Diagnostics and Notification

Dengue Frontier Training Workshop

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24th Aug 2023

Other lectures

- Initial management of severe dengue
  - Who teaching slide (Prof Lucy)
  - Cases (Sh F)
- More Case studies – DM, Obesity
  - Elderly (Sh F)
  - DM & Obesity (Ong)
  - ESRF (Khairil)
  - Post COVID with chronic lung problems (Prof Lucy- Sh F/Ong)
  - Thal trait (Prof Lucy)
- Suggested format for case studies: Max 8 slides,
- first slide – introduction – demographic, and past history and history of present illness
- slide 2 – physical findings, investigation results
- Slide 3 – 5 – Discuss management – Home or Referral or Emergency
- Last one or two slides – summary and learning points.

Outline

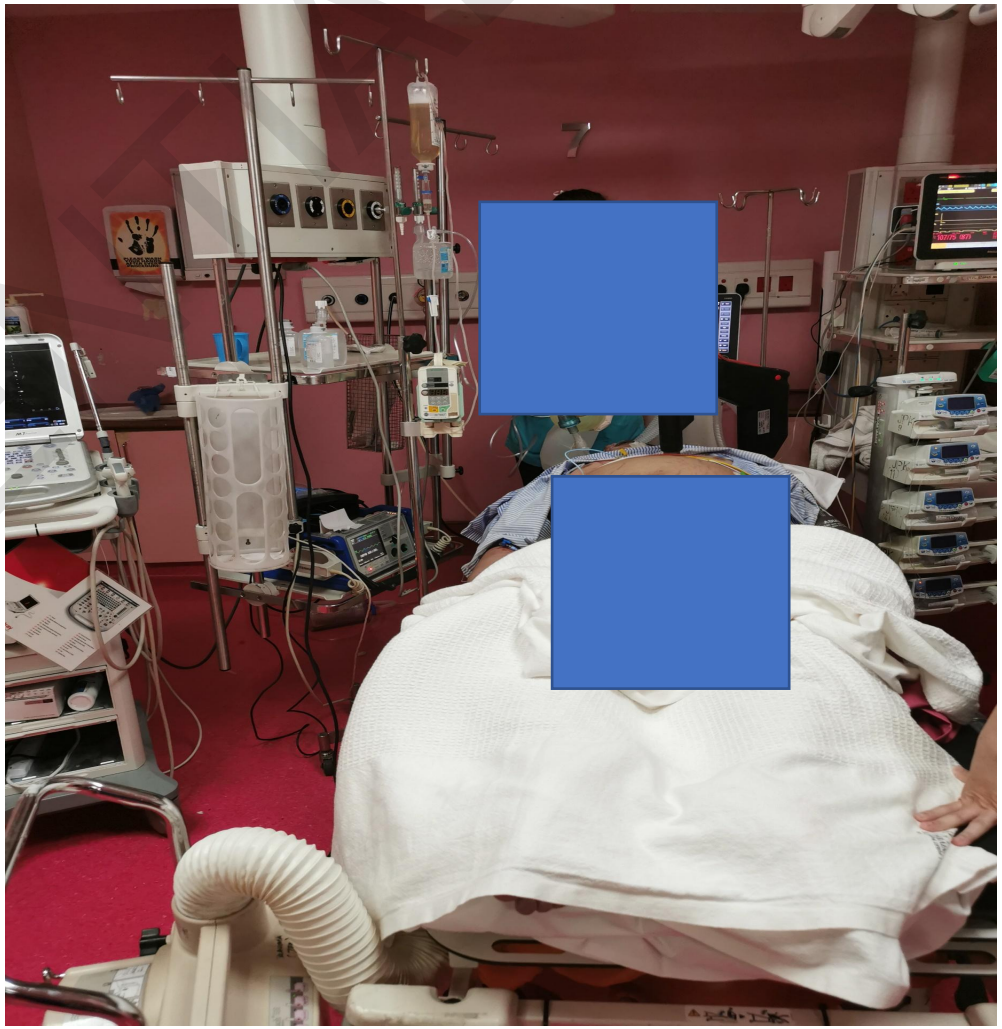
- Case study study 1
- Dengue diagnostics
  - When to do, what to do, how to do, how to interpret
  - Types of tests
    - Rapid antigen-antibody tests
    - Dengue ELISA
    - Dengue PCR
    - Virus isolation
- Dengue Notification

Case Study - 1

Patient profile

- Name: MFRF
- Gender: Male
- Age: 20 years old
- Estimated height 175 cm,
- BW 150 kg, adjusted BW 100 kg

- Co-morbid:
  - Autism disorder under GP follow up.
  - History of admission of symptomatic anemia secondary to LGIB – internal hemorrhoid in Nov 2021 (Band ligation done)



Visitation History (ED)

- Admission to A&E/OPD: 7/7/2023, 2134H
- Seen by A&E/OPD MO: 7/7/2023, 2222H
- First Fluid resuscitation: 7/7/2023, 2224H

Admission to A&E : 11/07/2023, 0206 H
Seen by A&E MO : 11/07/2023, 0206 H
Fluid resuscitation : 11/07/2023, ~0210 H
Surgical Referral : 11/07/2023, 0321 H
Crash Referral : 11/07/2023, 0330 H
Medical Referral : 11/07/2023, 0410 H

TRIAGE

- Time triaged 2130h, time seen 2222(+/- 30 minutes) ~ estimate review patient 2200H (within accepted time frame of AMC 1st assessment)
- Triaged to AMC (Appropriate)

7/7/2023 First ED Visit

History of presenting illness:

1) Fever A/w chills and rigors
2) Frontal headache
3) Sorethroat; no cough , no runny nose

Otherwise

- no diarrhoea, no abdominal pain
- no bleeding tendency

Physical Examination:

BP: 131/76mmHg

HR: 117 bpm

-Temp: 39.4Celcius

Alert , cooperative

CRT <2s, PV good, dry tongue

Throat : mild injected , tonsils not enlarged

Lungs : clear

CVS: DRNM

Abd: soft , non tender

No pedal edema

Impression:/Diagnosis:

Viral fever , day 1 illness

DEMAM BIASA

Not taught to drink

Lists of investigation

- Chest X ray
- ECG
- FBC, RP, CRP, LFT
- COVID RTK

Date/time	Day of illness	Progress	Impression	Action
8/7/2023 , 0100H	1	Reassess patient after given 1000ml NS (3 hours 30 mins in ED) - fever subsiding - Clinically not lethargic/ septic looking - not tachypneic - no GI loss Completed 2 pints NS hydration BP 132/ 65mmHG HR 108	Viral fever , day 1 illness	- allowed home - Tab PCM 1g QID - Thymol gargle 10ml TDS - Syrup diphenhydramine 10ml TDS - TCA Nearest KK to rv sx and repeat FBC and LFT on 10/7/23

Date/ Time	7/7/2023 , 2214H	8/7/2023, 0100H
Shock	nil	nil
Peripheries (CCRTV)	Pink, CRT<2s, good PV, tachycardia	?
Blood pressure (mmHg)	131/76	132/ 65
Heart rate (bpm)	117	108
Respiratory rate (bpm)	18	18
Haemoglobin (g/dL)	10.6	
Haematocrit (%)	35	
platelet	266	
pH	-	
HCO_3	-	
Lactate	-	
Glucose	-	
Urea/ creati	3.2/ 81	
AST/ ALT	49/82	
Othe	TWC 6.1 , GGT 56	
Crysta	NS 500ml/hour	
Colloid ty	-	
Blood produ ype/ ml/h	-	
Oral intake	-	
Cumulative input		1000ml NS
Hourly urine output	not measured	
Remarks		Off Ivdrips and discharge - Tab PCM 1g QID - Thymol gargle 10ml TDS - Syrup diphenhydramine 10ml TDS - TCA Nearest KK to rv sx and repeat FBC and LFT on 10/7/23

CCTVR?

PLT normal on D1

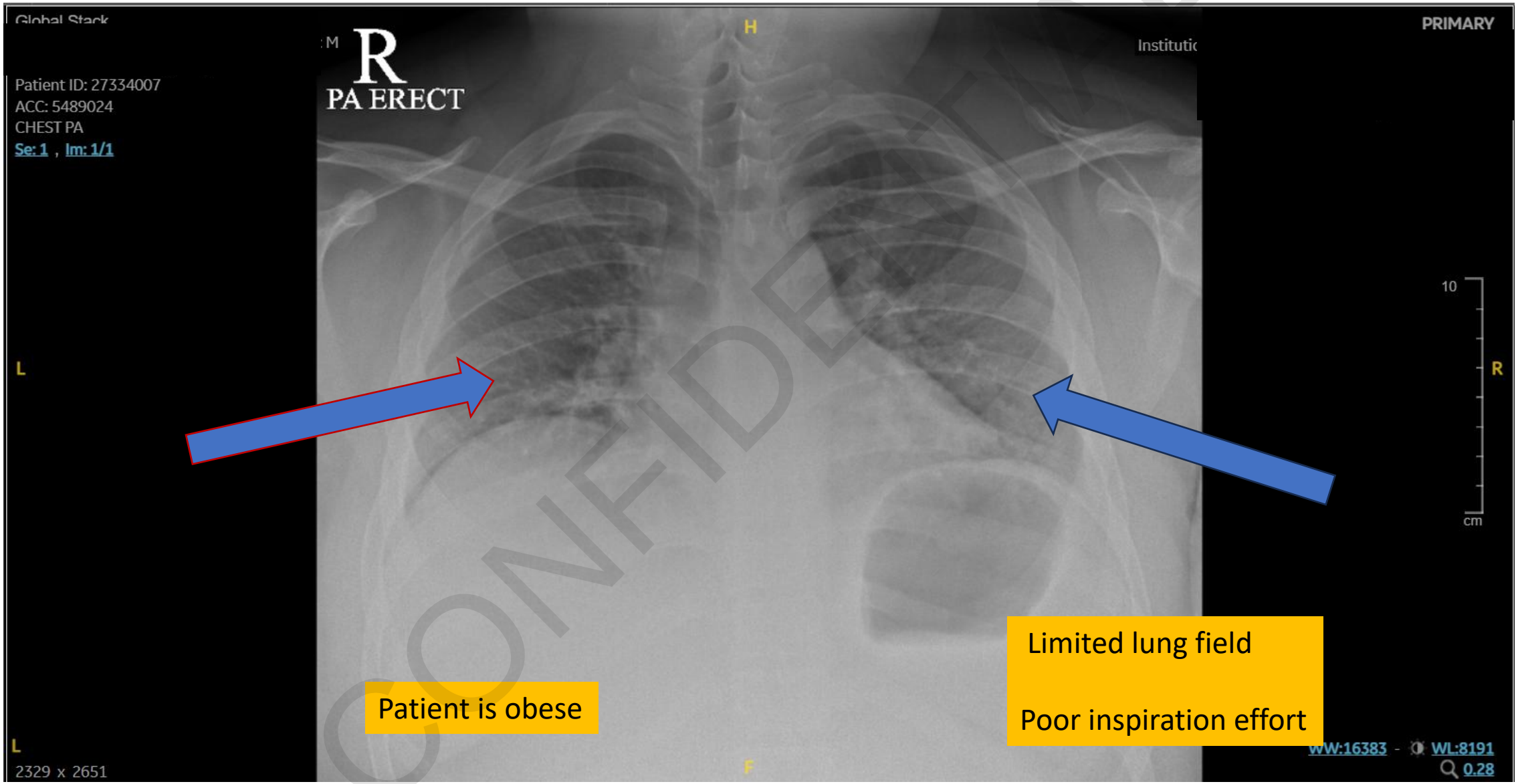
Na 130

Na low on D1, how much lower in critical phase?

