



Initial Management of Severe Dengue

Sharifah Faridah Syed Omar
ID Consultant

Universiti Malaya Medical Centre

Indications of IV fluid therapy



- Resuscitation Therapy
- Rehydration Therapy – Deficit
- Replacement Therapy – on-going abnormal losses
- Maintenance Therapy – “**Just enough**” IV fluid for metabolic rate – Oral + Parenteral

Summary of management of dengue

| Group A – Sent home (all of following) | Group B (any of following) | Group C (any of following) |
|---|---|--|
| <ol style="list-style-type: none"> 1. Give anticipatory guidance before sending home (see patient handout) 2. Follow up daily 3. Do serial CBCs 4. Identify warning signs early | <ol style="list-style-type: none"> 1. Admit for inpatient care 2. Monitor haemodynamic status frequently 3. Use HCT to guide interventions 4. Use isotonic IVF judiciously 5. Titrate fluid resuscitation to haemodynamic state 6. Correct metabolic acidosis, electrolytes as needed | <p><u>As Group B PLUS:</u></p> <ol style="list-style-type: none"> 1. Larger initial volume at a faster rate 2. Use colloids if several boluses of crystalloids already given 3. After improvement, a further resuscitation precedes step-wise IVF reduction 4. Monitor for occult bleeding 5. Prophylactic platelet transfusions not indicated |

Group C: Emergency treatment

Compensated shock (systolic pressure maintained + reduced perfusion)

Conduct CBC, HCT,
GXM and other blood
investigations before
fluid resuscitation

Obtain reference blood readings for all shock patients before fluid therapy.

Start IV fluid therapy with
isotonic crystalloids:
5–10 ml/kg/hr (adult) or
10–20 ml/kg/hr (child) for 1 hour

Start IV fluid resuscitation

*REASSESS

Then reassess haemodynamic response:

- Vital signs
- Peripheral perfusion: “5-in-1 magic touch”,
CCTV-R
- Urine output

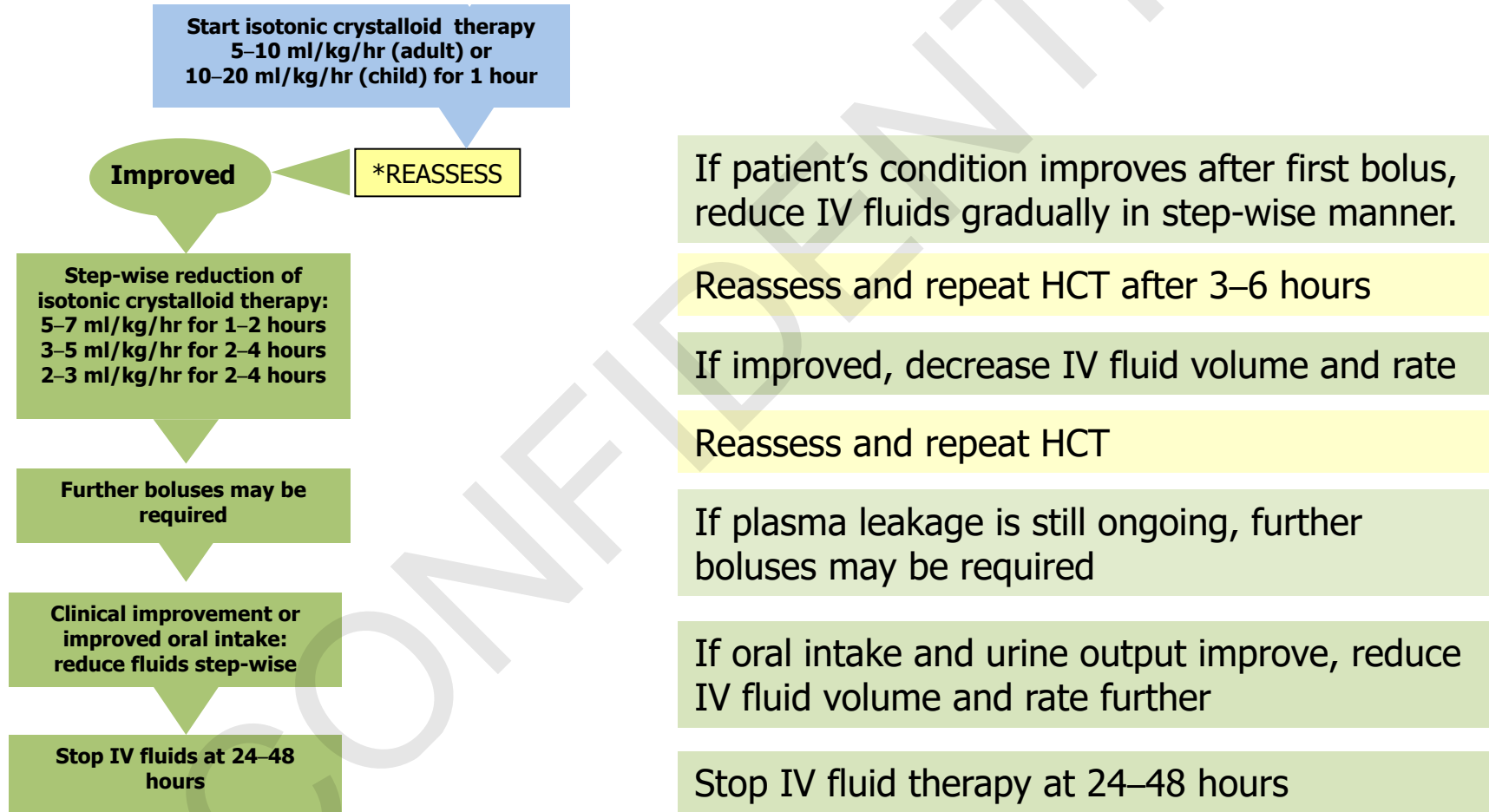
Decide if improved or not improved

* Reassess the patient’s clinical condition: vital signs, pulse volume, capillary refill time and temperature of extremities and decide on the situation.

NOTE: Colloids are preferable if the patient has already received several boluses of crystalloid

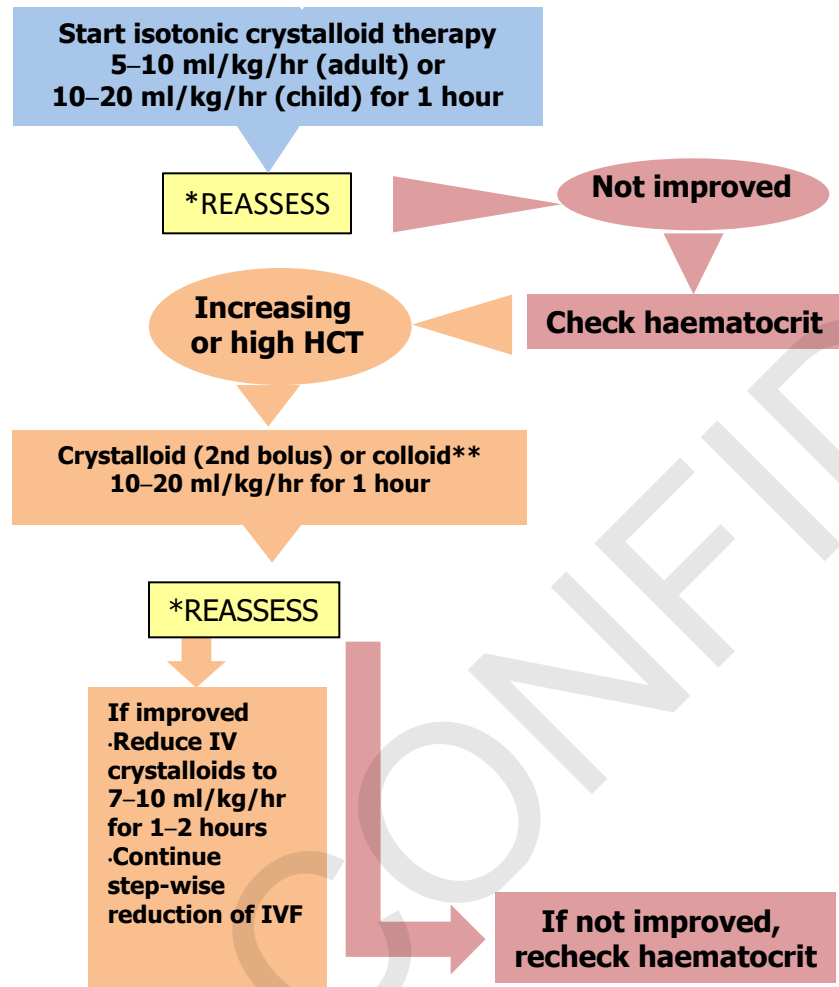
Group C: Emergency treatment

Compensated shock (systolic pressure maintained + reduced perfusion)



Group C: Emergency treatment

Compensated shock (systolic pressure maintained + reduced perfusion)



After first bolus, **if patient has not improved**, check HCT.

If HCT increases or is still high, give second bolus of crystalloid at 10-20 ml/kg/hr for 1 hour. Use colloid** if patient has already received several boluses of crystalloid.

*REASSESS

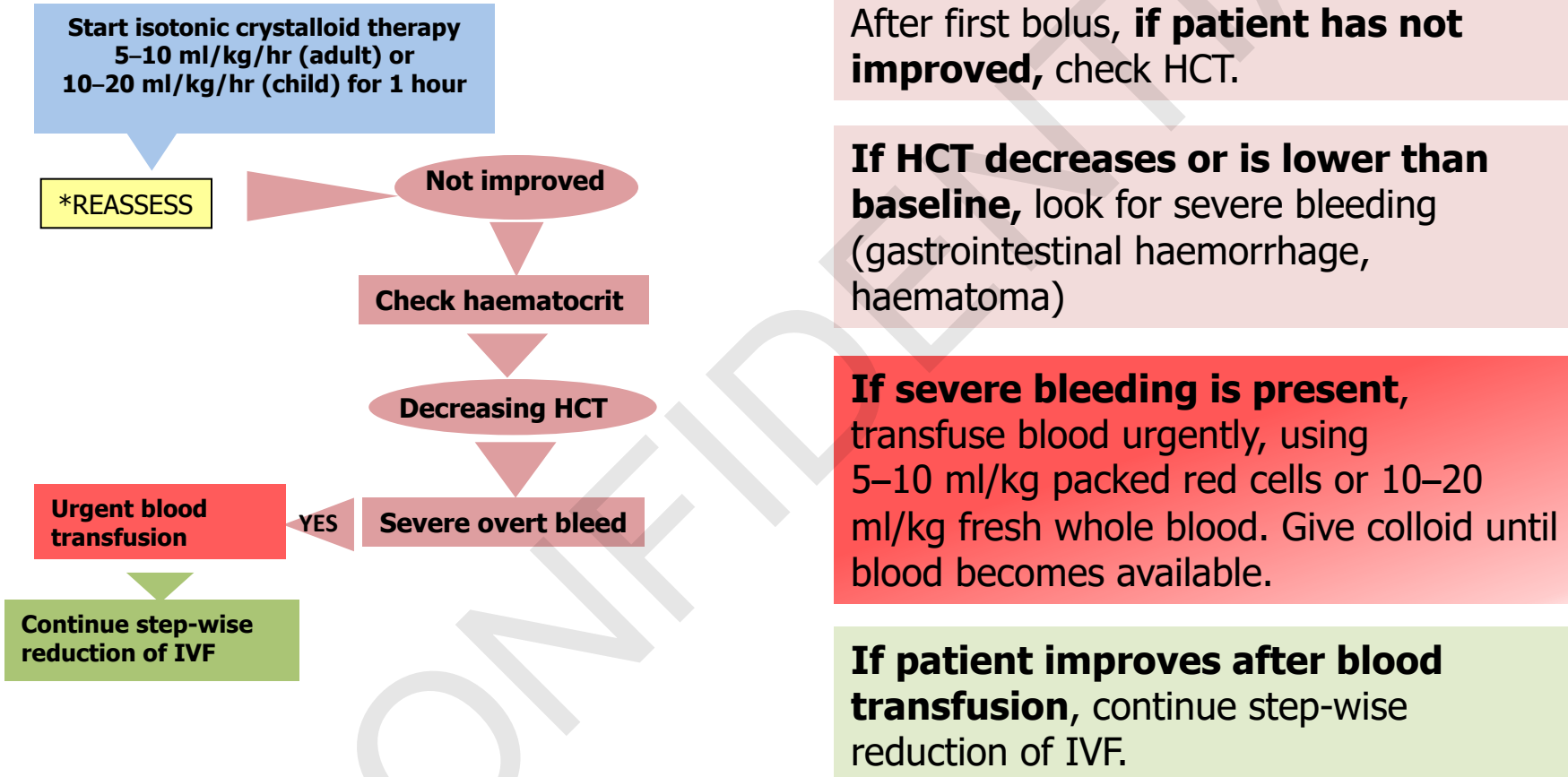
If patient improves, reduce IVF rate to 7-10 ml/kg/hr for 1-2 hours, and continue step-wise reduction of IVF.
If plasma leakage continues, further boluses may be required in the next 24-48 hours.

If not improved, recheck haematocrit

* Reassess the patient's clinical condition: vital signs, 5-in-1 magic touch, urine output; decide on the situation.

Group C: Emergency treatment – bleeding?

