnea	Kussmaul breathing
Urine Output	Normal	Reducing Trend	Oliguria or anuria

# Investigations

- FBC
  - White cell Count
  - Decrease rapidly as disease progress
  - Platelet Count
  - Hematocrit
    - Median values of normal HCT in Malaysian populations
    - male  $\leq 60$  years – 46%
    - male  $> 60$  years – 42%
    - female (all age groups) – 40%
- LFT, RP, Lactate, CK and Blood gasses – in severe dengue

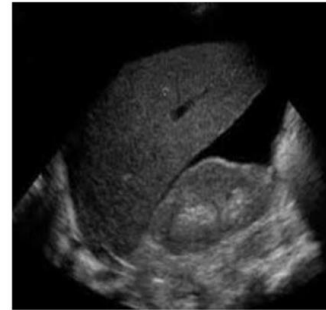
# Dengue Antigen and Serology

- Non structural protein 1
  - NS1 antigen is a glycoprotein that is a hallmark of flavivirus
  - Detection after day 5 is possible, however usually means poor prognosis
  - \*False positive : JE, Malaria, Leptospirosis, Toxoplasmosis, Connective Tissue disease
- Dengue IgM
  - Significantly higher in primary infections compared to secondary infections
  - Sensitivity is 93.9%, specificity is 92%
  - From day 5 up to 90
  - A negative IgM does not rule out dengue
- Dengue IgG
  - Detected in 100% of patients after day 7 of fever

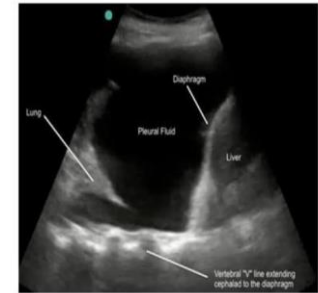
Clinical History	Test	Result	Interpretation
History of fever less than 5 days	Dengue NS1 Ag	Positive	Acute Dengue Infection
		Negative	Dengue infection still cannot rule out. Suggest to send second sample for Dengue IgM after day 5 of fever
History of fever more than 5 days	Dengue IgM	Positive	Presence of detectable IgM antibody. Suggestive of recent dengue infection
		Negative	The result does not rule out dengue infection. Advice to send repeat sample for dengue IgM after day 7 of fever or ask for Dengue IgG test.
	Dengue IgG	Positive	Elevated IgG levels are seen in acute or past infections. A titre of equal or more than 1:2560 is consistent with acute secondary infection.
		Negative	No detectable elevated IgG antibody. The absence of elevated IgG is presumptive evidence that the patient does not have secondary dengue infection.

# Role of US<sup>3</sup>

- Able to visualize first sign of plasma leakage – gall bladder wall thickening, pericholecystic fluid
- Ascitis
- Cardiac Assessment – to assess for cardiac dysfunction, pericardial effusion
- Lung Assessment – pleural effusions,
- IVC assessment – to guide fluid therapy



Intraperitoneal fluid collection



Pleural effusion



Gallbladder wall oedema



Pericardial effusion

# MANAGEMENT

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# Criteria for admission & referral

- Symptoms
  - Warning signs
  - Inability to tolerate oral fluids
  - Reduced urine output
- Signs
  - Dehydration
  - Shock
  - Organ failure
- Special groups
  - Multiple comorbidities – HPT, IHD, CKD, CLD
  - Elderly
  - Pregnancy
  - Social factors



# Oral Fluids

- Patients who are tolerating orally
- Patient who are hemodynamically stable
- Oral fluid : 1.2-1.5x normal maintenance
- DF with warning signs but with good oral intake



# IV Fluids

- Who?
- When?
- What?
- How much?
- How fast?

# Who?

- Those who are not able to drink enough to pee enough – only short duration
- Certain group of patients with warning signs **during the critical phase**
- Those with shock – compensated or hypotensive shock

# When to use?

## Febrile Phase

- Limit IV fluids (always try to give oral fluid) 2-3L
- Early IV therapy can lead to fluid overload especially with non-isotonic IV fluids

## Critical Phase

- IV fluids are usually required 24-48 hours
- DF with warning signs – persistently high or increasing HCT
- Usually for Dengue Shock Syndrom (DSS)
- In shock, IV fluids should be less than 48 hours

## Recovery Phase

- STOP IV fluids
- Late cessation of IV fluids will lead to reabsorption → Fluid overload

# What to use?

- Use isotonic solutions
- Colloids preferred if the blood pressure has to be restored urgently

Solution	Na	K	Cl	Lactate	Ca	Osm
Normal Saline	154		154			292
NSD5%	154		154			565
Ringers Lactate	130	4	109	28	3	274
Hartmann's Solution	131	5	111	29	2	278

- FFP, Plt concentrates are not useful in dengue fever

# How much? How fast?

- Give the minimum IVF required to maintain good perfusion and urine output of about 0.5ml/kg/hr
- Volume must be based on adjusted body weight if overweight
- Titrated to hemodynamic state and age
- Adult
  - Warning sings : **5-7ml/kg/hr over one hour**
  - Compensated shock **5-10ml/kg over one hour**
  - Hypotensive shock **10-20ml/kg over 15-30 minutes**
- Paediatric
  - Compensated shock **10-20ml/kg over 1 hour**
  - Hypotensive shock **20ml/kg over 15-30 minutes**
- After correction of shock
  - Reduce IV infusion in step-wise manner

# Obese patients ( $\text{BMI} \geq 27.5 \text{ kg/m}^2$ )

- Maintenance fluid can be calculated based on adjusted body weight
- Adjusted bodyweight (ABW) can be calculated using the • formula.
- $\text{ABW} = \text{IBW} + 0.4 (\text{actual weight} - \text{IBW})$
- **Ideal bodyweight (IBW) can be estimated based on the following formula.**
  - Female:  $45.5 \text{ kg} + 0.91(\text{height in cm} - 152)$
  - Male:  $50.0 \text{ kg} + 0.91(\text{height in cm} - 152)$

# REASSESSMENT!

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# Fluid responsiveness assessment

- Clinical response
  - Patient clinical picture
  - CCTVR
  - Hemodynamic
  - Urine output
- Laboratory parameters
  - Hematocrit
  - Improvement in metabolic acidosis
  - Lactate clearance

$$\frac{\text{lactate}_{\text{initial}} - \text{lactate}_{\text{subsequent}}}{\text{lactate}_{\text{initial}}} \times 100\%$$