DX: VIRAL FEVER

Why was dengue rapid test not done?

Chest Radiograph



DEMAM BIASA

Less alert

...nd family less vigilant

Not taught how to DRINK at home

FLAGS

- Special population : Morbid Obesity, Autistic
- GOLDEN QUESTIONS:
  - Tolerating Fluids
  - Urine output
  - Activities
- Always important to put down a PROPER DIAGNOSIS, followed by severity – educate patient
- Dengue rapid test? what was the barrier?
- Vital signs before discharge? – still tachycardic
- CCTVR before discharge?
- Following up sooner?
- Social circumstances – suitable for home management?

- Educate - DRINK ENOUGH
- Not able to hydrate IV once patient is discharged

- Ensure there are electrolytes

Price for RDTs

Rapid Dengue Test

(NS-1, IgM, IgG)

- RM 65 to 75 (Klang Valley)
- FBC RM 50 – 55

Cost factor

- Is it cheaper if we do RDT, clinch the DF diagnosis
  - Avoid prescribing antibiotics – save cost
  - Avoid prescribing other medications – save cost

- **Proper** early follow up for assessment
- Proper referral to hospital if required

Dashboard iDengue Untuk Komuniti

Versi 3.0.0

Kes Harian Terkini

Kes Harian Terkini

274

Kes Kumulatif

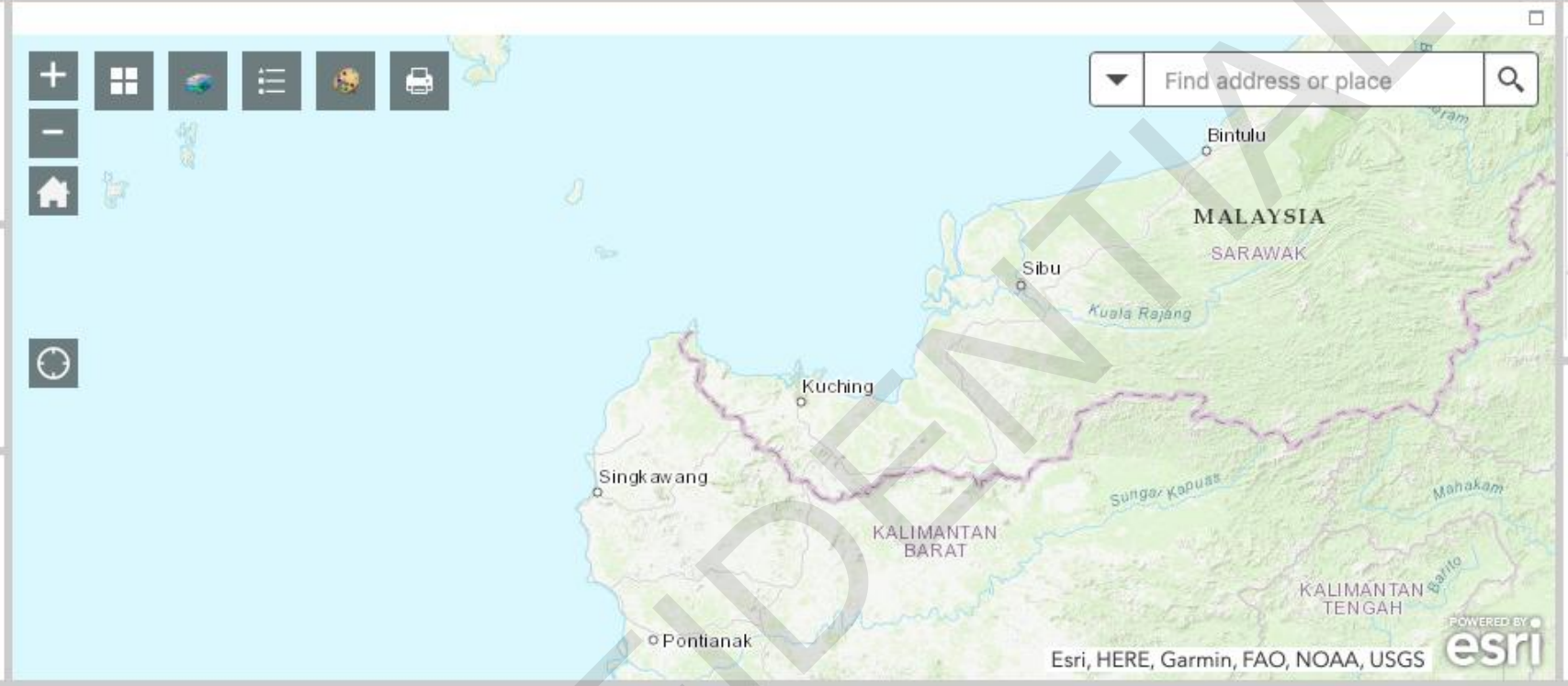
Kes Kumulatif

76,201

Kes Kematian

Kes Kematian

53



Maklumat Denggi Terkini

Hotspot	74
Lokaliti Wabak Aktif	482
Wolbachia	28

Statistik Denggi

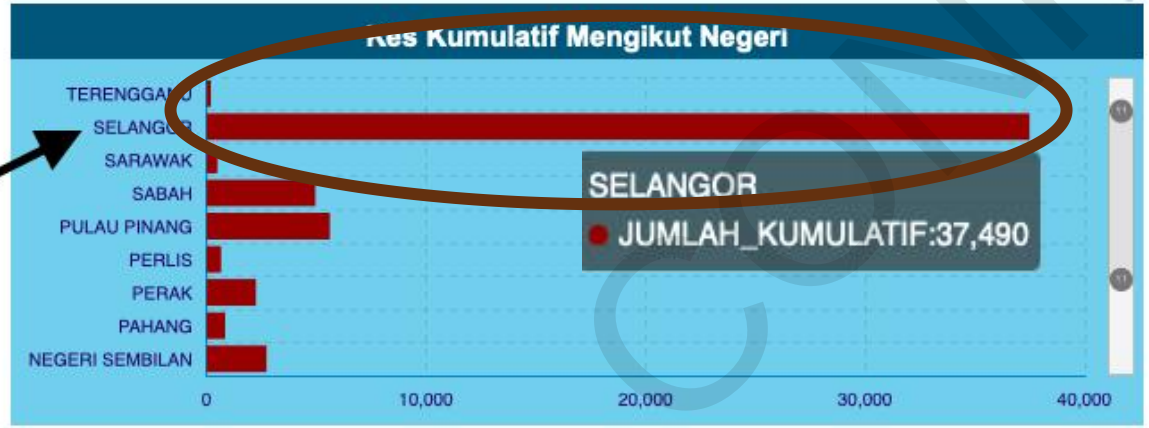
Statistik | **Negeri**

Kes harian dan Kumulatif _Qu

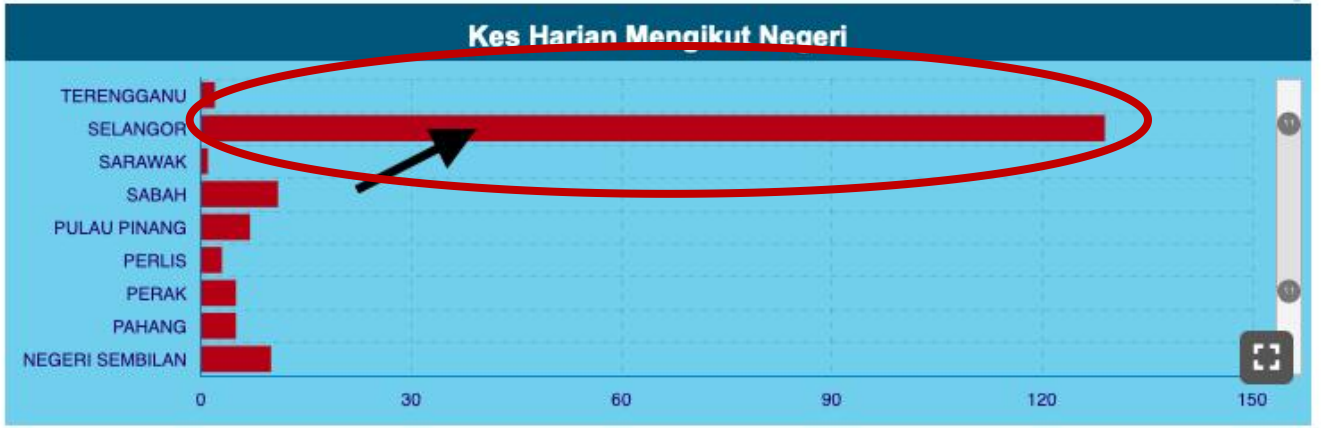
Displayed features:16/16

Kes harian dan Kumulatif: JOHOR

Kes Kumulatif Mengikut Negeri



Kes Harian Mengikut Negeri

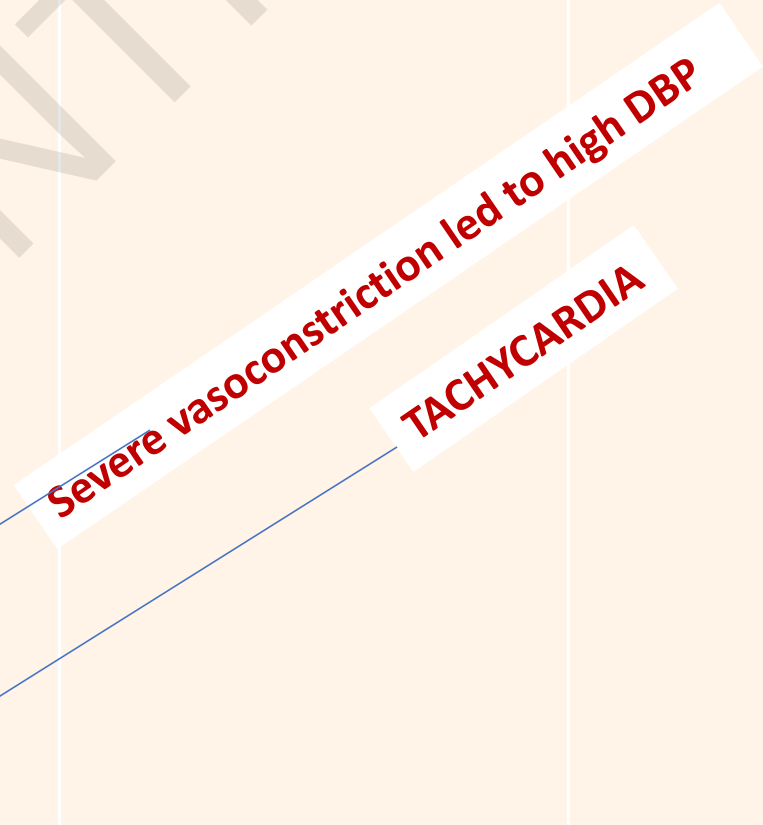


What happened to our patient?