Compensated shock (systolic pressure maintained + reduced perfusion)



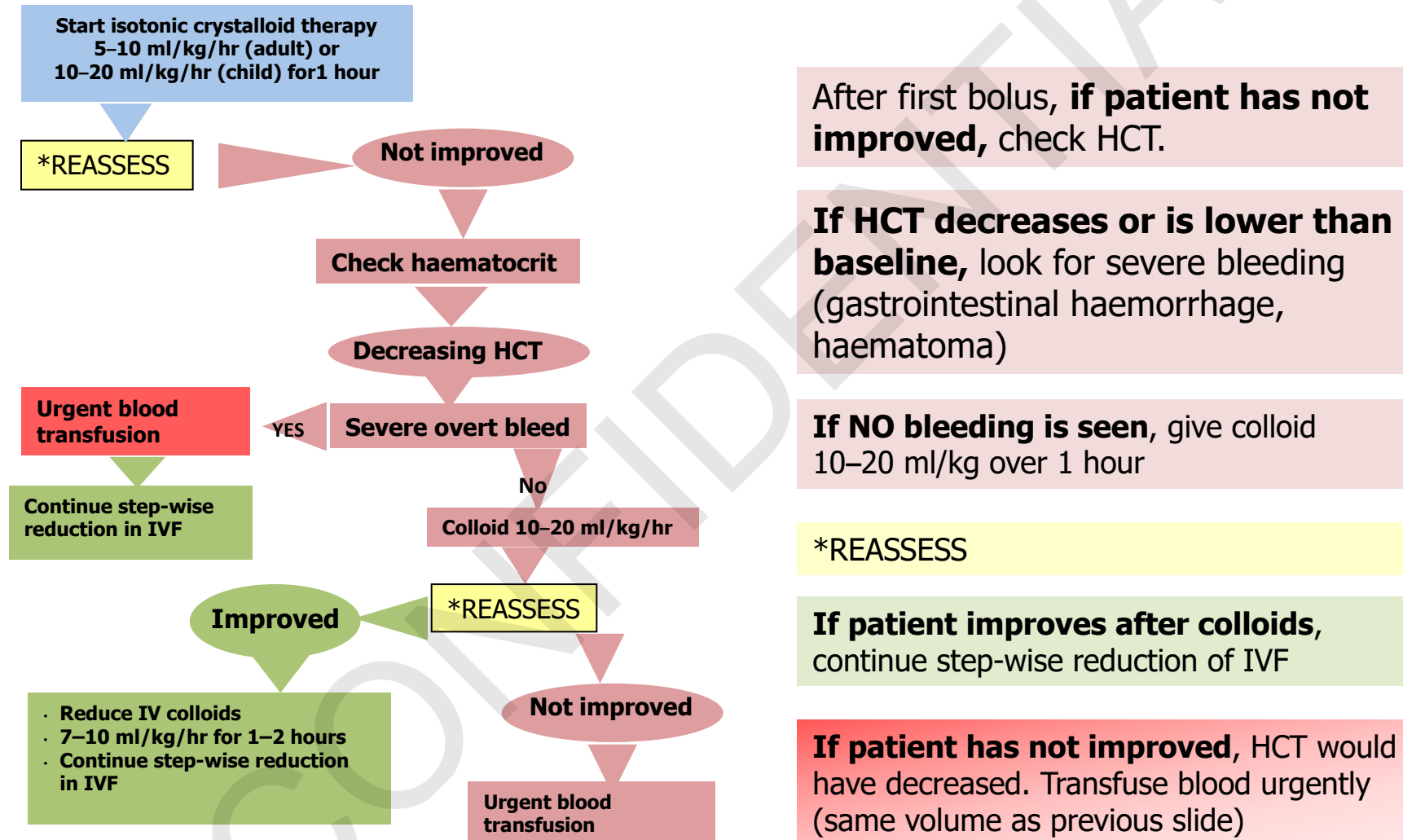
* Reassess the patient's clinical condition: vital signs, 5-in-1 magic touch, urine output; and decide on the situation.

** Colloid is preferable if the patient has already received several boluses of crystalloid

IV: intravenous, HCT: hematocrit, IVF: intravenous fluids

Group C: Emergency treatment – bleeding? (cont.)

Compensated shock (systolic pressure maintained + reduced perfusion)

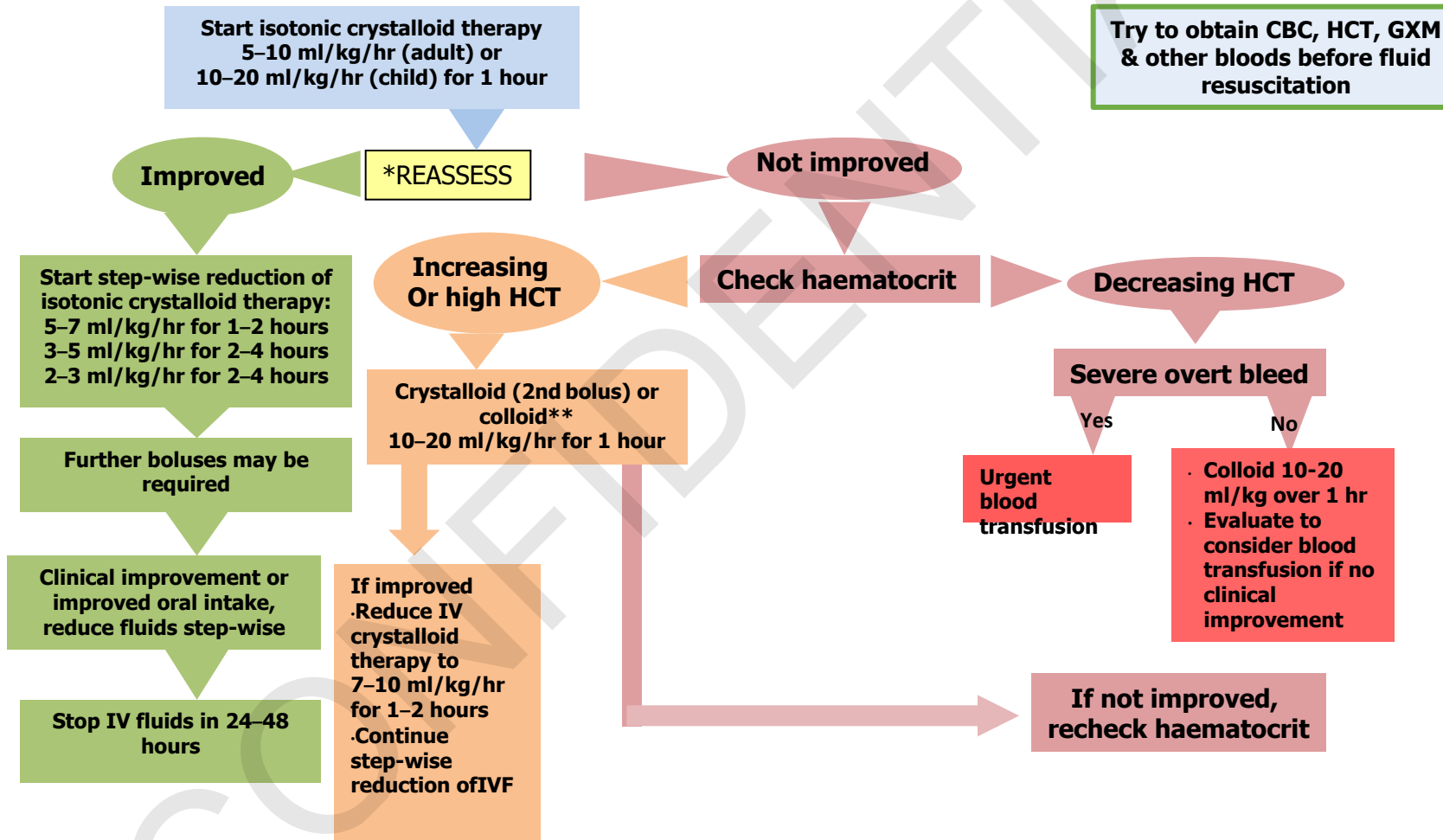


* Reassess the patient's clinical condition: vital signs, 5-in-1 magic touch, urine output; and decide on the situation.

** Colloid is preferable if the patient has already received several boluses of crystalloid

Group C: Emergency treatment – Summary

Compensated shock (systolic pressure maintained + reduced perfusion)



* Reassess the patient's clinical condition: vital signs, peripheral perfusion - 5-in-1 magic touch, urine output; and decide on the situation.

** Colloid is preferable if the patient has already received several boluses of crystalloid

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Haemodynamic assessment - continuum of haemodynamic changes

| 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 | Severe tachycardia or bradycardia in late shock |
| Blood pressure (BP) | Normal BP for age | Normal systolic pressure but 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" Tachypnoea | Kussmaul breathing (Metabolic acidosis) |
| Urine output | Normal | Reducing trend | Oliguria or anuria |

*Highlighted boxes are **early signs of shock**.

Group C: Emergency treatment

Hypotensive shock

Patient **Try to obtain CBC, HCT, GXM & other blood readings before fluid resuscitation** a longer period and should be managed more vigorously.

Obtain reference blood readings for all shock patients before fluid therapy.

**Start isotonic crystalloid or colloid therapy
10–20 ml/kg (adult) or
20 ml/kg (child) over 15–30 minutes**

Initiate IV resuscitation with crystalloid (NS, LR) or colloid solution as a bolus given at:

- 20 ml/kg (child)
- 10–20 ml/kg (adult)

over 15–30 minutes to bring patient out of shock as quickly as possible.

***REASSESS**

Reassess:

- Vital signs
- Peripheral perfusion: 5-in-1
- Mental state
- Urine output

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

** Colloid is preferable if the patient has already received several boluses of crystalloid

Group C: Emergency treatment

Hypotensive shock

If patient's condition improves after first bolus, give a crystalloid or colloid infusion of 10 ml/kg/hr for 1 hour.

*REASSESS

If patient continues to improve, continue with crystalloid and reduce IVF in step-wise manner

*REASSESS & repeat HCT after 2–4 hours

If improved, decrease IV rate every 2–4 hours

*REASSESS every 2–4 hours

On-going plasma leakage, further boluses required

Continue step-wise reduction if oral intake and urine output improve. Stop IVF at 24–48 hours.

Start isotonic crystalloid or colloid therapy
10–20 ml/kg (adult) or
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*REASSESS

Improved

IV crystalloid or colloid
10 ml/kg/hr for 1 hour

*REASSESS

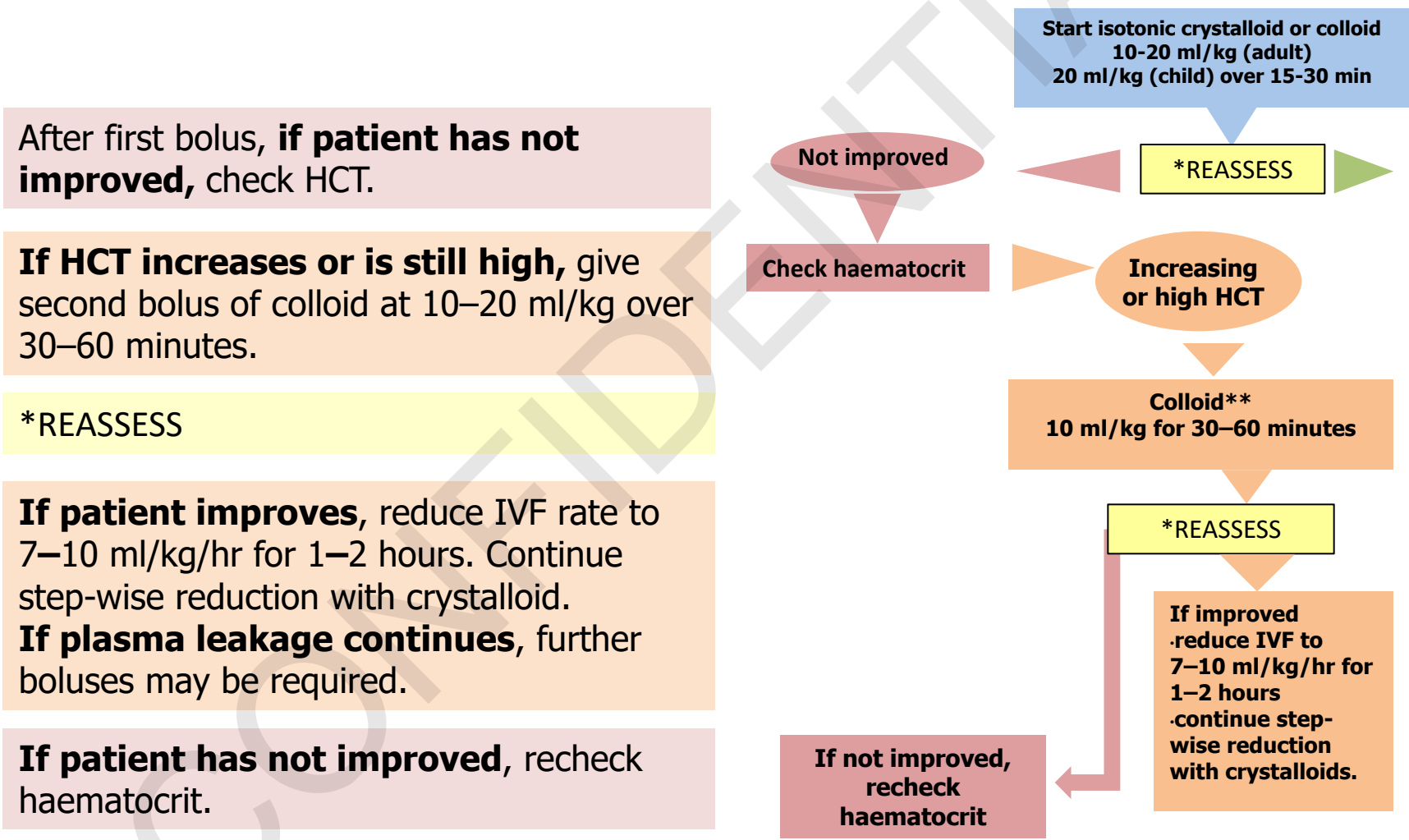
If improved, reduce IV
crystalloid, step-wise
5–7 ml/kg/hr for 1–2 hours
3–5 ml/kg/hr for 2–4 hours
2–3 ml/kg/hr for 2–4 hours

Further boluses may be required

If clinical improvement or
improved oral intake, reduce
fluids step-wise

Stop IV fluids at 24–48 hours

Group C: Emergency treatment Hypotensive shock



After first bolus, **if patient has not improved**, check HCT.