- Imaging parameters
  - IVC collapsibility index
  - Lung scan
  - Echo

$$\frac{\text{IVC expiratory diameter} - \text{IVC inspiratory diameter}}{\text{IVC expiratory diameter}} \times 100 = \text{Caval index (\%)}$$

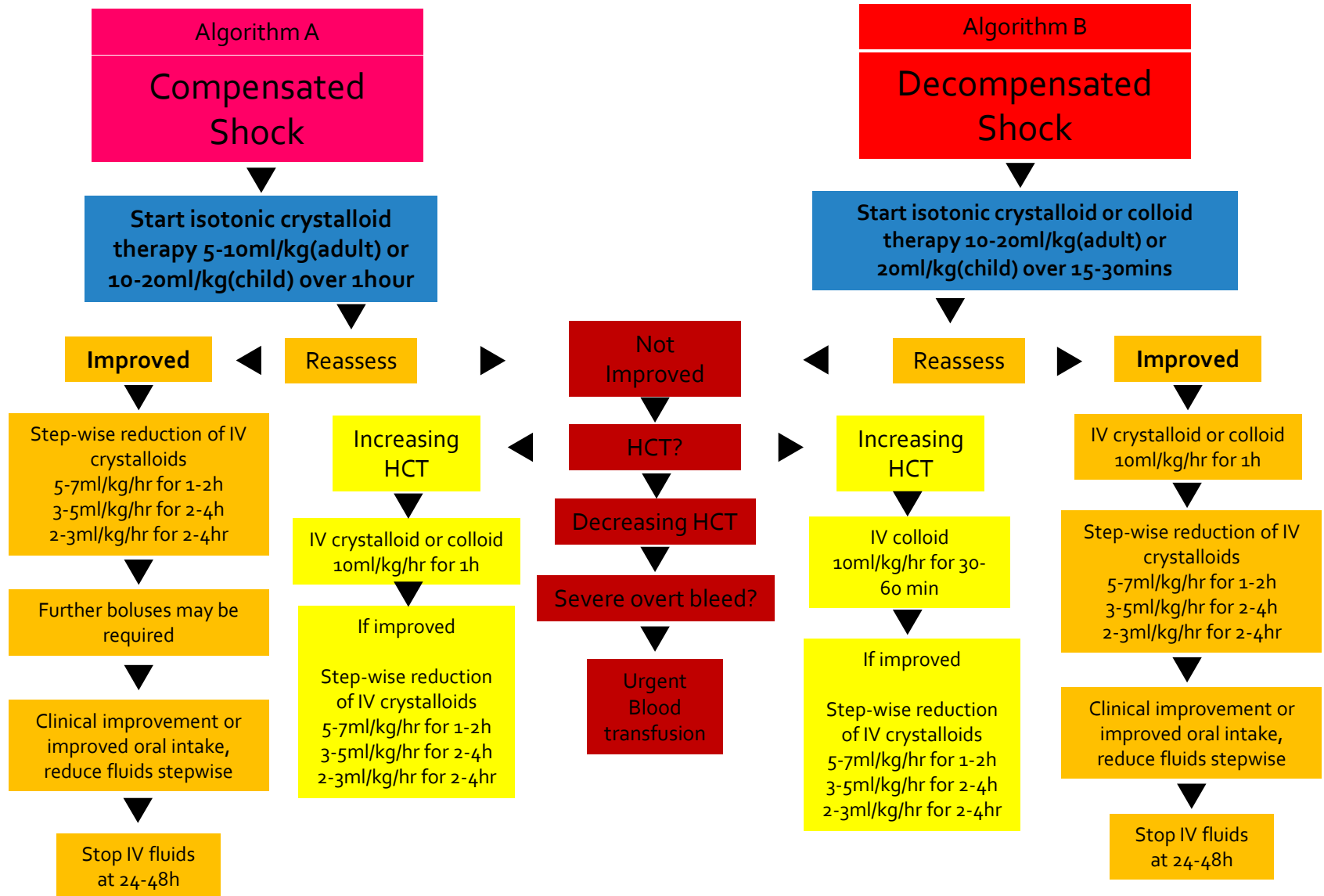
# DF with Warning Signs

- Oral fluid may be sufficient 2-3L of water
- IV fluids –
  - unable to tolerate orally
  - persistent warning signs with increasing or persistently high HCT
- Maintenance of IV Infusion 1.2-1.5ml/kg/hour
- Aim urine output 0.5-1.0 ml/kg/hr

**Table 8 : Graded Fluid Bolus Regime**

• Obtain a baseline HCT before fluid therapy.
• Give crystalloids solution (such as 0.9% saline).
• Start with 5 ml/kg/hour for 1–2 hours, then reduce to 3 ml/kg/hr for 2–4 hours, and then reduce to 2 ml/kg/hr or less according to the clinical response.
• If the clinical parameters are worsening and HCT is rising, increase the rate of infusion.
• Reassess the clinical status, repeat the HCT and review fluid infusion rates accordingly.