- Patient missed his KK appointment scheduled on the 10th July 2023

Brought back to ED on the 11th July (D5 illness)

Date/time	DOI	Progress	Impression	Action
11/7/2023 0206H	D5	complain of **SOB** and **abdominal pain**		Triage to Red Zone
		History from mother: 1. SOB x 1/7 2. Abdominal bloatedness x 4/7 3. NBO x 4/7 - Passed soft stool on day of arrival, 2-3 episodes of PR bleeding 4. Vomiting 2-3x today. Assessment: Restless, tachypneic RR 28, bounding PV, but coolish peripheries **BP 197/151mmHg** HR 157bpm SpO2 97% under RA T: 37°C CBS: 10.5mmol/L, Serum ketone: 0.3		



Date/time	DOI	Progress	Impression	Action
0206H **0212H**	D5	Lungs: clear, A/E equal CVS: S1S2 PA: Soft, thick, flabby abdomen, purple striae. no guarding. Bedside scans: ECHO: good contractility, no pericardial effusion, no dilated chambers. LUS: A profile seen, no pleural effusion unable to visualize IVC. TAS: **free fluid** seen at Morrison's pouch and pelvic region ABG under HFM 15L/min **pH 7.1/pO2 232/pCO2 22.9/HCO3 7.4/BE -21.7/ lactate 17.7/Hb 15.7**	**Acute Abdomen with severe metabolic acidosis with hyperlactatemia**. DDX: - Perforated gastric ulcer (PGU) - Mesenteric ischemia **TWC: 15.3** **HCT: 53%** **Hb: 12.8** **PLT: 12**	Run IVD bolus 3 pint Sterofundin run concurrently via 2 branulas (antecubital)

What is the patient having now?

Severe DF in compensated shock, possibly bleeding

Date/time		Progress	Impression	Action
0230H	D5	became **more restless** **Intubation**: Given IV fentanyl 25mcg prior as pt restless - Anticipated difficult airway -m obese + short neck.	1. Acute Abdomen TRO - PGU - Mesenteric ischemia 2. Severe metabolic acidosis with hyperlactatemia	Called for help: Anticipate difficult airway & intubation: Registrar ED attended stat.
0238H		Cardiac monitor s CPR commen Defibrilla Crash intub anchored at 23cm. POGO 100%, single attempt.		Medications given: IV Adrenaline 1mg x 3 IV Calcium Gluconate 10ml x2 IV Sodium bicarbonate 100ml
0243H		Repeated blood gas (During CPR): pH 7.05/pO2 NAV/pCO2 57.6/HCO3 - /BE -14.7 /lactate 12/Hb 10.8		

Patient developed arrhytmia after given Med for intubation

Date/time	DOI	Progress	Impression	Action
0246H	D5	ROSC achieved after 8 minutes of CPR. Ventilator setting post intubation: SIMV mode FiO2 1.0 TV 480 RR 28 PEEP 6 PS 10. Post intubation BP lowish 84/44mmHg HR 117. RT inserted : coffee ground aspirate 100ml. PR: blood-streaked stool.	1) Post cardiac arrest with hypovolemic shock 2) Acute abdomen TRO PGU/UGIB/ bowel ischemia 3) Severe metabolic acidosis with hyperlactatemia sec to above	Medications: IVI Norad 0.3mcg/kg/min IV Esomeprazole 80mg IVI Esomeprazole 8mg/h IVI Midazolam 2ml/hour IVI Fentanyl 2ml/hour 1 pint Sterofundin (Total 2L crystalloid = 20ml/kg)
0300H		Hb from blood gas drop from 15 (upon arrival) > 10.8 (during CPR)		Safe O transfusion started at 3AM
0321H		Repeated blood gas post transfusion (VBG): **pH 6.92/pCO2 56.6/HCO3 - /BE -21.2 /lactate 18/Hb 11.7** Repeated scan post ROSC : ECHO: good contractility, LUS: A profile seen, no pleural effusion, unable to visualize IVC. TAS: free fluid seen at Morrison's pouch and pelvic region (unchanged)		Strict I/O charting Close cardiac monitoring Trace blood Investigations Blood C&S GXM, CXR/AXR Referral to Surgical team 0321H Entry by surgical team at 0420 H.

Date/time	DOI	Progress	Impression	Action
0326H	D5	Repeated VS post transfusion: BP: 88/57mmHg HR 121 SpO2 100%		Planned for 2nd pint safe O transfusion while waiting for GXM.
0330H				Referral to Anaest team. Anaest team reviewed at 3.45am. ICU bed was being prepared Entry at 0324H.
0356H		Formal FBC result: Hb 15.3, wbc 12.8, HCT 53, platelet 12	Revised Diagnosis: Probable severe dengue fever D5 illness in critical phase, with warning signs (abdominal discomfort, bleeding, raised HCT with low platelet) in decompensated shock.	- 2nd pint Safe O transfusion started at 0400H. - Planned for IV Human Albumin 5% 500cc over 1 hour (withheld as ongoing Safe O transfusion) - **Dengue combo test sent urgent**. - Trace pending RP/LFT.

Date/time	DOI	Progress	Impression	Action
0410H	D5		Probable Severe Dengue Fever D5 illness in critical phase, with warning signs (abdominal discomfort, bleeding, raised HCT with low platelet) in decompensated shock	Referral to Medical team. Reviewed at 0420 H.
0417H		1st ABG post intubation (attempted earlier, but venous) : **pH 7.10/pCO2 33/pO2 77.8/HCO3 10.9/BE -19.5/Hb 13.7/lactate 14**		
0436H		Completed Safe O transfusion (earlier) VBG post 2nd safe O transfusion: **pH 7.09/pCO2 45.3/HCO3 11.5/BE -16/lactate 12/Hb 13.1** BP: 96/63mmHg (supported on IVI noradrenaline) HR 113		Medical plan noted: For another 10ml/kg crystalloid (ran 1L crystalloid) - continue IVI noradrenaline - to transfuse 4 unit FFP and 4 unit platelets
0454H		BP 53/40mmHg HR 111 Repeated scan: ECHO: moderate contractility, no pericardial effusion, IVC unable to visualize, Thickened GB wall 0.55cm, with pericholecystic collection, LUS: left pleural effusion, B profile R4. worsening free fluid at Morrison's pouch, pelvic region and left splenorenal angle.		IVI Vasopressin started ** case progress updated to both parents. DIL re-inforced.

Date/time	DOI	Progress	Impression	Action
0520H	D5	Intubated, sedated (IVI Mida + Fentanyl) ventilator setting SIMV mode FiO2 1.0, TV 450, RR 24, peep 6, PS 12 VS supported on double inotropes - IVI Noradrenaline 1.2mcg/kg/min - IVI Vasopressin 4.5ml/hour - IV Vitamin K 5mg stat. Total fluids given: - 3L sterofundin (total 30ml/kg) - 2 pints safe O transfusion Urine output: 50ml since arrival RT free flow: 300ml coffee ground aspirate.	1. Severe dengue fever, day 5 of illness in critical phase with warning signs (abdominal discomfort, lethargy, bleeding, raised Hct low platelet) in decompensated shock, complicated with ischemic hepatitis, AKI, coagulopathy and severe metabolic acidosis. 2. TRO UGIB 3. Type 2 MI	Ongoing 10ml/kg crystalloid (ran 1L crystalloid)
0525H		Dengue NS1/IgM/IgG: all detected 2nd episode cardiac arrest. CPR for 35 minutes. No ROSC.	COD: SEVERE DENGUE WITH MULTIORGAN FAILURE	

SUMMARY

Date/ Time 11/7/2023	0206H	0242	0321	0417	0436
Team	Emergency Department	Emergency Department	Emergency Department	Emergency Department	Emergency Department
Shock	Yes	Yes	Yes	Yes	Yes
Peripheries (CCRTV)	Bounding pulse, coolish peripheries, mottled skin				
Blood pressure (mmHg)	197/151 mmhg	84/44 mmhg	88/57mmhg	113/88 mmhg	96/63 mmhg
Heart rate (bpm)	157 bpm	117 bpm	121 bpm	118 bpm	113 bpm
Respiratory rate (bpm)	28	post intubation	ventilated	ventilated	ventilated
Haemoglobin (g/dL)	15.3 (formal)	10.8 (From VBG)	10.7	12.5	13.1
Haematocrit (%)	53 (baseline 35)		38	43	
platelet	12		17	34	
pH	7.1	7.05	6.92	7.10	7.09
HCO_3	7.4	NAV	8.4	10.9	11.5
Lactate	17.7	12	18.24	14.55	12.03
Glucose	10.6	-	5.8	-	-
Urea/ creatinine	7.1/179	-	7.4/221	6.9/243	-
AST/ ALT	7686/ 5305	-	5559/4161	10,227/7212	
Others					
Crystalloid type/ ml/h	Sterofundin, 20 ml/kg	0ngoing 20 ml/kg	Completed Sterofundin, 20 ml/kg	Sterofundin, 10ml/kg	Ongoing 10ml/kg
Colloid type/ ml/h					
Blood product type/ ml/h		1st Safe O started at 3AM	2nd Safe O started at 4AM	Ongoing 2nd Safe O	
Oral intake	-	-	-	-	-
Cumulative input	-	-	-	-	3604 (blood+ fluid+ meds)
Hourly urine output	-	50ml	Nil	Nil	Nil
Inotrope	-	IVI Noradrenaline	IVI Noradrenaline	IVI Noradrenaline	IVI Noradrenaline IVI Vasopressin
Remarks				Planned to start IVI Human Albumin, withheld for blood transfusion.	

