สถาบันสุขภาพเด็กแห่งชาติมหาราชินี
QUEEN SIRIKIT NATIONAL INSTITUTE OF CHILD HEALTH
กรมการแพทย์ กระทรวงสาธารณสุข

World Health Organization

Mahidol University
Wisdom of the Land

Webinar Series on Dengue Outbreak Control in South-East Asia Region

Session 6: Essentials in Dengue Critical Care – Follow up with Case Studies

Case Studies & Discussion - 1

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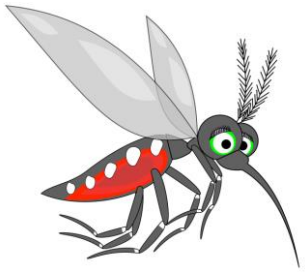
Ministry of Public Health, Bangkok, Thailand



Case Demonstration #1

A 71 yr-old Female with Fever for 1 day

A 71 yr-old Thai Female with Fever for 1 day (25 JUL : 16:22)

PI : **1 day PTA :** The patient had fever (T 38^{0}C), muscle pain (PS ≈ 3), running nose, sore throat and dry cough.

The patient also complained of nausea and fatigue.

The patient denied the symptoms of vomiting, abdominal pain and rash.

The patient took paracetamol 500 mg at 12:30.

PH : A lot of neighbors around her house had dengue.

A 71 yr-old Thai Female with Fever for 1 day (25 JUL : 16:22)

PE : The patient had good consciousness, not pale, no jaundice, dry lips, dry oral mucosa

- **BW** 63.7 kg, **Ht** 163 cm, **BMI** 24.0 kg/m^2
- **Vital signs :** Temp 37.7^{o}C, BP 135/74 mmHg, PR 94/min, RR 16/min, SaO2 98%
- **HEENT :** mild injected pharynx
- **Heart :** normal S1 and S2, no murmur
- **Lungs :** normal breath sound, no adventitious sound
- **Abdomen :** soft, not tender, liver and spleen were not palpable.
- **Extremities :** no pitting edema, no rash
- **Neurological exam :** grossly intact, no stiffness of neck

Laboratory Investigations (25 JUL : 18:12)

- **COVID-19 Ag :** negative
- **Nasal swab for Influenza A/B :** negative

- **CBC :**
  - Hb 14.5 g/dl, HCT 43.0% (19.4%)
  - WBC 6,400 cells/mm^3 (Neu 86%, Lym 6%, Mo 8%)
  - PLT 122,000/mm^3
- **Random BS :** 98 mg/dl
- **BUN/Cr :** 15/0.72 mg/dl, **eGFR** 84.5 ml/min/1.73m^2

- **Na** 138 mmol/l, **K** 4.6 mmol/l, **Cl** 102 mmol/l, **HCO3** 29 mmol/l
- **ALB** 4.1 g/dl, **AST** 36 U/L, **ALT** 41 U/l
- **Urinalysis :**
  - Yellow/Clear, Sp. gr 1.025, ketone 2+
  - pH 6.0, protein neg, glucose neg
  - WBC 1-2 cells/HPF, RBC 2-3 cells/HPF
  - Epi 0-1 cells/HPF
- **Dengue NS-1 Ag :** Negative
- **Dengue IgM :** Negative
- **Dengue IgG :** Weakly positive

Diagnostic Criteria of Probable Dengue

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WHO 1997, 2011

- Acute febrile illness with ≥2 of the following signs and symptoms :

✓ Headache

✓ Retro-orbital pain

✓ Myalgia

✓ Arthralgia/bone pain

✓ Rash

✓ Hemorrhagic manifestations : petechiae, epistaxis, gum bleeding, hematemesis, melena, positive tourniquet test

✓ Leukopenia (WBC ≤5,000 cells/mm^3)

✓ Hemoconcentration 5-10%

✓ PLT ≤150,000/mm^3

WHO 2009

- Live in /travel to endemic area
- Fever ≥2 of the following criteria
  - ✓ Nausea/vomiting
  - ✓ Rash
  - ✓ Aches and pains
  - ✓ TT positive
  - ✓ Leukopenia
  - ✓ Any warning signs
    - ✓ Abdominal pain or tenderness
    - ✓ Persistent vomiting
    - ✓ Clinical fluid accumulation
    - ✓ Mucosal bleeding
    - ✓ Lethargy, restlessness
    - ✓ Liver enlarge >2 cm
    - ✓ HCT rising with decrease PLT count

https://apps.who.int/iris/handle/10665/204894
https://www.who.int/publications/i/item/9789241547871

Confirmation Tests for Dengue

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Virological diagnosis

RT-PCR

- Sensitivity 98-99%
- Specificity 100%

Dengue NS-1

- ELISA
  - Sensitivity 60-75%
  - Specificity 71-95%
- Rapid strip tests
  - Sensitivity 40-81%
  - Specificity 76-97%

Serological diagnosis

Anti-den Ab (IgM/IgG)

- ELISA
  - Sensitivity 96-99%
  - Specificity 78-91%
- Rapid strip tests
  - Sensitivity 6-96%
  - Specificity 69-92%

Thanachartwet V. Clinical management of severe dengue in adults. 2017.pp 35-46.
Hunsperger EA *et a*l. PloS Negl Trop Dis. 2014;8:e3171.

Clinical Symptoms & Signs of Adults with Dengue

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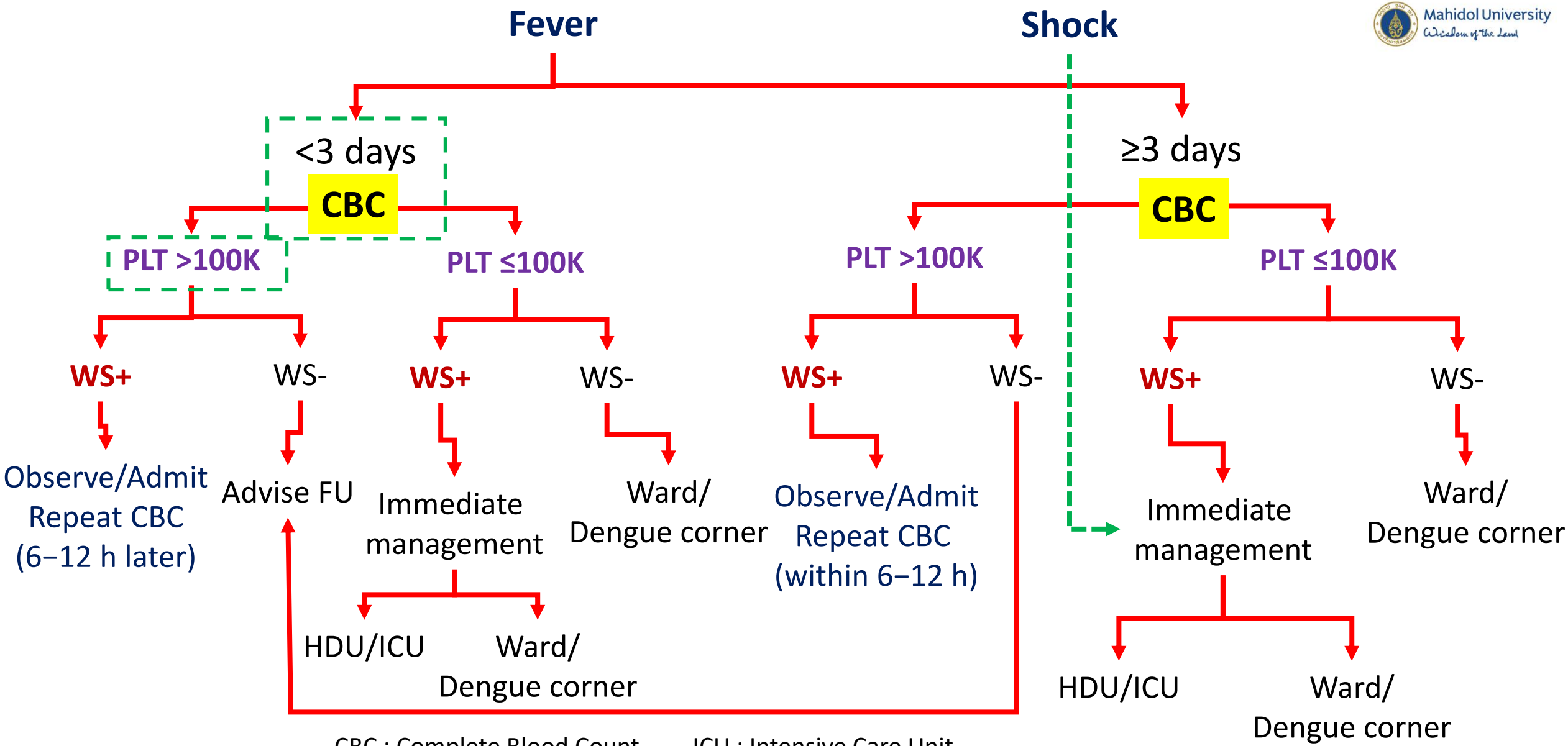
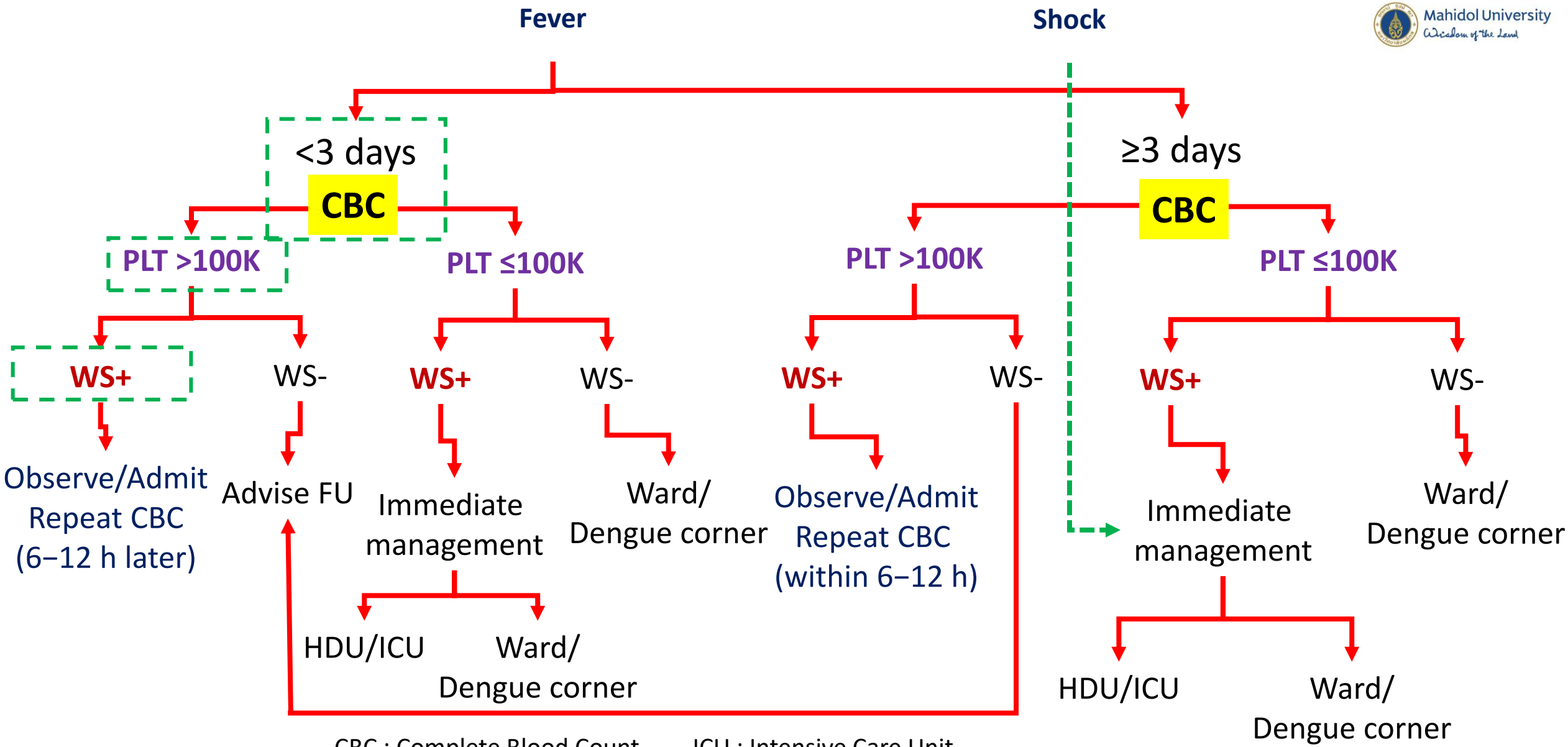
	Tantawichien T	Taylor WR et al.	Thomas L et al.	Thanachartwet V et al.
Country	Thailand	Vietnam	France	Thailand
Year	1997-1998	2008	2005-2010	2013-2015
Age (yr)	26.9	23.5	35.0	24.0
Fever (day)	5.2	5.0	3.0	4.0
Headache	38%	93%	84%	87%
Retro-orbital pain	-	40%	-	64%
Myalgia	26%	77%	75%	91%
Arthralgia	-	-	-	33%
Vomiting	47%	46%	-	16%
Abdominal pain	24%	28%	-	42%
Diarrhea	25%	34%	24%	32%
Cough	-	45%	21%	39%
Rash	28%	52%	-	44%
Hepatomegaly	21%	4%	-	23%



CBC : Complete Blood Count
FU : Follow Up
HDU : High Dependency Unit
ICU : Intensive Care Unit
PLT : Platelets
WS : Warning Signs

Warning Signs for Progression to Severe Disease in Dengue

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



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HDU : High Dependency Unit
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PLT : Platelets
WS : Warning Signs

Indications for Starting IV Fluid

1. Patients with persistent vomiting
2. Patients with signs of moderate to severe dehydration
3. Patients having plasma leakage in the critical phase with HCT rising ≥10%* or can not eat or drink ORS
4. Patients with DSS

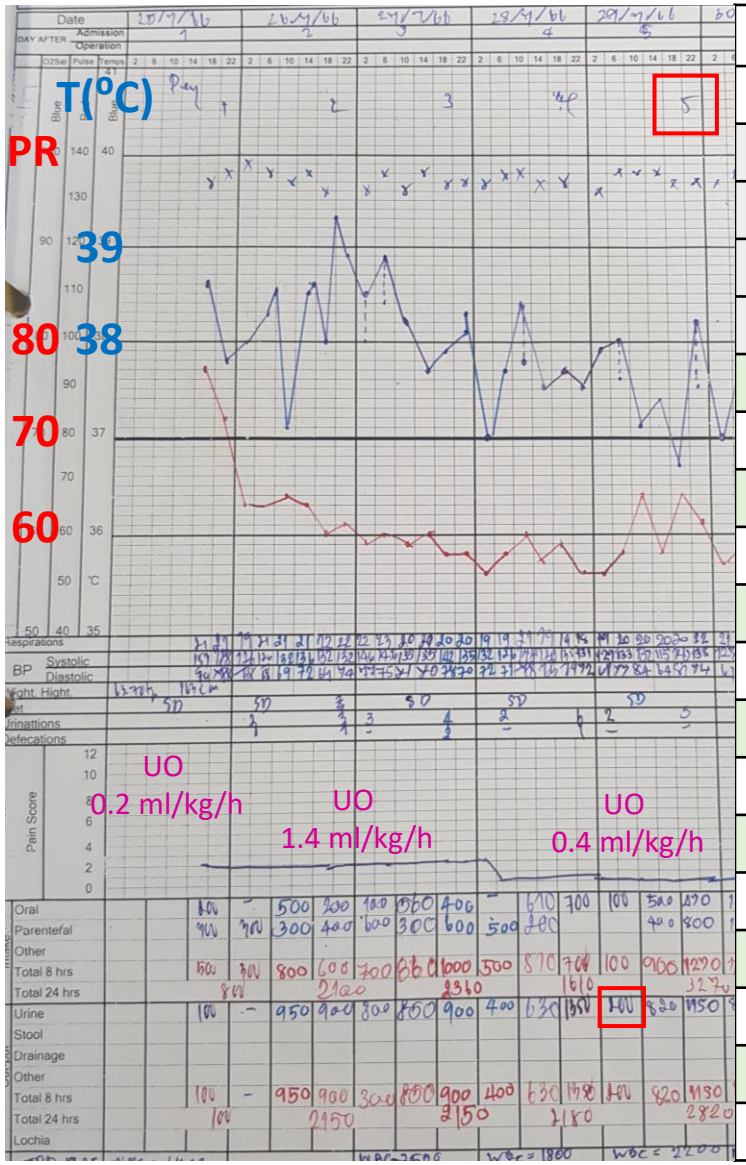
Note *Patients with bleeding may not have HCT rising.

Rates of IV Fluid Infusion in Non-shock Dengue (Adults)

Degree of HCT rising:

- If HCT rising <20%, starting IV fluid less than maintenance rate (40-60 ml/h)
- If HCT rising ≥20%, starting IV fluid at maintenance rate (80–100 ml/h)
- If HCT rising >25%, starting IV fluid more than maintenance rate (100–120 ml/h)

Note: Doses of IV fluid indicating above include oral fluid intake.