If HCT increases or is still high, give second bolus of colloid at 10–20 ml/kg over 30–60 minutes.

*REASSESS

If patient improves, reduce IVF rate to 7–10 ml/kg/hr for 1–2 hours. Continue step-wise reduction with crystalloid.
If plasma leakage continues, further boluses may be required.

If patient has not improved, recheck haematocrit.

* Reassess the patient’s clinical condition: vital signs, peripheral perfusion (CCTV-R) & urine output and decide on the situation.

Group C: Emergency treatment

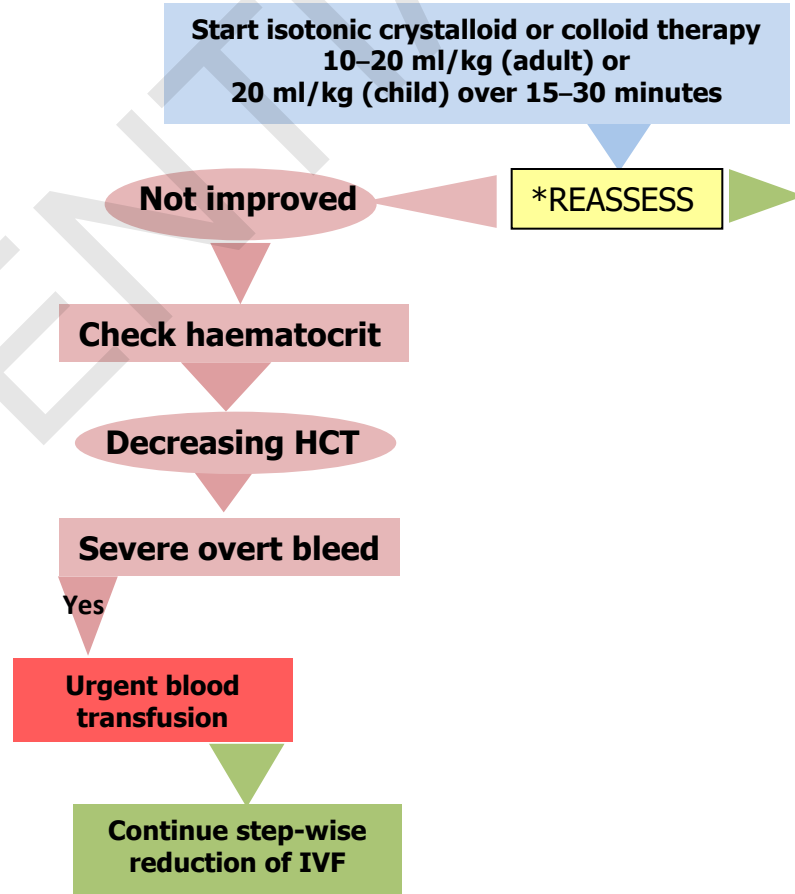
Hypotensive shock – bleeding?

After first bolus, **if patient has not improved**, check HCT.

If HCT decreases or is lower than baseline, look for severe bleeding (gastrointestinal haemorrhage, haematoma).

If severe is bleeding present, transfuse blood urgently, 5–10 ml/kg packed red cells or 10–20 fresh whole blood. Give colloid until blood is available.

If patient improves after blood transfusion, continue step-wise reduction of IVF.



* Reassess the patient’s clinical condition: vital signs, peripheral perfusion (CCTV-R) and urine output; decide on the situation.

** Colloids are preferable if the patient has already received several boluses of crystalloids.

Group C: Emergency treatment

Hypotensive shock – bleeding?

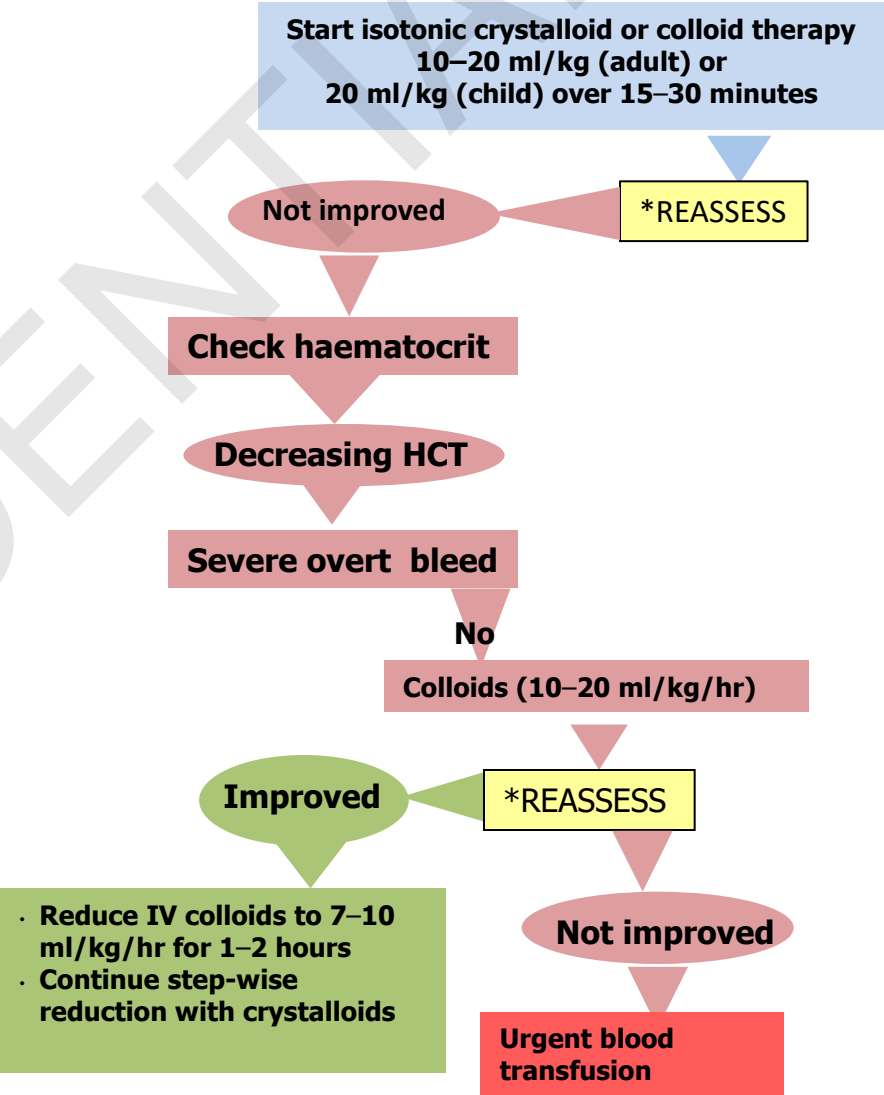
After first bolus, **if patient has not improved, HCT decreases or is lower than baseline**, look for severe bleeding (gastrointestinal haemorrhage, haematoma).

If **NO** bleeding seen, give colloids (10–20 ml/kg)

***REASSESS**

If patient improves after colloids, reduce to 7–10 ml/kg/hr for 1–2 hours. Continue step-wise reduction of crystalloids.

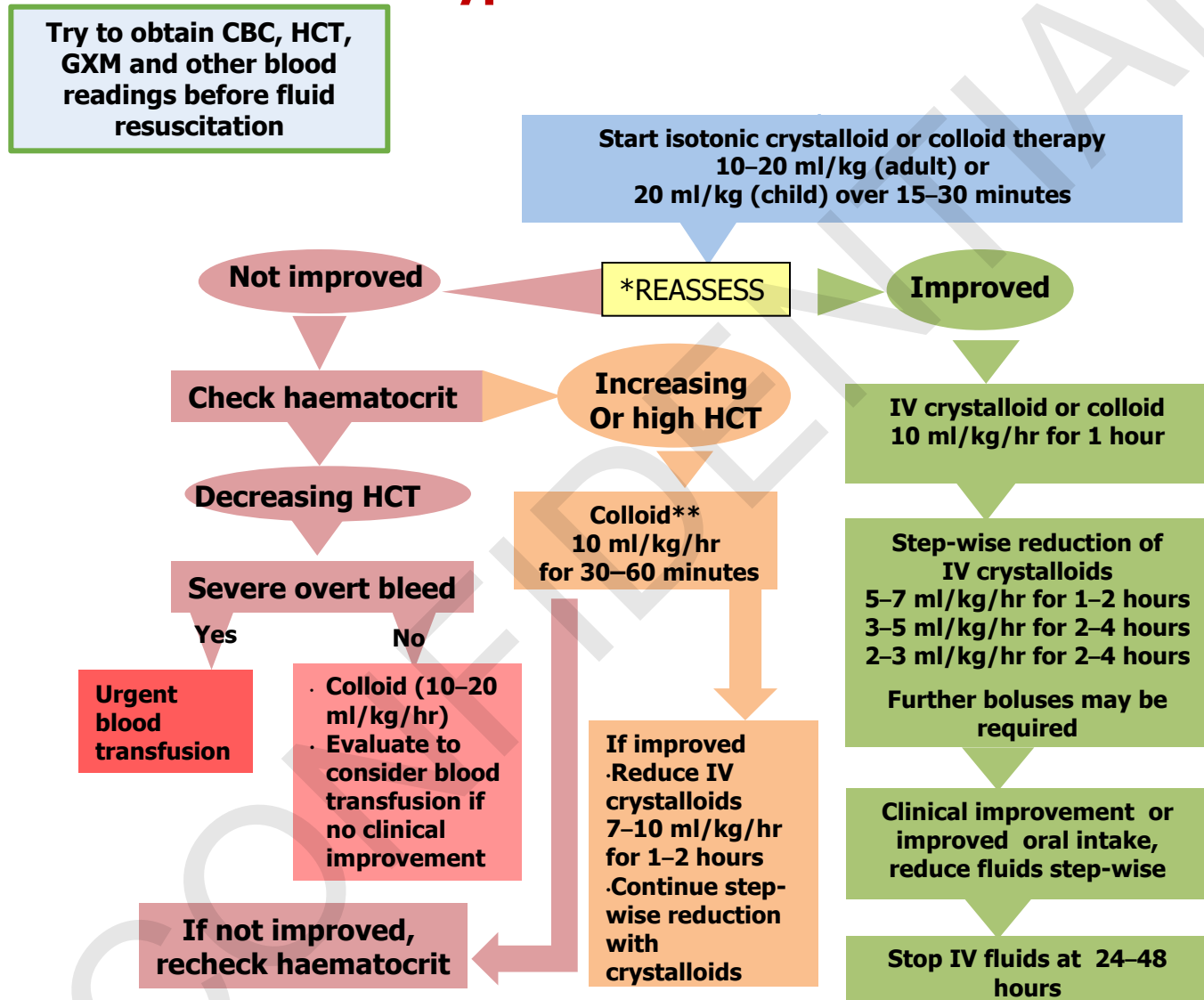
If patient has not improved, HCT would have decreased. Transfuse blood urgently.



* Reassess the patient's clinical condition: vital signs, peripheral perfusion (CCTV-R) and urine output; decide on the situation.
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Group C: Emergency treatment – Summary

Hypotensive shock

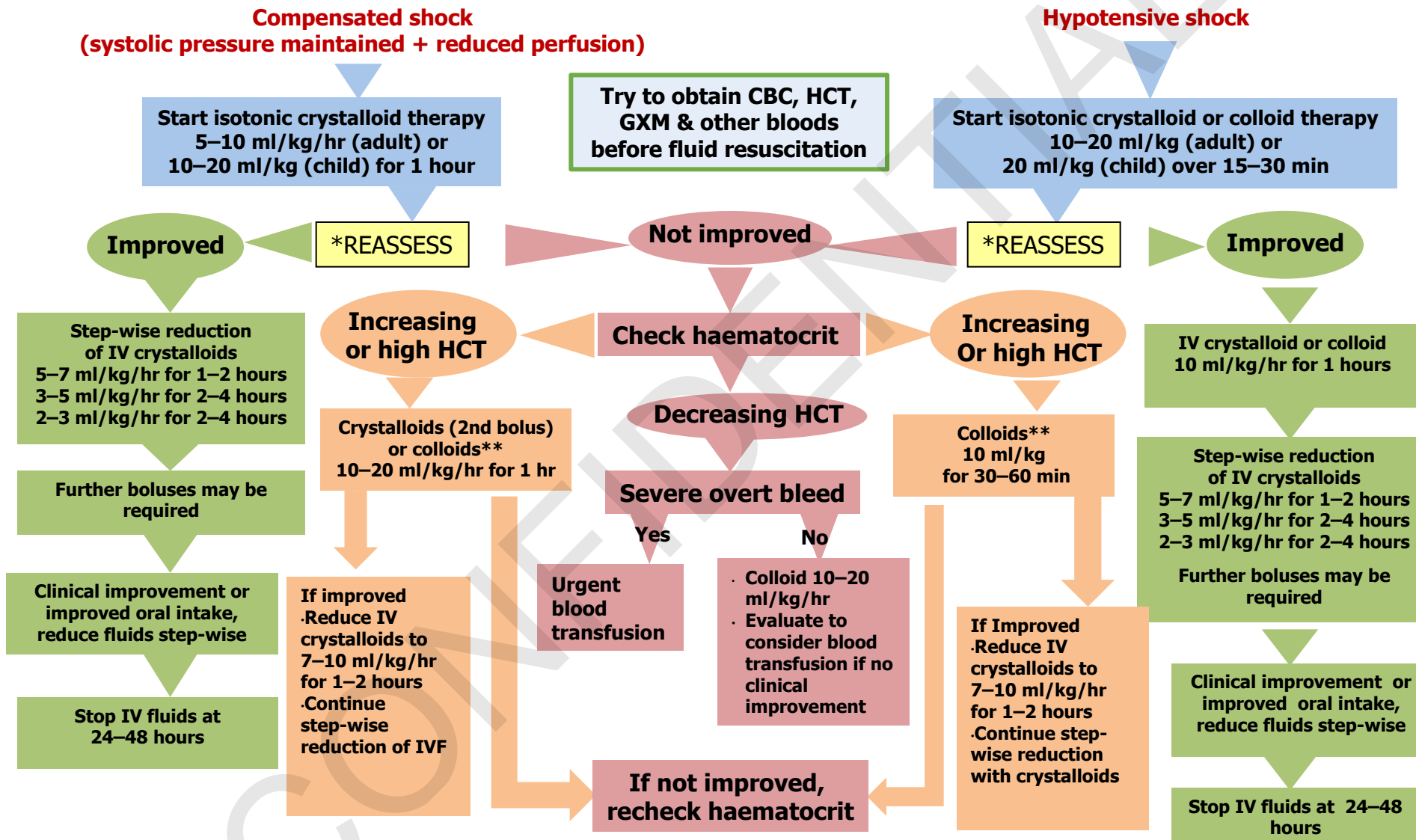


* Reassess the patient's clinical condition: vital signs, peripheral perfusion (CCTV-R) & urine output and decide on the situation.