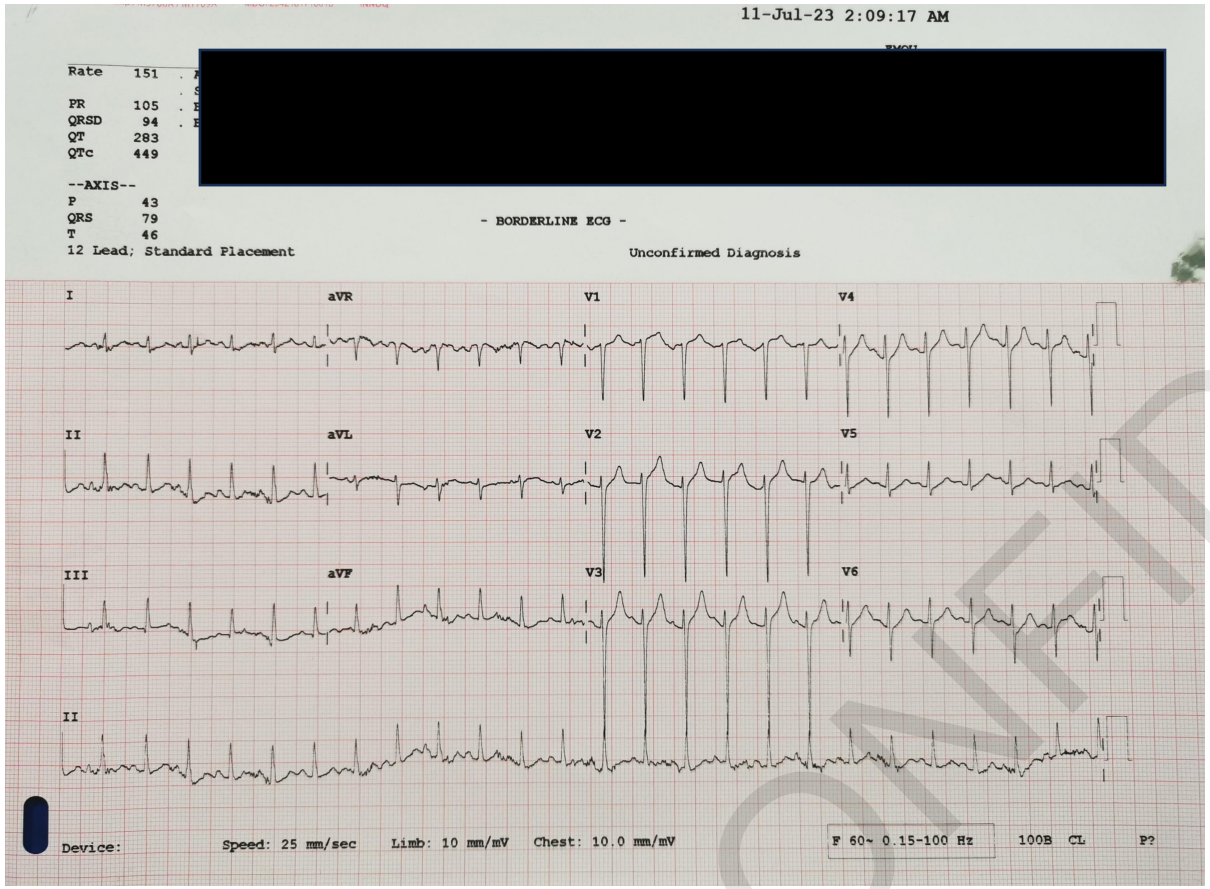
BLOOD INVESTIGATIONS

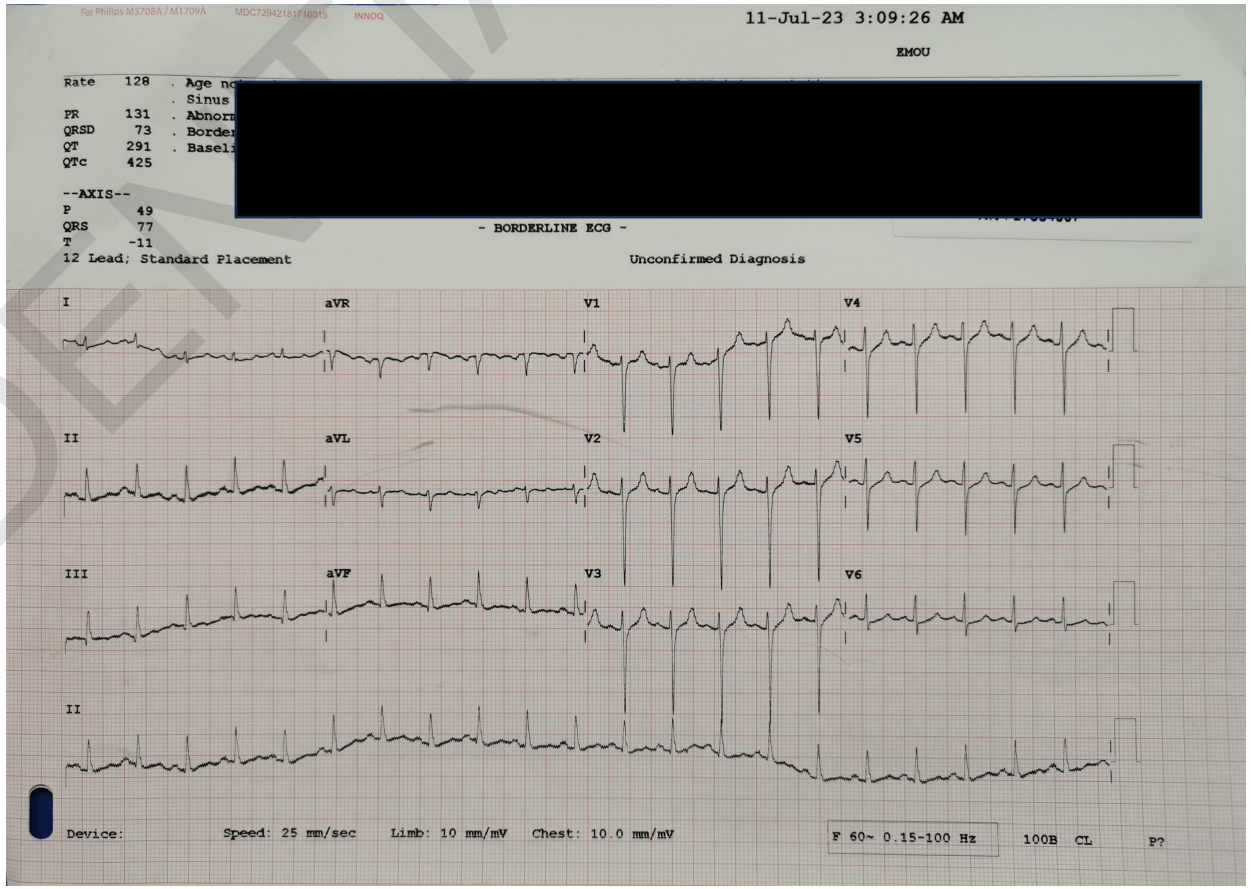
Date: 11/07/2023	0212H	0302H	0428H
Haemoglobin (g/dL)	15.3	10.7	12.5
Haematocrit (%)	53	38	43
WBC	12.8	11.3	18.8
Platelet	12	17	34
Glucose	10.6	5.8	-
Urea/ Creatinine	7.1 / 179	7.4 / 221	6.9 / 243
Na / K	130 / 4.3	136 / 5.5	126 / 8.4
AST/ ALT	7686 / 5305	5559 / 4161	10227 / 7212
Trop I	177.7	197.2	507.5
Lactate	>12.2	>12.2	-
INR	1.5	1.9	2.4
PT / APTT	16.7 / 51.8	21.4 / 98.8	26.9 / 123.3
D-dimer			2202
DENGUE NS-1/Ig-M/Ig-G	ALL DETECTED		

BLOOD GAS TREND

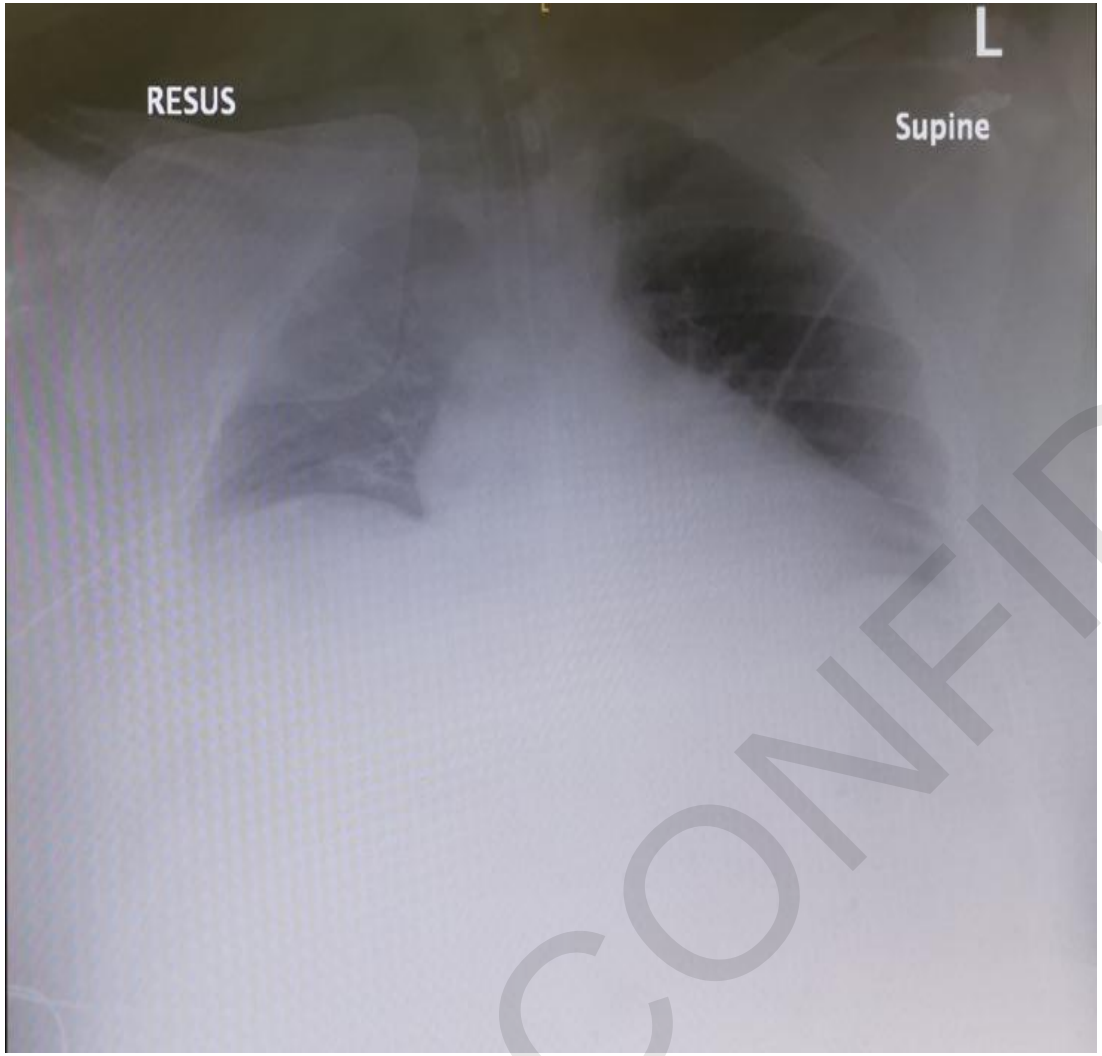
Time	0212H	0243H	0321H	0417H	0436H
pH	7.1	7.054	6.921	7.102	7.097
pO2	232	NAV	39.5	77.8	24.3
pCO2	22.9	57.6	56.4	33.3	45.3
HCO3	7.4	-	8.4	10.9	11.5
BE	-21.7	-14.7	-21.2	-19.5	-16.1
Lactate	17.7	12.73	18.24	14.55	12.03
Hb	15.7	10.8	11.7	13.7	13.1