Hospitalization	Day 1 (18:12)	Day 3 (07:55)	Day 4 (06:26)	Day 5 (06:58)	Day 5 (18:17)
Date	25/7	27/7	28/7	29/7	29/7
T (°C)	38.6	38.4	38.4	38.0	36.7
BP (mmHg)	153/79	135/71	126/71	133/77	143/81
PR (/min)	94	60	56	56	68
RR (/min)	21	23	21	20	20
Hct	43 (19.4%)	41	41	46 (27.7%)	46
WBC	6,400	2,500	1,800	2,200	-
Band/PMN	0/86	0/62	0/37	0/30	-
LYMP/ALYMP	6/0	27/0/M 10	51/1/M 9	33/25/M 10	-
Plt	122,000	87,000	71,000	77,000	-
BUN/Cr	15/0.72	-	-	-	-
Na	138	-	-	-	-
K	4.6	-	-	-	-
HCO_3	29	-	-	-	-
Albumin	4.1	-	-	-	-
AST/ALT	36/41	-	-	-	-
U. spec	1.025	-	-	-	-
DTX	98	-	-	-	-
5%DNSS	40 ml/h	60 ml/h	60 ml/h	80 ml/h	100 ml/h

Rates of IV Fluid Infusion in Non-shock Dengue (Adults)

Degree of HCT rising:

- If HCT rising <20%, starting IV fluid less than maintenance rate (40-60 ml/h)
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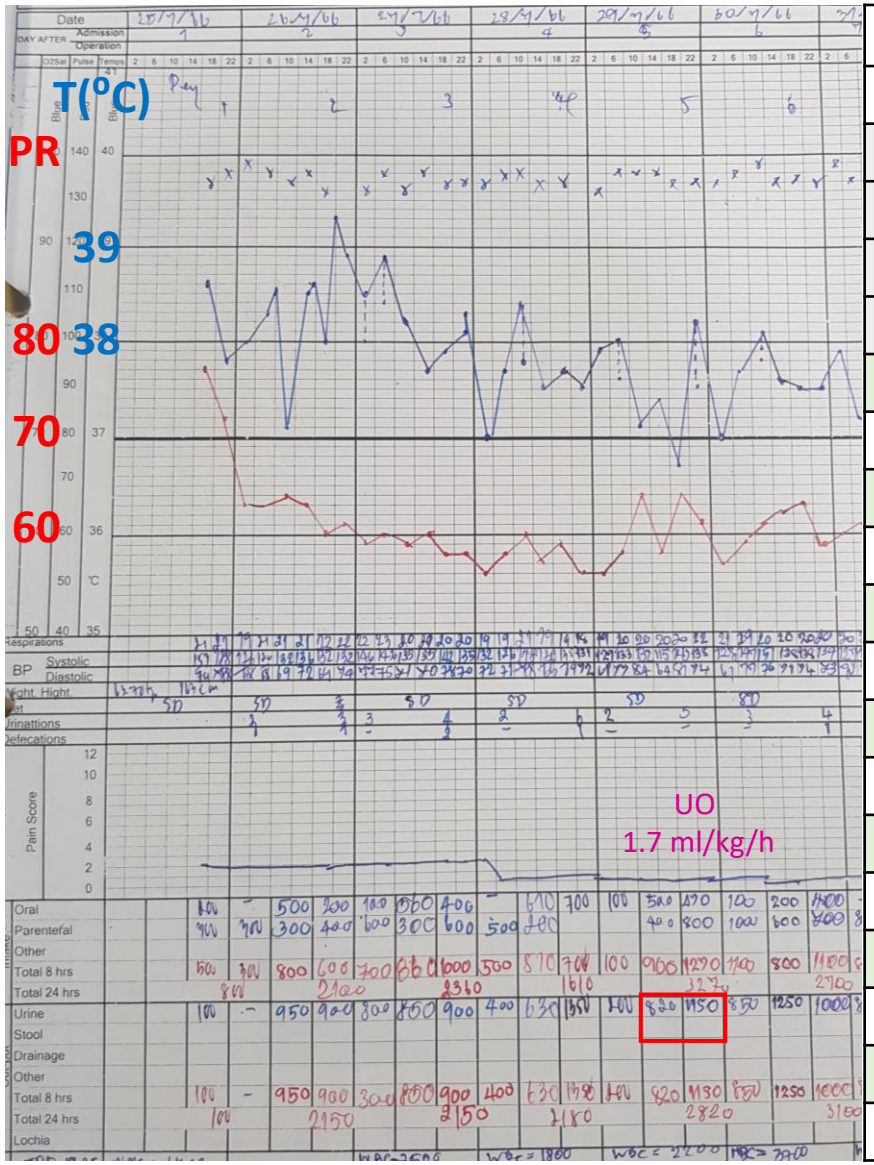
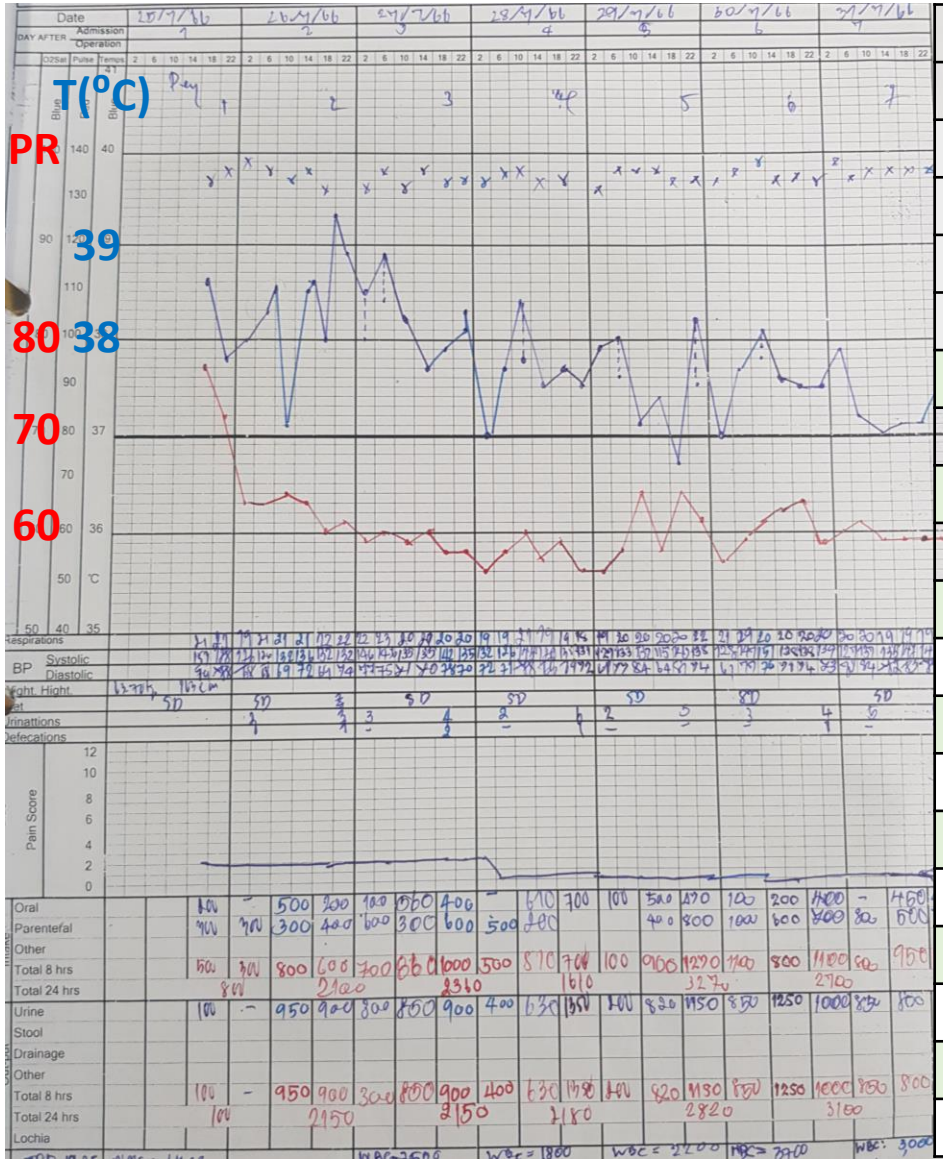
Note: Doses of IV fluid indicating above include oral fluid intake.

Rash/Itching



Hospitalization	Day 1 (18:12)	Day 5 (06:58)	Day 5 (18:17)	Day 6 (6:40)	Day 6 (18:53)
Date	25/7	29/7	29/7	30/7	30/7
T (°C)	38.6	38.0	36.7	37.7	37.5
BP (mmHg)	153/79	133/77	143/81	147/77	138/74
PR (/min)	94	56	68	58	66
RR (/min)	21	20	20	19	20
Hct	43	46	46	41	41
WBC	6,400	2,200	-	3,700	-
Band/PMN	0/86	0/30	-	0/24	-
LYMP/ALYMP	6/0	33/25/M 10	-	26/41/M 8	-
Plt	122,000	77,000	-	60,000	-
BUN/Cr	15/0.72	-	-	-	-
Na	138	-	-	-	-
K	4.6	-	-	-	-
HCO_3	29	-	-	-	-
Albumin	4.1	-	-	-	-
AST/ALT	36/41	-	-	-	-
U. spec	1.025	-	-	-	-
DTX	98	-	-	-	-
5%DNSS	40 ml/h	80 ml/h	100 ml/h	80 ml/h	60 ml/h

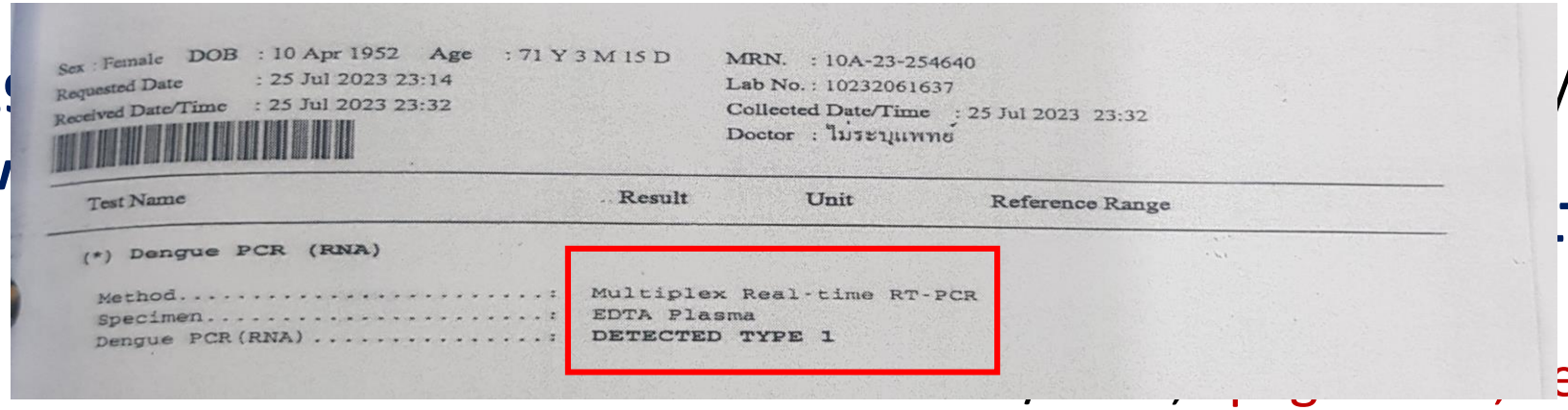
Rash/Itching



Hospitalization	Day 1 (18:12)	Day 5 (06:58)	Day 7 (07:11)	Day 8 (06:59)	Day 9 (07:01)
Date	25/7	29/7	31/7	1/8	2/8
T (°C)	38.6	38.0	37.2	36.7	37.4
BP (mmHg)	153/79	133/77	137/84	141/82	132/70
PR (/min)	94	56	62	60	60
RR (/min)	21	20	19	19	20
Hct	43	46	42	42	42
WBC	6,400	2,200	3,000	2,700	3,400
Band/PMN	0/86	0/30	0/26	0/40	0/54
LYMP/ALYMP	6/0	33/25/M 10	39/26/M 8	35/15/M 8	27/2/M 13
Plt	122,000	77,000	55,000	69,000	104,000
BUN/Cr	15/0.72	-	-	-	-
Na	138	-	-	138	-
K	4.6	-	-	3.8	-
HCO_3	29	-	-	30	-
Albumin	4.1	-	-	-	-
AST/ALT	36/41	-	-	-/82	-
U. spec	1.025	-	-	-	-
DTX	98	-	-	-	-
5%DNSS	40 ml/h	80 ml/h	Taper off IV	Off IV	Discharge

Laboratory Investigations (25 JUL : 18:12)

- **COVID-19** /l, **Cl** 102
- **Nasal sw** negative **T** 41 U/l

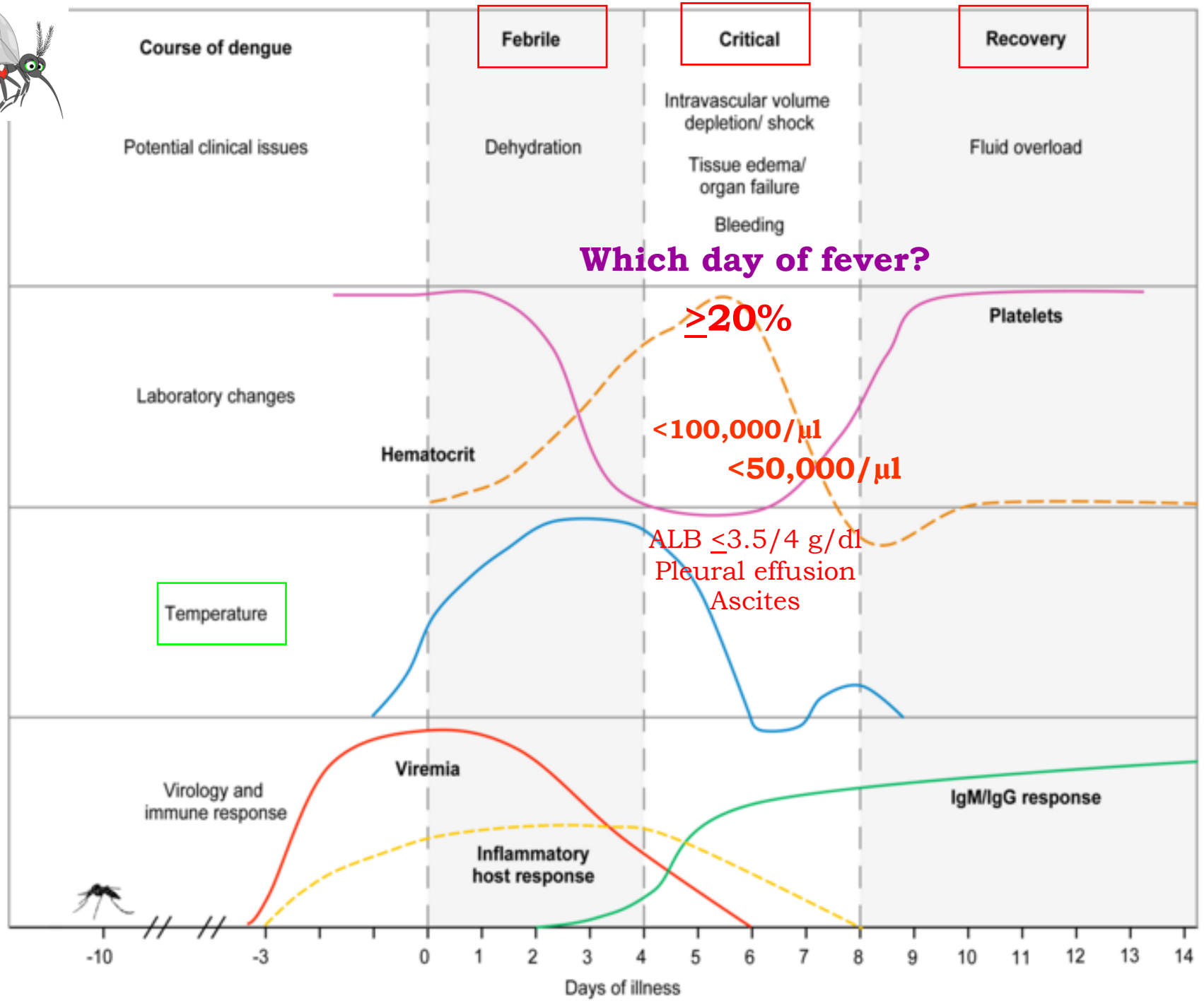


Sex : Female DOB : 10 Apr 1952 Age : 71 Y 3 M 15 D
Requested Date : 25 Jul 2023 23:14
Received Date/Time : 25 Jul 2023 23:32
MRN. : 10A-23-254640
Lab No. : 10232061637
Collected Date/Time : 25 Jul 2023 23:32
Doctor : ไม่ระบุแพทย์

Test Name	Result	Unit	Reference Range
(*) Dengue PCR (RNA)			
Method	Multiplex Real-time RT-PCR		
Specimen	EDTA Plasma		
Dengue PCR (RNA)	DETECTED TYPE 1		

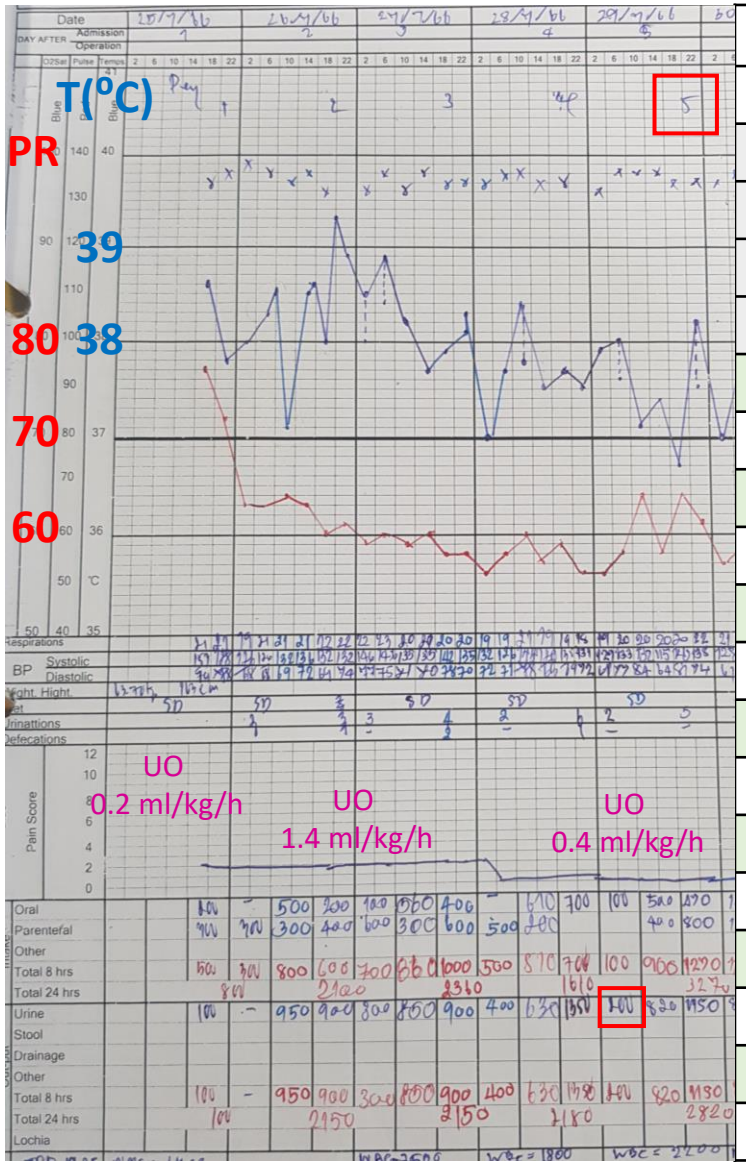
- **CBC :**
  - Hb 14.5 g/dl, HCT 43.0%
  - WBC 6,400 cells/mm^3 (Neu 86%, Lym 6%, Mo 8%)
  - PLT 122,000/mm^3
- **Random BS :** 98 mg/dl
- **BUN/Cr :** 15/0.72 mg/dl, **eGFR** 84.5 ml/min/1.73m^2

- **etone 2+**
  - pH 6.0, protein neg, glucose neg
  - WBC 1-2 cells/HPF, RBC 2-3 cells/HPF
  - Epi 0-1 cells/HPF
- **Dengue NS-1 Ag :** Negative
- **Dengue IgM :** Negative
- **Dengue IgG :** Weakly positive


Course of dengue
Febrile
Critical
Recovery
Potential clinical issues
Dehydration
Intravascular volume depletion/ shock
Tissue edema/ organ failure
Bleeding
Fluid overload
Which day of fever?
≥20%
Laboratory changes
Hematocrit
Platelets
<100,000/µl
<50,000/µl
ALB ≤3.5/4 g/dl
Pleural effusion
Ascites
Temperature
Virology and immune response
Viremia
Inflammatory host response
IgM/IgG response
-10
-3
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Days of illness

Which day of fever is the critical phase?