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IV: intravenous, HCT: hematocrit, IVF: intravenous fluids

Group C: Emergency treatment – Summary



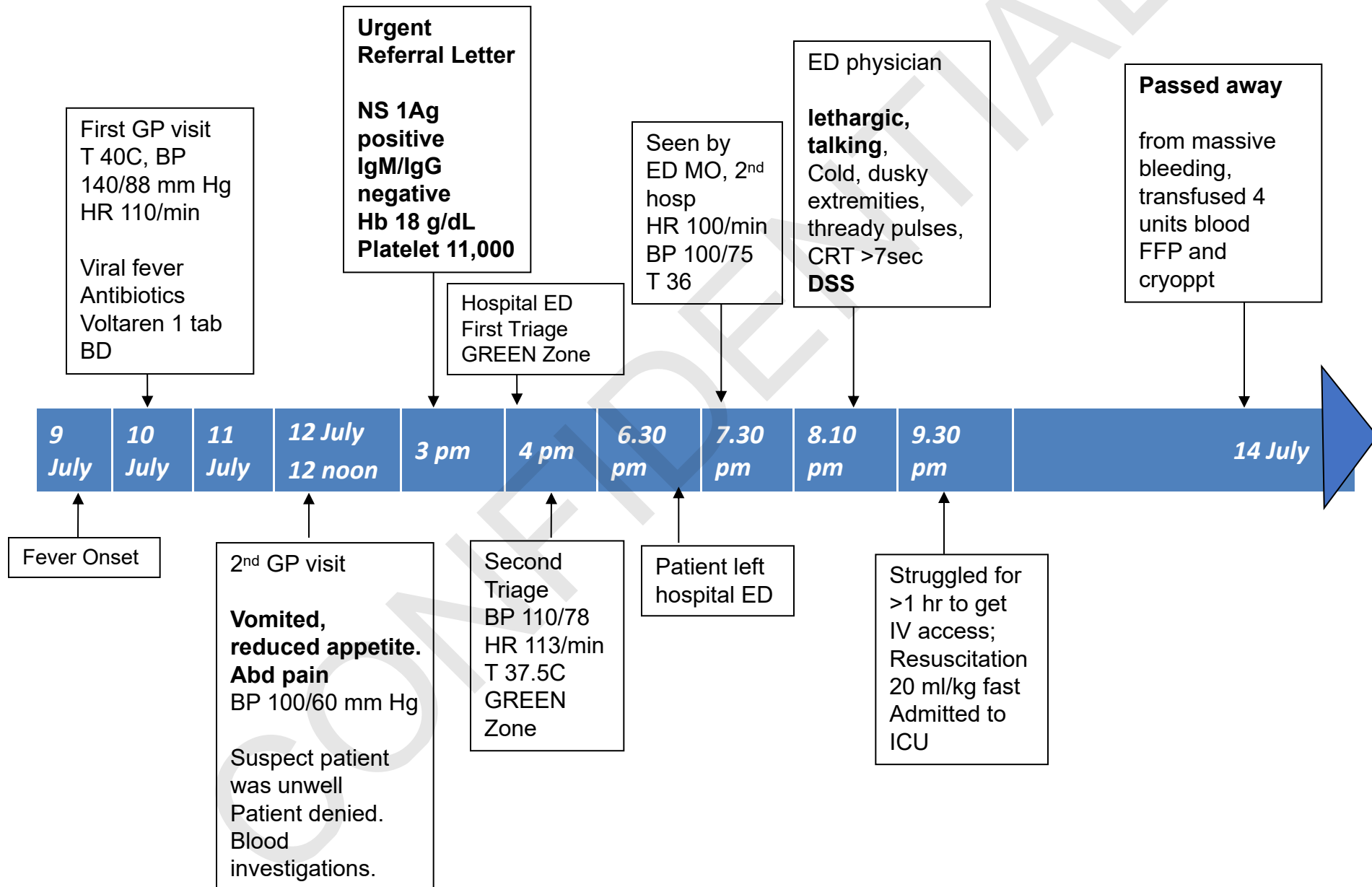
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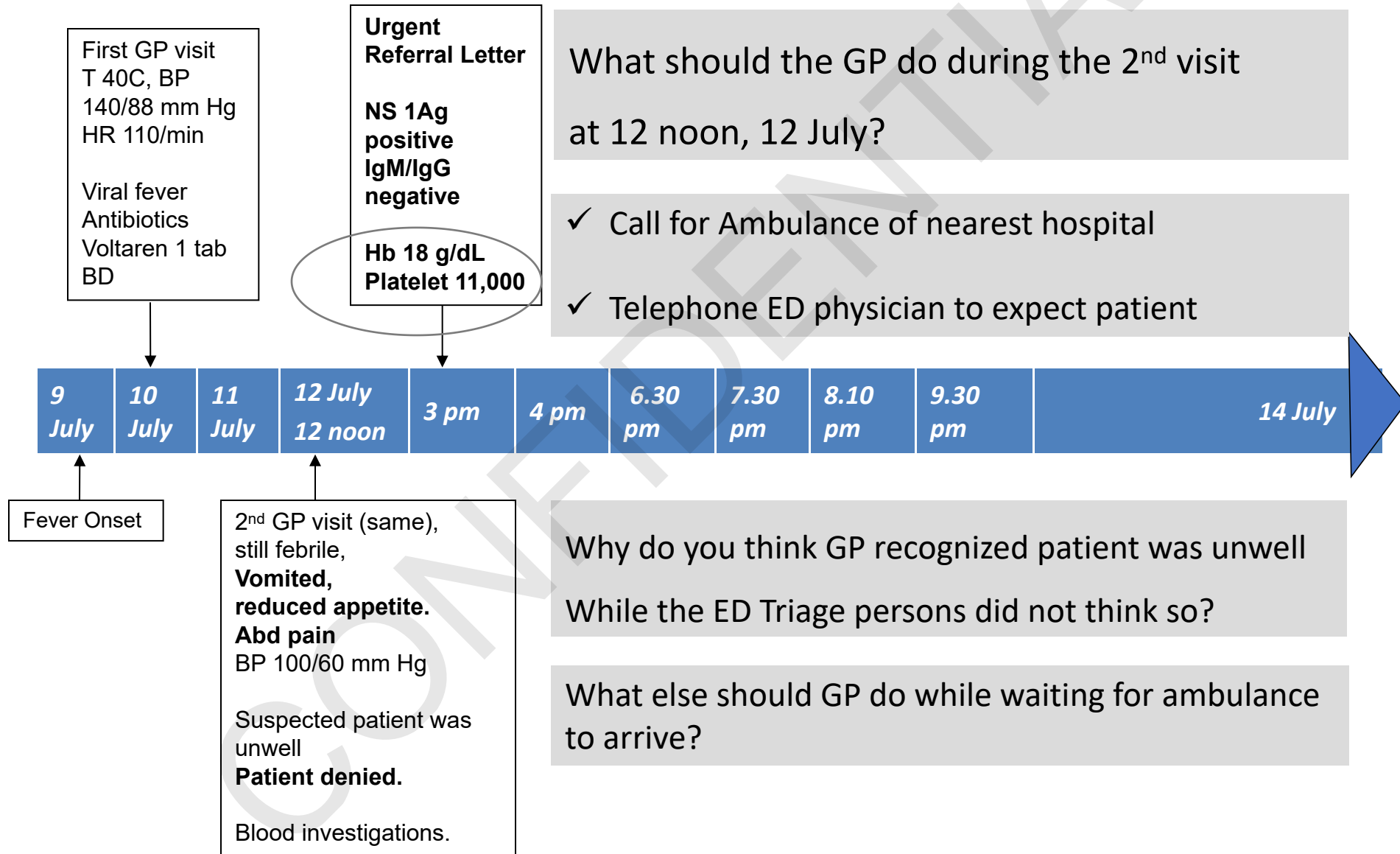
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Case discussion 1

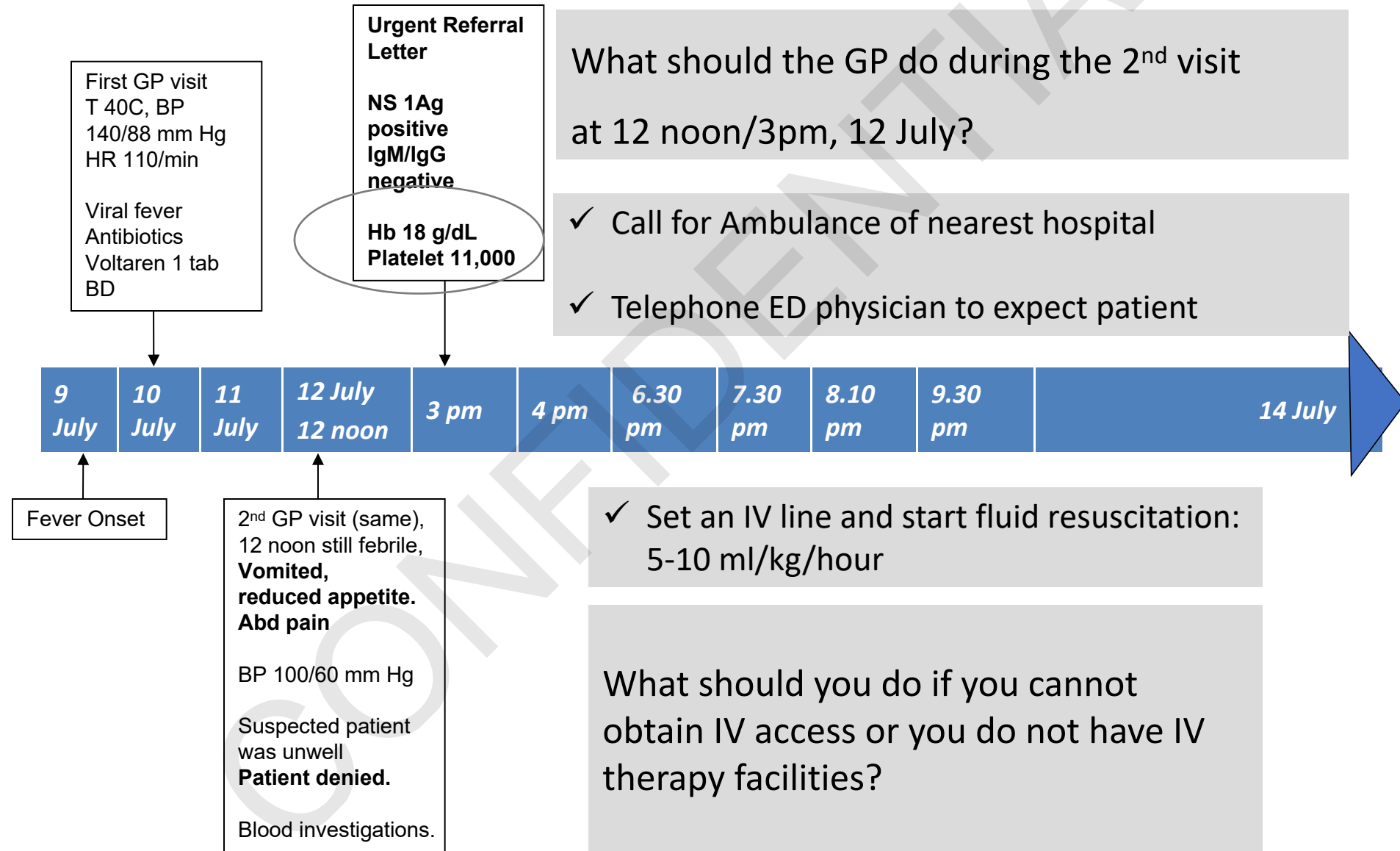
Case Timeline



Case Timeline



Case Timeline





Case discussion 2

Case study – 33-year-old, male

- No co-morbid conditions
- First GP visit:
 - Fever x 3 days
- Abdominal pain started that morning, recurrent vomiting, unable to tolerate orally
- Alert but lethargic
- Temp 38.5°C
- BP 110/70 mmHg
- HR 90/min
- Dehydration status: mild
- Lungs normal.
- Abd soft. Non tender. Hyperactive BS
- Provisional diagnosis:
 - AGE with dehydration
 - Dengue
- Management – IV Fluids
- FBC
- Referral letter
- **HCT 58, PLT ~120**