# Dengue Shock Syndrome (DSS)

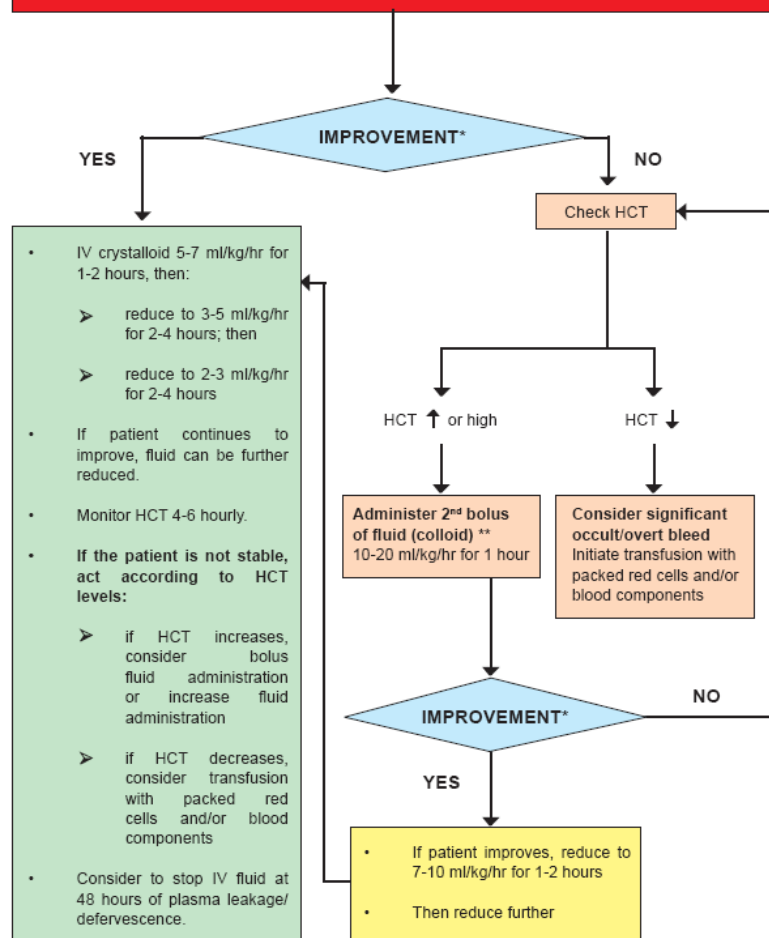


## ALGORITHM A - FLUID MANAGEMENT IN COMPENSATED SHOCK

### COMPENSATED SHOCK

(systolic pressure maintained but has signs of reduced perfusion)

- Fluid resuscitation with isotonic crystalloid 5-10 ml/kg/hr for 1 hour
- Obtain FBC, HCT, RP, LFT, RBS, PT/APTT, CK, Lactate/HCO<sub>3</sub>, GXM<sup>1</sup> before fluid resuscitation.



\* Reassess the patient's clinical condition, vital signs, pulse volume, capillary refill time, urine output and temperature of extremities.

\*\* Colloid is preferable if the patient has already received previous bolus of crystalloid

IV = intravenous ; HCT = haematocrit

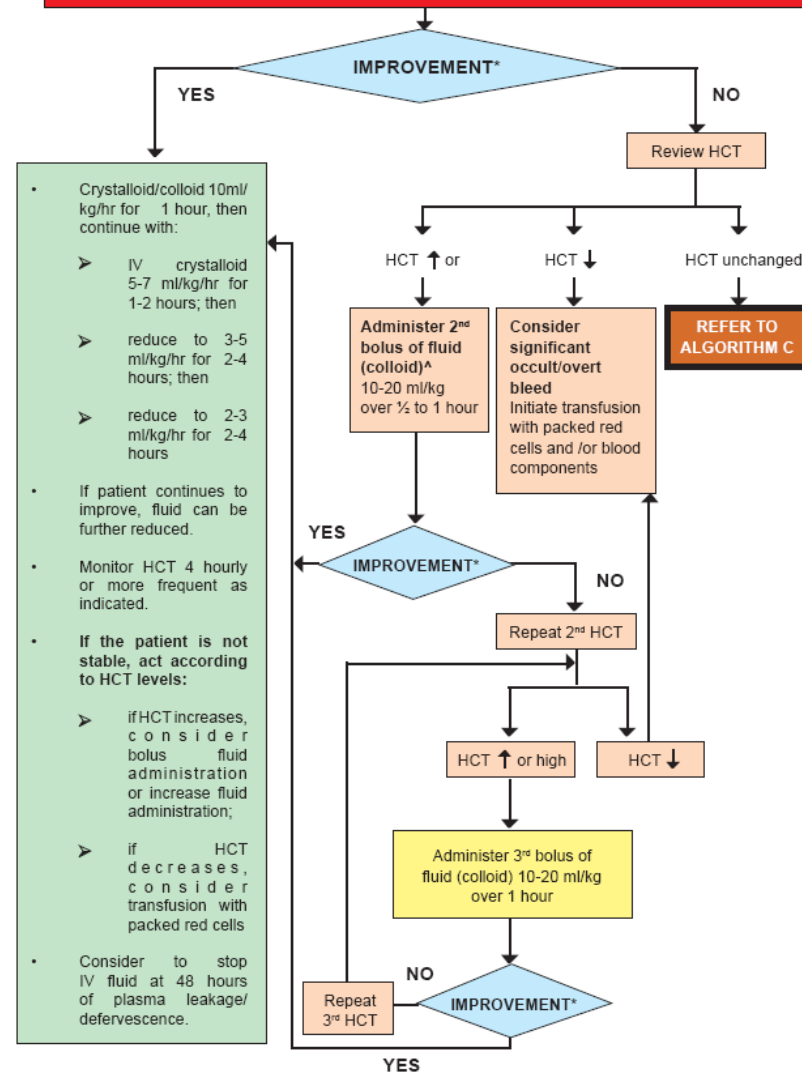
↑ = increased ; ↓ = decreased

<sup>1</sup>GXM: emergency cross-match

## ALGORITHM B - FLUID MANAGEMENT IN DECOMPENSATED SHOCK

### DECOMPENSATED SHOCK

- Fluid resuscitation with 20 ml/kg colloid / crystalloid within 15 - 30 minutes
- Obtain HCT/FBC, RP, LFT, RBS, PT/APTT, CK, Lactate/HCO<sub>3</sub>, GXM<sup>1</sup> before fluid resuscitation.



\* Reassess the patient's clinical condition, vital signs, pulse volume, capillary refill time and temperature of extremities.

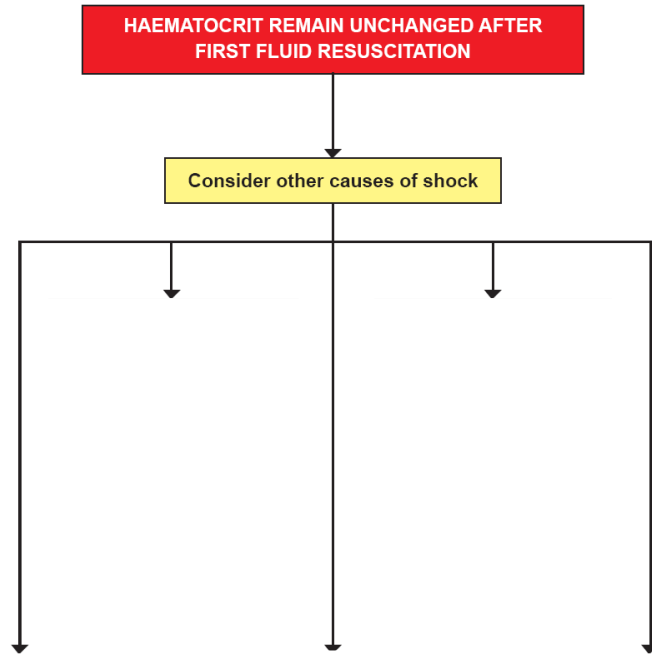
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ALGORITHM C - FLUID MANAGEMENT IN DECOMPENSATED SHOCK  
(WITH PRESENCE OF BLEEDING & LEAKING OR OTHER CAUSES OF SHOCK)