Rash/Itching



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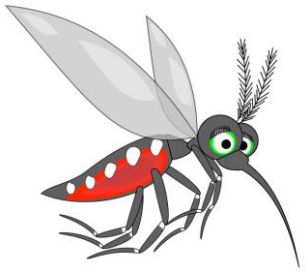
Hct	43 (19.4%)	41	41	46 (27.7%)	46
WBC	6,400	2,500	1,800	2,200	-
Band/PMN	0/86	0/62	0/37	0/30	-
LYMP/ALYMP	6/0	27/0/M 10	51/1/M 9	33/25/M 10	-
Plt	122,000	87,000	71,000	77,000	-
BUN/Cr	15/0.72	-	-	-	-
Na	138	-	-	-	-
K	4.6	-	-	-	-
HCO_3	29	-	-	-	-
Albumin	4.1	-	-	-	-
AST/ALT	36/41	-	-	-	-
U. spec	1.025	-	-	-	-
DTX	98	-	-	-	-
5%DNSS	40 ml/h	60 ml/h	60 ml/h	80 ml/h	100 ml/h



Case Demonstration #2

A 32 yr-old Female with Vomiting Blood for 4 hours

A 32 yr-old Thai Female with Vomiting Blood for 4 h

Mahidol University
Wisdom of the Land

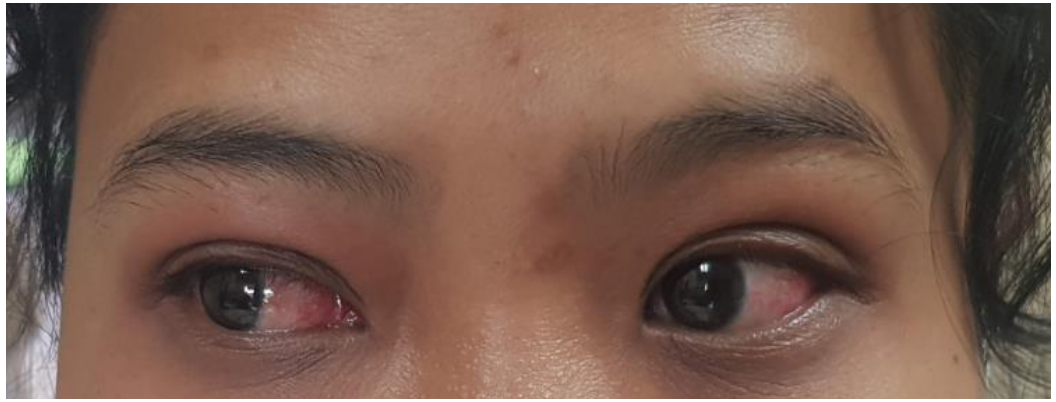
PI : **3-4 days PTA :** The patient had severe muscle pain and retro-orbital pain. The patient took Ibuprofen 3 times/day for pain relief.

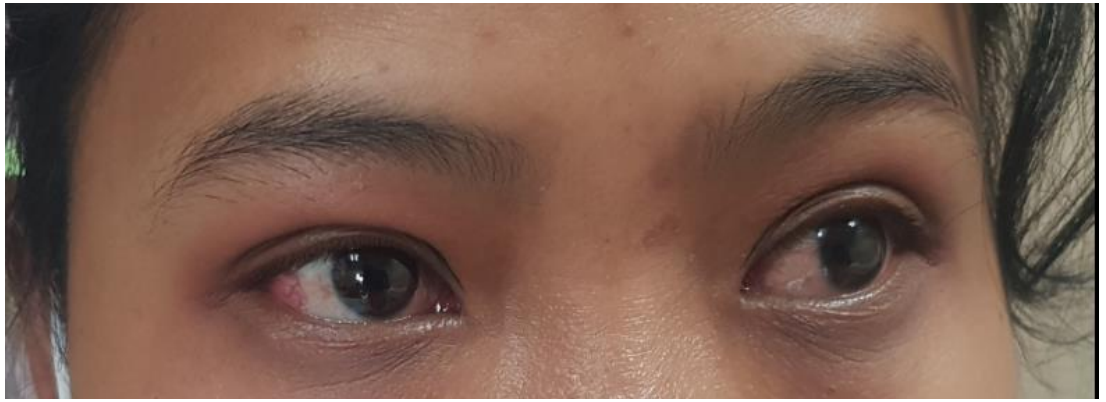
4 h PTA : The patient had RUQ pain and then started vomiting fresh blood (≈ 50 ml), but no melena or fresh blood in stool. The patient felt fatigue.

PH : The patient had no underlying disease.

PE : The patient had good consciousness, mild pale, no jaundice, conjunctival injection BE

- **BW** 71.3 kg, **Ht** 162 cm, **BMI** 27.2 kg/m^2
- **Vital signs :** Temp 36.0^{o}C, BP 122/71 mmHg, PR 52/min (weak), RR 16/min, SaO2 98%
- **Heart :** normal S1 and S2, no murmur
- **Lungs :** normal breath sound, no adventitious sound
- **Abdomen :** soft, not tender, liver and spleen were not palpable.
- **Extremities :** no pitting edema, no rash, cold extremities, sweating
- **Neurological exam :** grossly intact, no stiffness of neck

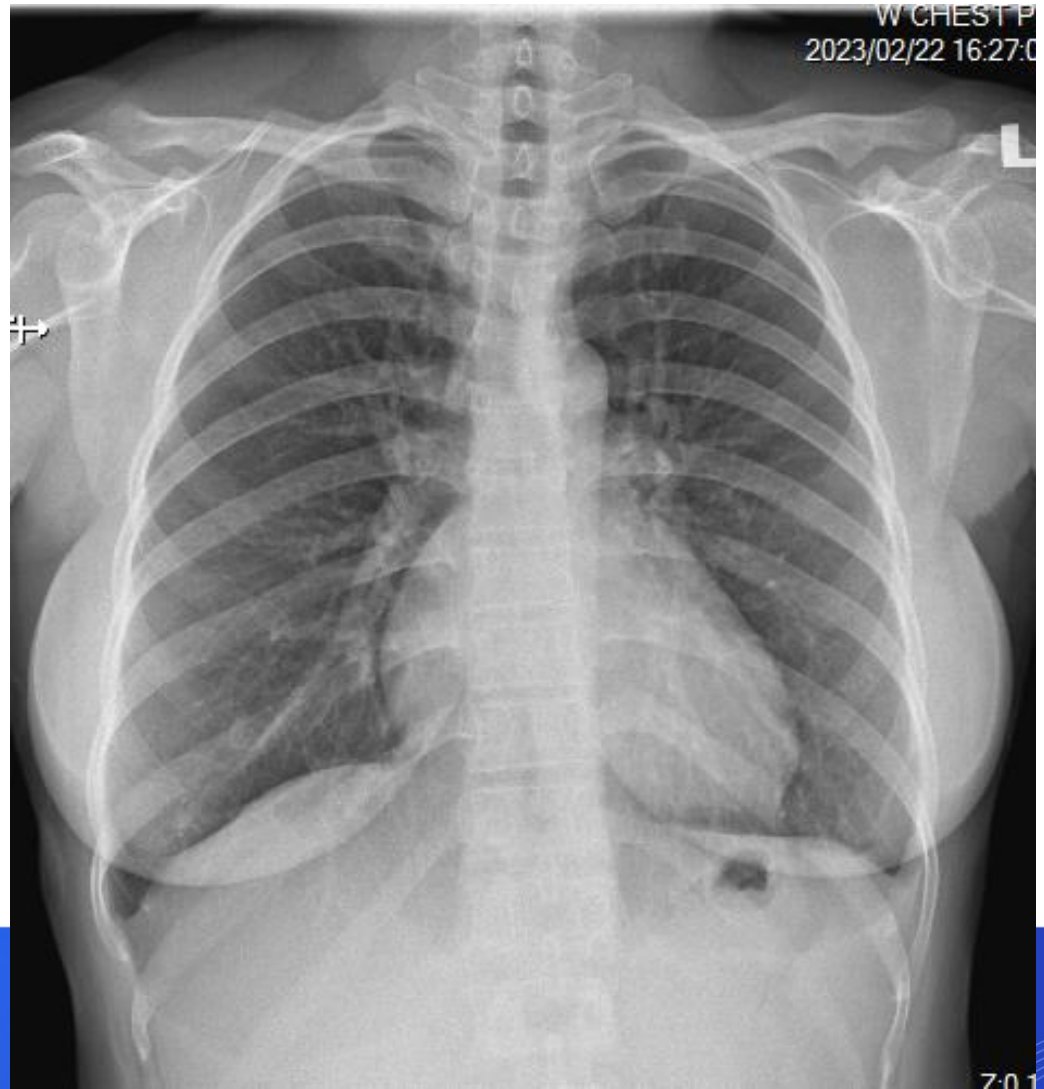


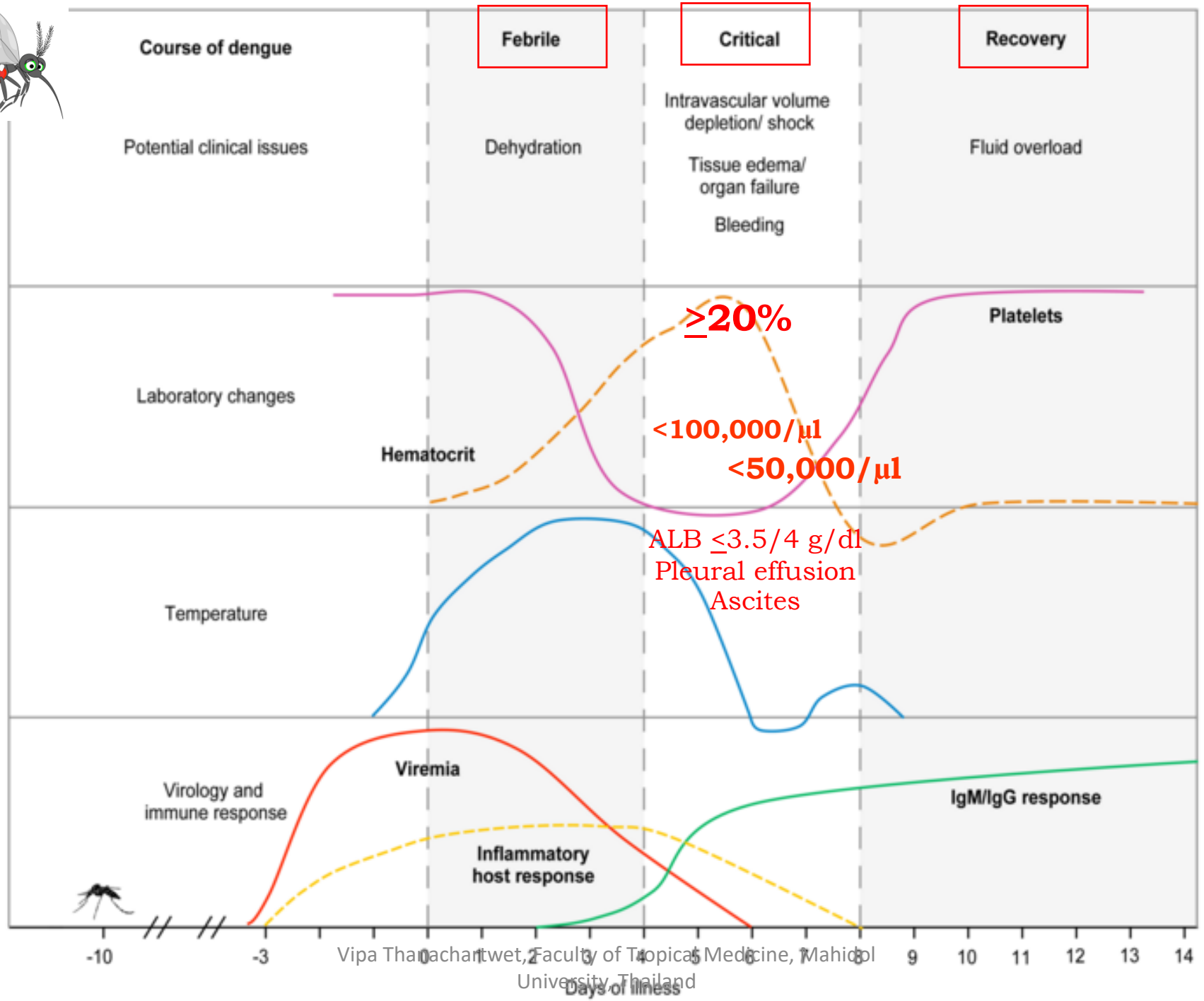


Laboratory Investigations (22 FEB : 16:30)

- **CBC :**
  - Hb 11.3 g/dl, HCT 33.9%
  - WBC 1,400 cells/mm^3 (Neu 59%, Lym 17%, Mo 5%, Eo 2% B 14%)
  - PLT 77,000/mm^3
  - PT 13.2 sec (9.6-12.5), INR 1.19
  - APTT 52.5 sec (21.6-31.2)
  - TT >120 sec (14.4-21.2)
- **Random BS :** 78 mg/dl
- **BUN/Cr :** 17.6/0.74 mg/dl, **eGFR** 107 ml/min/1.73m^2
- **Na** 142 mmol/l, **K** 3.6 mmol/l, **Cl** 110 mmol/l, **HCO3** 22 mmol/l, **Ca** 8.1 mg/dl
- **ALB** 3.9 g/dl, **AST** 116 U/L, **ALT** 85 U/l
- **Lactate** 0.8 mmol/l
- **Urinalysis :**
  - Yellow/Turbid, Sp. gr 1.033
  - pH 6.0, protein 2+, glucose neg
  - WBC 2-3 cells/HPF, RBC 30-50 cells/HPF
  - Epi 2-3 cells/HPF (UPCI = 0.643)
- **Dengue NS-1 Ag :** Positive
- **Dengue IgM/IgG :** Negative

CXR (PA) [22 FEB : 16:27]

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Fluid overload
Laboratory changes
≥20%
Platelets
Hematocrit
<100,000/µl
<50,000/µl
Temperature
ALB ≤3.5/4 g/dl
Pleural effusion
Ascites
Virology and immune response
Viremia
IgM/IgG response
Inflammatory host response
-10
-3
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Days of illness

WHO 2009

Dengue Shock Syndrome

What is the Cause of DSS???

- **Circulatory failure** :
  - ✓Rapid and weak pulse
  - ✓Cold clammy skin particularly cold extremities
  - ✓PP <20 mmHg (25% of adults with DSS)
- **Hypotension with tissue hypoperfusion** :
  - ✓Dizziness, fainting, syncope, decrease urine volume, restlessness, altered mental status
  - ✓Capillary refill time >2 second

https://www.dms.go.th/backend//Content/Content_FIle/Bandner_(Small)/Attach/25640302103903AM_CPG%20Adult%20Dengue.pdf
Short guideline for dengue case management 2023

Laboratory Investigations (22 FEB : 16:30)

- **CBC :**
  - Hb 11.3 g/dl, HCT 33.9%
  - WBC 1,400 cells/mm^3 (Neu 59%, Lym 17%, Mo 5%, Eo 2% B 14%)
  - PLT 77,000/mm^3
  - PT 13.2 sec (9.6-12.5), INR 1.19
  - APTT 52.5 sec (21.6-31.2)
  - TT >120 sec (14.4-21.2)
- **Random BS :** 78 mg/dl
- **BUN/Cr :** 17.6/0.74 mg/dl, **eGFR** 107 ml/min/1.73m^2
- **Na** 142 mmol/l, **K** 3.6 mmol/l, **Cl** 110 mmol/l, **HCO3** 22 mmol/l, **Ca** 8.1 mg/dl
- **ALB** 3.9 g/dl, **AST** 116 U/L, **ALT** 85 U/l
- **Lactate** 0.8 mmol/l
- **Urinalysis :**
  - Yellow/Turbid, Sp. gr 1.033
  - pH 6.0, protein 2+, glucose neg
  - WBC 2-3 cells/HPF, RBC 30-50 cells/HPF
  - Epi 2-3 cells/HPF (UPCI = 0.643)
- **Dengue NS-1 Ag :** Positive
- **Dengue IgM/IgG :** Negative

Indications for Blood Transfusion

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

Laboratory Investigations (22 FEB : 16:30)

- **Dengue NS1 Ag :** positive
- **Dengue IgM :** negative
- **Dengue IgG :** negative

- **COVID-19 Ag :** negative

Management (17:30)

- NPO
- 5%DNSS iv drip 60 ml/h
- LPRC 2 U iv drip in 3 h (hold 5%DNSS during blood Tx)
- 10% Calcium gluconate 10 ml iv slowly in 5 min after receiving first unit of LPRC
- Ondansetron 4 mg iv
- Pantoprazole 40 mg iv q 12 h
- Vit K 10 mg iv OD x 3 days
- Ceftriaxone 2 gm iv OD

Clinical symptoms/signs of DSS
(DHF grade III or compensated shock or PP ≤20 mmHg)

Immediately management: HCT+ blood glucose testing + oxygen therapy
5%D/NSS (DAR/DLR) 10 ml/kg (children) or 500 ml (adults) IV drip in 1–2 h

Improved

Reduce rate of IV fluid
- 7,5,3,1.5 ml/kg/h (children)
- 250,150,100,80,40 ml/h (adults)

Stop/decrease IV fluid after 24 h

Not improved

Not improved

Check A,B,C,S,F (Table 1) and correct

HCT increase

Dextran-40 in NSS IV drip in 1 h
- 10 ml/kg (children)
- 500 ml (adults)