Case study – 33 year old, male, Day 4 of fever

- Brought in by brother next day – **NO Referral letter**
- Not responsive to call/stimulus
- Rapid shallow breathing
- CRT prolonged ~4 secs, cold peripheries, very poor pulse volume
- Radial pulse rate ~120 beats per minute manually
- CVS: S1+S2 no murmur
- Lungs: Clear
- Abdomen: soft non tender, no organomegaly
- No bleeding noted
- Pupils 4 mm bilaterally and reactive

Initial vital signs

- 1530H:
 - Temp: 36.5°C
 - HR : 115 bpm
 - BP on monitor not recordable
- 1545H:
 - HR: 115 bpm
 - BP: 68/44 mmHg
 - Sat 100% (15 L/min non-re-breathable mask)
 - RR 40/min

Severe dengue in decompensated shock

Immediate Management (1530H – 1545H)

- Placed patient on 15 L/min oxygen via HFM
- 2 large bore IV access (difficulty getting 2nd IV access)
 - VBG
 - Reflo
 - **FBC/INR/RP/LFT/CE**
 - **GXM whole blood**
 - **Dengue NS1**
- **20 ml/kg bolus of NS 15-30 minutes (est weight: 80 kg)**
- Insert CBD with strict IO charting
- Continuous vital monitoring
- **Rpt FBC/VBG/lactate after the first bolus**

Bedside Investigation (1530- 1545H)

- Reflo: 8.8
- Bedside ultrasound:
 - Echo on subcostal 4 chamber view: hyperdynamic,
 - **small LV – walls kissing with contraction**
 - **IVC: fully collapsed (kissing)**
 - Lung: no pleural effusion
 - Abdomen: no free fluid
- ECG: sinus tachycardia
- VBG (pre-bolus):
 - **pH 7.02 pCO₂ 32.9 pO₂ 43.9 HCO₃ 8.6 BE -20.4**
 - **Hb 18.7 Hct 58**

| TIME | 1545 | 1600 | 1615 | 1630 | 1645 | 1700 | 1715 | 1730 |
|-------------------------|---|-------|-------|--|-------|--------|--------|--------|
| BP | 68/44 | 86/46 | 95/69 | 83/42 | 93/47 | 113/57 | 109/52 | 91/50 |
| HR | 115 | 115 | 110 | 108 | 106 | 102 | 102 | 110 |
| RR | 40 | | | | 25 | | | |
| Sat | 100 | | | | 100 | | | |
| Fluids: | 20 ml/kg bolus NS (total 1.5L) | | | 20 ml/kg bolus - 2 NS + 1 gelafundin (1.5L) | | | | |
| Urine output (total) | - | - | - | - | - | - | - | 100 ml |

Reassessment (1630H -retrospective entry at 1645H)

- Patient progressively becoming more alert
 - E3 V2 M5 → E4 V4 M5
 - CRT ~ 2 secs, less cold peripheries but still very poor pulse volume
 - Lungs were clear
 - Abdomen was soft non tender
 - BP 93/47 HR 105
 - Urine output: NIL

Repeated ABG after the first bolus:

- pH 7.07 pCO₂ 12 pO₂ 247 HCO₃ 7.6 BE -24.5
- **Hb 15.3 (decr from 18) Hct 46.8 (decr from 57.7)**
- **Lactate decreased from 20 to 17 mmol/L**

Impression:

- After 20 ml/kg x 1 bolus, **HCT decreased from 58 to 46**, but still poor perfusion; Clinically cap refill time still prolonged, cold peripheries, thready poor pulse volume
- Severe Dengue in decompensated shock with plasma leakage
- **PLUS OCCULT BLEEDING**
- Bedside Ultrasound:
 - Echo – LV wall still kissing with contraction
 - IVC – still fully collapsed – kissing walls

- Called lab – request for NS1 to be read urgently
- **Called blood bank** – GXM 4 pints blood – get 2 pints - available in 30 mins
- Referral to medical team (1610H)
- Referral anaesthesia team (1630H)

| TIME | 1753 | 1800 | 1815 | 1830 |
|----------------------|--|--------|--------|---------------|
| BP | 91/50 | 105/66 | 110/71 | 126/68 |
| HR | 114 | 115 | 117 | 114 |
| RR | 20 | | | 20 |
| Sat | 100% | | | 100 |
| Fluids: | Completed blood transfusion @ 1830H (504 ml + 411 ml) | | | |
| Urine output (total) | 400 ml | | | 1100 ml |

@1837H

- Reassessed patient – **just completed blood transfusion**
 - Alert
 - CRT =2 , less cool peripheries **Pulse volume improved but still thready**
 - Lungs clear
 - Abdomen Soft non tender

MEDICAL REVIEW:

To **consider Septicemic shock** and reduce IVF normal saline to 5 ml/kg, then 3 ml/Kg

Informed by staff nurse patient can be sent up to ICU → to send now

Impression @ ICU @19:30 pm

- Severe dengue D4 of illness with decompensated shock
- AKI with severe lactic acidosis
- **Suspected occult bleeding**
- Lungs clear RR 20-24 on NPO2 3L/min
- Abdomen: soft non tender
- Bedside ECHO: IVC collapsing, LV under-filled with good contractility, no pleural effusion

Examination in ICU @ 7.30 pm

- GCS Full
- HR 123 pulse volume low, peripheries coolish, CRT 3s
- **BP 86/61 (NIBP) unsupported**
- **MX:**
- Increase IVD normal saline 7cc/kg/hr for 2 hours—BP 103/82
- IVD NS 5cc/kg/hr
- Cont IV ceftriaxone 2g OD

Patient improved after blood transfusion (ended at 6:30 pm) and that after reducing IV fluids, hemodynamics became unstable which means this is on-going plasma leakage ± severe bleeding

Blood gases in ICU

malena Post intubation

| | 2025 | 2325 | 0210 | 0407 | 0430 | 0513 |
|------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| pH | 7.37 | 7.39 | 7.36 | 7.08 | 7.15 | 7.13 |
| pCO ₂ | 21 | 16 | 20 | 36 | 38 | 47 |
| pO ₂ | 101 | 77 | 265 | 184 | 176 | 98 |
| HCO ₃ | 16.1 | 14.7 | 15.0 | 10.8 | 13.1 | 14.4 |
| BE | -12.3 | -14.5 | -13.2 | -17.5 | -14.2 | -12.2 |
| Lact | 3.6 | 4.3 | 4.9 | 9.7 | 9.1 | 9.3 |
| Glu | 6.7 | 9.1 | | | | |
| Hb | 16.7 | 14.5 | 11.9 | 7.1 | 6.5 | 7.0 |
| Hct | 51 | 44 | 36 | 22 | 20 | 21 |

Dengue mortality – Lessons learnt

- Wide spectrum of clinical manifestation – Dengue shock a dynamic phenomenon
- Dengue Shock: Minute-to-minute evaluation and decision-making to achieve and then maintain hemodynamic equilibrium
- **Handover from one team to another, across departments:**
Gaps in continuity of care - Change of work shift, on-call team
- Instructions have to be clear – that bleeding is suspected, how much blood left in blood bank, etc; when is next review, etc

Step-wise Clinical Evaluation

1. Other illnesses such as Diabetes mellitus, Hypertension, etc?
2. Phase of dengue (viremic / plasma leakage / reabsorption)?
3. How much was he able to drink, what fluid? Urine volume, colour?
4. Warning signs resolved?
5. Haemodynamic response to IV fluid therapy? Urine output in the last few hours?
6. Still stable after step-wise reduction in IVF? – Urine output?
7. Cumulative fluid balance: Size of pleural effusion/ascites? Effect on breathing?
8. Liver size?
9. Check Electrolytes – sodium and potassium
10. When is next review – clinical review or review of hematocrit?

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CONTINUE PREVIOUS CASE....

Mr SD
52 year old Gentleman
Height : 168 cm
Weight : 69.4 kg
Ideal Body Weight : 64 kg
BMI : 24.5

No previous medical co-morbidities
Smoker 20 pack years
Lorry driver
Stays at dengue endemic area.

Presented with :
Fever 6 days associated with myalgia and mild arthralgia

- No vomiting ; Can still take fluids.
- Poor oral intake
- Diarrhoea 2 times per day
- No abdominal pain

- Lethargic and unable to work past 3 days
- Spends most hours resting in bed
- Dizziness
- Urine output reported to be normal

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IN TRIAGE

**Alert, Walked into Consultation,
Examination: Pink , Coated tongue , mildly dehydrated**

Temp : 37.9 Celsius
BP : 134 / 66 mmHg
**Pulse : 70 bpm (volume good, CRT <2 seconds,
peripheries warm and pink)**
SPO₂ : 100% RA
Lungs : Clear
PA : Soft and Non Tender ; No hepatosplenomegaly

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| | Day 6 8:30 pm | |
|------------------|---------------|--|
| Hb | 18.8 | |
| HCT | 0.55 | |
| WBC | 4.8 [N64 L28] | |
| PLT | 115 | |
| Urea/Creat | 4.3 / 89 | |
| TCO ₂ | 24 | |
| Na/K | 134 / 3.9 | |

WHAT IS YOUR NEXT STEP OF MANAGEMENT ?



ENCOURAGE to drink adequate amounts of fluid & discharge



RUN 1 pint of normal saline and reassess clinically for discharge



RUN 1 pint of normal saline and repeat FBC before deciding discharge



REFER MEDICAL for admission to ward for IV Drip

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| HCT | 0.55 | IS THE HEMATOCRIT NORMAL FOR HIM ? |
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8:00 PM

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Temp : 37.9
 BP : 134 / 66 mmHg
 Pulse : 70 bpm (volume good, CRT <2 seconds, peripheries warm & pink)
 SPO2 : 100 % RA
 Lungs : Clear
 PA : Soft and Non Tender ; No hepatosplenomegaly

Presented with :

Fever 6 days associated with myalgia and mild arthralgia

- No vomiting ; Can still take fluids.
- Diarrhoea 2 times per day
- No abdominal pain
- Poor oral intake
- Lethargic and unable to work past 3 days
- Spends most hours resting in bed
- Dizziness
- Urine output reported to be normal

| | Day 6 8:30 pm | |
|------------|---------------|---|
| | 18.8 | |
| HCT | 0.55 ← | <div style="border: 2px solid red; padding: 5px;"> IS THE HEMATOCRIT NORMAL FOR HIM ? GUESS HIS BASELINE HCT... </div> |
| WBC | 4.8 [N64 L28] | |
| PLT | 115 | |
| Urea/Creat | 4.3 / 89 | |
| TCO2 | 24 | |
| Na/K | 134 / 3.9 | |

THE STORY CONTINUES ...

This patient was given 1 pint of NS over next 2 hours and allowed for discharge.
BP 130/70 mmHg and Pulse was 80 bpm.

Discharged at 12 Midnight and asked to recheck bloods again in Clinic in the morning.

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Mr SD
52 year old Gentleman
Height : 168 cm
Weight : 69.4 kg
Ideal Body Weight : 64 kg
BMI : 24.5

No previous medical co-morbidities
Smoker 20 pack years
Lorry driver
Stays at dengue endemic area.

Presented with:

Day 7 of illness associated with myalgia and mild arthralgia

- No vomiting
- Diarrhoea 2 times per day
- No abdominal pain
- Poor oral intake
- Lethargic and unable to work past 3 days
- Spends most hours resting in bed
- Dizziness
- Urine output reported to be normal

Day 7 morning, follow-up in CLINIC as advised by ED Dr
Still poor oral intake ; No vomiting ; Diarrhoea x 2 over-night.

On examination : Looked generally well (walked into clinic)
Temp 36.8°C
BP 117/78 mmHg
Pulse 102 bpm ;
Good pulse volume / CRT <2 sec
Lungs : Clear

Plan : FBC STAT

Interpret His Symptoms And Physical Findings ?

What Would You Write As The Diagnosis ?

List The Current Problems To Highlight To The Managing Team In The Ward.

Presented with :

Fever 7 days associated with myalgia and mild arthralgia

- No vomiting
- Diarrhoea 2 times per day
- No abdominal pain
- Poor oral intake
- Lethargic and unable to work past 3 days
- Spends most hours resting in bed
- Dizziness
- Urine output reported to be normal

Presented the next morning for follow-up (DAY 7)

Still poor oral intake ; No vomiting ; Diarrhoea x 2 over-night.

On examination : Looked generally well (walked into clinic)

Temp 36.8°C

BP 117/78 mmHg

Pulse 102 bpm ;

Good pulse volume / CRT <2 sec

Lungs : Clear

Plan : FBC STAT

| | Day 6 | Day 7 |
|------------------|---------------|--------------------|
| Hb | 18.8 | 19.5 |
| HCT | 0.55 | 0.59 |
| WBC | 4.8 [N64 L28] | 7.3 [N49 L24 A 22] |
| PLT | 115 | 82 |
| Urea/Creat | 4.3 / 89 | |
| TCO ₂ | 24 | |
| Na/K | 134 / 3.9 | |

CURRENT DIAGNOSIS

Presumed Dengue Fever Day 7 Illness
In Critical Phase with Compensated Shock.

Warning Signs :

Dehydration ; Lethargy

Hemoconcentration with rapid PLT drop.

Tachycardia

Do You Think There Is Any Plasma Leakage At This Point ?

THE STORY CONTINUES ...

Mr. SD was planned for admission and IV Drip started at Clinic.

But, no infusion pump in clinic

Upon arrival to ward at 12 noon, only 250 c.c. was given over past 2 hours.

How much of IV Fluids would you plan to give Mr SD, while in the clinic & upon arrival to ward at 12 noon.

Presented with :

Fever 7 days associated with myalgia and mild arthralgia

- No vomiting ; Can still take fluids.
- Diarrhoea 2 times per day
- No abdominal pain
- Poor oral intake
- Lethargic and unable to work past 3 days
- Spends most hours resting in bed
- Dizziness
- Urine output reported to be normal

WARD REVIEW

Presumed Dengue Fever Day 7 Illness
In Critical Phase with ? Compensated Shock.