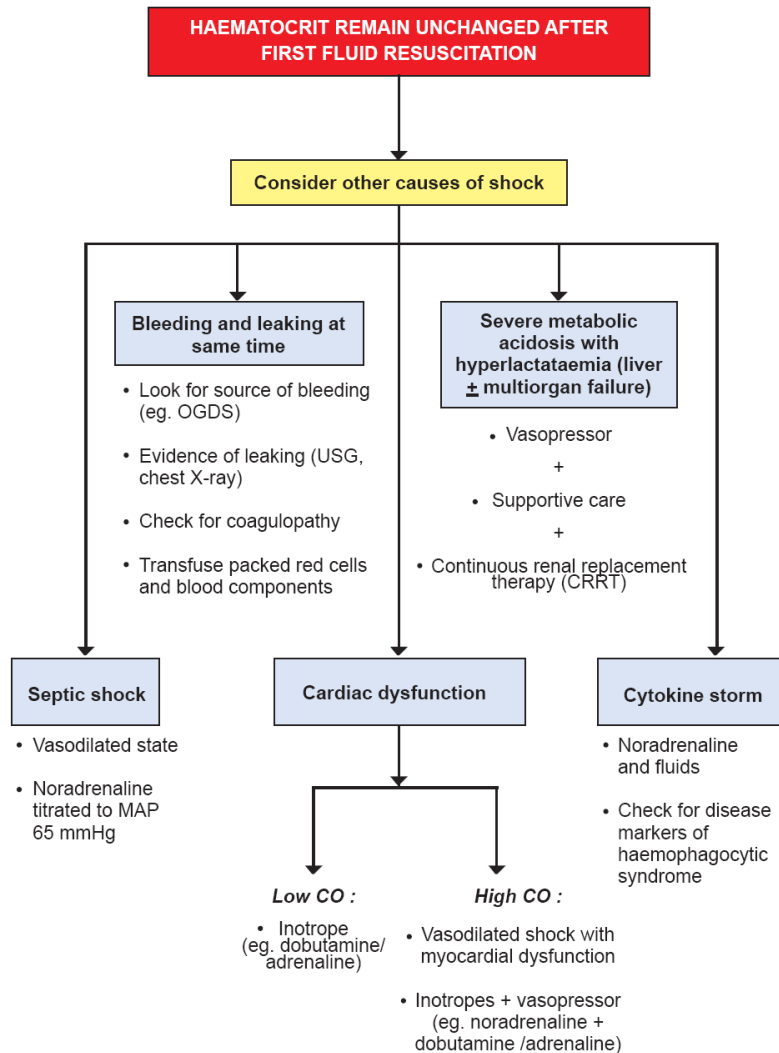
All the above types of shocks need to be supported by echocardiography and non-invasive cardiac output monitoring and treatments tailor to each patient.

HCT = haematocrit ; MAP = mean arterial pressure ; CO = cardiac output;  
OGDS = oesophagogastrroduodenoscopy USG = ultrasonography

REFRACTORY  
SHOCK? –  
ALGORITHM C

WHAT AM I  
DEALING  
WITH?

**ALGORITHM C - FLUID MANAGEMENT IN DECOMPENSATED SHOCK  
(WITH PRESENCE OF BLEEDING & LEAKING OR OTHER CAUSES OF SHOCK)**



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HCT = haematocrit ; MAP = mean arterial pressure ; CO = cardiac output;  
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# Complications of Dengue Infection

## Bleeding/Hemostasis

- Suspect occult bleeding in patient who are in shock but with low/normal HCT despite fluid replacement
- Transfuse blood (5-10mL/kg of PC) in significant bleed and observe clinical response, repeat as per required
- UGB
  - Fluid resuscitation
  - PC transfusion
  - PPI
  - Endoscopy

## Hepatitis in dengue infection

- Elevated transaminases
- Pathogenesis of liver involvement is poorly understood
- Usually self limiting
- Acute liver failure (defined by coagulopathy, INR > 5) management is symptomatic, fluid management, monitoring
- Avoid hepatotoxic drugs
- Insufficient evidence of NAC use

## Cardiac complications

- Ensure adequate fluid resuscitation prior to diagnosing myocardial dysfunction
- ECHO patient in refractory shock despite adequate fluid resuscitation and improving HCT
- Cardiac markers have limited sensitivity
- ECG may show
  - Sinus bradycardia
  - Atrial block
  - AF
- Management focused on cautious fluid management
- May require inotropic support – dobutamine or adrenaline in combination with a vasopressor

## Neurological complications

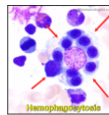
- 0.5-5.4% of hospitalized dengue patient
- Dengue encephalopathy
  - Most common complication
  - Due to prolonged shock, hypoxia, cerebral edema, acute liver/renal failure, cerebral hemorrhage
- Dengue encephalitis
  - Seizures, altered consciousness and focal neurological signs
  - Neuroimaging → cerebral edema
  - LP should be done and sent for IgM Ab, NSs antigen,
  - Supportive management
  - Look for signs of increased ICP
- Acute transverse myelitis
  - Within first week due to direct virus invasion
  - > 2 weeks later as immune mediated

## Renal Complications

- May cause transient proteinuria/hematuria, usually normalise within 2-4 weeks
- Acute Renal Failure – due to acute tubular necrosis as a result of prolonged hypotension/DIC
  - High mortality rate
- Management is volume optimisation, treat electrolyte abnormalities
- Dialysis if indicated
  - Severe metabolic acidosis
  - Fluid overload
  - Hyperkalemia

## Hemophagocytic Syndrome

- Uncontrolled activations of histiocytes and T-cells → cytokine storm
- Presents as unexplained persistent fever or high grade fever after an initial defervescence
- Associated with hepatosplenomegaly, rash, bleeding and CNS manifestation
- Laboratory findings
  - Eosinopenia or pancytopenia
  - Hyperferritinemia
  - Transaminitis
  - Hyperbilirubinemia
  - Bone marrow biopsy - hemophagocytosis
- Management
  - Supportive for mild HPS
  - IV methylprednisolone or dexamethasone
  - Taper off steroid rapidly if there is improvements
  - IVIG