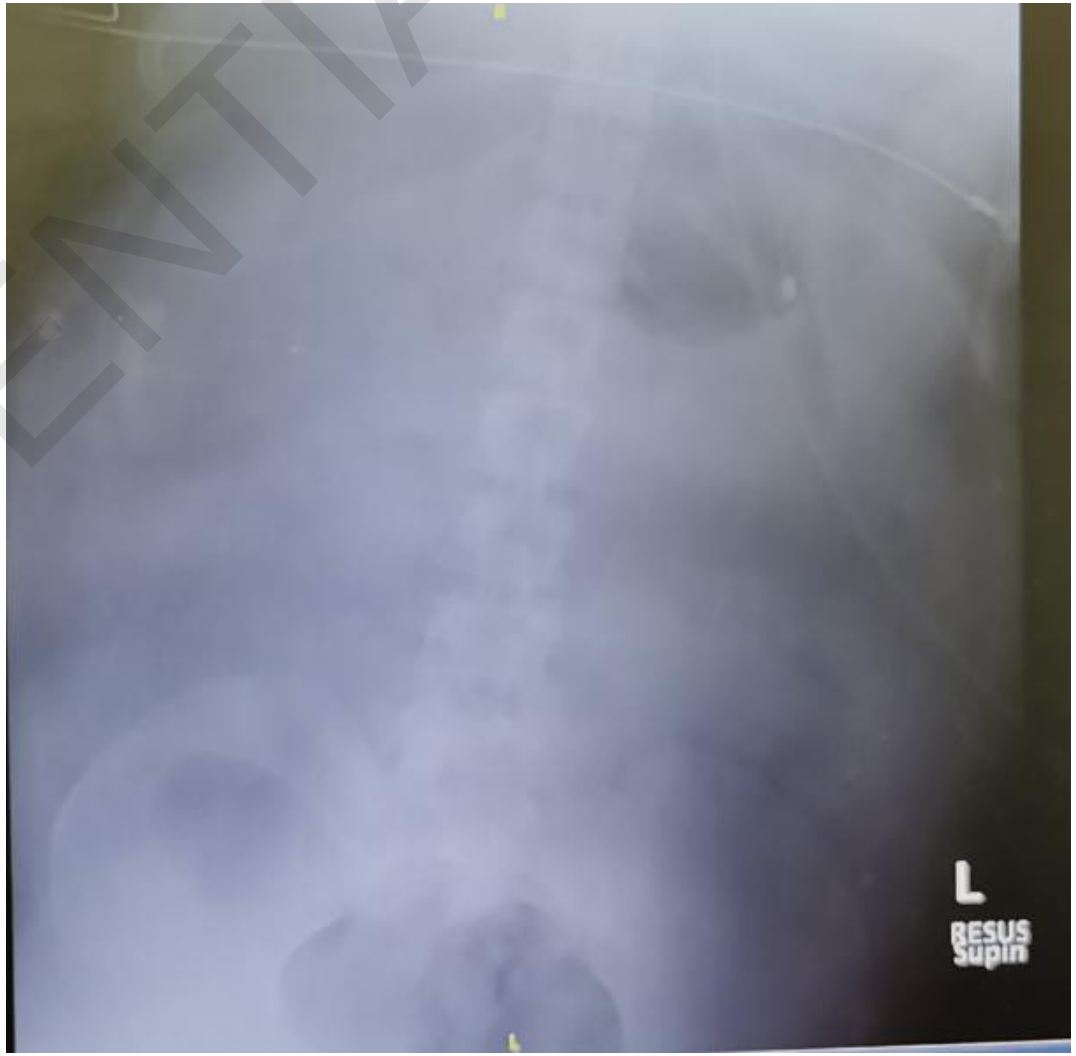
ECG





IMAGING

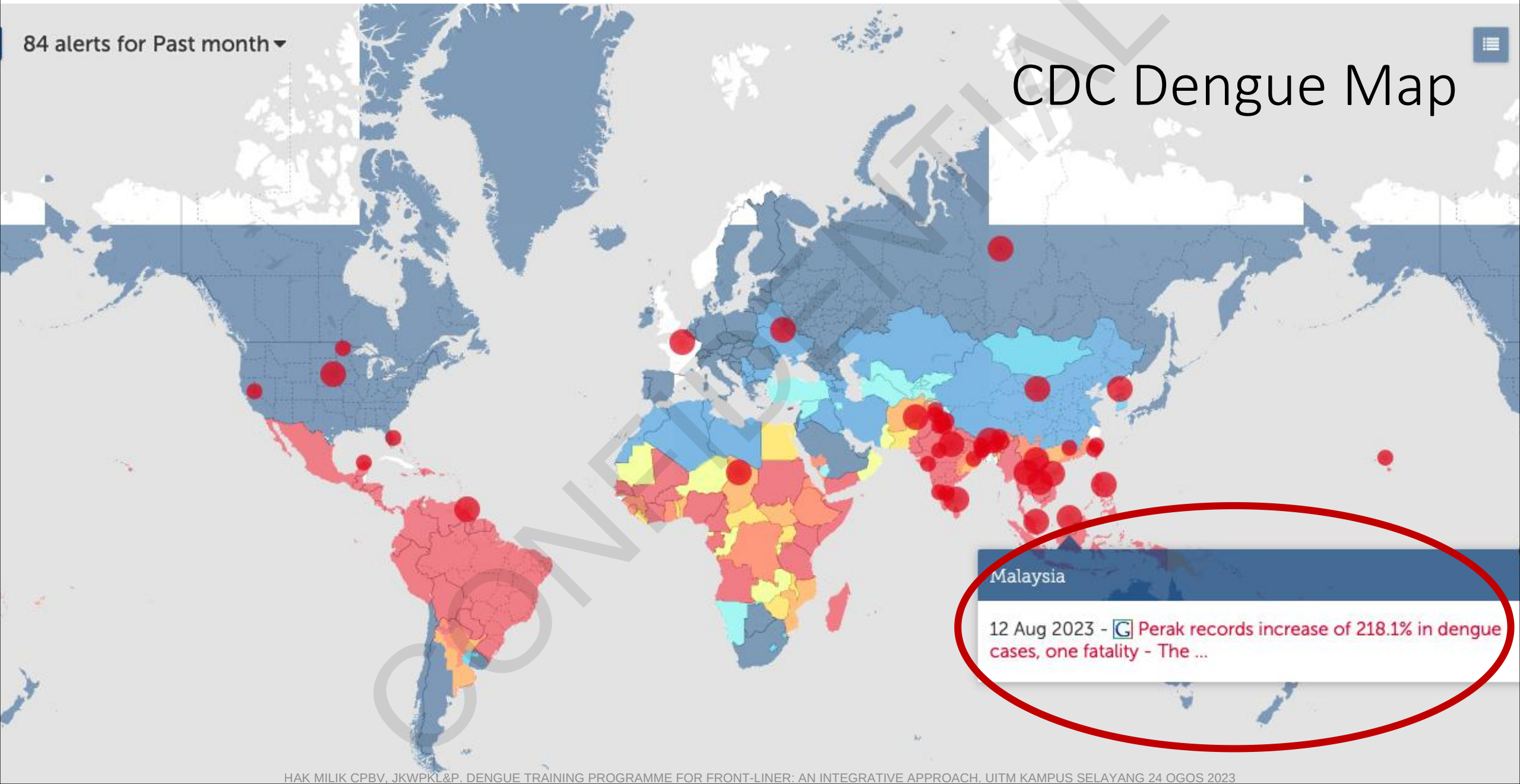




PITFALLS

- Delayed diagnosis of dengue fever – MISSED in the 1st visit
- No RDT Dengue Combo
- Fluid and Blood resuscitation adequately first before intubation.
  - sedations/fentanyl potentially tipped to decompensation

