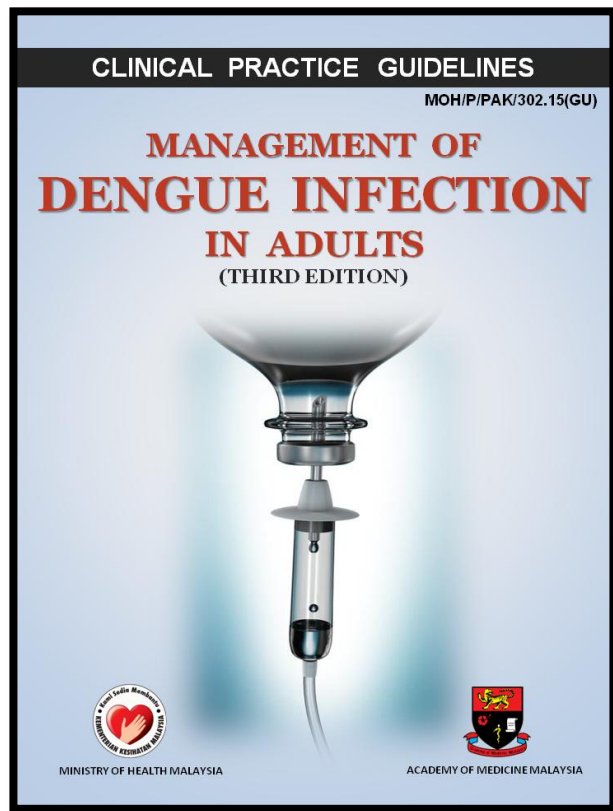




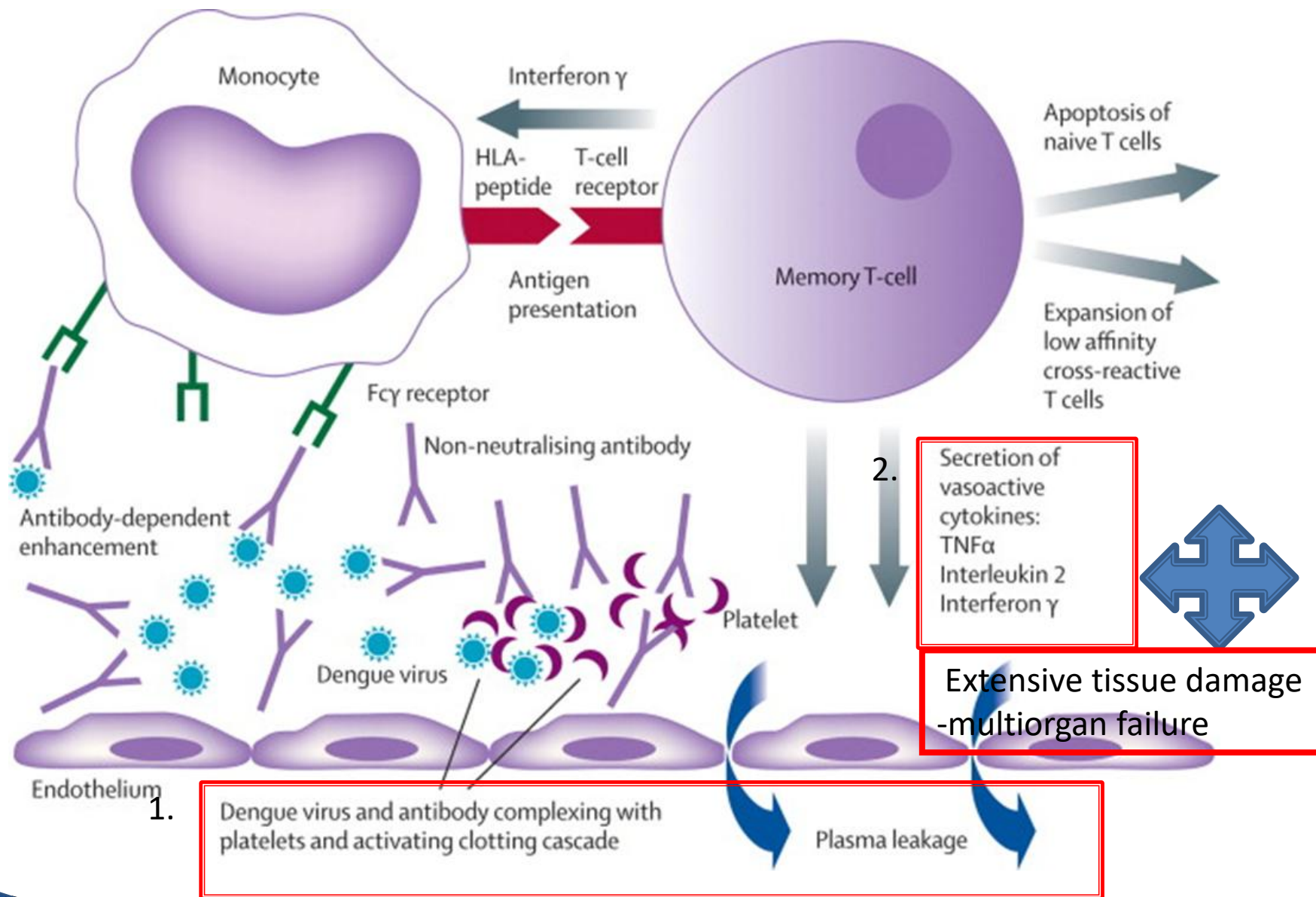
Recognizing Severe Dengue



Introduction of severe dengue

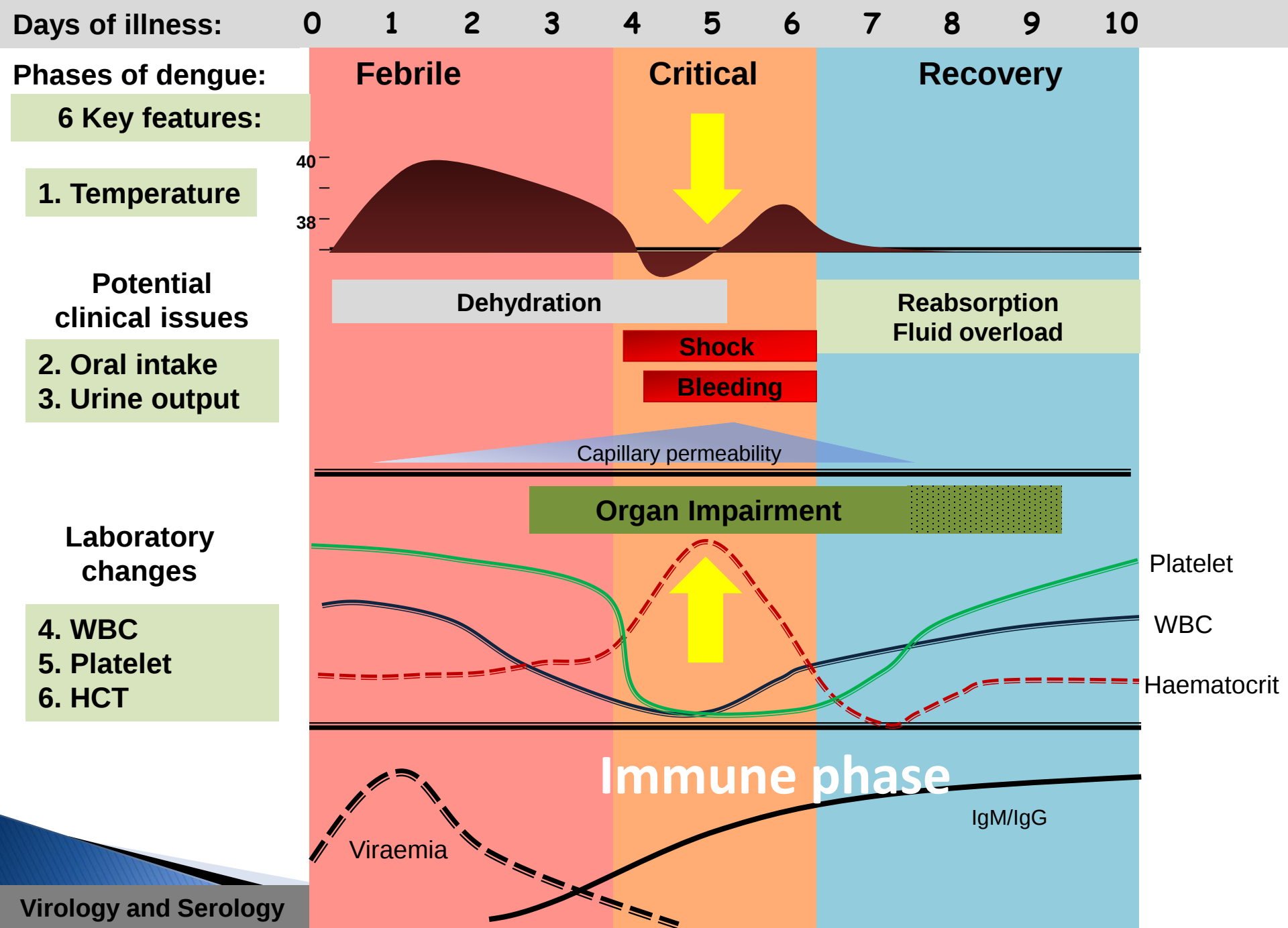
Two types of severe dengue manifestation:

1. Severe dengue mainly due to severe plasma leakage
 - would responding to judicious fluid management
2. Severe dengue beyond optimal fluid management
 - despite optimal fluid management, patients develop multiorgan failure.