Warning Signs :

Dehydration; Lethargy

Hemoconcentration with rapid PLT drop.

Tachycardia

On Review 2 pm:

Alert ; Pink

BP : 132/92 mmHg

Pulse : 98 bpm

Good pulse volume ; CRT < 2 seconds

Lungs : No pleural Effusion

PA : Liver palpable 3 FB with shifting dullness

Urine : 200 c.c. at 2:00 PM (*)

WHAT WOULD BE YOUR NEXT STEP OF MANAGEMENT ?

WHAT WOULD BE YOUR NEXT PLAN OF MANAGEMENT ?

- REDUCE IV drip as patient is having ascites (1 cc/kg/Hr)
- IV Drip 3 cc/kg/Hr
- IV Drip 5 cc/kg/Hr for 2 hours and reassess again in 2 hours (to make up for inadequate IVF)
- IV Drip 7 – 10 cc/kg/Hr and reassess (since IV fluid given in Clinic was inadequate)

THE STORY CONTINUES ...

Mr. SD was given IV Drip 3 cc/kg/Hr and repeat bloods 2 hours later (**4 pm**)

Passed over to on-call team to review FBC and general condition.

FBC repeated 2 hours post IV fluids (**4 pm**)

On-Call review **10:00 pm**

IV Drip 3 c.c./kg/Hr continued till on-call review.

Ward Review by On-Call Team

On Review : No vomiting
c/o Abdominal colicky pain

Alert

Temp : 37.2 °c

BP : 110/78 mmHg

Pulse : 102 bpm :

Good pulse volume ; CRT < 2 seconds

Warm Peripheries

Lungs : Clear

PA : Soft and Non tender ;
No hepatosplenomegaly

Urine output : Concentrated

WHAT WOULD BE YOUR NEXT PLAN OF MANAGEMENT ?



REDUCE IV Drip to 1 cc/kg/Hr



REDUCE IV Drip to 2 cc/kg/Hr



MAINTAIN IV Drip at 3cc/kg/Hr



INCREASE IV Drip 5cc/kg/Hr and
re-assess again in 2 hours

Ward Review by On Call Team

On Review :
 No vomiting ;
 Abdominal colicky pain

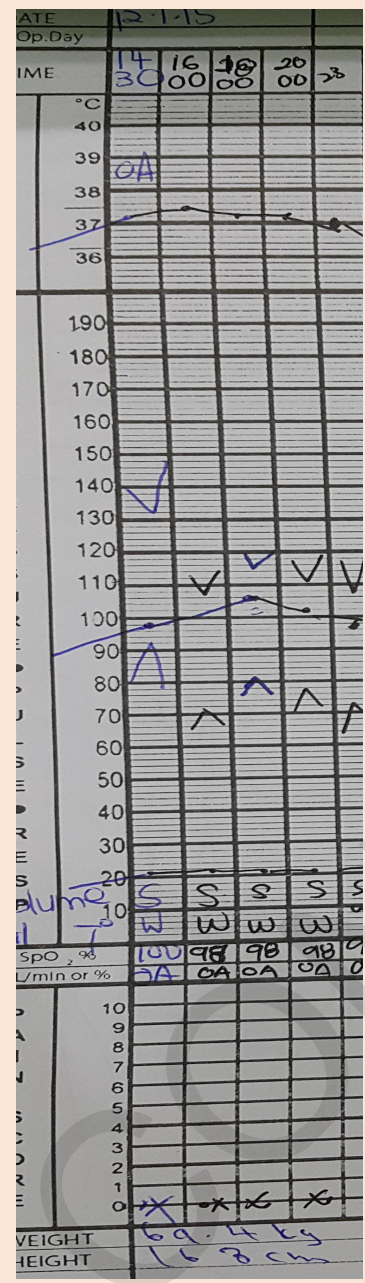
Alert
 Temp : 37.2 °c
 BP : 110/78 mmHg
 Pulse : 102 bpm :

Good pulse volume ;
 CRT < 2 seconds :
 Warm Peripheries

Lungs : Clear

PA : Soft and Non tender ;
 No hepatosplenomegaly

Urine output : Concentrated



FBC 12 NOON
Hb 19.5
HCT 0.59
PLT 82

| Time | Intake | Output |
|------|------------------------------------|----------|
| 1300 | N/Saline 500 | 100 200 |
| 1400 | N/Saline 180 | 1400 200 |
| 1500 | N/Saline 180 | |
| 1600 | H ₂ O 150, N/Saline 180 | 1600 150 |
| 1700 | N/Saline 180 | 1700 250 |
| 1800 | H ₂ O 150, N/Saline 180 | |
| 1900 | H ₂ O 150, N/Saline 180 | |
| 2000 | N/Saline 180 | |
| 2100 | N/Saline 180 | 2145 200 |

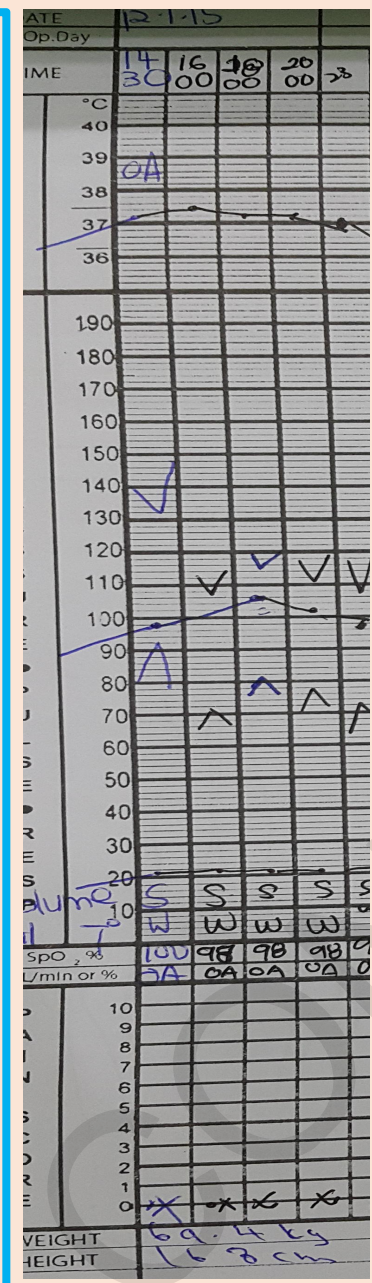
24-HOUR TOTAL INTAKE: 3050 OUTPUT: 2000

FBC 4 PM
Hb 18.5
HCT 0.54
PLT 67

WHAT WOULD BE YOUR NEXT PLAN OF MANAGEMENT ?

- REDUCE IV Drip to 1 cc/kg/Hr
- REDUCE IV Drip to 2 cc/kg/Hr
- MAINTAIN IV Drip at 3cc/kg/Hr
- INCREASE IV Drip 5cc/kg/Hr and re-assess again in

2hours



FBC 12 NOON
Hb 19.5
HCT 0.59
PLT 82

| Time | Intake | Output |
|------|------------------------------------|---------|
| 1300 | N/saline 500 | 170 200 |
| 1400 | N/saline 180 | 140 200 |
| 1500 | N/saline 180 | 160 150 |
| 1600 | H ₂ O 150, N/saline 180 | 170 250 |
| 1700 | N/saline 180 | |
| 1800 | H ₂ O 150, N/saline 180 | |
| 1900 | H ₂ O 150, N/saline 180 | |
| 2000 | N/saline 180 | 240 200 |
| 2100 | N/saline 180 | |

12-Hour INTAKE: 1750
 24-HOUR TOTAL INTAKE: 3050

FBC 4 PM
Hb 18.5
HCT 0.54
PLT 67

Ward Review by On Call Team

On Review :
No vomiting ;
Abdominal colicky pain

Alert
Temp : 37.2 °c
BP : 110/78 mmHg
Pulse : 102 bpm :

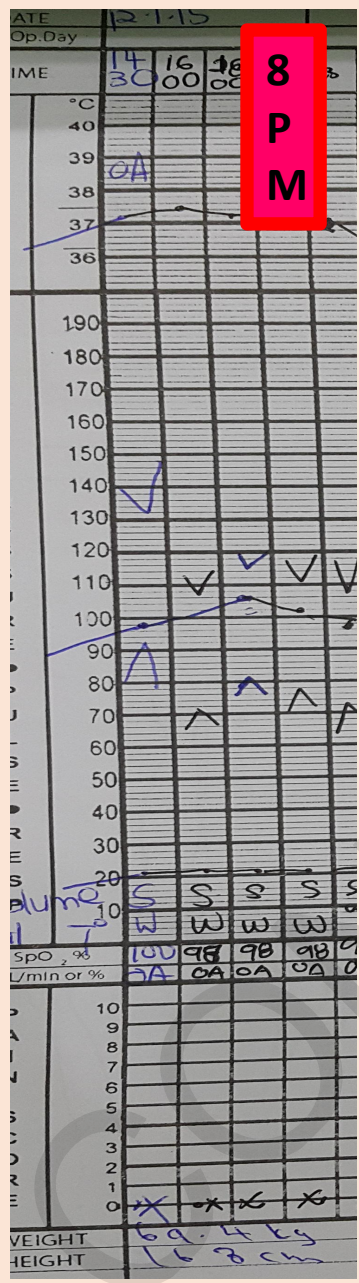
Good pulse volume ;
CRT < 2 seconds :
Warm Peripheries

Lungs : Clear

PA : Soft and Non
tender ;

No
hepatosplenomegaly

Urine output : Concentrated



FBC 12 NOON
Hb 19.5
HCT 0.59
PLT 82

What do these numbers mean?
How should you deal with them?

| | | | | | | |
|------|------------------|-----|----------|-----|--|----------|
| 1300 | | | n/saline | 500 | | |
| 1400 | | | n/saline | 180 | | 1400 200 |
| 1500 | | | | | | |
| 1600 | H ₂ O | 150 | | | | 1600 150 |
| 1700 | | | | | | 1700 250 |
| 1800 | H ₂ O | 150 | | | | |
| 1900 | H ₂ O | 150 | n/saline | 180 | | |
| 2000 | | | n/saline | 180 | | |
| 2100 | h ₂ | 150 | n/saline | 180 | | 2145 200 |

Interpret the urine output

FBC 4 PM
Hb 18.5
HCT 0.54
PLT 67

How best to interpret urine output chart at 10 PM?

**8
P
M**

| FBC 12 NOON | |
|-------------|------|
| Hb | 19.5 |
| HCT | 0.59 |
| PLT | 82 |

What do these numbers mean?
How should you deal with them?

| | | | | | | |
|------|------------------|-----|----------|-----|------|-----|
| 1300 | | | N/saline | 500 | | |
| 1400 | | | N/saline | 180 | 1400 | 200 |
| 1500 | | | N/saline | 180 | | |
| 1600 | H ₂ O | 150 | N/saline | 180 | 1600 | 150 |
| 1700 | | | N/saline | 180 | 1700 | 250 |
| 1800 | H ₂ O | 150 | N/saline | 180 | | |
| 1900 | H ₂ O | 150 | N/saline | 180 | | |
| 2000 | | | N/saline | 180 | 2145 | 200 |
| 2100 | hr | 150 | N/saline | 180 | | |

12-Hour INTAKE: 750
24-HOUR TOTAL INTAKE: 3050

| FBC 4 PM | |
|----------|------|
| Hb | 18.5 |
| HCT | 0.54 |
| PLT | 67 |

THE STORY CONTINUES ...

Mr. SD was allowed to sleep that night.

PLAN : IV Drip 2cc/kg/Hr till the next morning review at 8 am, Day 8.

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Ward Review The Next Morning 8 AM [18 hours from admission]

On Review : Having abdominal pain
 No vomiting / diarrhoea / bleeding

Hydration good

Temp : 37.0 °c

BP : 126/88 mmHg

Pulse : 100 bpm, good pulse volume

SPO₂ : 100% RA

Lungs : Reduced air entry right basal

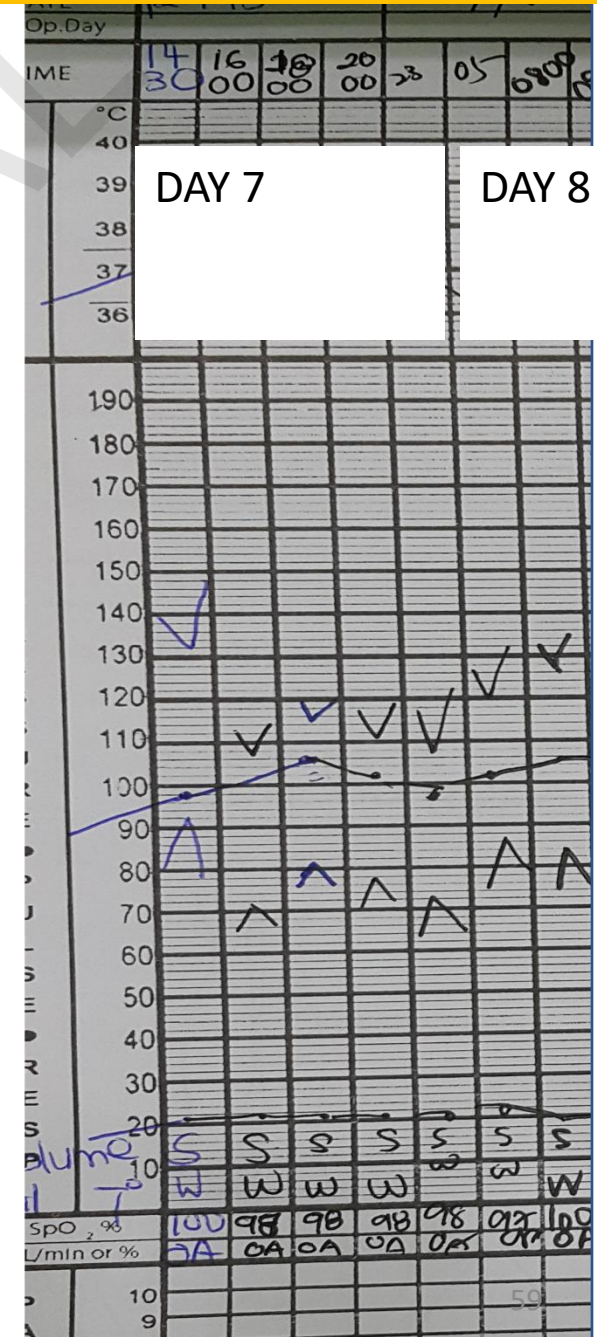
PA : Soft and Non tender

I/O : 4010 / 1050 cc [+ 2960] over 18 Hours

FBC pending

WHAT DO YOU THINK IS HAPPENING IN THE MORNING ?