HCT decrease >10 points or below baseline

PRC/FWB IV drip in 1–2 h
- 5-10 ml/kg (children)
- 1 unit (adults)

Not improved

- Check A,B,C,S,F (Table 1) and correct
- Plan for RRT

HCT decrease <10 points

Improved

HCT decrease

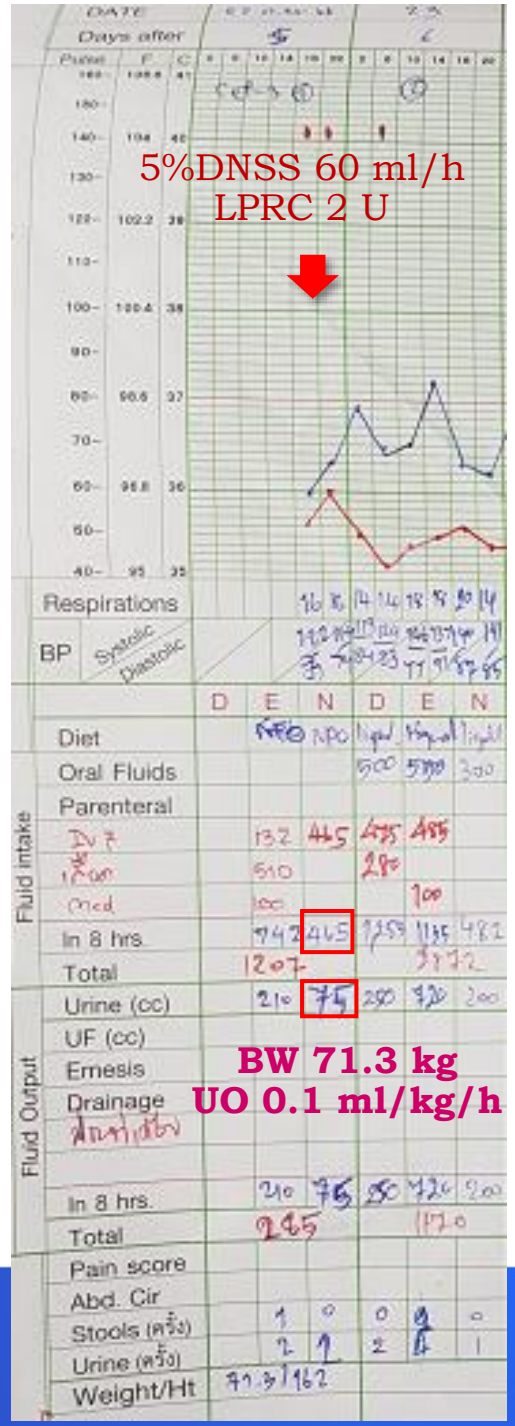
PRC/FWB IV drip in 1–2 h
- 5-10 ml/kg (children)
- 1 unit (adults)

Improved

Reduce rate of IV fluid
- 7,5,3,1.5 ml/kg/h (children)
- 250,150,100,80,40 ml/h (adults)

Stop/decrease IV fluid after 24 h

DAR : Acetate Ringer's Solution in dextrose
DHF : Dengue Hemorrhagic Fever
DLR : Lactate Ringer's Solution in dextrose
DSS : Dengue Shock Syndrome
FWB : Fresh Whole Blood
HCT : Hematocrit
IV : Intravenous
NSS : Normal Saline Solution
NS1 Ag : Nonstructural protein-1 Antigen
PRC : Packed Red Cells
PP : Pulse Pressure
RRT : Renal Replacement Therapy



Hospitalization	Day 1 (17:30)	Day 2 (05:43)
Date	22/2	23/2
T (°C)	36.0	36.5
BP (mmHg)	122/71	124/83
PR (/min)	52 (weak)	44 (weak)
RR (/min)	16	14
Hct	33.9	39.1 **(8.6%)**
WBC	1,400	1,700
Band/PMN	14/59	14/56
LYMP/ALYMP	17/3	20/9
Plt	77,000	33,000
PT/INR	13.2/1.19	12.7/1.23
APTT	52.5	32.7
TT	>120	22.2
BUN/Cr	17.6/0.74	17.2/0.63
Na	142	141
K	3.6	3.7
HCO_3	22	22
Albumin	3.9	3.7
AST/ALT	116/85	188/126
U. spec	1.033 (RBC 30-50)	1.045 (RBC 30-50)
Ca	8.1	8.1
DTX	78	133
5%DNSS	60 ml/h	80 ml/h

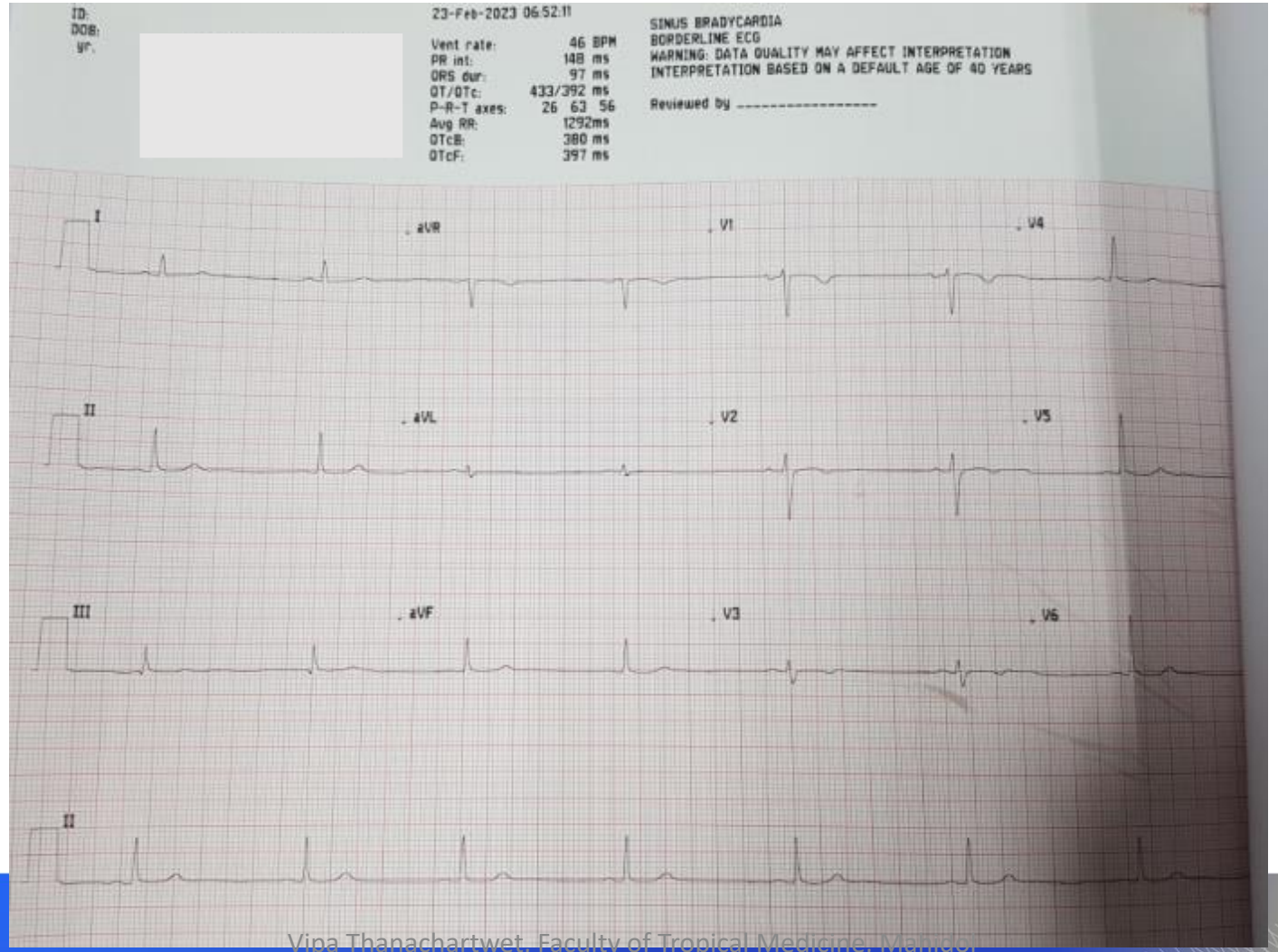
Management (23 Feb)

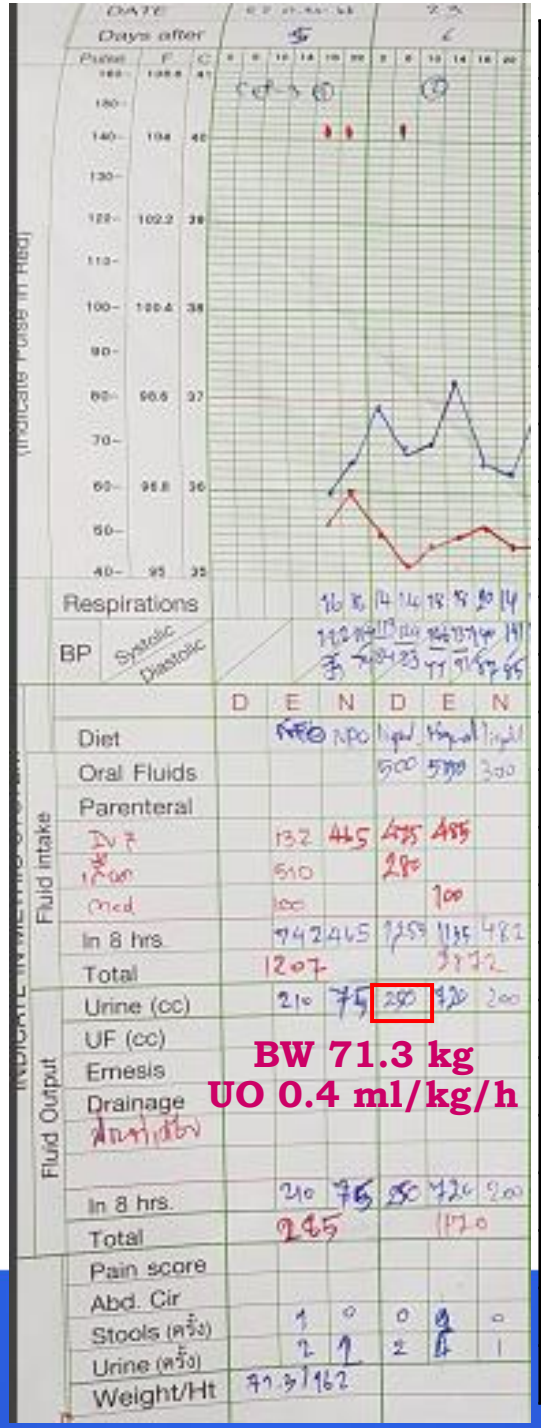
- 5%DNSS 80 ml/h
- LPRC 1 U iv drip in 3 h
- 10% Calcium gluconate 10 ml iv dilute slowly

No N/V, no abdominal pain

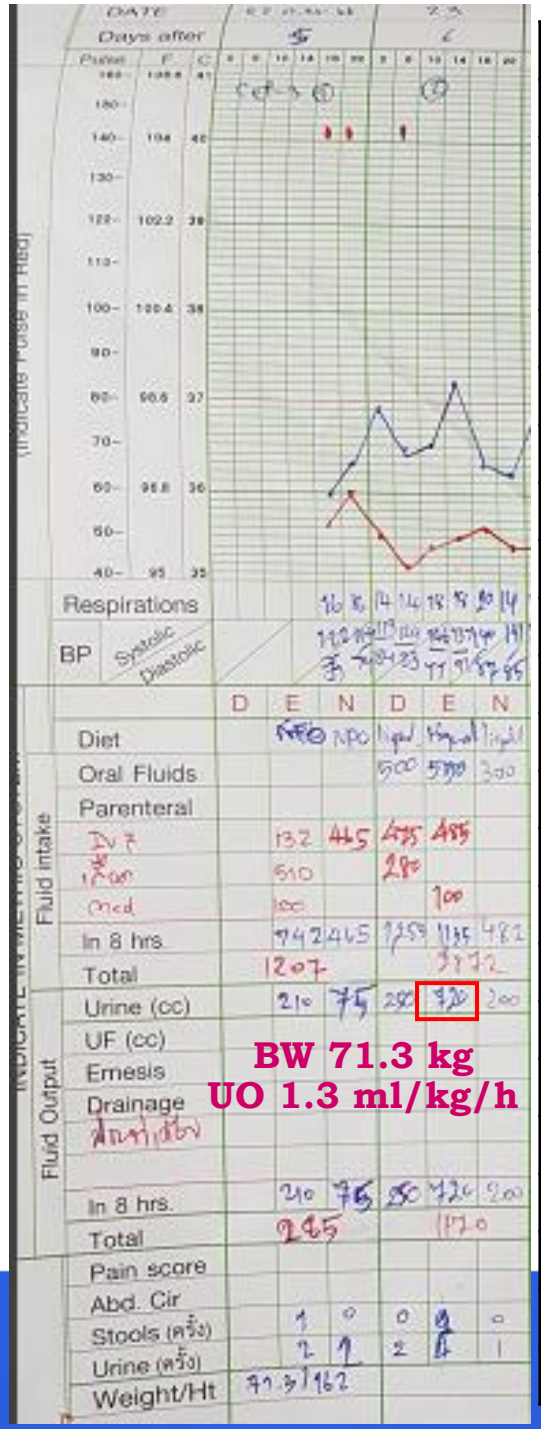
- Off NPO
- Clear liquid diet
- Domperidone 1x3 oral ac
- Ceftriaxone 2 gm iv OD
- Pantoprazole 40 mg iv q 12 h

EKG 12 leads (23 FEB : 6:25)





Hospitalization	Day 1 (17:30)	Day 2 (05:43)	Day 2 (15:44)
Date	22/2	23/2	23/2
T (°C)	36.0	36.5	36.3
BP (mmHg)	122/71	124/83	126/80
PR (/min)	52 (weak)	44 (weak)	56
RR (/min)	16	14	14
Hct	33.9	39.1	41.9
WBC	1,400	1,700	2,100
Band/PMN	14/59	14/56	8/55
LYMP/ALYMP	17/3	20/9	21/12
Plt	77,000	33,000	23,000
PT/INR	13.2/1.19	12.7/1.23	-
APTT	52.5	32.7	-
TT	>120	22.2	-
BUN/Cr	17.6/0.74	17.2/0.63	11.0/0.58
Na	142	141	139
K	3.6	3.7	4.0
HCO_3	22	22	21
Albumin	3.9	3.7	3.5
AST/ALT	116/85	188/126	233/157
U. spec	1.033 (RBC 30-50)	1.045 (RBC 30-50)	-
Ca	8.1	8.1	-
DTX	78	133	-
5%DNSS	60 ml/h (LPRC 2 U)	80 ml/h (LPRC 1 U)	60 ml/h



Hospitalization	Day 1 (17:30)	Day 2 (05:43)	Day 2 (15:44)	Day 2 (23:51)
Date	22/2	23/2	23/2	23/2
T (°C)	36.0	36.5	36.3	36.2
BP (mmHg)	122/71	124/83	126/80	135/83
PR (/min)	52 (weak)	44 (weak)	56	52
RR (/min)	16	14	14	18
Hct	33.9	39.1	41.9	42.6
WBC	1,400	1,700	2,100	2,500
Band/PMN	14/59	14/56	8/55	9/48
LYMP/ALYMP	17/3	20/9	21/12	24/13
Plt	77,000	33,000	23,000	23,000
PT/INR	13.2/1.19	12.7/1.23	-	12.1/1.08
APTT	52.5	32.7	-	34.8
TT	>120	22.2	-	24.5
BUN/Cr	17.6/0.74	17.2/0.63	11.0/0.58	-
Na	142	141	139	-
K	3.6	3.7	4.0	-
HCO_3	22	22	21	-
Albumin	3.9	3.7	3.5	-
AST/ALT	116/85	188/126	233/157	-
U. spec	1.033 (RBC 30-50)	1.045 (RBC 30-50)	-	-
Ca	8.1	8.1	-	-
DTX	78	133	-	-
5%DNSS	60 ml/h (LPRC 2 U)	80 ml/h (LPRC 1 U)	60 ml/h	40 ml/h