Modified from:

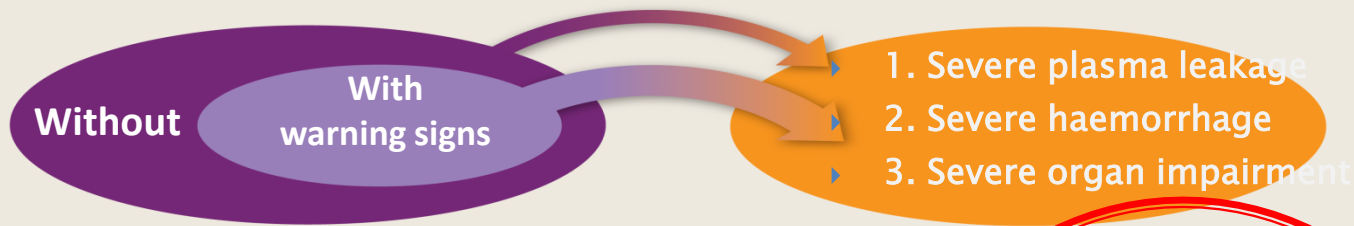
Daniel P Webster, Jeremy Farrar, Sarah Rowland-Jones. Progress towards a dengue vaccine. *The Lancet Infectious Diseases*. Vol.9, No 11, pg 678-687, Nov 2009.



Dengue case classification (2009)

Dengue ± warning signs

Severe dengue



Criteria for dengue ± warning signs

Probable dengue

Live in or travelled to dengue-endemic area. Fever and two of the following criteria:

- Nausea, vomiting (**new**)
- Rash
- Aches and pains (**combined**)
- Tourniquet test positive
- Leucopenia
- Any warning sign

Laboratory-confirmed dengue

(important when no sign of plasma leakage)

Warning signs*

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

** Requiring strict observation and medical intervention*

Criteria for severe dengue

1. Severe plasma leakage leading to:

- Shock (DSS)
- Fluid accumulation with respiratory distress

2. Severe bleeding

Bleeding that causes hemodynamic instability and may require blood transfusion

3. Severe organ involvement

- Liver: AST or ALT ≥ 1000
- CNS: Impaired consciousness
- Impaired cardiac function