WHAT WOULD YOUR ORDERS BE ?



Ward Review @ 08:00 [18 hours from admission]

On Review : Having abdominal pain
No vomiting/diarrhoea
/bleeding

Hydration good
Temp : 37.0 °c
BP : 126/88 mmHg
Pulse : 100 bpm, good pulse volume
SPO2 : 100% RA

Lungs : Reduced air entry right basal
PA : Soft and Non tender

I/O : 4010 / 1050 cc [+ 2960] over 18 Hours

FBC pending

WHAT WOULD YOU DO NEXT ?



REDUCE IV Drip to 1 cc/kg/Hr



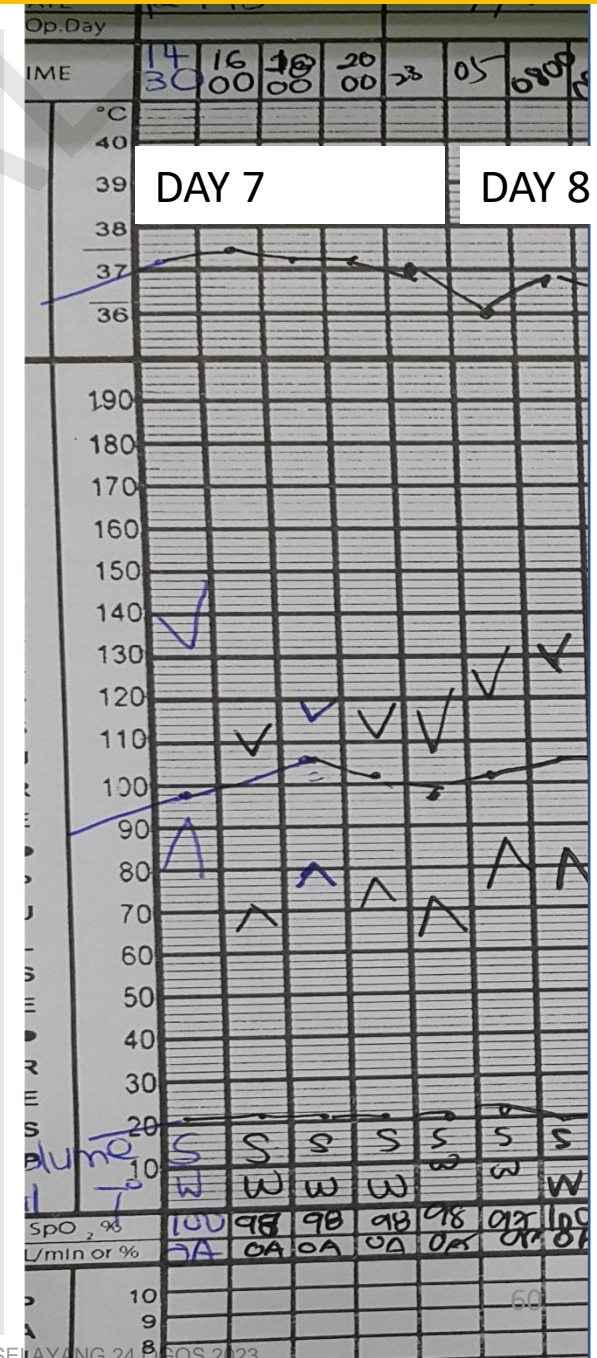
MAINTAIN IV Drip to 2 cc/kg/Hr



INCREASE IV Drip Rate



NO DECISION till FBC is ready.



THE STORY CONTINUES ...

Since pulse volume was still good;
IV Drip was reduced to 1 cc/kg/Hr between 9 am → 12 Noon

FBC was reviewed 11 AM

Increase In Hematocrit

Increase In WBC

At 12 noon, 4 HOURS after Morning Review

Increasing Respiratory Rate

Developed diaphoresis / Cold Clammy
Pulse was weak and thready

| | Day 6 (ED) | Day 7 12 noon | Day 7 4pm | Day 8 7am |
|------------|-----------------|---------------------------|-----------------------------|---------------------------------------|
| Hb | 18.8 | 19.5 | 18.5 | 19.7 |
| HCT | 0.55 | 0.59 | 0.54 | 0.59 |
| WBC | 4.8 [N64 28] | 7.3 [N49 L24 A 22] | 8.4 [N60 L18 A 11] | 13.4 |
| PLT | 115 | 82 | 67 | 42 |
| Urea/Creat | 4.3 / 89 | | 3.8 / 73 | 4.3 / 79 |
| TCO2 | 24 | | 21 | 20 |
| Na/K | 134 / 3.9 | | 135 / 3.7 | 137 / 4.2 |
| | 500cc STAT | Overnight with no IV Drip | After 3cc/kg/Hr for 2 hours | After reducing to 2cc/kg/Hr overnight |

Ward Review : 12 noon, 4 Hours LATER

On Review : Cramp like abdominal pain (feels better after MMT/PPI)
Was still trying to drink water as much as he can (increasing lethargy)

Mild tachypnoea , Dry tongue

Temp : 37.0 °c

BP : **146/100** mmHg

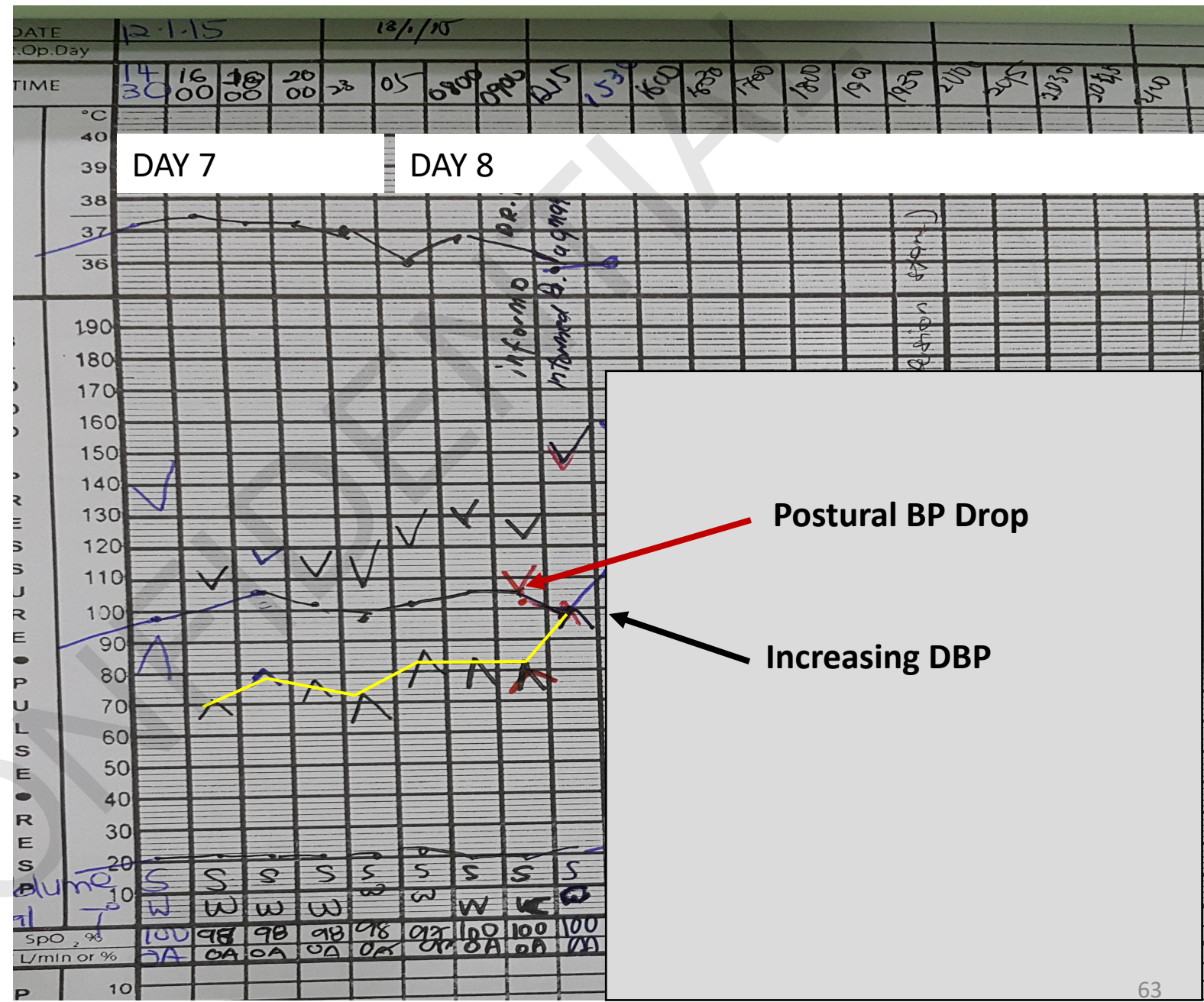
Pulse : 98 bpm (weak to moderate pulse volume) : CRT < 2s

SPO₂ : **100% RA**

Lungs : Reduced air entry right basal

PA : Soft with mild tenderness @ epigastrium

WHAT DO YOU THINK IS HAPPENING NOW ?



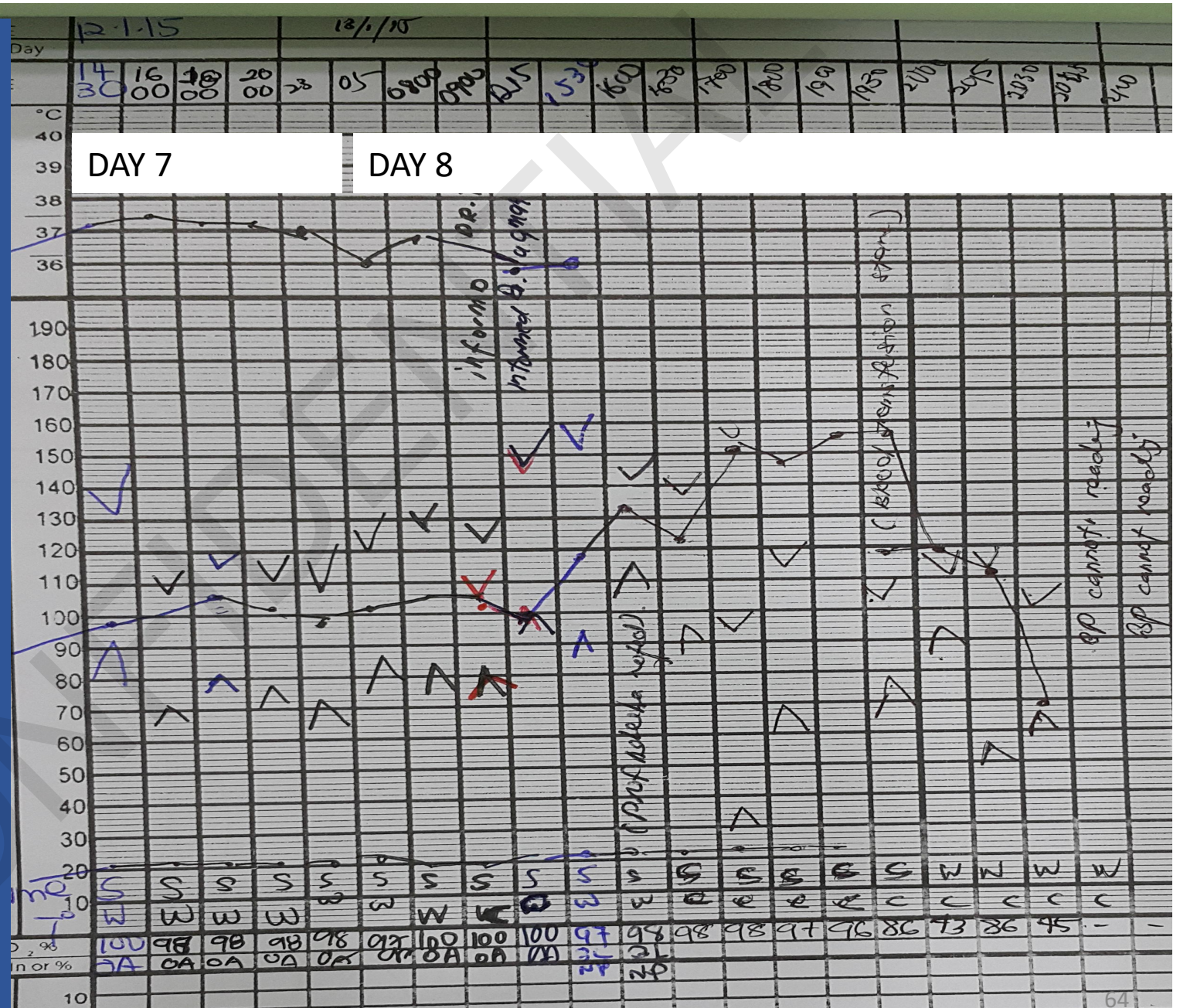
THE STORY CONTINUES ...

Eventually failed resuscitation attempt.