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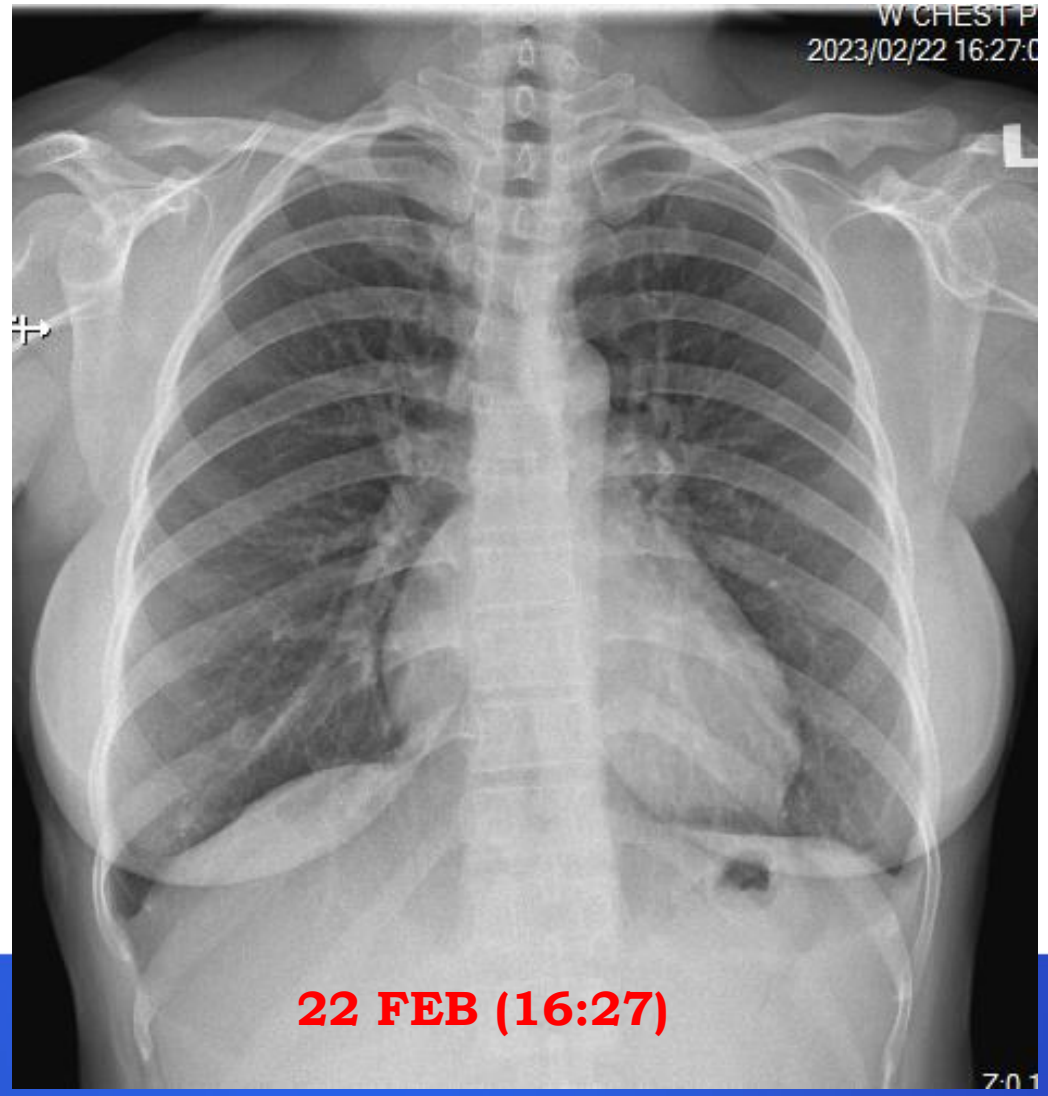
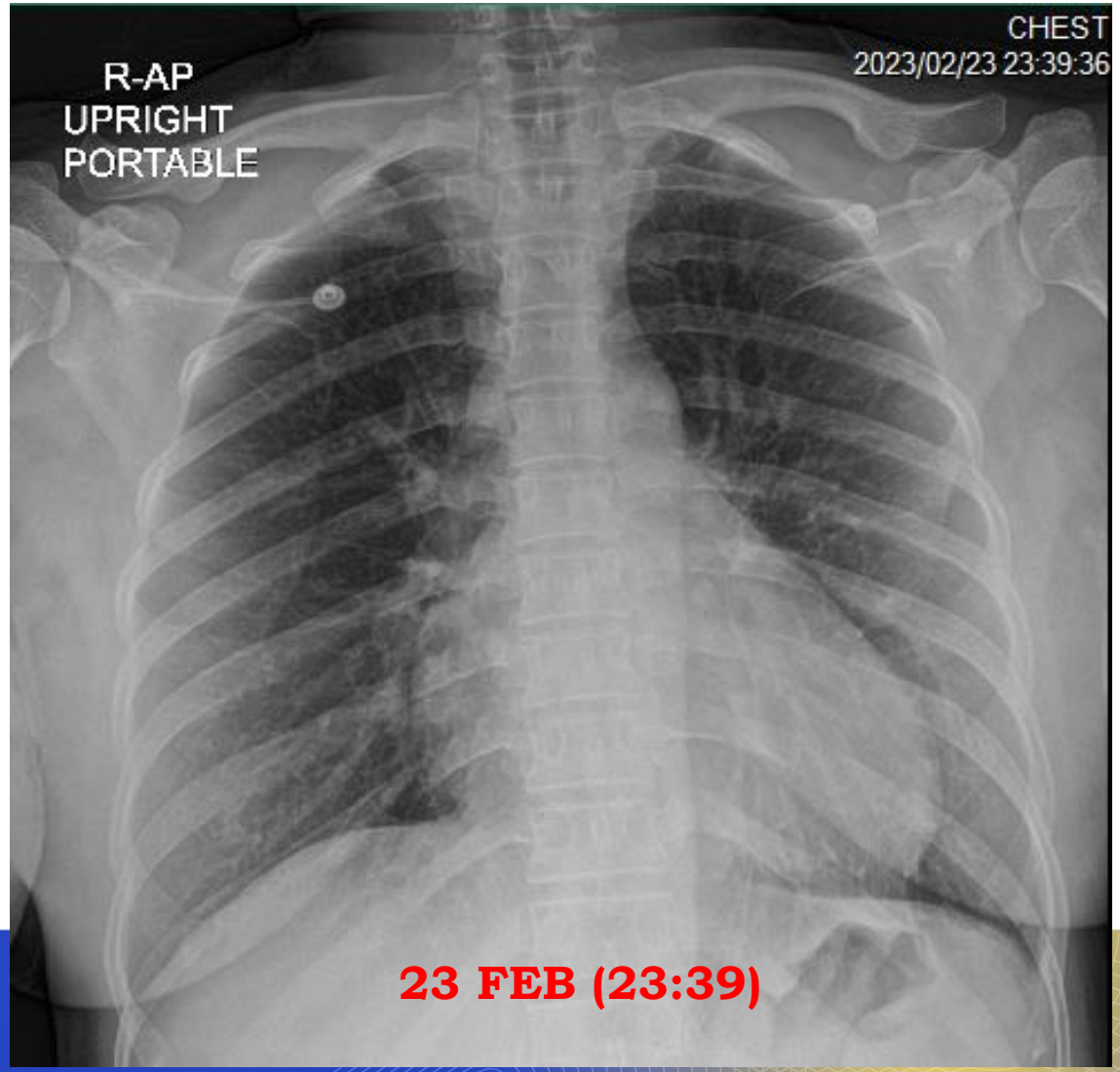
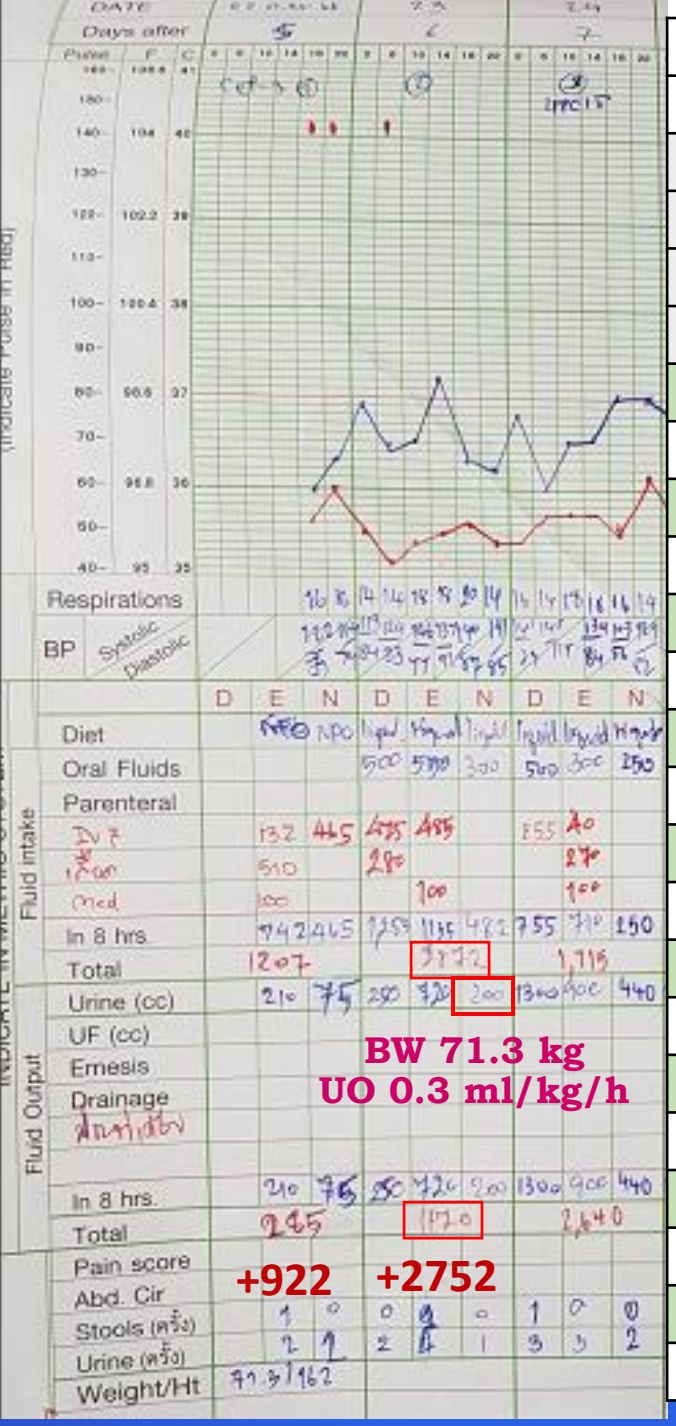
Chest Radiography



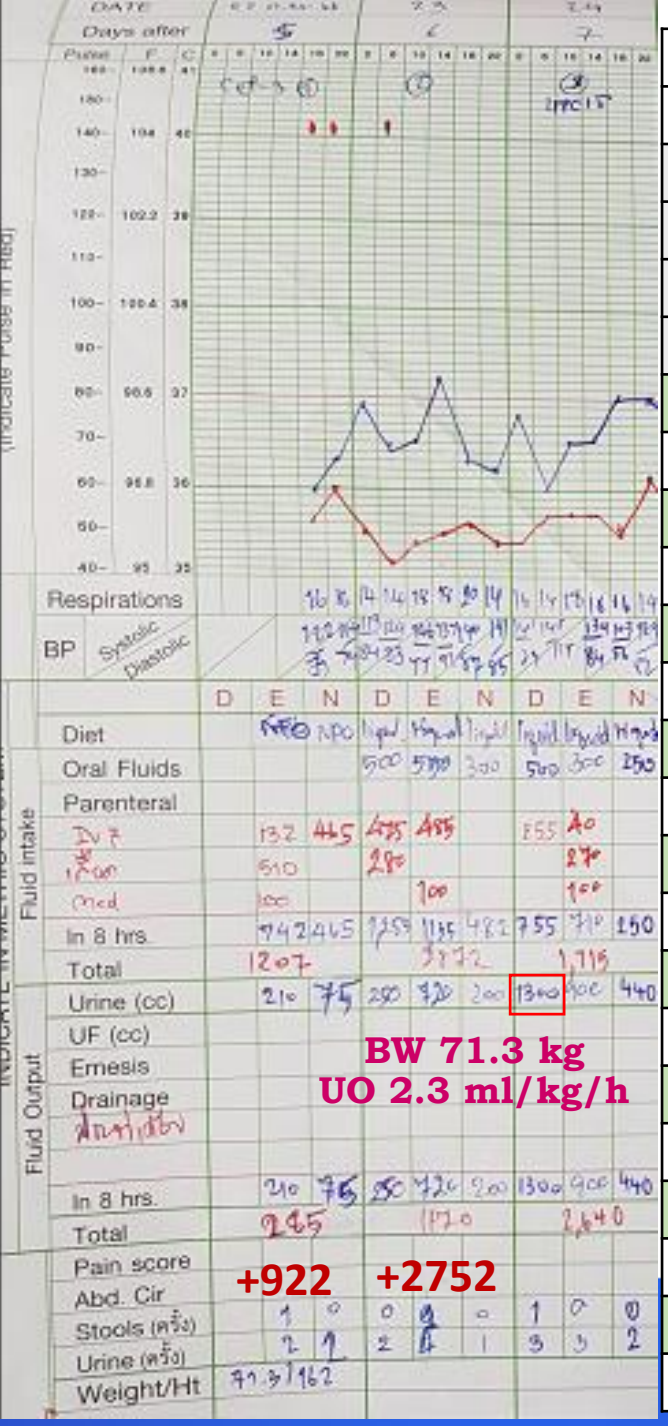
22 FEB (16:27)



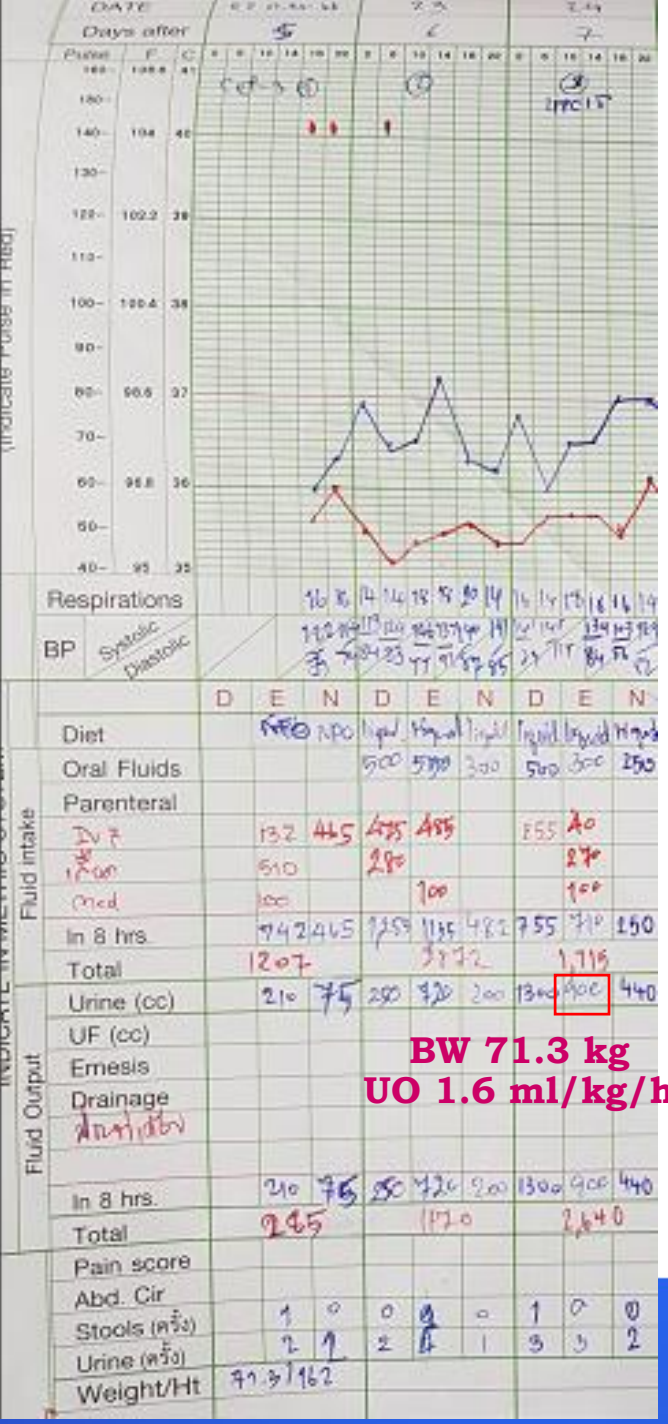
23 FEB (23:39)



Hospitalization	Day 1 (17:30)	Day 2 (05:43)	Day 2 (15:44)	Day 2 (23:51)	Day 3 (05:41)
Date	22/2	23/2	23/2	23/2	24/2
T (°C)	36.0	36.5	36.3	36.2	36.0
BP (mmHg)	122/71	124/83	126/80	135/83	138/78
PR (/min)	52 (weak)	44 (weak)	56	52	54
RR (/min)	16	14	14	18	18
Hct	33.9	39.1	41.9	42.6	43.3
WBC	1,400	1,700	2,100	2,500	2,700
Band/PMN	14/59	14/56	8/55	9/48	7/51
LYMP/ALYMP	17/3	20/9	21/12	24/13	32/5
Plt	77,000	33,000	23,000	23,000	21,000
PT/INR	13.2/1.19	12.7/1.23	-	12.1/1.08	-
APTT	52.5	32.7	-	34.8	-
TT	>120	22.2	-	24.5	-
BUN/Cr	17.6/0.74	17.2/0.63	11.0/0.58	-	7.7/0.55
Na	142	141	139	-	137
K	3.6	3.7	4.0	-	4.0
HCO_3	22	22	21	-	21
Albumin	3.9	3.7	3.5	-	3.6
AST/ALT	116/85	188/126	233/157	-	260/180
U. spec	1.033 (RBC 30-50)	1.045 (RBC 30-50)	-	-	1.025 (RBC 30-50)
Ca	8.1	8.1	-	-	-
DTX	78	133	-	-	115
5%DNSS	60 ml/h (LPRC 2 U)	80 ml/h (LPRC 1 U)	60 ml/h	40 ml/h	20 ml/h



Hospitalization	Day 2 (05:43)	Day 2 (15:44)	Day 2 (23:51)	Day 3 (05:41)	Day 3 (15:39)
Date	23/2	23/2	23/2	24/2	24/2
T (°C)	36.5	36.3	36.2	36.0	37.0
BP (mmHg)	124/83	126/80	135/83	138/78	123/66
PR (/min)	44 (weak)	56	52	54	68
RR (/min)	14	14	18	18	16
Hct	39.1	41.9	42.6	43.3	43.5
WBC	1,700	2,100	2,500	2,700	2,700
Band/PMN	14/56	8/55	9/48	7/51	2/60
LYMP/ALYMP	20/9	21/12	24/13	32/5	17/14
Plt	33,000	23,000	23,000	21,000	16,000
PT/INR	12.7/1.23	-	12.1/1.08	-	-
APTT	32.7	-	34.8	-	-
TT	22.2	-	24.5	-	-
BUN/Cr	17.2/0.63	11.0/0.58	-	7.7/0.55	4.5/0.57
Na	141	139	-	137	138
K	3.7	4.0	-	4.0	3.7
HCO_3	22	21	-	21	23
Albumin	3.7	3.5	-	3.6	3.5
AST/ALT	188/126	233/157	-	260/180	242/172
U. spec	1.045 (RBC 30-50)	-	-	1.025 (RBC 30-50)	-
Ca	8.1	-	-	-	-
DTX	133	-	-	115	-
5%DNSS	80 ml/h (LPRC 1 U)	60 ml/h	40 ml/h	20 ml/h	20 ml/h