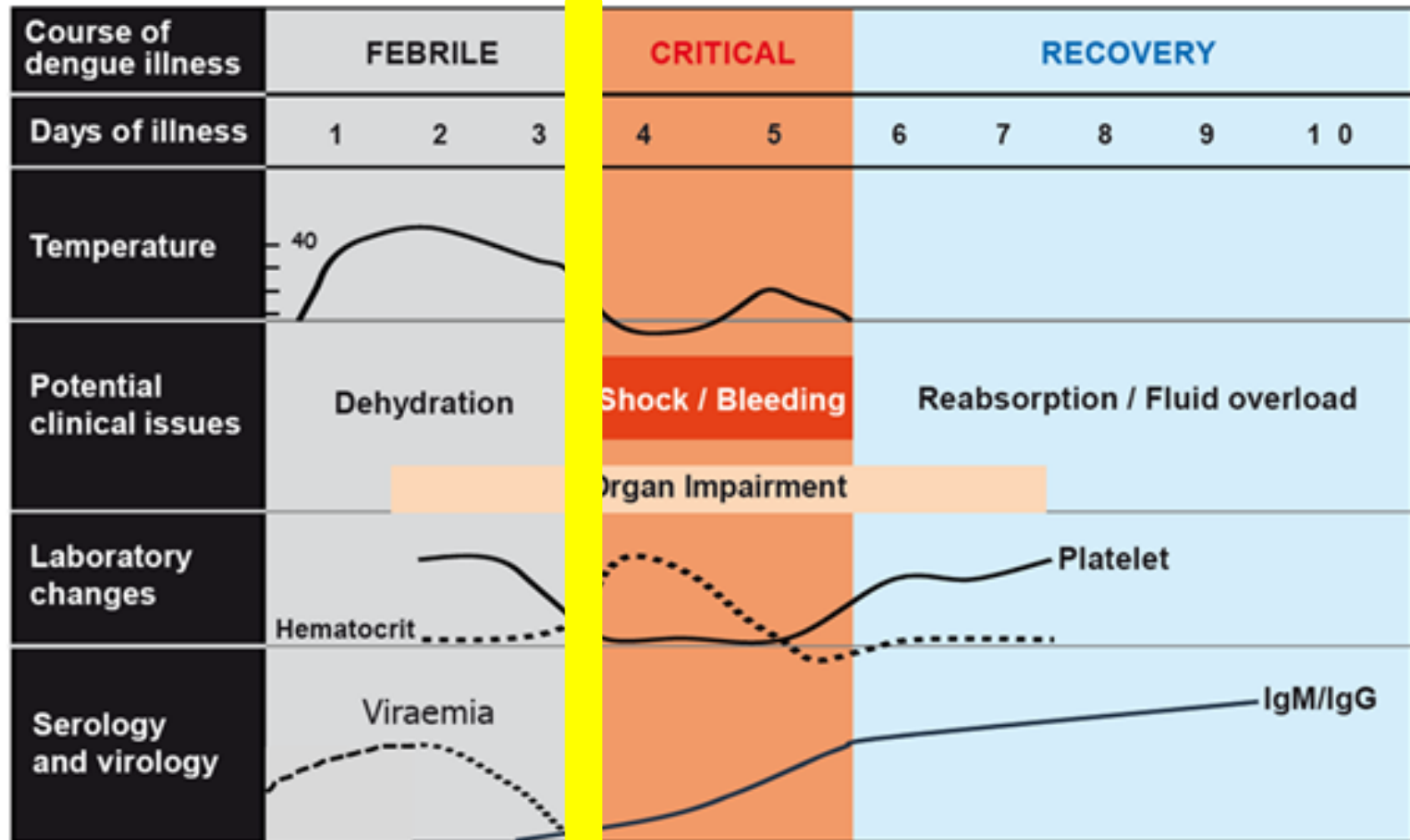
Recognizing severe dengue

1. **Anticipation** – who is at risk?
2. **Detection** – who already has severe dengue?

How?

1. Anticipate who is at risk

Onset of warning signs



Transition from febrile phase to critical phase

- Usually day 4 to day 7 of illness
- Could be as early as day 3 or as late as day 7 or 8
- Coincides with defervescence

Development of warning signs:

Identify dengue patients already in shock or at risk of developing shock

Clinical Warning Signs

1. Severe abdominal pain
2. Persistent vomiting
3. Mucosal bleed
4. Lethargy; restlessness
5. Liver enlargement >2cm
6. Clinical fluid accumulation

Laboratory Warning Signs

1. Leukopenia
2. Rapid decrease platelet count
3. Rising haematocrit

Patient assessment: four important steps

Step 1: History taking



Step 2: Clinical examination



Step 3: Investigations



Step 4: Diagnosis, phase of disease and severity

Step 1: History taking

What are important histories in dengue patients?

1. Date of onset of fever or illness

2. Symptoms and severity

3. The 3 golden questions:

- How much oral fluid intake: quantity and quality?
- How much urine output: frequency, volume and time of most recent voiding?