## Introgenic Complications

- Aggressive fluid therapy may lead to fluid overload
  - Acute Pulmonary Edema
  - Pleural Effusion
- NIV for patients who are alert, cooperative and hemodynamically stable
- Indications for mechanical ventilation
  - Persistent shock
  - Acute respiratory failure due to pleural effusion and fluid overload
  - Severe metabolic acidosis
  - Airway protection
- Intercostal drainage of pleural effusion should be avoided – may lead to severe hemorrhage and circulatory collapse

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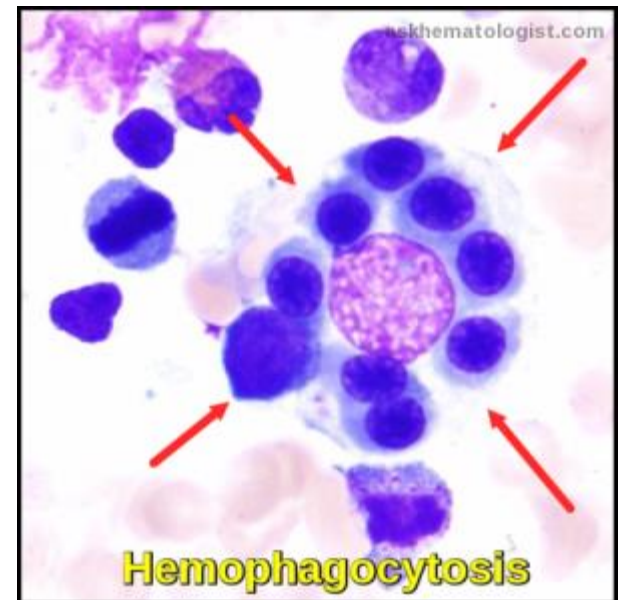
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# Dengue infection in Pregnancy

## Problems

HCT elevation is masked by hemodilution especially in 2<sup>nd</sup> and 3<sup>rd</sup> trimester → serial HCT

Third space accumulation difficult due to presence of gravid uterus

Baseline blood pressure is often lower

Elevated liver enzymes

Low haemoglobin and platelets

Mild metabolic acidosis in 3<sup>rd</sup> trimester

Higher mortality rate – 3 fold

# Dengue infection in Pregnancy

- First trimester infections is associated with miscarriage
- Third trimester is complicated with preterm birth
- Infection during labour may lead to PPH
  - SVD is preferred mode of delivery
  - Dengue Shock may lead to fetal distress → LSCS → massive bleeding
    - Platelet transfusion to achieve minimum of 50,000/ml
  - Prepare GXM in all dengue patients in labour – to be given only when indicated



# Dengue infection in Pregnancy

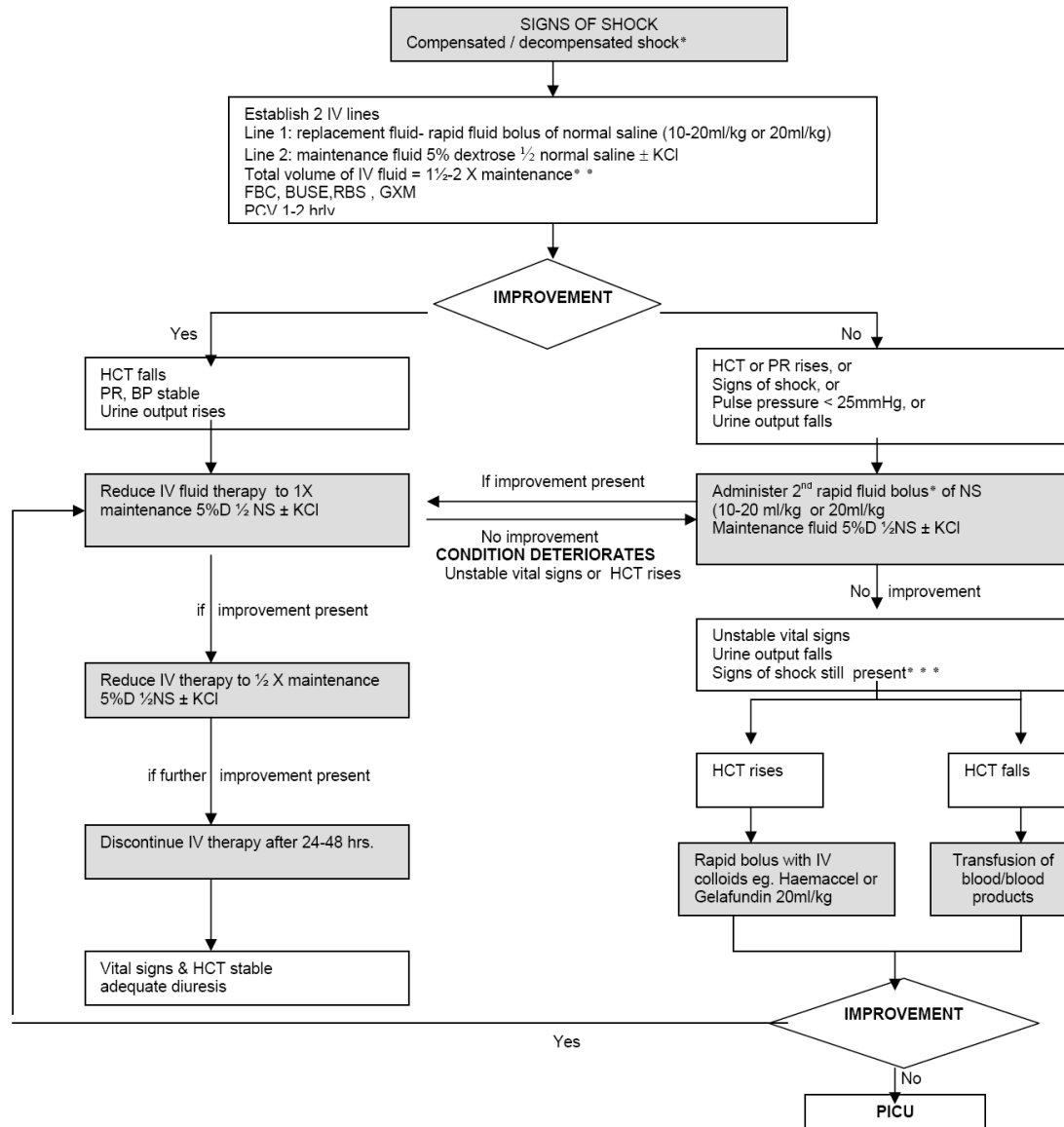
- Close monitoring
- Serial haematocrit
- Appropriate fluid therapy
- Referral to obstetrician & intensivist should be done early
- Vertical transmission
  - Monitoring of neonates with serology tests (NS1 and Dengue IgM)

## Normal Pregnancy Values of the Different Blood Elements

Blood element	Pregnancy values
<b>Red blood cells (hematocrit)</b>	
Second trimester	31.2%–35.5%
Third trimester	31.9%–36.5%
<b>White blood cells</b>	9–15 × 10 <sup>9</sup> cells/L
<b>Platelets</b>	140–400 × 10 <sup>9</sup> cells/L
<b>Coagulation factors</b>	
Fibrinogen	Increased up to 200%
Prothrombin	No change
V	No change
VII	Increased up to 200%
VIII	Increased up to 300%
IX	Slight increase
X	Increased up to 200%
XI	Slight decrease
XIII	Slight decrease

Adapted from Kilpatrick SJ. Anemia and pregnancy. In: Creasy RK, Resnik R, Iams JD, eds. *Maternal-fetal medicine principles and practice*. 6th ed. Philadelphia: W.B. Saunders, 2009:869–884.