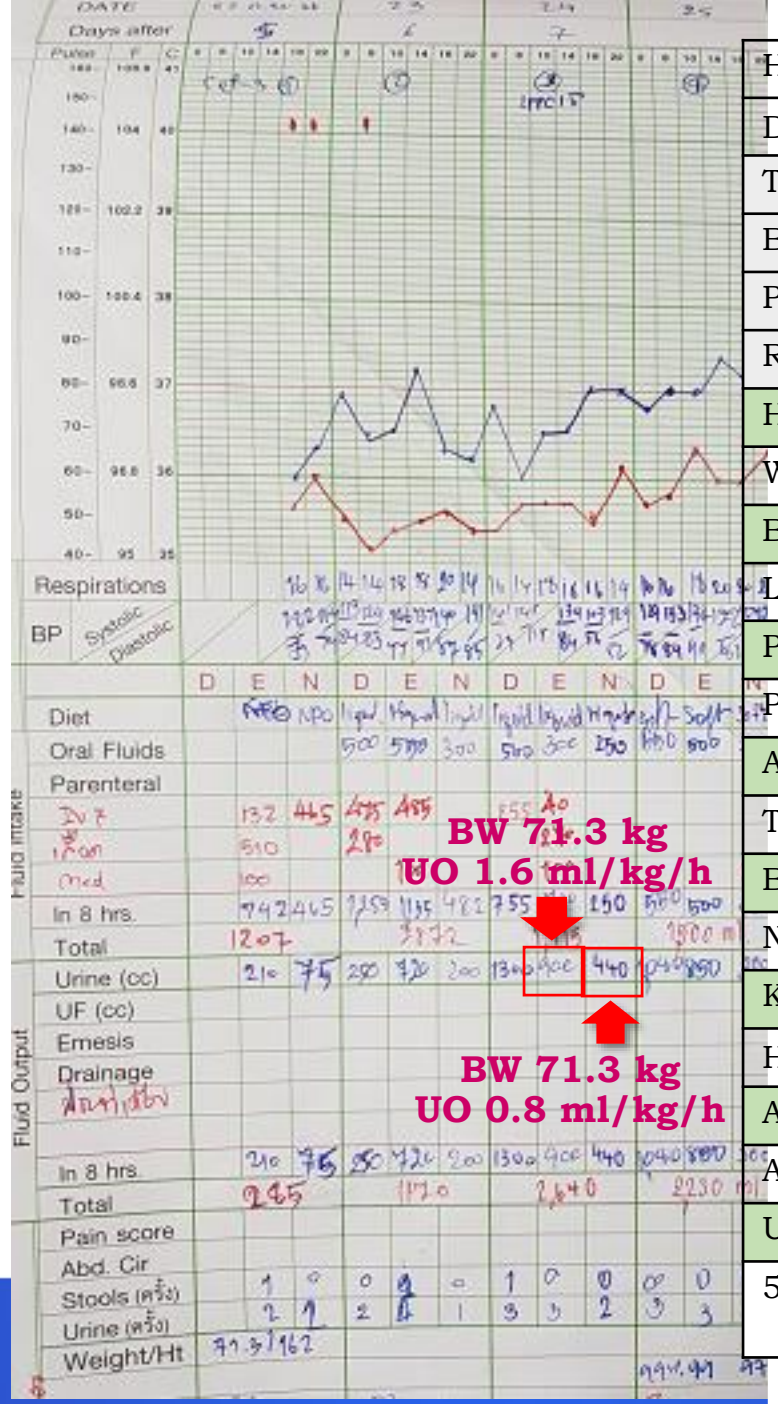
BW 71.3 kg
UO 1.6 ml/kg/h

24 FEB (23:20)

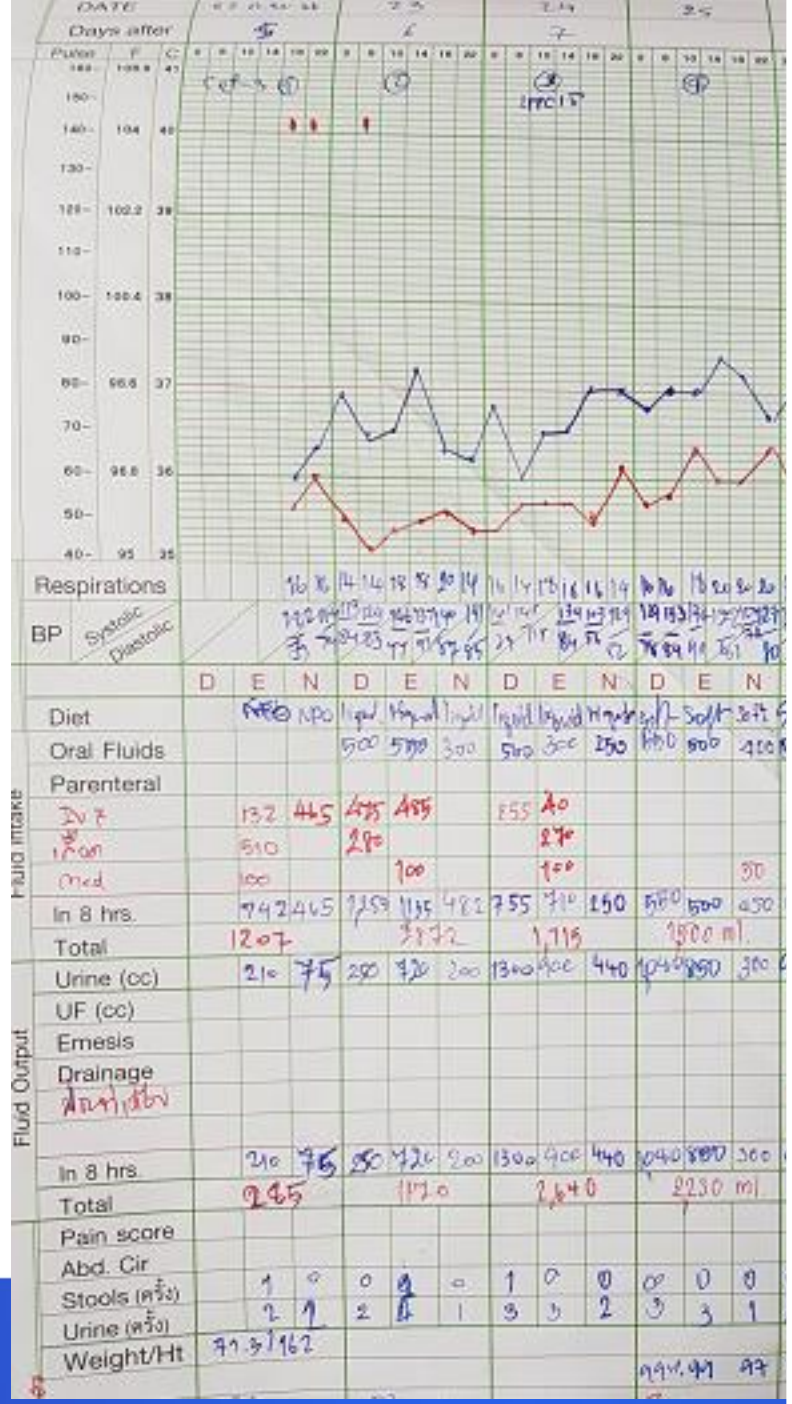
Vomiting blood with sputum

Management???

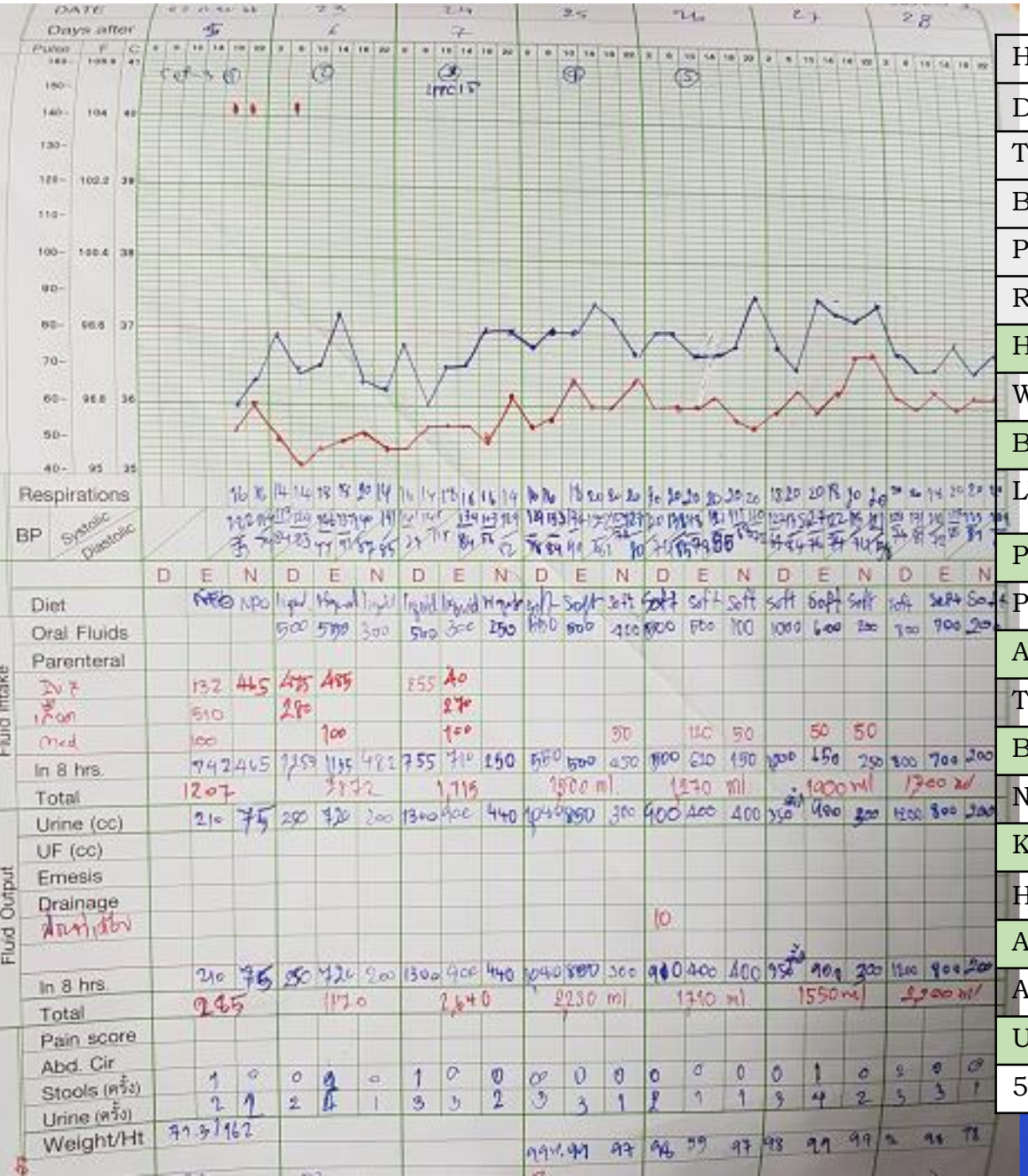
- LPPC 1 u
- Off 5%DNSS



Hospitalization	Day 2 (15:44)	Day 2 (23:51)	Day 3 (05:41)	Day 3 (15:39)	Day 4 (06:25)
Date	23/2	23/2	24/2	24/2	25/2
T (°C)	36.3	36.2	36.0	37.0	37.0
BP (mmHg)	126/80	135/83	138/78	123/66	120/72
PR (/min)	56	52	54	68	56
RR (/min)	14	18	18	16	16
Hct	41.9	42.6	43.3	43.5	44.4
WBC	2,100	2,500	2,700	2,700	3,500
Band/PMN	8/55	9/48	7/51	2/60	8/61
LYMP/ALYMP	21/12	24/13	32/5	17/14	14/13
Plt	23,000	23,000	21,000	16,000	27,000
PT/INR	-	12.1/1.08	-	-	-
APTT	-	34.8	-	-	-
TT	-	24.5	-	-	-
BUN/Cr	11.0/0.58	-	7.7/0.55	4.5/0.57	4.8/0.55
Na	139	-	137	138	137
K	4.0	-	4.0	3.7	3.5
HCO_3	21	-	21	23	24
Albumin	3.5	-	3.6	3.5	3.2
AST/ALT	233/157	-	260/180	242/172	195/148
U. spec	-	-	1.025 (RBC 30-50)	-	1.015 (RBC 5-10)
5%DNSS	60 ml/h	40 ml/h	20 ml/h	20 ml/h (LPPC 1U)	Off IV



Hospitalization	Day 3 (05:41)	Day 3 (15:39)	Day 4 (06:25)	Day 5 (06:12)
Date	24/2	24/2	25/2	26/2
T (°C)	36.0	37.0	37.0	37.0
BP (mmHg)	138/78	123/66	120/72	120/74
PR (/min)	54	68	56	60
RR (/min)	18	16	16	16
Hct	43.3	43.5	44.4	46.1
WBC	2,700	2,700	3,500	4,600
Band/PMN	7/51	2/60	8/61	5/50
LYMP/ALYMP	32/5	17/14	14/13	27/12
Plt	21,000	16,000	27,000	24,000
PT/INR	-	-	-	-
APTT	-	-	-	-
TT	-	-	-	-
BUN/Cr	7.7/0.55	4.5/0.57	4.8/0.55	-
Na	137	138	137	-
K	4.0	3.7	3.5	-
HCO_3	21	23	24	-
Albumin	3.6	3.5	3.2	-
AST/ALT	260/180	242/172	195/148	-
U. spec	1.025 (RBC 30-50)	-	1.015 (RBC 5-10)	-
5%DNSS	20 ml/h	20 ml/h (LPPC 1U)	Off iv	-



Hospitalization	Day 4 (06:25)	Day 5 (06:12)	Day 6 (06:08)	Day 7 (05:51)
Date	25/2	26/2	27/2	28/2
T (°C)	37.0	37.0	36.5	36.5
BP (mmHg)	120/72	120/74	127/64	128/74
PR (/min)	56	60	64	64
RR (/min)	16	16	18	18
Hct	44.4	46.1	43.7	43.3
WBC	3,500	4,600	4,400	4,500
Band/PMN	8/61	5/50	3/38	1/25
LYMP/ALYMP	14/13	27/12	24/24	39/22
Plt	27,000	24,000	44,000	80,000
PT/INR	-	-	-	-
APTT	-	-	-	-
TT	-	-	-	-
BUN/Cr	4.8/0.55	-	-	-
Na	137	-	-	-
K	3.5	-	-	-
HCO_3	24	-	-	-
Albumin	3.2	-	-	-
AST/ALT	195/148	-	-	73/84
U. spec	1.015 (RBC 5-10)	-	-	-
5%DNSS	Off iv	-	-	-

Hematological Complications in Dengue

- **Abnormal bleeding**
  - ✓**Minor** : petechiae, ecchymosis, gum bleeding, epistaxis, heavy and frequent menstrual bleeding
  - ✓**Major** : Significant blood loss, requiring blood transfusion or intervention, ICH, GI bleeding
- **Lab. investigations**
  - ✓Low platelet
  - ✓Abnormal coagulogram

- DHF: Prolonged APTT & TT > PT
- DSS (prolonged shock): Prolonged APTT & TT & PT

Thanachartwet V. Clinical management of severe dengue in adults; 2017. pp 161-175.

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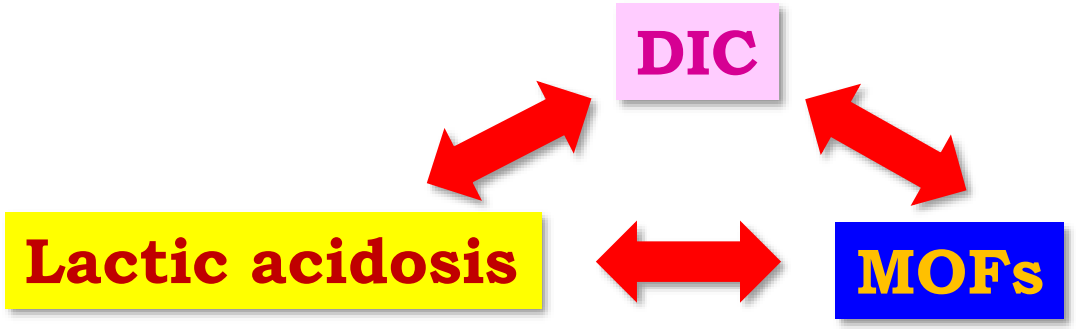
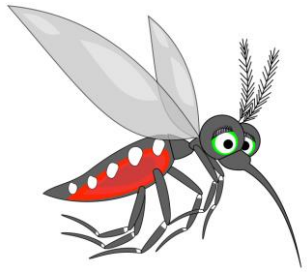
Management of Bleeding in Dengue

- **Bleeding in dengue :** Low PLT, APTT prolong, PT prolong (liver failure)
- **PRC or LPRC >>>** PLT or FFP
- **Prolonged shock :** Vicious cycle



WHO, 2009; WHO, 2011



Case Demonstration #3

A 26-yr-old Male with Fever for 6 days.

26-yr-old Thai Male with Fever for 6 days

CC: Fever for 6 days

PI: **6 days PTA:** He had high-graded fever with chills, headache, myalgia and loose stool 5 times/day.

1 days PTA: He had no fever, but the patient had the symptoms of fatigue and no urine for 6 hr. (drink water 3 L last night).

PH: He had travel history to Nakorn Na-Yok (2 months ago).

He had dengue fever 5-6 years ago.

Physical Examination

Vital signs : BT 36.2°C, PR 96/min (weak), RR 24/min, BP 114/80 mmHg,

Wt 79.7 kg, Ht 175 cm, BMI 26 kg/m^2, IBW 70.5 kg

GA : Conscious, dry lips, dry oral mucosa

HEENT : JVP flat, LN: not palpable,

pharynx and tonsils: not injected

Heart : Normal S1, S2, no murmur

Lungs : Normal breath sound, no adventitious sound

Abdomen : Soft, not tender, liver and spleen was not palpable.