What can we learn from this dengue patient?

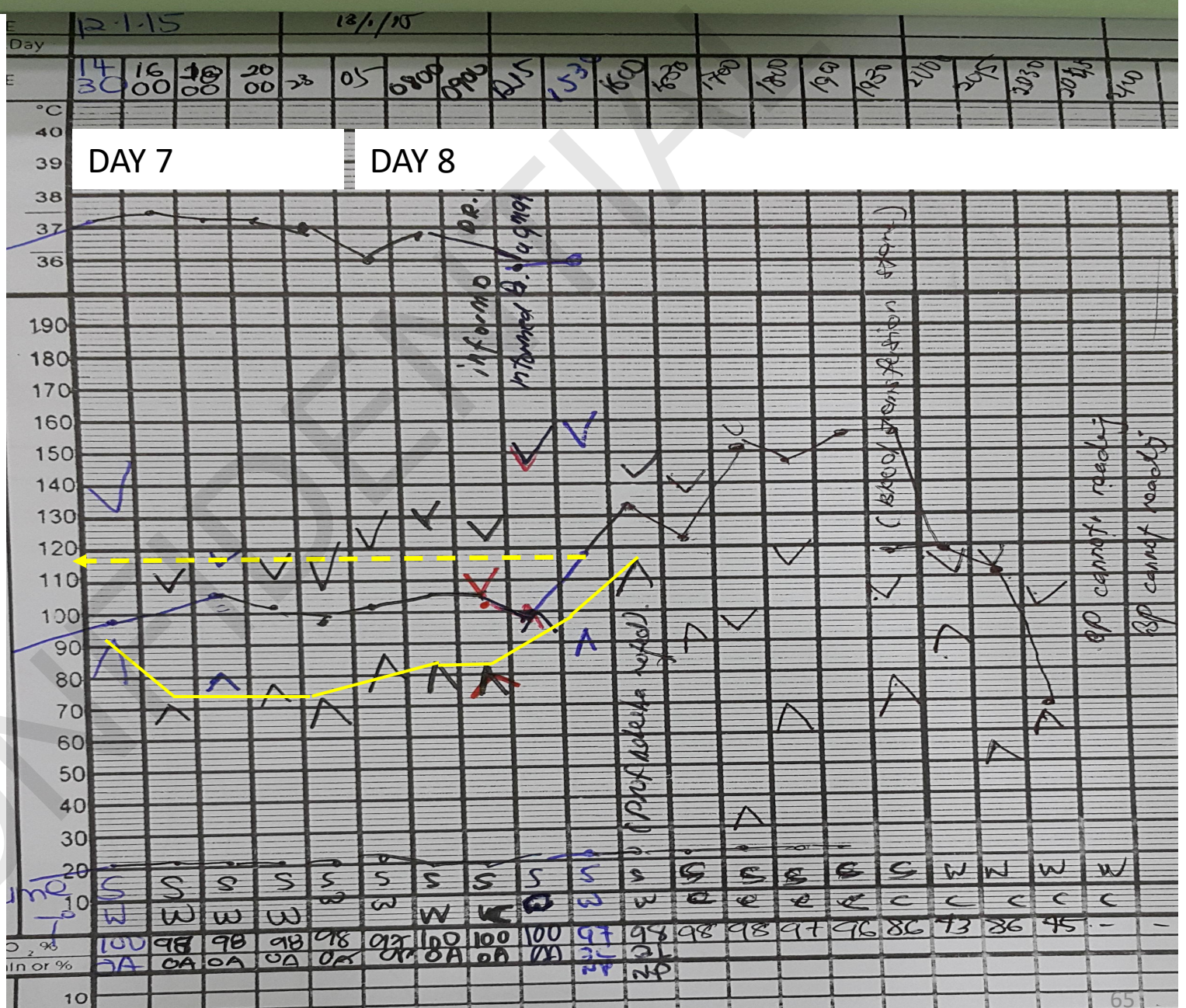
Poor outcome if they are NOT ADEQUATELY Resuscitated in the first 24 hours of admission.

WHAT We Can Learn From The Effects Of Dengue When A Patient Is Intravascularly Depleted.

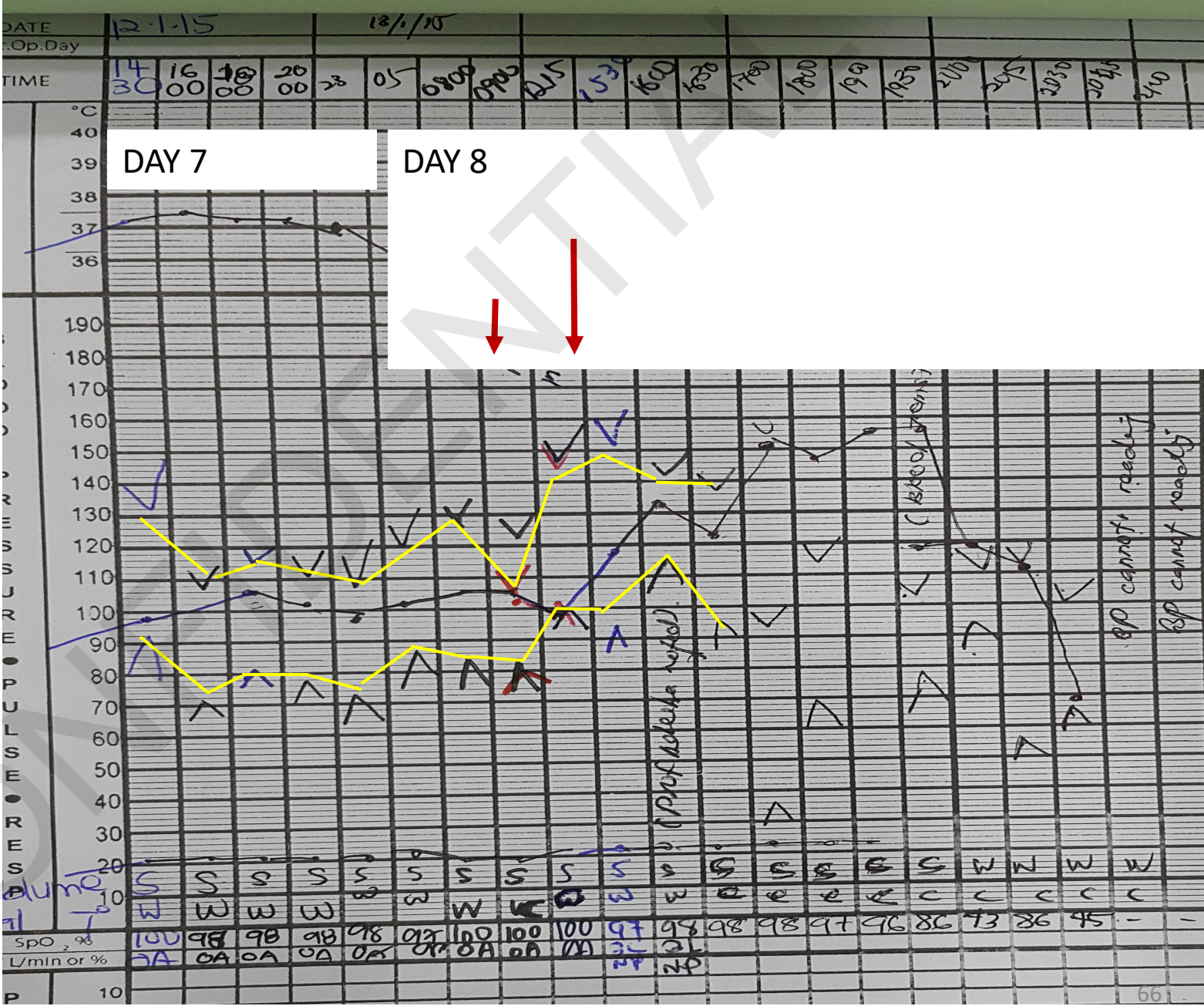


**INCREASING
DIASTOLIC pressure
(Peripheral vasoconstriction)**

**Increasing systolic pressure
during the phase of compensated
shock**



NARROWING PULSE PRESSURE



What Can We Learn From Mr. SD's Case ?

1. ED and Clinic:

DO NOT BE TRICKED into thinking that just because the patient is able to walk, he must be “well” or “stable”!

Listen to the STORY – Poor oral intake, not able to work.....For past 6 days, regardless of blood results

2. During ward admission and when taking over the management:

REVIEW The History and Previous Management Given. Was it Adequate ? Catch Up IV Fluids?

Evaluate every Hematocrit result. Trace blood investigation results and interpret results in REAL-TIME

RECOGNISE the Problem In Real-Time. Assessment to be done in Real-Time. Then - identifying the Problem List.

COMMUNICATION between colleagues – ward doctors and on-call doctors.

3. **Management during the first 12 to 24 hours of admission is critical in determining the outcome**



Case Discussion 3

NJ – 54 yr old female @ KK 1

- **16 Feb** – onset of fever

17 Feb – Walked into KK 1,
Fever for 2 days with decreased oral intake
Associated with myalgia
No vomiting, no abdominal pain, no warning signs.

Phy exam: Temp 39.2°C, BP 137/62, HR – 108,
CVS and Lungs – normal

Management: Paracetamol 1 gm QID, CBC next morning

18 Feb – same clinic KK 1, day 3 of fever

Dizziness, headache, decreased oral intake

No URTI symptoms

No vomiting, No diarrhea, No abd pain, No chest pain, No myalgia/arthralgia

Phy exam: Temp 37.9°C, BP 134/70, PR 95, Good volume pulse, CRT <2 sec

CBC- WBC 3.1, Hb 13.7, HCT 39.6, Platelet 132

Management: Paracetamol – 1 g qid,
Notify as dengue,
Dengue alert card given,
Advice patient to seek medical help if worsening symptoms.
Repeat CBC next morning

19 Feb @ KK 2 – Day 4, late afternoon

Less oral intake, nausea

No vomiting/diarrhoea, No abd pain, No URTI, No bleeding.

Pink, good hydration, warm peripheries, CRT < 2 sec, Good pulse volume

Lungs, CVS, abdomen – normal

Temp 36.5°C, BP 130/90, PR 92

TWC – 2.9, Hb 13.2, HCT 39.8, Platelet 88

Diagnosis: DF, Day 4, in defervescence, No warning signs

Encourage fluid intake

Advice – go to nearest hospital if warning signs

Repeat CBC next day.

Time line

| Day 1 16 Feb | Day 2 17 Feb | Day 3 18 Feb | Day 4 19 Feb |
|-----------------|---|--|--|
| Fever onset | Fever, Myalgia Headache Decr oral intake No D.V.AP, WS | Dizziness, Headache Decr oral intake. No D.V.AP, WS | Less oral intake, nausea No D, V, AP, WS |
| | Temp 39.2°C | Temp 37.9°C | Temp 36.5°C |
| | Good perfusion | Good perfusion | Good perfusion |
| | | WBC 3.1, HCT 39.6 | WBC 2.9, HCT 39.8 |
| | | Hb 13.7, Platelet 132 | Hb 13.2, Platelet 88 |
| | Encourage oral fluid | Encourage oral fluid | Encourage oral fluid |

20 Feb – KK 3 – Day 5, 9.45 am

Brought by daughter

Severe headache, dizziness, has not taken anything orally for past 2 days.

Lethargic looking, severely dehydrated, coated tongue, dry lips, no petechiae

Temp – 36.7°C, BP 118/60, PR 120, small pulse volume, CRT > 2 sec

Lungs clear, abdomen – soft

CBC: WBC 2.6, HCT 46.2, Hb 15.2, Platelet 56

Dengue with dehydration and shock

Management: IV 500 ml NS, referred to nearest hospital.

Timeline

| Day 1 16 Feb | Day 2 17 Feb | Day 3 18 Feb | Day 4 19 Feb | Day 5 20 Feb |
|-----------------|--|--|---|---|
| Fever onset | Fever, Myalgia Headache Decr oral intake No D,V,AP, WS | Dizziness, Headache Decr oral intake No D,V,AP, WS | Less oral intake, nausea No D,V,AP, WS | Dizziness Not eaten anything for past 2 days. |
| | Temp 39.2°C | Temp 37.9°C | Temp 36.5°C | Temp 36.7°C |
| | Good perfusion | Good perfusion | Good perfusion | Poor perfusion |
| | | WBC 3.1, HCT 39.6 Hb 13.7, | WBC 2.9, HCT 39.8 Hb 13.2, | WBC 2.6, HCT 46.2, Hb 15.2, |
| | Encourage oral fluid | Platelet 132 Encourage oral fluid | Platelet 88 Encourage oral fluid | Platelet 56 Dengue Shock |

Why does this patient who had daily follow-up and blood tests from early febrile phase and who had **no warning signs at all**, yet developed shock?

Discuss how this outcome can be avoided

Lessons Learnt

- 1) Draw the timelines – understand cumulative effects of illness, plot trajectory **versus** seeing patient in “**silo**”
- 2) Reduced oral intake vs persistent vomiting
Three golden questions :
 1. **Fluid intake**
 2. **Urine output**
 3. **Activities**
- 3) After 72 hours, esp when temperature is normal, anyone with reduced oral intake should be admitted for intravenous rehydration



Thank You

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End of Training Discussion

Now that you have completed today's training, in your groups of 5-10 people, please list down the following:

- What are the measures that you think you would be able to practice in your workplace to improve management of dengue patients at the frontline?
- We will now go round the room and get each group to present 1 suggestion at a time

List of actionable things that you would like to do:

- From this list, rank the top 3 items (you have 3 points which you can allocate to 1 or 2 or 3 items)
 - 3 points for 1 item OR
 - 2 points for 1 item and 1 point another item
 - 1 point each for 3 items

For the top 3 items

- Let's discuss the barriers of carrying this out. Are there any?
- How do we overcome these barriers?

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