- What activities can the patient do during the febrile illness?

4. Other fluid losses: diarrhoea, vomiting

5. Presence of warning signs

Step 1: History taking

What are other relevant histories?

6. Family or neighbour with dengue, or travel to dengue-endemic areas
7. Medications (including non-prescription or traditional medicine) in use?
List of medications and last time they were taken.
8. Risk Factors: infancy, pregnancy, obesity, co-morbidity, living alone or too far from clinic without convenient/reliable means of transport.

Why do we ask?

High risk group for developing severe dengue

9. Jungle trekking or swimming in waterfall
Consider leptospirosis, typhus, malaria
10. Recent unprotected sexual or drug use behaviour
Consider acute HIV seroconversion illness

Step 2: Clinical examination

General assessment:

Mental state

Hydration state

Haemodynamic state

Clinical evidence of warning signs:

Bleeding manifestations: mucosal bleeding

Abdominal tenderness

Liver enlargement

Fluid accumulation: pleural effusion, ascites

Other important signs:

Rash (isles of white in the sea of red- mostly in recovery phase)

Tachypnoea/acidotic breathing: indicates shock

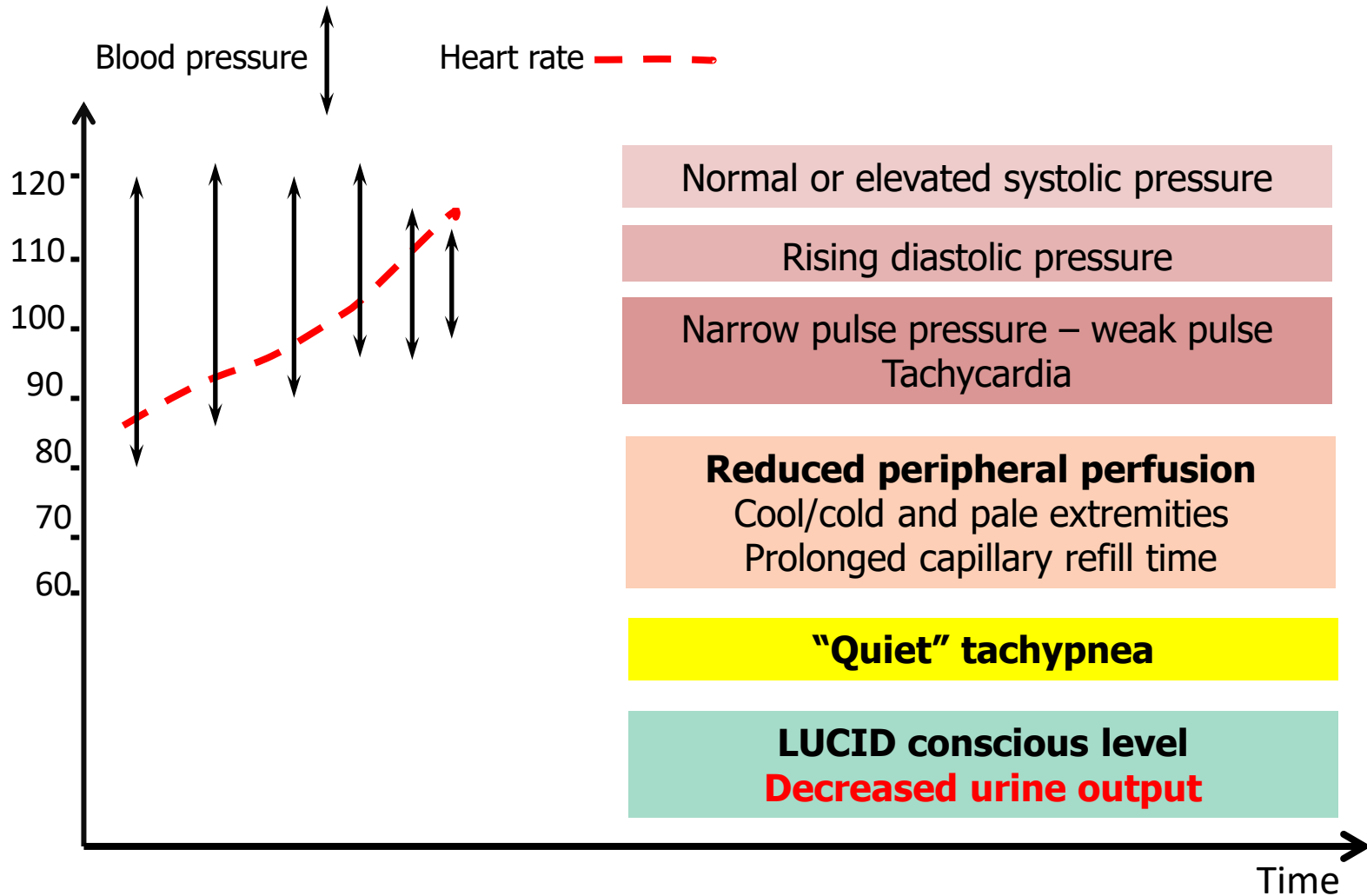
Hemodynamic Assessment - Clinical Parameters