Extremities : No pitting edema, petechiae, CRT >2 sec

Neuro : Grossly intact

Laboratory Investigations (Day 6 of fever; 17 Jul : 10.06 am)

CBC :	Hb 19.0 g/dl; Hct 54.6%
	WBC 11,100 cells/mm^3
	Band 7%; PMN 47%; L 12%; M 4%; ATL 30%
	Platelets 11,000 cells/mm^3
Biochemistries :	TB/DB 1.6/0.6 mg/dL; AP 128 U/L
	Alb 4.3 g/dL; AST 1078 U/L; ALT 1107 U/L
	BUN/Cr 22/1.34 mg/dL (eGFR 74.9 ml/min)
	Na 130 mmol/L; K 4.7 mmol/L; Cl 88 mmol/L; HCO3 25 mmol/L
Urinalysis :	Y/Gold; Spec. gr. 1.030; pH 6.0; Protein: 2+; WBC 3-5/HPF; RBC 0-1/HPF
Dengue NS1/IgM/IgG :	**Negative**

Diagnostic Criteria of Probable Dengue

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WHO 1997, 2011

- Acute febrile illness with ≥2 of the following signs and symptoms :

✓ Headache

✓ Retro-orbital pain

✓ Myalgia

✓ Arthralgia/bone pain

✓ Rash

✓ Hemorrhagic manifestations : petechiae, epistaxis, gum bleeding, hematemesis, melena, positive tourniquet test

✓ Leukopenia (WBC ≤5,000 cells/mm^3)

✓ Hemoconcentration 5-10%

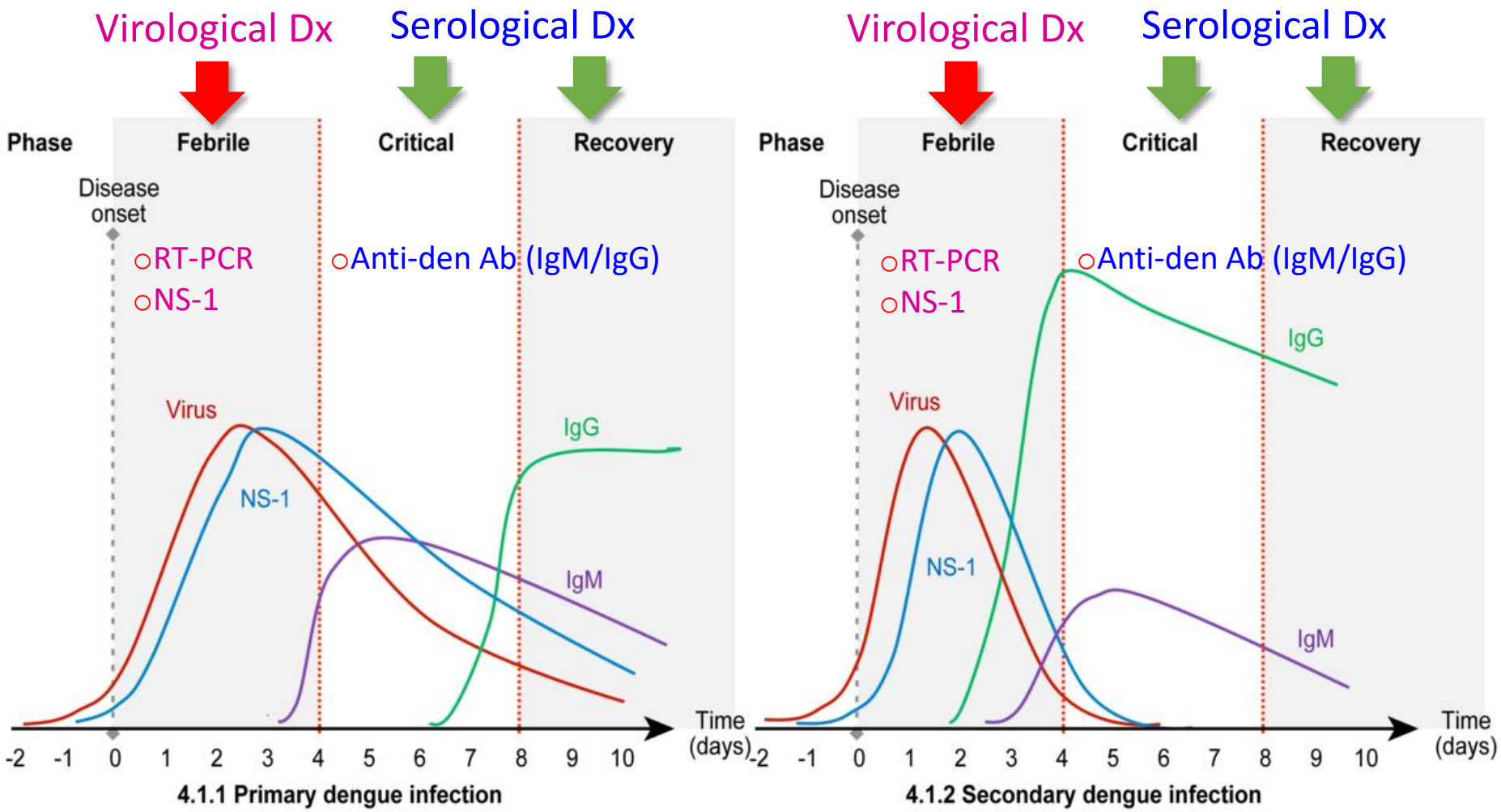
✓ PLT ≤150,000/mm^3

WHO 2009

- Live in /travel to endemic area
- Fever ≥2 of the following criteria
  - ✓ Nausea/vomiting
  - ✓ Rash
  - ✓ Aches and pains
  - ✓ TT positive
  - ✓ Leukopenia
  - ✓ Any warning signs
    - ✓ Abdominal pain or tenderness
    - ✓ Persistent vomiting
    - ✓ Clinical fluid accumulation
    - ✓ Mucosal bleeding
    - ✓ Lethargy, restlessness
    - ✓ Liver enlarge >2 cm
    - ✓ HCT rising with decrease PLT count

https://apps.who.int/iris/handle/10665/204894
https://www.who.int/publications/i/item/9789241547871

Confirmation Tests for Dengue



Thanachartwet V. Clinical management of severe dengue in adults. 2017.pp.35-46.
Muller DA *et al*. J Infect Dis. 2017;215:S89-95.

Dengue Shock Syndrome

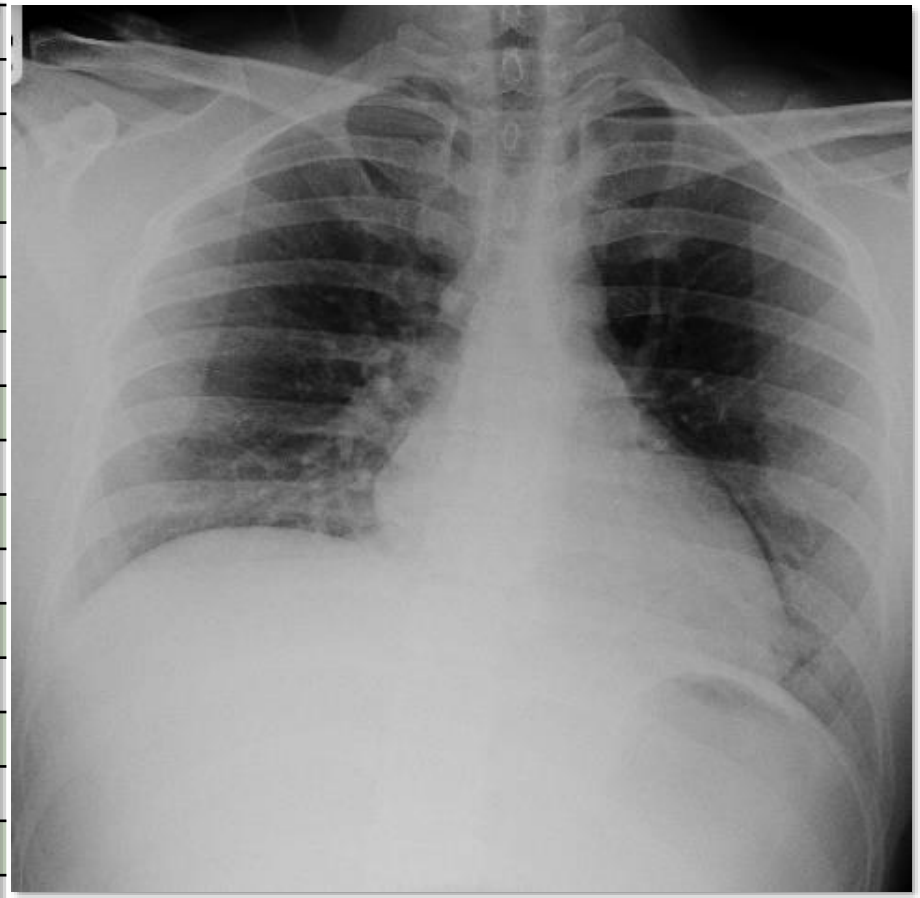
What is the Cause of DSS???

- **Circulatory failure** :
  - ✓Rapid and weak pulse
  - ✓Cold clammy skin particularly cold extremities
  - ✓PP <20 mmHg (25% of adults with DSS)
- **Hypotension with tissue hypoperfusion** :
  - ✓Dizziness, fainting, syncope, decrease urine volume, restlessness, altered mental status
  - ✓Capillary refill time >2 second

https://www.dms.go.th/backend//Content/Content_FIle/Bandner_(Small)/Attach/25640302103903AM_CPG%20Adult%20Dengue.pdf

Laboratory Investigations

	Day 6
	17/7 (10:06)
BP : PR	114/80 : 96 (weak)
Hct	54.6 (36.5%)
WBC	11,100
Band	7
PMN	47
LYMP	12
ALYMP	30
Plt	11,000
BUN/Cr	22/1.34
Na	130
K	4.7
HCO_3	25
TB/DB	1.6/0.6
Albumin	4.3
AST/ALT	1078/1107
Lactate	-
U. spec	1.030
Fluid intake	5%DNSS 200 mL/hr + 5% ALB 200 mL/hr
Urine output	20 mL



17 JUL (Fever D6)

Clinical symptoms/signs of DSS
(DHF grade III or compensated shock or PP ≤20 mmHg)

Immediately management: HCT+ blood glucose testing + oxygen therapy
5%D/NSS (DAR/DLR) 10 ml/kg (children) or 500 ml (adults) IV drip in 1–2 h

- BS 278 mg/dl (load 5%DNSS)
- HbA1c 5.8

Improved

Reduce rate of IV fluid
- 7,5,3,1.5 ml/kg/h (children)
- 250,150,100,80,40 ml/h (adults)

Stop/decrease IV fluid after 24 h

Not improved

Not improved

Check A,B,C,S,F (Table 1) and correct

HCT increase

Dextran-40 in NSS IV drip in 1 h
- 10 ml/kg (children)
- 500 ml (adults)

HCT decrease >10 points or below baseline

PRC/FWB IV drip in 1–2 h
- 5-10 ml/kg (children)
- 1 unit (adults)

Not improved

- Check A,B,C,S,F (Table 1) and correct
- Plan for RRT

HCT decrease <10 points

Improved

HCT decrease

PRC/FWB IV drip in 1–2 h
- 5-10 ml/kg (children)
- 1 unit (adults)

Improved

Reduce rate of IV fluid
- 7,5,3,1.5 ml/kg/h (children)
- 250,150,100,80,40 ml/h (adults)

Stop/decrease IV fluid after 24 h

DAR : Acetate Ringer's Solution in dextrose
DHF : Dengue Hemorrhagic Fever
DLR : Lactate Ringer's Solution in dextrose
DSS : Dengue Shock Syndrome
FWB : Fresh Whole Blood
HCT : Hematocrit
IV : Intravenous
NSS : Normal Saline Solution
NS1 Ag : Nonstructural protein-1 Antigen
PRC : Packed Red Cells
PP : Pulse Pressure
RRT : Renal Replacement Therapy

Characteristics of Commonly Available Infusion Fluids

	Plasma	Crystalloids			Colloids		
		0.9% NaCl	Lactate Ringer's	Acetate Ringer's	5% ALB	20% ALB	Dextran 40
Na (mmol/L)	142	154	130	130	130-160	130-160	154
Cl (mmol/L)	103	154	109	109	-	-	154
K (mmol/L)	4.5	0	4	4	<2	<10	0
Ca (mmol/L)	2.5	0	2.7	2.7	-	-	0
Buffer (mmol/L)	24	0	28	28	-	-	0
Osmolarity (mOsm/L)	291	308	280	280	250	250	308
COP* (mmHg)	25	0	0	0	26-30	100-120	168-191

*COP = Colloid Osmotic Pressure (oncotic pressure) results from the osmotic force created by macromolecules within the intravascular compartment and is essential to retaining appropriate intravascular volume.

McClelland DBL. BMJ 1990;300:35–37. Lira A, Pinsky MR. Ann Intensive Care. 2014;4:38. doi: 10.1186/s13613-014-0038-4.
Severs D, *et al*. Nephrol Dial Transplant 2015;30(2):178-87.
Hurcombe SD. Critical Care. Editor(s): Reed SM, Bayly WM, Sellon DC. Equine Internal Medicine (Fourth Edition). W.B. Saunders. 2018.

Laboratory Investigations

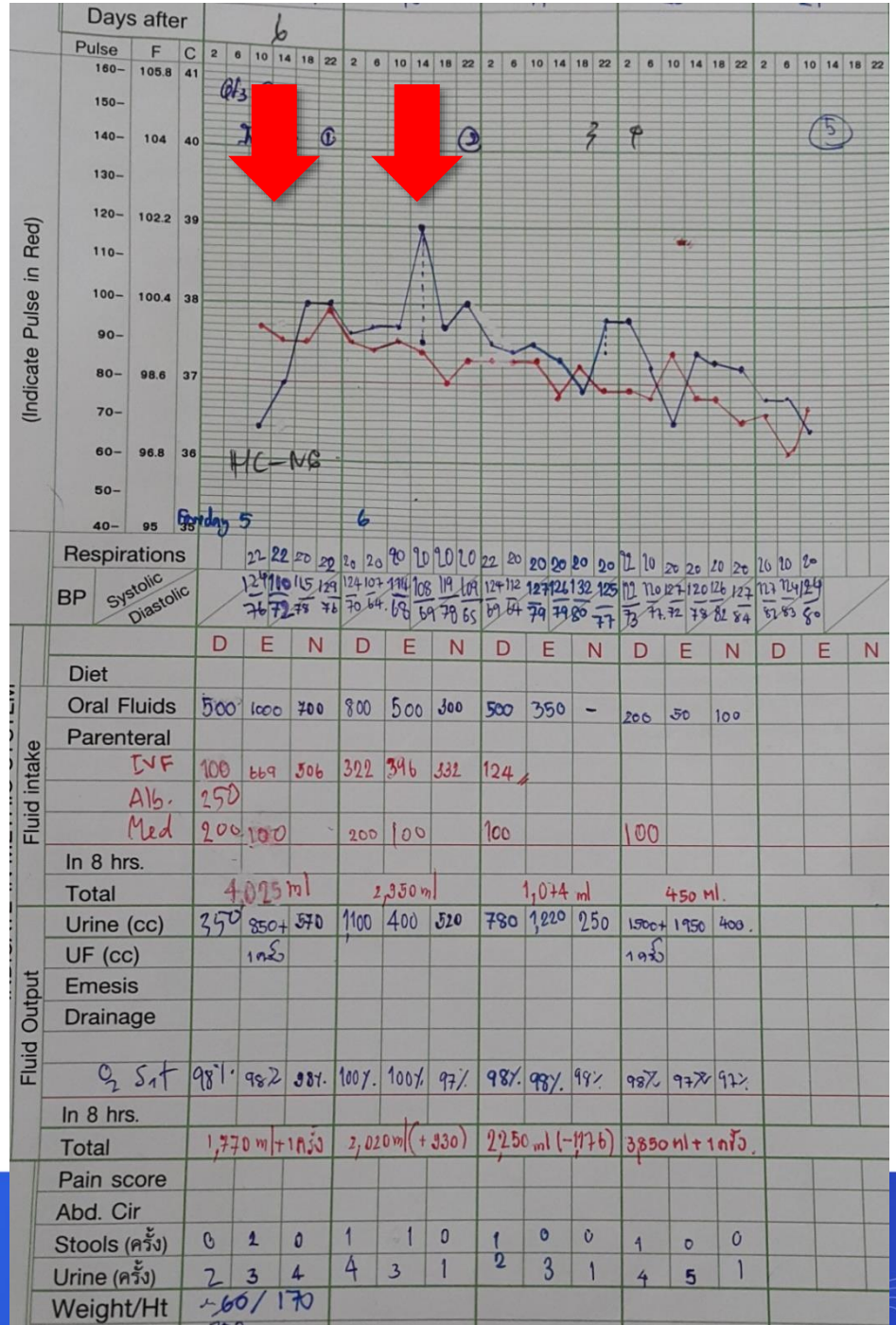
	Day 6 17/7 (10:06)	Day 6 17/7 (12:26)
BP : PR	114/80 : 96	110/70 : 94
Hct	54.6	48.8
WBC	11,100	9,300
Band	7	2
PMN	47	50
LYMP	12	23
ALYMP	30	22
Plt	11,000	17,000
BUN/Cr	22/1.34	20.5/0.96
Na	130	126
K	4.7	4.8
HCO_3	25	21
TB/DB	1.6/0.6	1.3/0.3
Albumin	4.3	3.6
AST/ALT	1078/1107	896/904
Lactate	-	5.0
U. spec	1.030	1.025
Fluid intake	5%DNSS 200 mL/hr + 5% ALB 200 mL/hr	5%DNSS 120 mL/h
Urine output	20 mL	30 mL

Laboratory Investigations

	Day 6	Day 6	Day 6
	17/7 (10:06)	17/7 (12:26)	17/7 (16:13)
BP : PR	114/80 : 96	110/70 : 94	107/66 : 98
Hct	54.6	48.8	49.0
WBC	11,100	9,300	-
Band	7	2	-
PMN	47	50	-
LYMP	12	23	-
ALYMP	30	22	-
Plt	11,000	17,000	-
BUN/Cr	22/1.34	20.5/0.96	-
Na	130	126	-
K	4.7	4.8	-
HCO_3	25	21	-
TB/DB	1.6/0.6	1.3/0.3	-
Albumin	4.3	3.6	-
AST/ALT	1078/1107	896/904	-
Lactate	-	5.0	4.2
U. spec	1.030	1.025	-
Fluid intake	5%DNSS 200 mL/hr + 5% ALB 200 mL/hr	5%DNSS 120 mL/h	5%DNSS 100 mL/h (1,050)
Urine output	20 mL	30 mL	350 mL