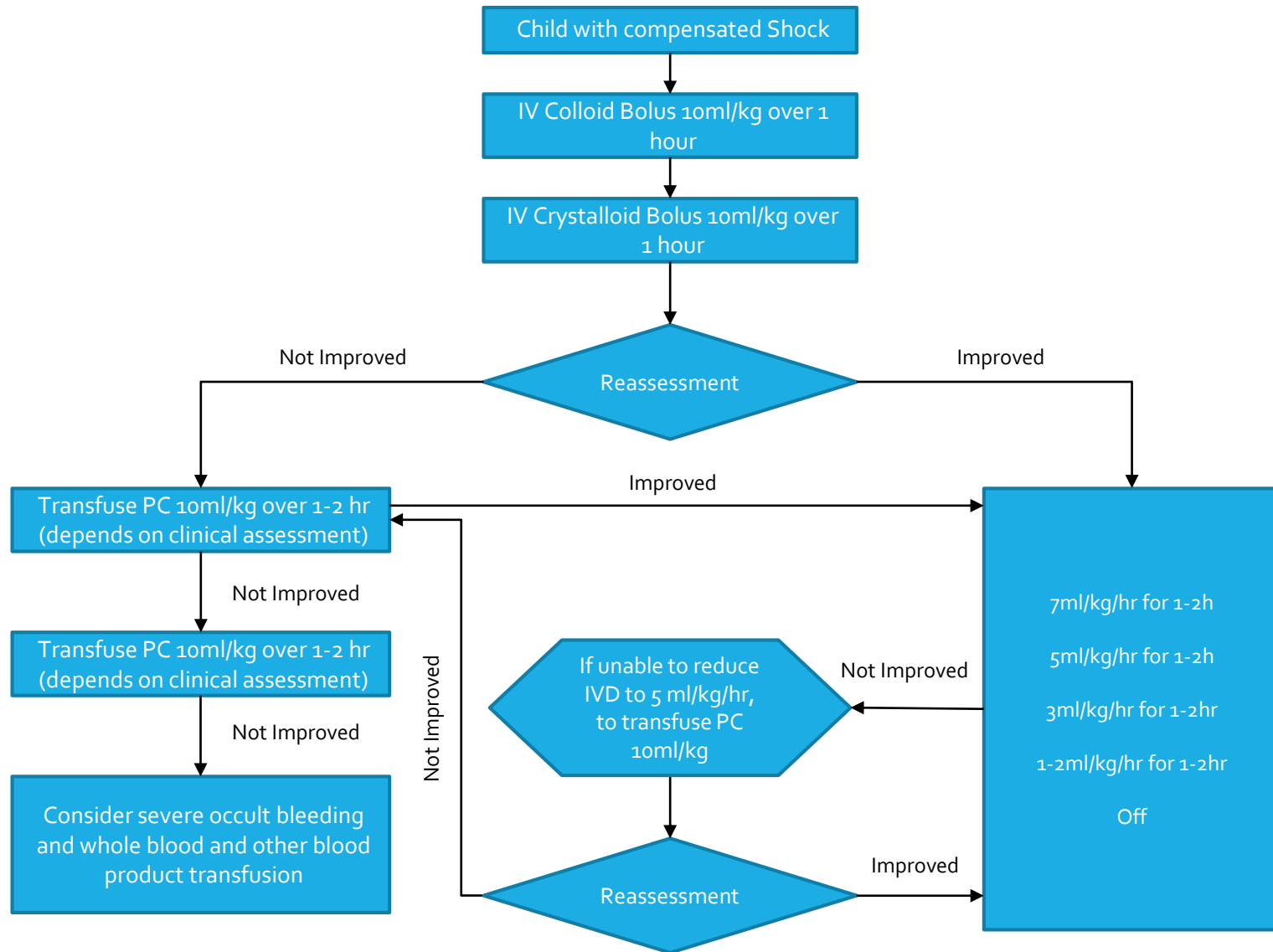
## Fluid Therapy for Patients with DHF and DSS



2004

# DENGUE INFECTION IN PAEDIATRIC

# Compensated Dengue Shock Syndrome (DSS) Flow Chart for Paediatric Patients in Sabah



# Paediatric Hematocrit Range

Age	Range
0-1 month	42-65
1-2 months	33-55
2-3 months	28-41
3-6 months	29-41
6 months-1 year	31-41

Nathan, David G. And Oski, Frank A. "Hematology of Infancy and Childhood", third addition

# Who gets to go home

- Able to tolerate orally well
- Good urine output
- Absence of warning signs
- Physical examination
  - Hemodynamically stable
  - No tender abdomen/liver
  - No bleeding
  - No third space fluid accumulation
  - No alterations in mental state
- Stable serial HCT
- No other criteria for admission (ie co-morbidities, pregnancy, social factors)

# Home Management

- Symptomatic and supportive
- Provide patient with and outpatient dengue monitoring record
- Follow up patient at nearest KK until past critical phase

## Front View

### HOME CARE ADVICE FOR DENGUE PATIENTS

#### WHAT SHOULD BE DONE?

- Adequate bed rest
- Adequate fluid intake (more than 8 glasses or 2 litres for an average person).
  - Milk, fruit juice (caution with diabetes patient) and isotonic electrolyte solution (ORS) and barley water.
  - Plain water alone is not sufficient and may cause electrolyte imbalance.
- Take paracetamol (not more than 4 gram per day).
- Tepid sponging.
- If possible, use mosquito repellent or rest under a mosquito net even during day time to prevent mosquito bites.
- Look for mosquito breeding places in and around the home and eliminate them.