Parameters			
Conscious level	←	3a. Organ perfusion (brain)	
Capillary refill time			
Extremities (color, temp)		1. Peripheral perfusion	
Peripheral pulse volume			
Heart rate (HR)			
Pulse pressure (PP)		2. Cardiac output	
Blood pressure (BP)			
Respiratory rate (RR)	←	4. Respiratory compensation for tissue hypoxia	
Urine output	←	3b. Organ perfusion (kidney)	

Hemodynamic Assessment - Stable Circulation

Parameters	Stable Circulation		
Conscious level	Clear and	← 3a. Normal Brain Perfusion	
Capillary refill time	Brisk (<2 seconds)		
Extremities (color, temp)	Warm and pink	1. Normal Peripheral perfusion	
Peripheral pulse volume	Good volume		
Heart rate (HR)	Normal HR for age		
Pulse pressure (PP)	Normal PP for age	2. Normal Cardiac output	
Blood pressure (BP)	Normal BP for age		
Respiratory rate (RR)	Normal RR for	4. No Respiratory compensation	
Urine output	No	← 3b. Normal kidney perfusion	

Hemodynamic Changes in Compensated Shock



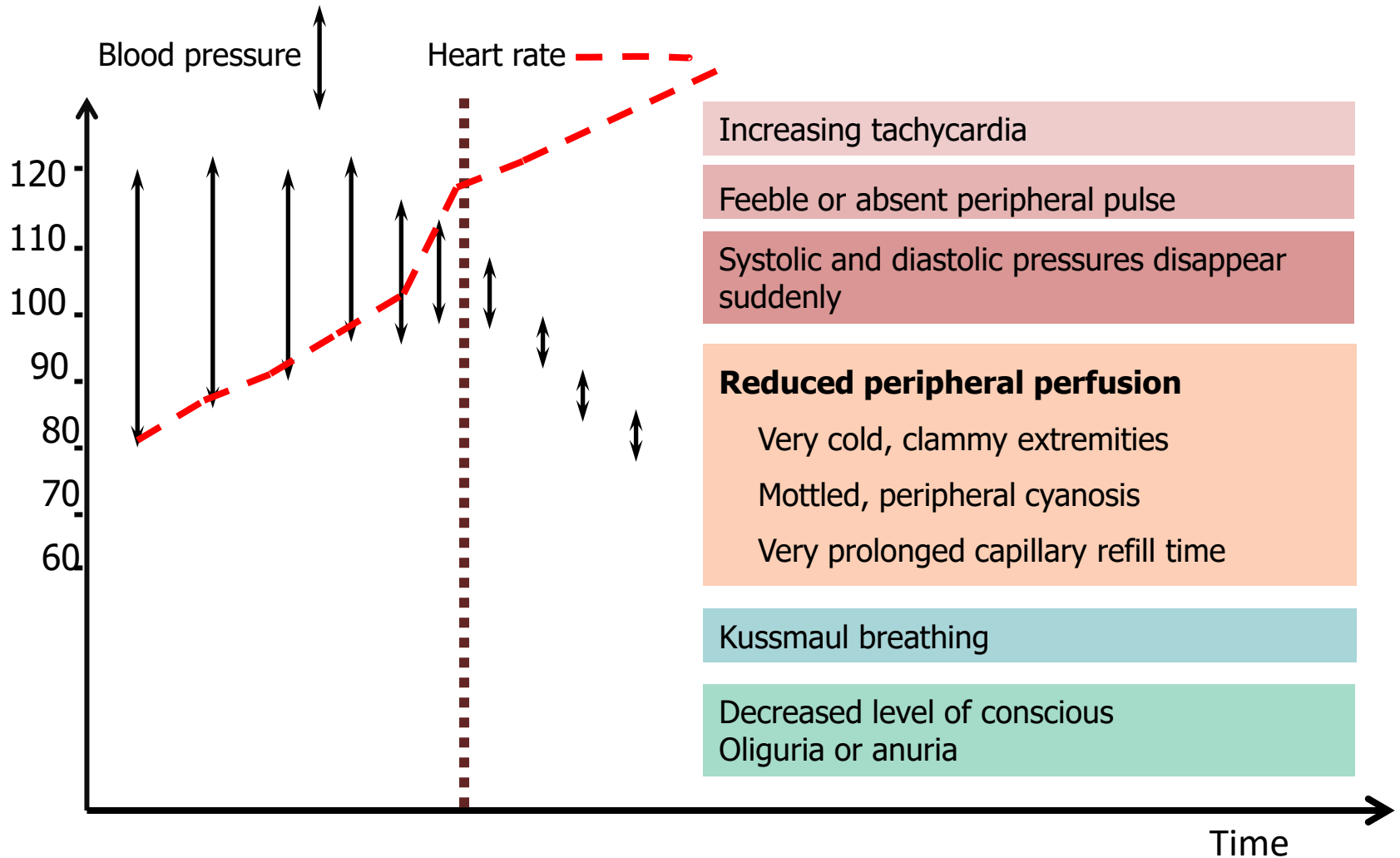
Hemodynamic Assessment – Compensated Shock