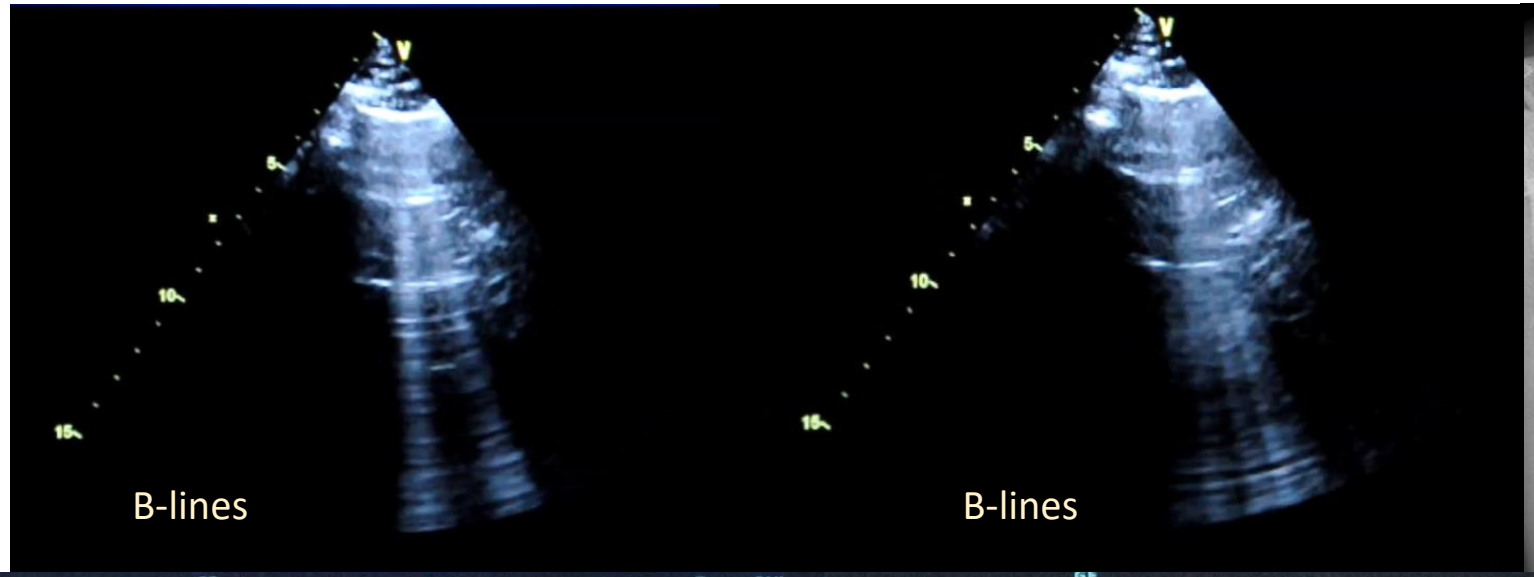
Laboratory Investigations

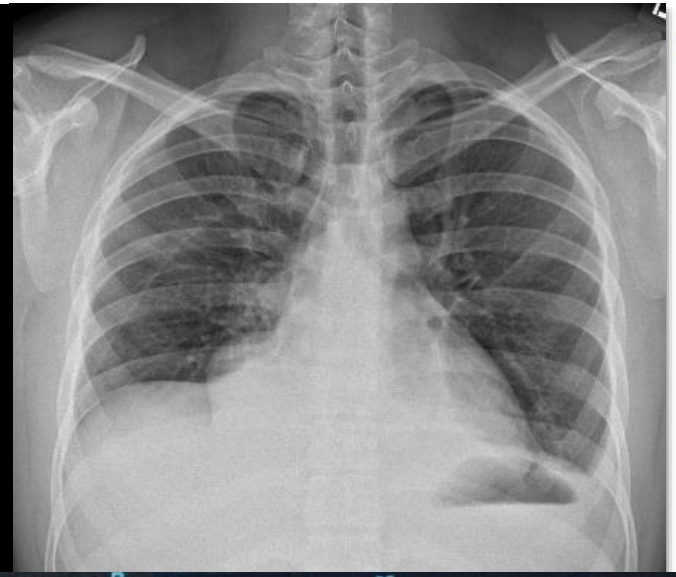
	Day 6	Day 6	Day 6	Day 6	Day 6
	17/7 (10:06)	17/7 (12:26)	17/7 (16:13)	17/7 (20:04)	17/7 (23:41)
BP : PR	114/80 : 96	110/70 : 94	107/66 : 98	123/73 : 90	107/67 : 90
Hct	54.6	48.8	49.0	44.0	46.0
WBC	11,100	9,300	-	-	-
Band	7	2	-	-	-
PMN	47	50	-	-	-
LYMP	12	23	-	-	-
ALYMP	30	22	-	-	-
Plt	11,000	17,000	-	-	-
BUN/Cr	22/1.34	20.5/0.96	-	-	-
Na	130	126	-	-	-
K	4.7	4.8	-	-	-
HCO_3	25	21	-	-	-
TB/DB	1.6/0.6	1.3/0.3	-	-	-
Albumin	4.3	3.6	-	-	-
AST/ALT	1078/1107	896/904	-	-	-
Lactate	-	5.0	4.2	-	-
U. spec	1.030	1.025	-	1.015	1.022
Fluid intake	5%DNSS 200 mL/hr + 5% ALB 200 mL/hr	5%DNSS 120 mL/h	5%DNSS 100 mL/h (1,050)	5%DNSS 80 mL/h (1,410)	5%DNSS 60 mL/h (359)
Urine output	20 mL	30 mL	350 mL	950 mL	100 mL


Days after
Pulse
F
C
(Indicate Pulse in Red)
Respirations
BP
Systolic
Diastolic
Fluid intake
Diet
Oral Fluids
Parenteral
IVF
Alb.
Med
In 8 hrs.
Total
Fluid Output
Urine (cc)
UF (cc)
Emesis
Drainage
In 8 hrs.
Total
Pain score
Abd. Cir
Stools (ครั้ง)
Urine (ครั้ง)
Weight/Ht
HC-NG
Friday 5
6

Laboratory Investigations

	Day 6	Day 7	Day 7	Day 7	Day 8	Day 9
	17/7 (12:26)	18/7 (6:20)	18/7 (14:27)	18/7 (20:17)	19/7 (7:02)	20/7 (6:12)
Hct	48.8 → 46.0	42.7	43.0	42.0	38.7	38.3
WBC	9,300	10,900	-	-	10,100	8,000
Band	2	10	-	-	5	2
PMN	50	38	-	-	45	50
LYMP	23	28	-	-	31	36
ALYMP	22	23	-	-	18	10
Plt	17,000	18,000	-	-	37,000	75,000
BUN/Cr	20.5/0.96	9.4/0.98	-	-	-	9.0/0.84
Na	126	134	-	-	134	133
K	4.8	3.7	-	-	3.6	4.1
HCO_3	21	24	-	-	24	26
TB/DB	1.3/0.3	1.0/0.5	-	-	-	1.0/0.6
Albumin	3.6	2.8	-	-	-	3.1
AST/ALT	896/904	427/511	-	-	399/415	522/495
Lactate	5.0	2.0	-	-	-	-
U. spec	1.025	1.005	-	1.015	-	1.015
Fluid intake	4,025 mL	5%DNSS 40 mL/h (2,350 mL)			1,074 mL	450 mL
Urine output	1,990 mL	2,020 mL (1.2 ml/kg/h)			2,250 mL	4,050 mL





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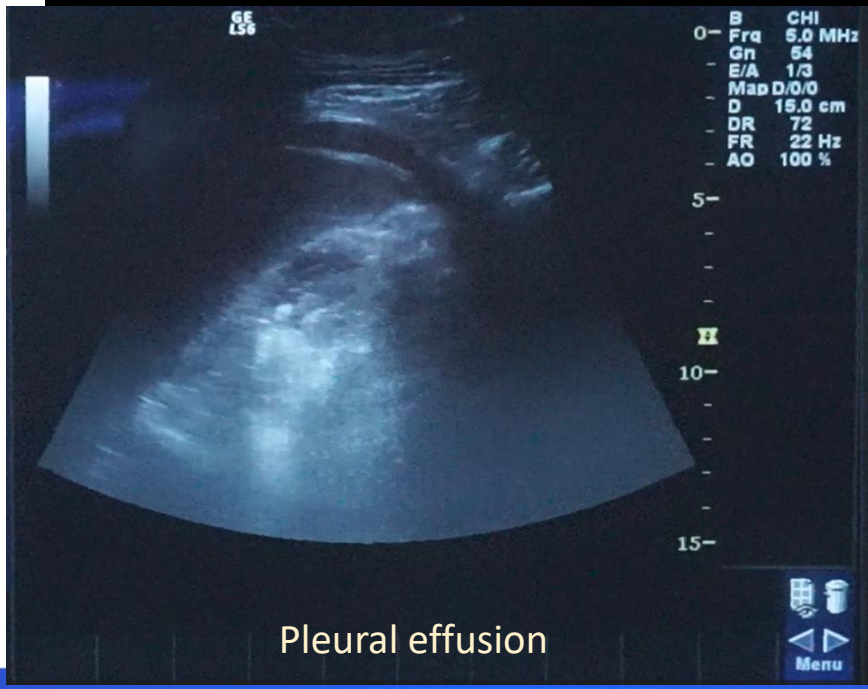
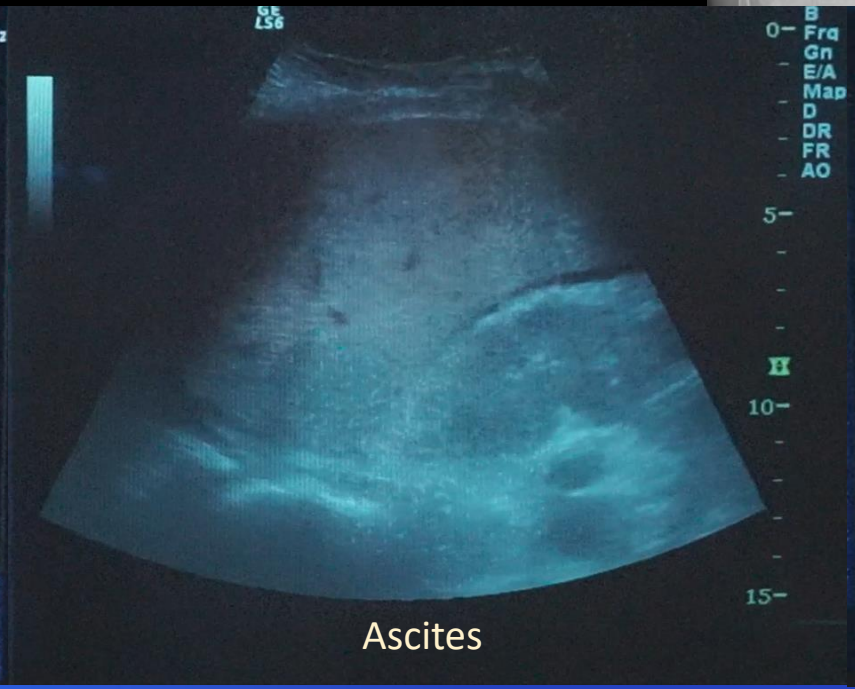
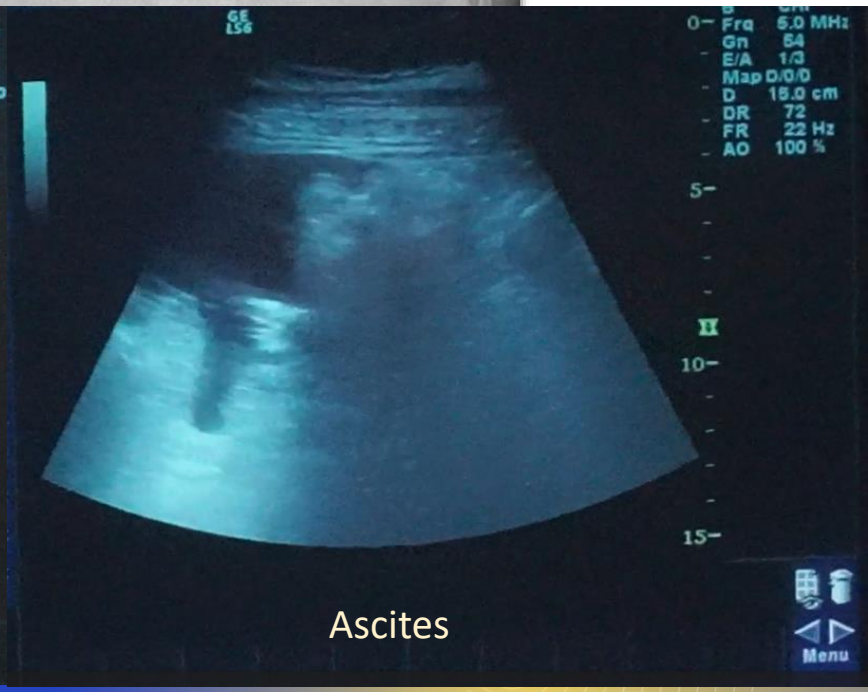
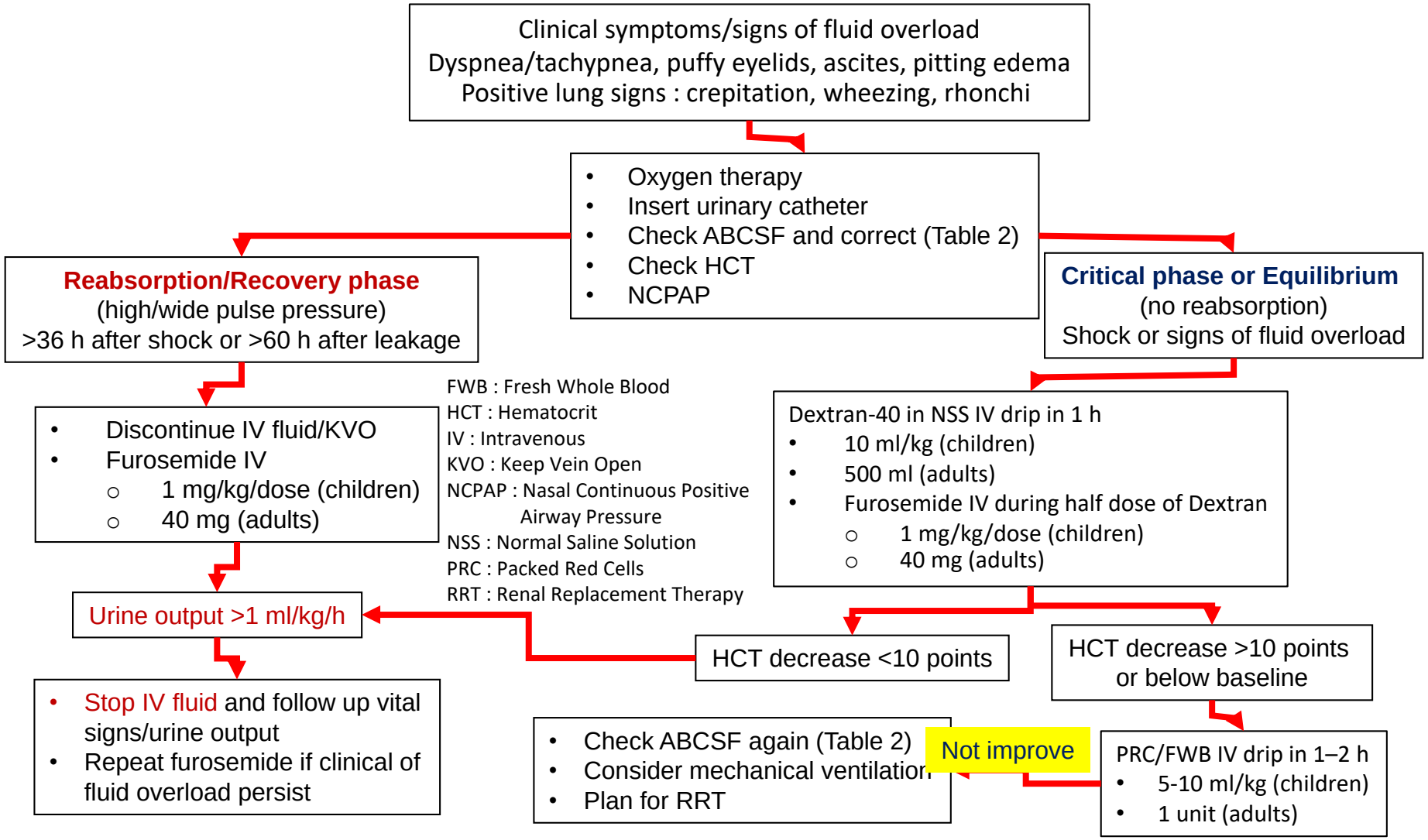






Laboratory Investigations

	Day 7	Day 7	Day 7	Day 8	Day 9	Day 10
	18/7 (6:20)	18/7 (14:27)	18/7 (20:17)	19/7 (7:02)	20/7 (6:12)	21/7 (6:43)
Hct	42.7	43.0	42.0	38.7	38.3	38.3
WBC	10,900	-	-	10,100	8,000	6,400
Band	10	-	-	5	2	0
PMN	38	-	-	45	50	47
LYMP	28	-	-	31	36	42
ALYMP	23	-	-	18	10	3
Plt	18,000	-	-	37,000	75,000	184,000
BUN/Cr	9.4/0.98	-	-	-	9.0/0.84	10.2/0.82
Na	134	-	-	134	133	140
K	3.7	-	-	3.6	4.1	4.2
HCO_3	24	-	-	24	26	25
TB/DB	1.0/0.5	-	-	-	1.0/0.6	1.0/0.5
Albumin	2.8	-	-	-	3.1	3.2
AST/ALT	427/511	-	-	399/415	522/495	273/396
Lactate	2.0	-	-	-	-	-
U. spec	1.005	-	1.015	-	1.015	1.010
Fluid intake	5%DNSS 40 mL/h (2,350 mL)			1,074 mL	450 mL	
Urine output	2,020 mL			2,250 mL	4,050 mL	


Clinical symptoms/signs of fluid overload
Dyspnea/tachypnea, puffy eyelids, ascites, pitting edema
Positive lung signs : crepitation, wheezing, rhonchi
• Oxygen therapy
• Insert urinary catheter
• Check ABCSF and correct (Table 2)
• Check HCT
• NCPAP
Reabsorption/Recovery phase
(high/wide pulse pressure)
>36 h after shock or >60 h after leakage
Critical phase or Equilibrium
(no reabsorption)
Shock or signs of fluid overload
• Discontinue IV fluid/KVO
• Furosemide IV
○ 1 mg/kg/dose (children)
○ 40 mg (adults)
FWB : Fresh Whole Blood
HCT : Hematocrit
IV : Intravenous
KVO : Keep Vein Open
NCPAP : Nasal Continuous Positive Airway Pressure
NSS : Normal Saline Solution
PRC : Packed Red Cells
RRT : Renal Replacement Therapy
Dextran-40 in NSS IV drip in 1 h
• 10 ml/kg (children)
• 500 ml (adults)
• Furosemide IV during half dose of Dextran
○ 1 mg/kg/dose (children)
○ 40 mg (adults)
Urine output >1 ml/kg/h
HCT decrease <10 points
HCT decrease >10 points or below baseline
• Stop IV fluid and follow up vital signs/urine output
• Repeat furosemide if clinical of fluid overload persist
• Check ABCSF again (Table 2)
• Consider mechanical ventilation
• Plan for RRT
Not improve
PRC/FWB IV drip in 1–2 h
• 5-10 ml/kg (children)
• 1 unit (adults)

Problems in Management of Dengue in Thailand

- Diagnosis of dengue
- Recognition of plasma leakage

→ **Fluid management :**
(**Over** > Under resuscitation)

- Recognition of significant bleeding

→ **Delayed blood transfusion**

- Detection of dengue shock syndrome

→ **Improper fluid management &**
Delayed blood transfusion

Thank you for your attention