CDC Dengue Map



Rapid diagnostic tests

NS-1, IgM, IgG

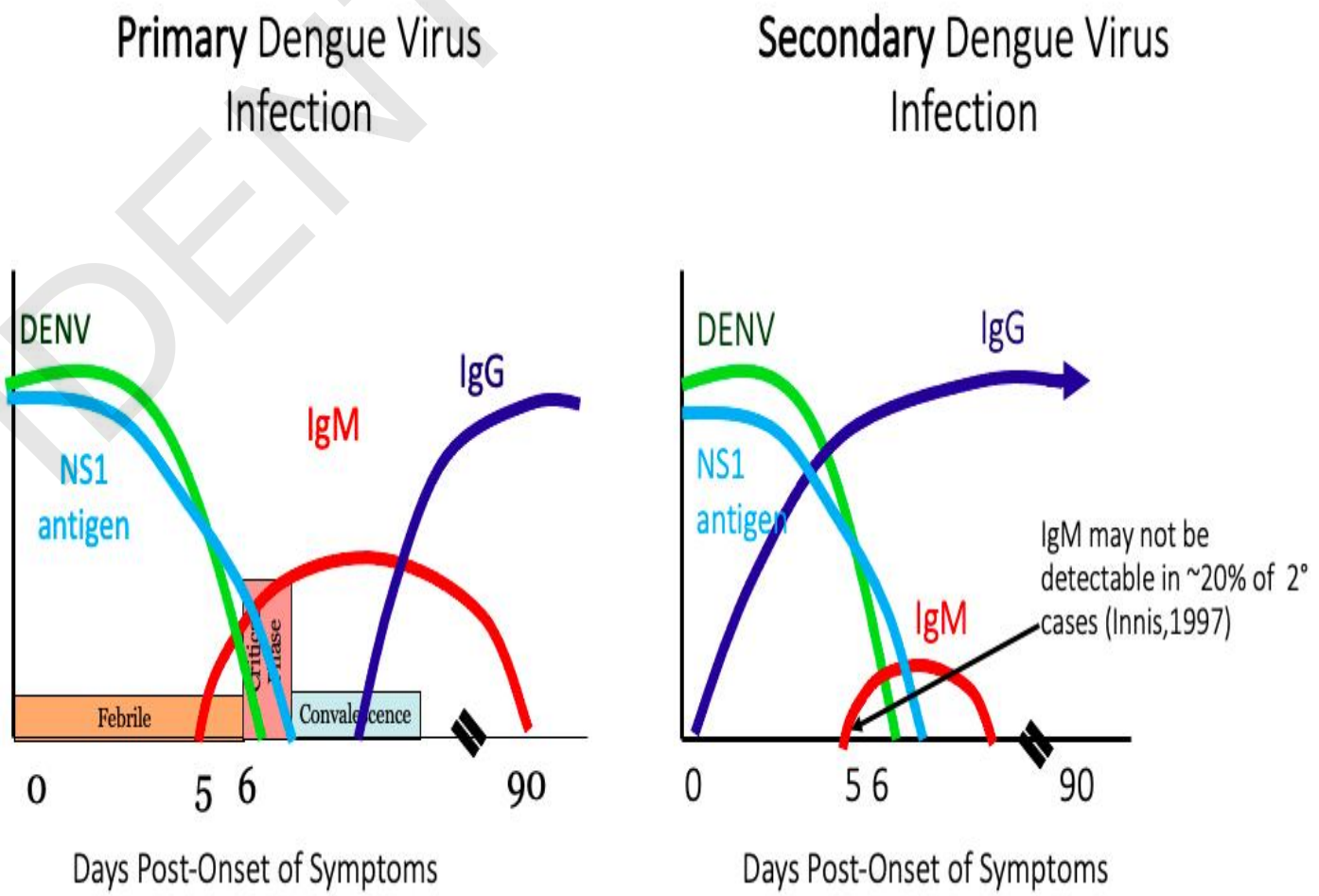
- How accurate ?
- How can it be helpful ?
- How to interpret ?

- False positive or false negatives ?

- RCT tests is read within 15-20 minutes.
- According to manufacturer’s recommendation.
- Reading too late gives false results.
- The sensitivity is 93.9% and specificity is 92%

NS-1 Ag

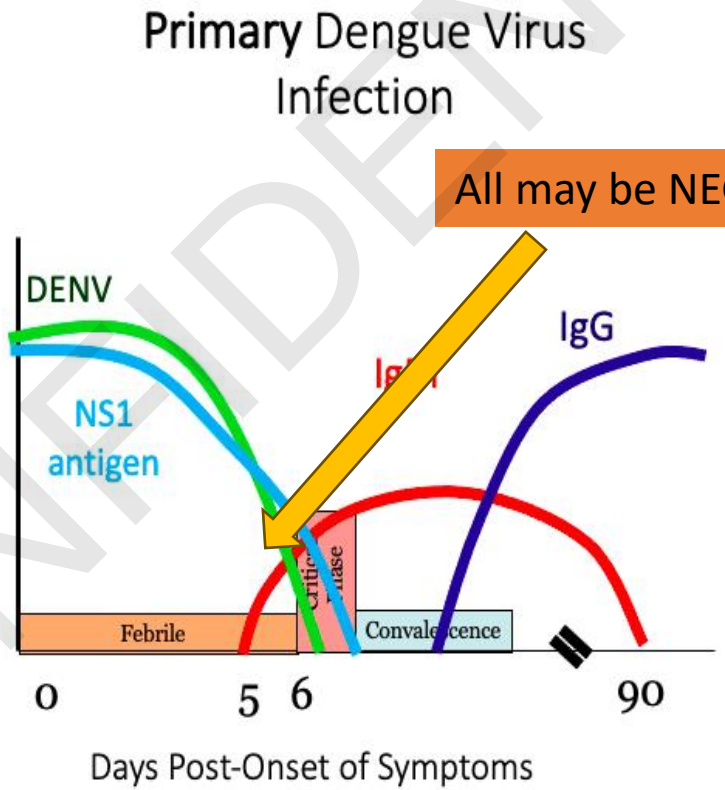
- NS1 antigen - highly conserved glycoprotein that is essential for virus viability.
- **POS NS-1 is most likely a DF**
- **Sensitivity highest on first 3 days and drops from day 4-5 onwards; undetectable in convalescence.**
- **NEG result does not mean it is not DF (10% being neg even in first 3 days) not to be callous if neg.**
- NS1 detection after D5 → may predict severe dengue.

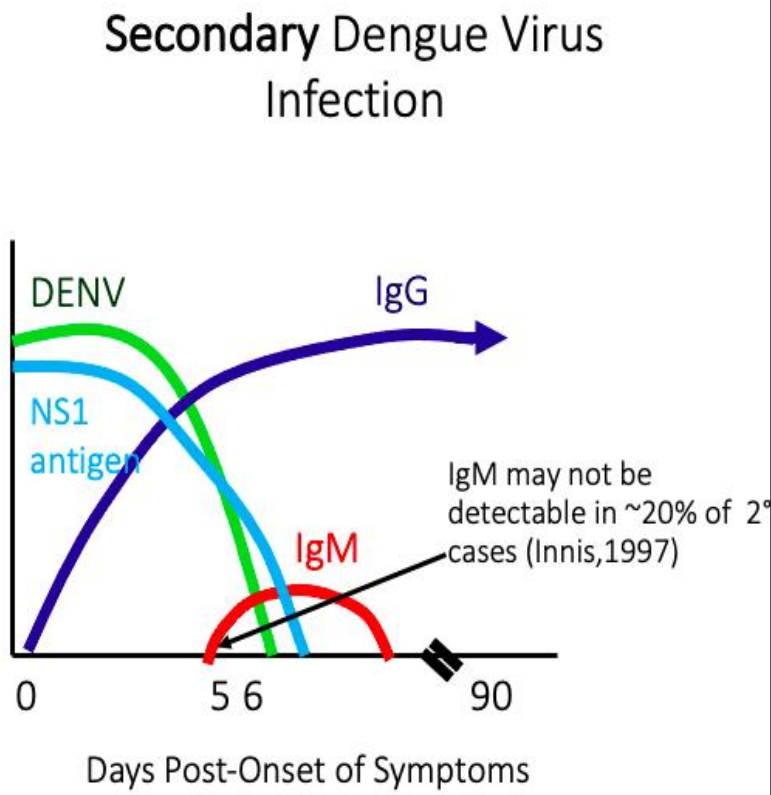


Anti Dengue **IgM**

- **Primary dengue** -detected after 4 days in ± 80% of the cases.
- **Last up to 100 days.**
- *In the event of a negative IgM, repeat serum should be collected after 5 days.*

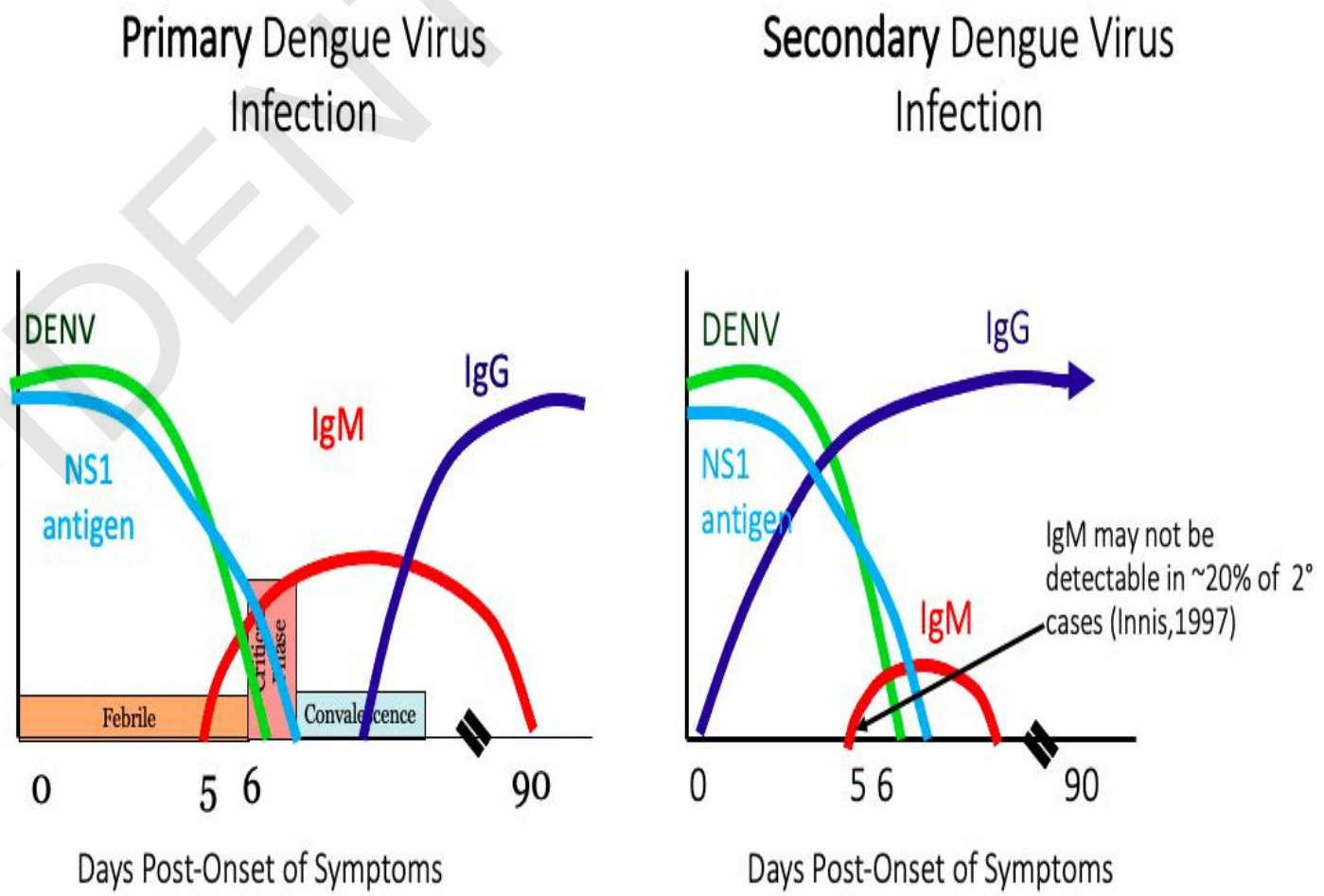
- **Secondary dengue** -detected among 78% of patients after 1 week at lower titres compared to primary dengue.
- Don't be surprised if it is not positive