Parameters	Stable Circulation	Compensated shock	
Conscious level	Clear and lucid	Clear and alert	3a. Normal brain perfusion
Capillary refill time	Brisk (<2 seconds)	Prolonged (>2 sec)	
Extremities	Warm and pink	Cool peripheries	Reduced peripheral perfusion
Peripheral pulse volume	Good volume	Weak & thready	
Heart rate (HR)	Normal HR for age	Tachycardia for age	
Pulse pressure (PP)	Normal PP for age	Normal systolic pressure rising diastolic pressure	Reduced cardiac output
Blood pressure (BP)	Normal BP for age	Narrowing PP Postural hypotension	
Respiratory rate (RR)	Normal RR for age	"Quiet" tachypnea	Tissue acidosis
Urine output	Normal	Reducing	Reduced kidney perfusion

Hemodynamic Assessment - Compensated Shock (cont.)

Parameters	Stable Circulation	Compensated shock	
Conscious level	Clear and lucid	Clear and lucid	Note that changes are seen in all parameters <u>except</u> conscious level and systolic blood pressure
Capillary refill time	Brisk (<2 sec)	Prolonged (>2 sec)	
Extremities	Warm and pink	Cool peripheries	
Peripheral pulse volume	Good volume	Weak & thready	
Heart rate (HR)	Normal HR for age	Tachycardia for age	
Blood pressure (BP)	Normal BP for age	Normal systolic pressure rising diastolic pressure	←
Pulse pressure (PP)	Normal PP for age	Narrowing PP Postural hypotension	
Respiratory rate (RR)	Normal RR for age	"Quiet" tachypnea	
Urine output	Normal	Reducing trend	

Hemodynamic Changes in Hypotensive Shock



Hemodynamic Assessment – Hypotensive Shock (cont.)

Key clinical signs of deterioration: Changes in Mental State

- Restless, confused, extremely lethargic
- Seizures
- Agitation alternating with drowsiness

Yet, some children and young adults continue to have **clear** mental state!

Imminent total cardiorespiratory collapse!

Hemodynamic Assessment – Monitoring urine output

Why is monitoring of urine output crucial in haemodynamic monitoring?

Reflects renal blood flow -- kidneys regulate intravascular volume.

In early shock state, kidneys conserve fluids by reducing urine volume.

In severe shock, no urine is produced.

What is considered adequate urine output?

In outpatient setting, the patient should drink enough fluids to pass urine about 4 to 6 times a day.

A patient with dengue shock should pass at least 0.5 ml/kg urine per hour.

An indwelling catheter will give an accurate measurement. If the urine volume exceeds this amount, consider reducing the IV fluid

Pitfall?

In uncontrolled diabetes or hyperglycemia, inappropriately large quantities of urine is produced.

Shock becomes worse because of glycosuria.

Hemodynamic Assessment – Hypotensive Shock (cont.)