#### WHAT SHOULD BE AVOIDED?

- Do not take non steroidal anti-inflammatory (NSAIDS) eg. aspirin / mefenamic acid (ponstan) or steroids. If you are already taking these medications, please consult your doctor.
- Antibiotics are not required
- Do not take injection
- Do not do massage / cupping / quasa

## Back View

### THE DANGER SIGNS OF DENGUE INFECTION (IF ANY OF THESE ARE OBSERVED, PLEASE GO IMMEDIATELY TO THE NEAREST HOSPITAL / EMERGENCY DEPARTMENT)

1. **Bleeding**  
for example :
  - Red spots or patches on the skin
  - Bleeding from nose or gums
  - Vomiting blood
  - Black coloured stools
  - Heavy menstruation / vaginal bleeding
2. **Frequent vomiting and/or diarrhoea**
3. **Abdominal pain / tenderness / diarrhoea**
4. **Drowsiness or irritability**
5. **Pale, cold or clammy skin**
6. **Difficulty in breathing**

**Adapted :** CPG Management of Dengue Infection in Adults (Revised 2<sup>nd</sup> Edition), 2010





# Papaya leaves

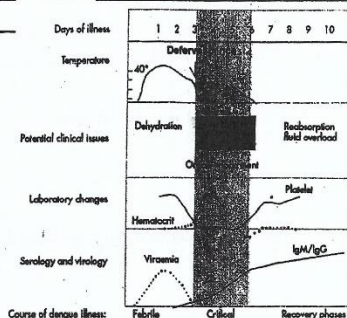
Authors	Subjects/animals	Article type	Article title	Key message
Patil, Shetty, Bhide, Narayanan	n=24 (4 groups with 6 animals in each)	Placebo controlled	Evaluation of platelet augmentation activity of Carica papaya leaf aqueous extract in rats	Increased platelet counts and reduced clotting time by Carica papaya leaf aqueous extract in cyclophosphamide-induced thrombocytopenic rat model
Hettige	n=12	Case series	Salutary effects of Carica papaya leaf extract in dengue fever patients: a pilot study	Papaya leaf juice elevated total white cells and platelets in dengue patients
Al Ay Mo Fa Yu	<div> <p>Most Research were of small sample size</p> <p>May prove increased in platelets but not in clinical conditions</p> </div>			
Kumar	n=2	Case series (rapid response)	Dengue: An escalating problem	Increase in platelets within 12 h and 2 days respectively
Kala	n=5	Case series	Leaf juice of Carica papaya L.: A remedy of dengue fever	Increase in platelets by 24 h
Subenthiran, Choon, Cheong, Thayan, Teck, Muniandy <i>et al.</i>	n=228	Open labeled randomized control trial	Carica papaya leaves juice significantly accelerates the rate of increase in platelet count among patients with dengue fever and dengue hemorrhagic fever	Increase in platelets after 40 h of the first dose

## Dengue Fever Clerking Sheet:

Name: \_\_\_\_\_ Gender: (male / female) \_\_\_\_\_  
 Age: \_\_\_\_\_ IC No: \_\_\_\_\_  
 Date of admission: \_\_\_\_\_

### History:

Fever (date of onset): \_\_\_\_\_  
 Time of defervescence: \_\_\_\_\_  
 (fever settled)  
 Abdominal pain: (yes / no) \_\_\_\_\_  
 Persistent vomiting: (yes / no) \_\_\_\_\_  
 Mucosal bleed: (yes / no) \_\_\_\_\_  
 Lethargy, restlessness: (yes / no) \_\_\_\_\_



Co-morbidity (e.g pregnancy, obesity, old age, diabetes mellitus, hypertension, renal failure): \_\_\_\_\_

Other medical history: \_\_\_\_\_

Drug and allergy: \_\_\_\_\_

Social history: \_\_\_\_\_

### Physical examination:

Weight: \_\_\_\_\_ Blood pressure: \_\_\_\_\_  
 Mental state: \_\_\_\_\_ Pulse rate: \_\_\_\_\_  
 Hydration status: \_\_\_\_\_ Capillary refill time: \_\_\_\_\_  
 Respiratory rate: \_\_\_\_\_ SpO<sub>2</sub> (if RR>20): \_\_\_\_\_  
 Bleeding: (specify if present) \_\_\_\_\_

Respiratory system: (e.g. pleural effusion) \_\_\_\_\_

Abdominal system: (any tenderness, hepatosplenomegaly, ascites) \_\_\_\_\_

Other relevant findings: \_\_\_\_\_

### Diagnosis: (please tick appropriate box)

- ☐ Dengue fever without warning signs
- ☐ Dengue fever with warning signs
- ☐ Severe dengue (DHF) with compensated shock
- ☐ Severe dengue (DHF) with hypotensive shock

#### WARNING SIGNS\*

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical fluid accumulation
- Mucosal bleed
- Lethargy, restlessness
- Tender hepatomegaly > 2cm
- Laboratory: increase in HCT concurrent with rapid decrease in platelet count

\*[requiring strict observation and medical intervention]

Differential diagnosis (if any): \_\_\_\_\_

#### Severe Dengue (if any of following present):

- severe plasma leakage with shock and/or fluid accumulation with respiratory distress
- severe bleeding
- severe organ impairment

Compensated shock: clear and lucid; CRT > 2 sec; cool periphery; weak pulse; tachycardia; narrow pulse pressure; postural hypotension; tachypnoea

**Investigations:**

1. FBC
2. BUSE/ Creatinine
3. LFT/ PT/ PTT
4. ABG (if RR>20)
5. CXR (if necessary)
6. ECG (if any CV risk factor)
7. BFMPx3
8. Blood C+S
9. Urine C+S
10. Dengue IgM

**Management Plan: (refer recommendations)****1. Fluid regime:****2. Monitoring:****3. Review plan:****4. Dengue notification**

**Complete dengue summary chart for each subsequent review**

Pegawai Sains/Makmal: 010-953 4196 (MLT haematology on call)

**MANAGEMENT PLAN RECOMMENDATIONS:****1. DENGUE WITHOUT WARNING SIGNS:**

- Encourage oral fluid. Patient may not necessarily need IV fluids.
- If not tolerating orally, start intravenous fluid 0.9% saline or Ringer's lactate at maintenance rate
- Monitor temperature, input and output chart, warning signs, haematocrit, platelet count
- Review by HO (Name) 4 hourly, MO (Name) twice daily
- Inform MO (Name) if warning signs develop
- Daily FBC

IBW for overweight/obese adults can be estimated on the basis of the following formula

Female:  $45.5 \text{ kg} + 0.91(\text{height} - 152.4) \text{ cm}$

Male:  $50.0 \text{ kg} + 0.91(\text{height} - 152.4) \text{ cm}$

(17)

Estimated ideal body weight, or IBW (kg)	Fluid regime based on 2-3 ml/kg /hour (ml/hour)	Fluid regime based on 1.5-2 ml/kg/hour (ml/hour)
5	10-15	
10	20-30	
15	30-45	
20	40-60	
25	50-75	
30	60-90	
35	70-105	
40	80-120	
50	100-150	
60		90-120
70		105-140
80		120-150

**Notes:**

For adults with IBW >50 kg, 1.5-2 ml/kg can be used for quick calculation of hourly maintenance fluid regime.