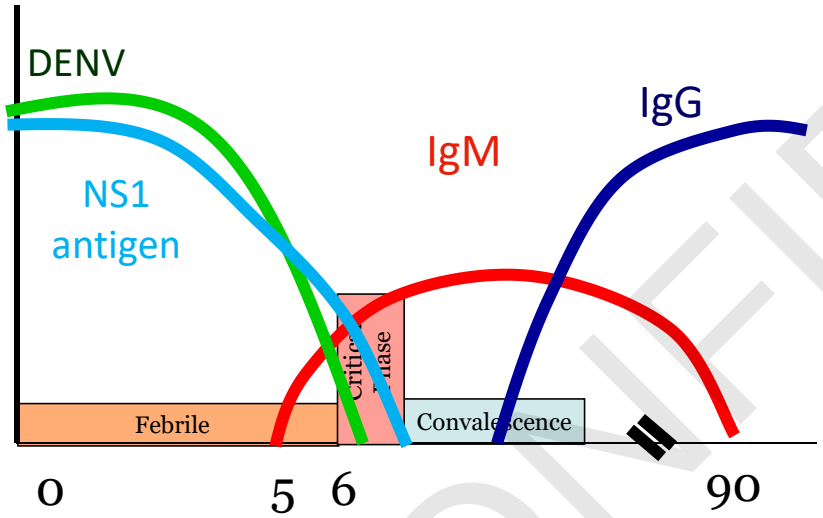
Anti Dengue IgG

- In primary appears after 1 week
- Secondary dengue, IgG was detected within first few days
- IgG lasts for LIFE (but not high titre)



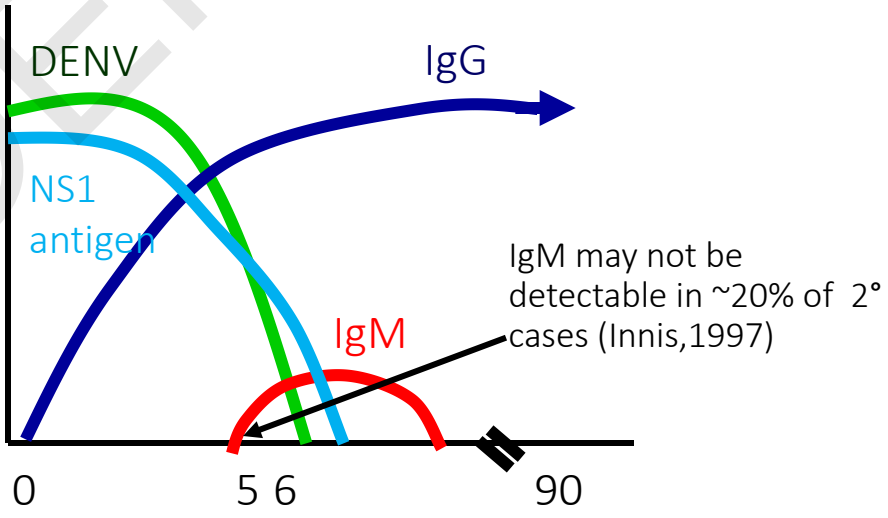
Timelines of Dengue Diagnostic Testing

Primary Dengue Virus Infection



Days Post-Onset of Symptoms

Secondary Dengue Virus Infection



Days Post-Onset of Symptoms

WINDOW PERIOD: NEG test DOES NOT mean it is not DF

What info out there about RDT?

- How reliable?
- How accurate?
- How helpful in clinical setting?
- Can it help save money?

Phuong *et al. BMC Health Services Research* 2010, **10**:275
http://www.biomedcentral.com/1472-6963/10/275

BMC
Health Services Research

RESEARCH ARTICLE Open Access

Randomised primary health center based interventions to improve the diagnosis and treatment of undifferentiated fever and dengue in Vietnam

Hoang L Phuong[1,2], Tran TT Nga[1,3], Phan T Giao[2], Le Q Hung[2], Tran Q Binh[2], Nguyen V Nam[4], Nico Nagelkerke[5], Peter J de Vries[1*]

- 12 PHCs in South training on infectio (B), the combinatic
- 2002 – 2006

Table 2 Characteristics of the febrile patients consulting 15 permanent health staffs, their presumptive diagnosis and the antibiotic treatment

	Pre-Intervention	Intervention					p-value[b]
		Training	RDTs	Training + RDTs	Control	p- value[a]	
No. of patients included	1321	1120	2798	1516	899		
					15.1 (1 - 74)	< 0.001	0.024
					1.0	< 0.001	0.009
					0.6	< 0.001	0.014
					1.3	< 0.001	NS
					35	< 0.001	< 0.001
					47		
Other	25	38	16	13	18		
Presumptive Diagnoses (%)						< 0.001	< 0.001
Acute Fever	56	67	52	53	45		
Pharyngitis	22	13	46	26	43		
Dengue	9	4	1	12	3		
Tonsillitis	6	11	0	7	6		
Other[e]	7	5	1	2	3		
Antibiotic treatment (%)	77	81	57	44	90	< 0.001	< 0.001
Intravenous fluid (%)	23	8	51	13	2	< 0.001	< 0.001

p-value (a): for intervention groups; p-value (b): for pre-intervention and intervention groups, p-value by chi-square test.
c): non specified: 7; d) non specified: 60; e) 12 other diagnoses: Diarrhoea, Typhoid fever, Leptospirosis, Hepatitis, Varicella, Allergy, Arthritis, Clinical Malaria, Gastritis, ARI, Lymphadenitis, Measles.

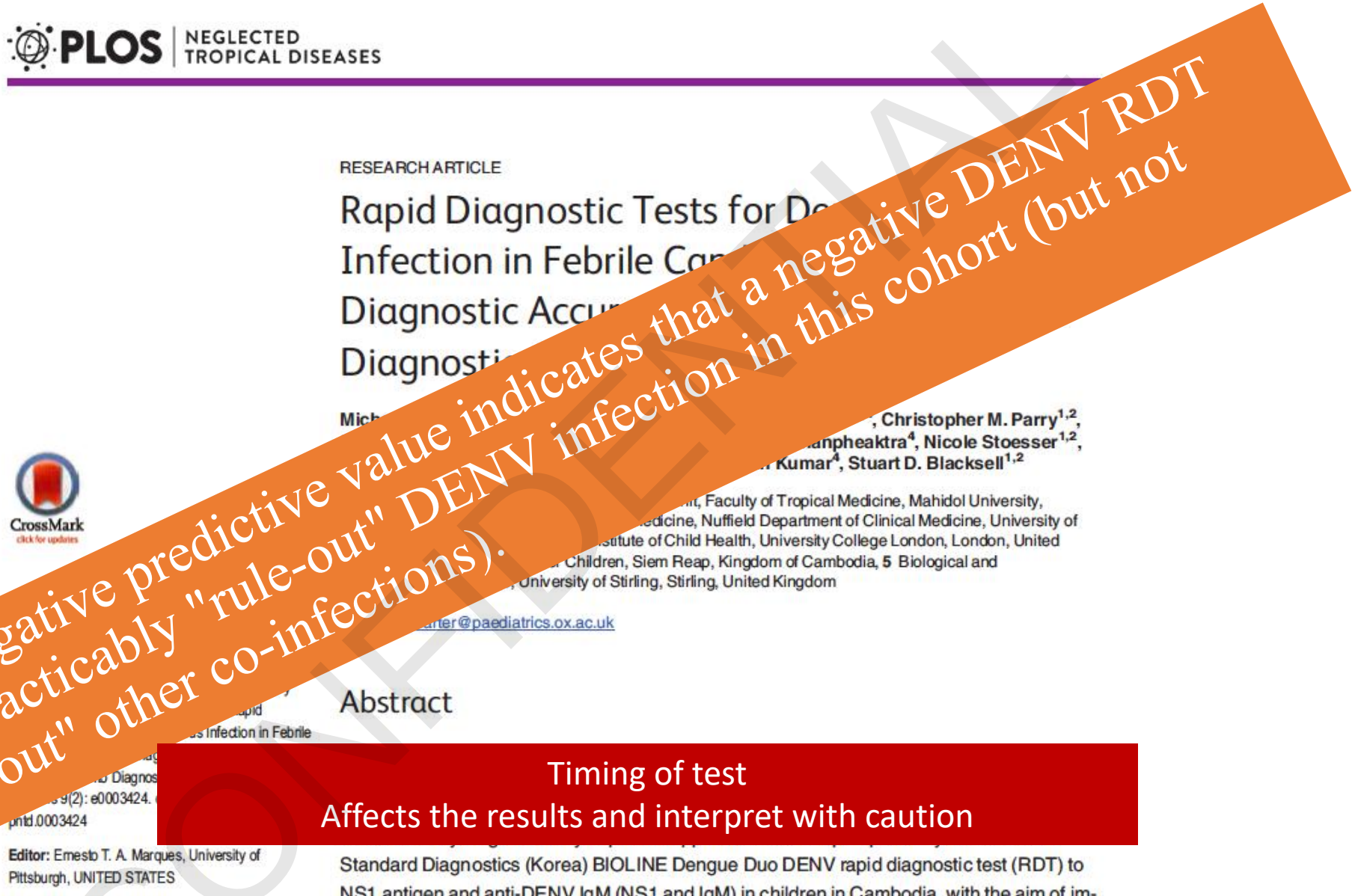
Training and RDT:
Increased diagnosis of dengue
Reduced antibiotic usage

RDT without training: increased use of IV fluids

improve t

The effect is

Randomised primary health center based interventions to improve the diagnosis and treatment of undifferentiated fever and dengue in Vietnam. *Hoang L Phuong et al. BMC Health Services Research 2010*



PLOS | NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Rapid Diagnostic Tests for D
Infection in Febrile Ca
Diagnostic Accu
Diagnosti

Mich , Christopher M. Parry[1,2], anpheaktra[4], Nicole Stoesser[1,2], Kumar[4], Stuart D. Blacksell[1,2]

, Faculty of Tropical Medicine, Mahidol University, edicine, Nuffield Department of Clinical Medicine, University of stitute of Child Health, University College London, London, United Children, Siem Reap, Kingdom of Cambodia, 5 Biological and University of Stirling, Stirling, United Kingdom

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CrossMark click for updates

Abstract

s Infection in Febrile

Diagnos

9(2): e0003424.

pntd.0003424

Editor: Ernesto T. A. Marques, University of Pittsburgh, UNITED STATES

Received: May 13, 2014

Standard Diagnostics (Korea) BIOLINE Dengue Duo DENV rapid diagnostic test (RDT) to NS1 antigen and anti-DENV IgM (NS1 and IgM) in children in Cambodia, with the aim of improving the diagnosis of DENV infection.