Parameters	Stable Circulation	Compensated shock	Hypotensive shock
Conscious level	Clear and lucid	Clear and lucid	Restless, combative
Capillary refill time	Brisk (<2 sec)	Prolonged (>2 sec)	Very prolonged, mottled skin
Extremities	Warm and pink	Cool peripheries	Cold, clammy
Peripheral pulse volume	Good volume	Weak & thready	Feeble or absent
Heart rate (HR)	Normal HR for age	Tachycardia for age	Severe tachycardia or bradycardia in late shock
Blood pressure (BP)	Normal BP for age	Normal systolic pressure, rising diastolic pressure	Hypotension Unrecordable BP
Pulse pressure (PP)	Normal PP for age	Narrowing PP Postural hypotension	Narrowed pulse pressure (≤ 20 mmHg)
Respiratory rate (RR)	Normal RR for age	"Quiet" tachypnea	Kussmaul breathing
Urine output	Normal	Reducing trend	Oliguria or anuria

Reduced brain perfusion

Reduced peripheral perfusion

Reduced cardiac output

Severe tissue acidosis

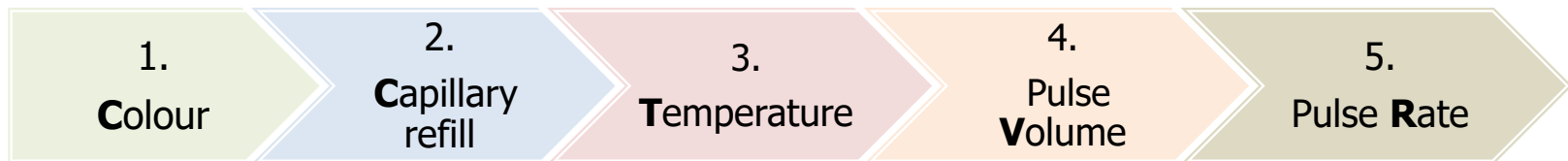
No kidney perfusion

Pearls in clinical examination of dengue patients

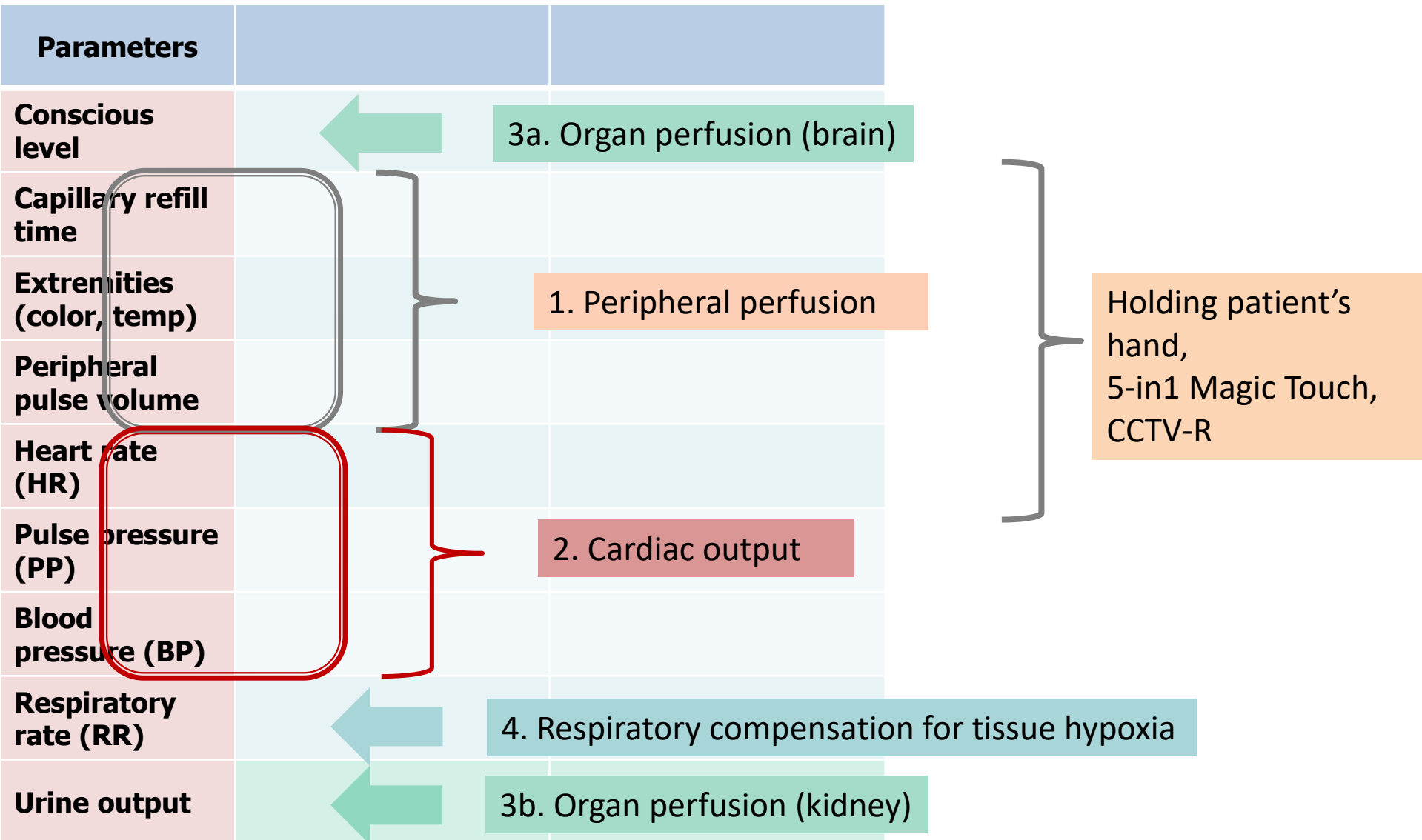
The “5-in-1 maneuver” magic touch – CCTV-R

Hold the patient’s hand to evaluate peripheral perfusion.