For adults with IBW ≤ 50 kg, 2-3 ml/kg can be used for quick calculation of hourly maintenance fluid regime.

**2. DENGUE WITH WARNING SIGNS:**

- Obtain reference HCT before fluid therapy
- Give 0.9% saline at 5 - 7ml/kg/hr for 1 - 2 hrs; then 3 - 5ml/kg/hr for 2 - 4 hrs; then reduce to 2 - 3ml/kg/hr OR LESS according to clinical response
- Review by HO 2 hourly, MO 4 - 6 hourly, Specialist 12 hourly
- FBC after 4 hours, then 6 - 12 hourly (Results to be obtained within 1 hour)
- I/O chart



- Inform MO and Specialist if the patient develops compensated shock.
- Patient to be managed in the front bed in the general ward
- **MONITOR CLOSELY FOR SIGNS OF FLUID OVERLOAD**
- Once the warning signs resolve, continue monitoring 4 hourly
- **CAUTIOUS FLUID INFUSION IF PATIENT HAS SIGNIFICANT CO-MORBIDITIES** (eg heart or renal failure)

### 3. SEVERE DENGUE WITH COMPENSATED SHOCK:

- Refer patient to ICU/HDU
- To refer patient to PHYSICIAN
- Start IV fluid resuscitation with isotonic crystalloid solutions at 5–10 ml/kg/hr over 1 hour. Reassess patient's condition.
- Close monitoring of the patient is required.
- Strict I/O chart
- **MONITOR CLOSELY FOR SIGNS OF FLUID OVERLOAD**
- Needs hourly review by HO/MO (Name) until the patient is out of danger.
- Specialist to review patient.

#### **If patient improves:**

- IV fluids should be reduced gradually to 5–7 ml/kg/hr for 1–2 hours, then to 3–5 ml/kg/hr for 2–4 hours, then to 2–3 ml/kg/hr for 2–4 hours and then reduced further depending on haemodynamic status.
- IV fluids can be maintained for up to 24–48 hours. It can be stopped after that.

#### **If patient is 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 hour;
- if there is improvement after second bolus, reduce rate to 7–10 ml/kg/hr for 1–2 hours and continue to reduce as above;
- if HCT decreases, this indicates bleeding and need to cross-match and transfuse blood as soon as possible.

### 4. SEVERE DENGUE WITH HYPOTENSIVE SHOCK:

- **TO REFER PATIENT TO PHYSICIAN**
- Managed by Specialist (In Main Referral Hospitals) or Senior MO
- To refer for ICU care.
- District hospitals to refer to Physician on Call (name) in Referral hospitals for transfer.
- Initiate IV fluid resuscitation with crystalloid or colloid solution at 20 ml/kg as a bolus for 15 minutes.

#### **If patient improves:**

- give a crystalloid/colloid solution of 10 ml/kg/hr for 1 hour, then reduce gradually as above.

#### **If patient is still unstable:**

- review the HCT taken before the first bolus; if HCT was low (<40% in children and adult females, <45% in adult males) this indicates bleeding.

- if HCT was high compared to baseline value, change to IV colloids at 10–20 ml/kg as a second bolus over 30 minutes to 1 hour; reassess after second bolus.
- If patient is improving reduce the rate to 7–10 ml/kg/hr for 1–2 hours, then back to IV crystalloids and reduce rates as above.
- If patient's condition is still unstable, repeat HCT after second bolus.
- If HCT decreases, this indicates bleeding
- If HCT increases/remains high (>50%), continue colloid infusion at 10–20 ml/kg as a third bolus over 1 hour, then reduce to 7–10 ml/kg/h 1–2 hours, then change back to crystalloid solution and reduce rate as above.

### RECOVERY PHASE

After the patient has been afebrile for 48 hours, strongly consider stopping IV fluids if the patient's condition has improved.

- Stop IV fluids in the following conditions:
  - a. signs of cessation of plasma leakage;
  - b. stable blood pressure, pulse and peripheral perfusion;
  - c. haematocrit decreases in the presence of a good pulse volume;
  - d. afebrile for more than 24–48 days (without the use of antipyretics);
  - e. resolving bowel/abdominal symptoms;
  - f. improving urine output.
- If there is evidence of fluid overload (ie pulmonary oedema) then fluid restriction is needed and diuretics (ie frusemide) may be necessary.

### HAEMORRHAGIC COMPLICATION

- Give 5–10 ml/kg of fresh-packed red cells or 10–20 ml/kg of fresh whole blood at an appropriate rate and observe the clinical response. It is important that fresh whole blood or fresh red cells are given.
- Consider repeating the blood transfusion if there is further blood loss or no appropriate rise in haematocrit after blood transfusion. Platelet transfusion can be considered when massive bleeding cannot be managed with just fresh whole blood/fresh-packed cells.
- Great care should be taken when inserting a naso-gastric tube. If needed then use a lubricated oro-gastric tube.

# Reference

- CPG Management of Dengue Infection in Adults (Third Edition), KKM, 2015
- CPG Management of Dengue Fever in Children, KKM, 2004
- Dengue : Guidelines for diagnosis, treatment, prevention and control, WHO, 2009
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- Role of ultrasound in dengue fever, Venkata et al, British Journal of Radiology, 2005
- Review : Papaya Extract to Treat Dengue: A Novel Therapeutic Option?, N Sarala & SS Paknikar, Ann Med Health Sci Res, 2014
- Dengue: Moving from Current Standard of Care to State-of-the-Art Treatment, Victor C. Gan, Current Treatment Options in Infectious Disease, 2014

# Take home message

- Treat patients, not numbers
- Prescribe IV Fluid Therapy Judiciously
- Reassessment is key
- Vector management for prevention