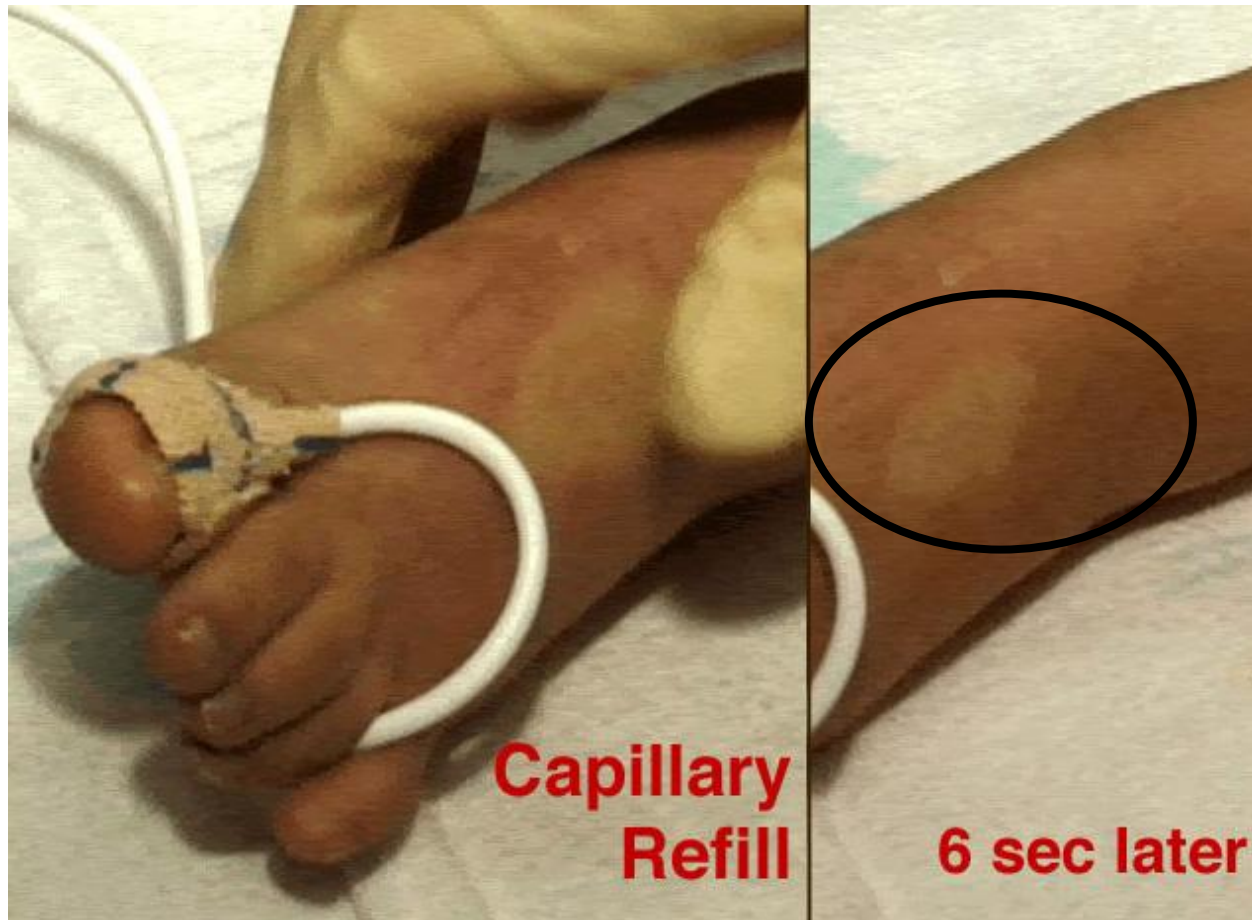
Save life in 30 seconds by recognizing shock



Hemodynamic Assessment – Holding patient's hand



The “5-in-1 maneuver” magic touch



**Delayed capillary refill time.
The blood pressure was normal at this time.**

Caution

- ▶ Patient could still be having severe dengue even though clinically stable with warning signs.
- ▶ Baseline renal and liver function tests must be taken for all admitted patients to detect organ dysfunction and repeated when necessary
- ▶ Renal and liver function +/- CK and LDH monitoring are crucial in those patients who have persistent warning signs.

Severe dengue patients

- ▶ Tend to deteriorate within **minutes or hours!**