- High negative predictive value indicates that a negative DENV RDT may practicably "rule-out" DENV infection in this cohort (but not "rule-out" other co-infections).

Timing of test
Affects the results and interpret with caution

Am. J. Trop. Med. Hyg., 93(1), 2015, pp. 33–39
doi:10.4269/ajtmh.15-0142

Temperature and the Field Stability of a Dengue Rapi[illegible]gnostic Test in the Tropics

Koukeo Phommasone, Onanong Sengvilaipaseuth, Xavier de Lamb[illegible]ongsouvath, Ooyanong Phonemixay, Stuart D. Blacksell, Paul N. Ne[illegible]rès*

Microbiology Laboratory, Lao-Oxford-Mahosot Hospital-W[illegible]OMWRU), Mahosot Hospital, Vientiane, Lao People's Democratic Republic; UMR_D 190 "Emer[illegible](Aix-Marseille University, IRD French Institute of Research for Development, EHESP French School[illegible]nce; Centre for Tropical Medicine and Global Health, Nuffield Department of Clinical Medicine, [illegible]Hospital, Oxford, United Kingdom; Mahidol-Oxford Tropical Medicine Researc[illegible]cine, Mahidol University, Bangkok, Thailand

Abstract. The global inci[illegible]ed significantly in recent decades, resulting in a large public health burden in tropical and subtrop[illegible]e rapid diagnostic tests (RDTs) can provide accurate, rapid accessible diagnosis for patient managem[illegible] easily used by health workers in rural areas. However, in dengue-endemic areas, ambient temperatures are[illegible]gher than manufacturer's recommendation. We therefore evaluated the effect of high temperature over time on th[illegible]performance of one commonly used dengue RDT, the Standard Diagnostics Bioline Dengue Duo. RDTs were kept in five different conditions (at 4°C, 35°C, 45°C, 60°C, and at fluctuant ambient temperatures in a free-standing hut) for between 2 days and 2 years in the Lao People's Democratic Republic (PDR). RDTs were tested with four control sera (negative, dengue nonstructural protein 1 [NS1], anti-dengue immunoglobulin [Ig] M, and anti-dengue IgG positive). The RDTs had 100% consistency over the 2-year study, despite high temperatures, including in the hut in which temperatures exceeded the manufacturer's recommendations for 29% of time points. These data suggest that the diagnostic accuracy of the SD Bioline Dengue Duo RDT remains stable even after long-term storage at high temperatures. Therefore, use at such ambient temperatures in tropical areas should not jeopardize the dengue diagnostic outcome.

RDT had 100% consistency over the 2 year study

Lim *et al. BMC Health Services Research* (2017) 17:850
DOI 10.1186/s12913-017-2789-8

BMC Health Services Research

RESEARCH ARTICLE Open Access

A systematic review of the economic impact of rapid diagnostic tests for dengue

Jacqueline Kyungah Lim[1,2*], Neal Alexander[2] and Gian Luca Di Tanna[3]

Two studies analyzed:
one by Lubell et al. and another by Mitra et al.
in India and in Laos, over different time periods between 2008 and 2013

Conclusions

These two studies reported different conclusions and there is a need for new studies to specifically measure economic impact of dengue RDTs.

FALSE POSITIVES and FALSE NEGATIVES

False positives

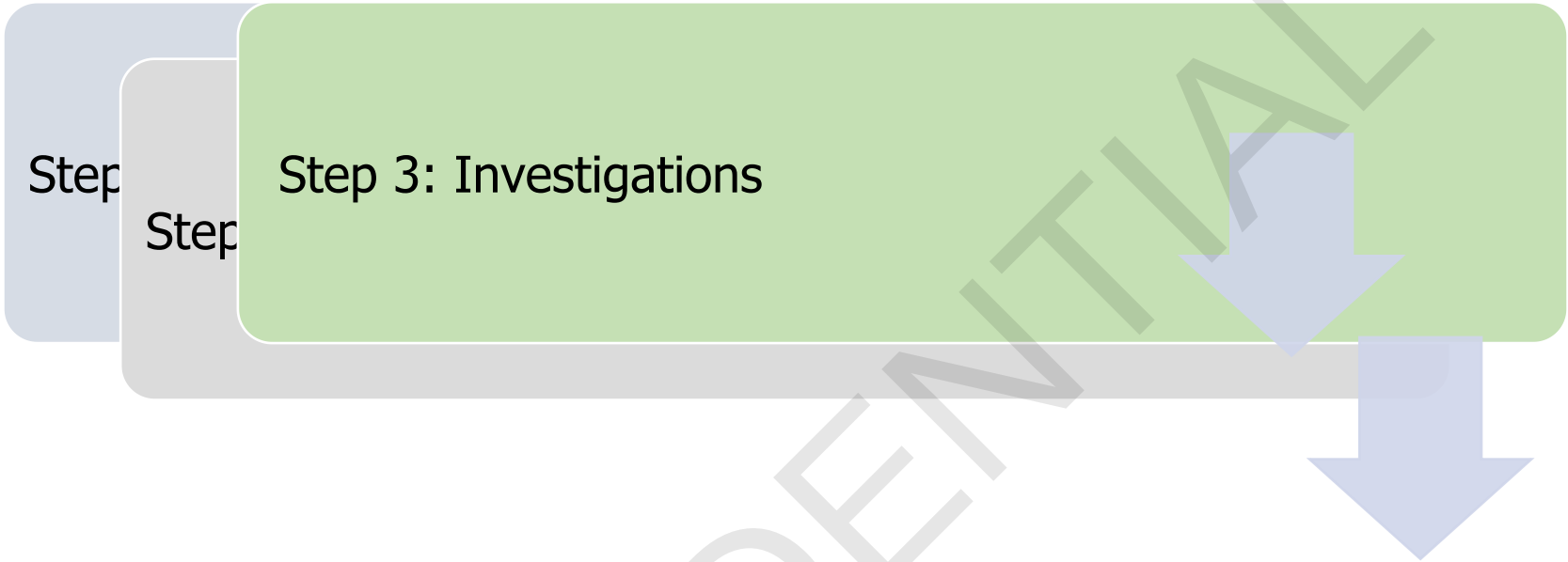
Serological tests for dengue have been shown to cross-react with:

- other flavivirus – Japanese Encephalitis, ZIKA

SO, WHAT IF WE GET THE DX early?

- Know when is the onset of illness. >> Strategize for preparedness of any potential crisis.
- Education can be done, like for example our autistic boy
- Estimate when is the storm coming?
- How to prepare the patient for the storm, which hospital to go to, warning signs to look out to.

Patient assessment: Step 3



Step 3: Investigations

Who should get a **Dengue Diagnostic Test (Rapid) + FBC**

- All patients with fever and undifferentiated signs and symptoms
- All patients with Fever and co-morbid conditions (esp febrile phase)
- All patients with warning signs (urgently)
- All patients with shock (FBC and glucose check urgently)

Dengue-specific diagnostic tests *

- For confirmation, e.g. NS1/IgM/IgG rapid tests or nucleic acid detection (PCR) NS1 Ag positive – Confirms the diagnosis

- Lab Confirmation in Febrile phase (Day 1-3) **DOES NOT** mean referral or IV Fluid therapy.
- **PROACTIVE MANAGEMENT – Intense Oral Rehydration, Close follow up, Education on Defervescence and Warning signs**

Step 3: Investigations

Dengue investigation basics

- Complete blood count (CBC) with haematocrit (HCT) are usually all that are necessary for monitoring
- Of special importance are:
  - HCT;
  - white blood cell count (WBC) and;
  - platelet count
- An HCT in the first 3 days of illness suffices for the baseline HCT; in acute cases, age-specific population HCT levels can substitute for a patient's baseline
- A steep drop in platelet count with a **rising HCT** compared to baseline suggests progression to the plasma leakage/critical phase of dengue
- A falling WBC followed by falling platelet count by Day 3 or 4 of illness is almost surely dengue

Step 3: Investigations

- If resources are available, all febrile patients should get baseline CBC at first visit. A normal CBC in the febrile phase does not exclude dengue.
- **If resources are limited**, CBC for febrile patients with poor oral intake and/or poor urine output.

Other tests? *

- Blood chemistry tests (liver function, glucose, serum electrolytes, urea, creatinine
- Should be considered in patients with **risk factors and Co-morbid conditions**

When should a patient be referred for immediate medical treatment?

- Rising HCT or high HCT
- Leucopenia and/or thrombocytopenia
- Presence of warning signs, shock
- Poor oral intake/not passing urine

Can we and should we do RDT for all?

- Locality outbreak?
- Seasonal outbreak?

- FBC parameters interpret sequence – drop in TWC or PLT

- Put clinical, lab and epidemiology scenario together

- Dengue IgM is usually positive after day 5-7 of illness. Therefore a negative IgM taken before day 5-7 of illness does not exclude dengue infection.

Recommendation 2

- Dengue rapid combo test or non-structural protein 1 antigen (NS1 Ag) should be taken as soon as dengue infection is suspected.
- If dengue IgM is negative before day seven, a repeat sample must be taken in recovery phase.
- If dengue IgM is still negative after day seven, dengue IgG should be done for diagnostic confirmation of secondary dengue infection.

Caution: Massive blood transfusion may affect the test results mentioned above.

Dengue Notification

LAWS OF MALAYSIA

Act 342

PREVENTION AND CONTROL OF INFECTIOUS DISEASES ACT 1988

An Act to amend and consolidate the law relating to the prevention and control of infectious diseases and to provide for other matters connected therewith.

[ ]

JADUAL PERTAMA

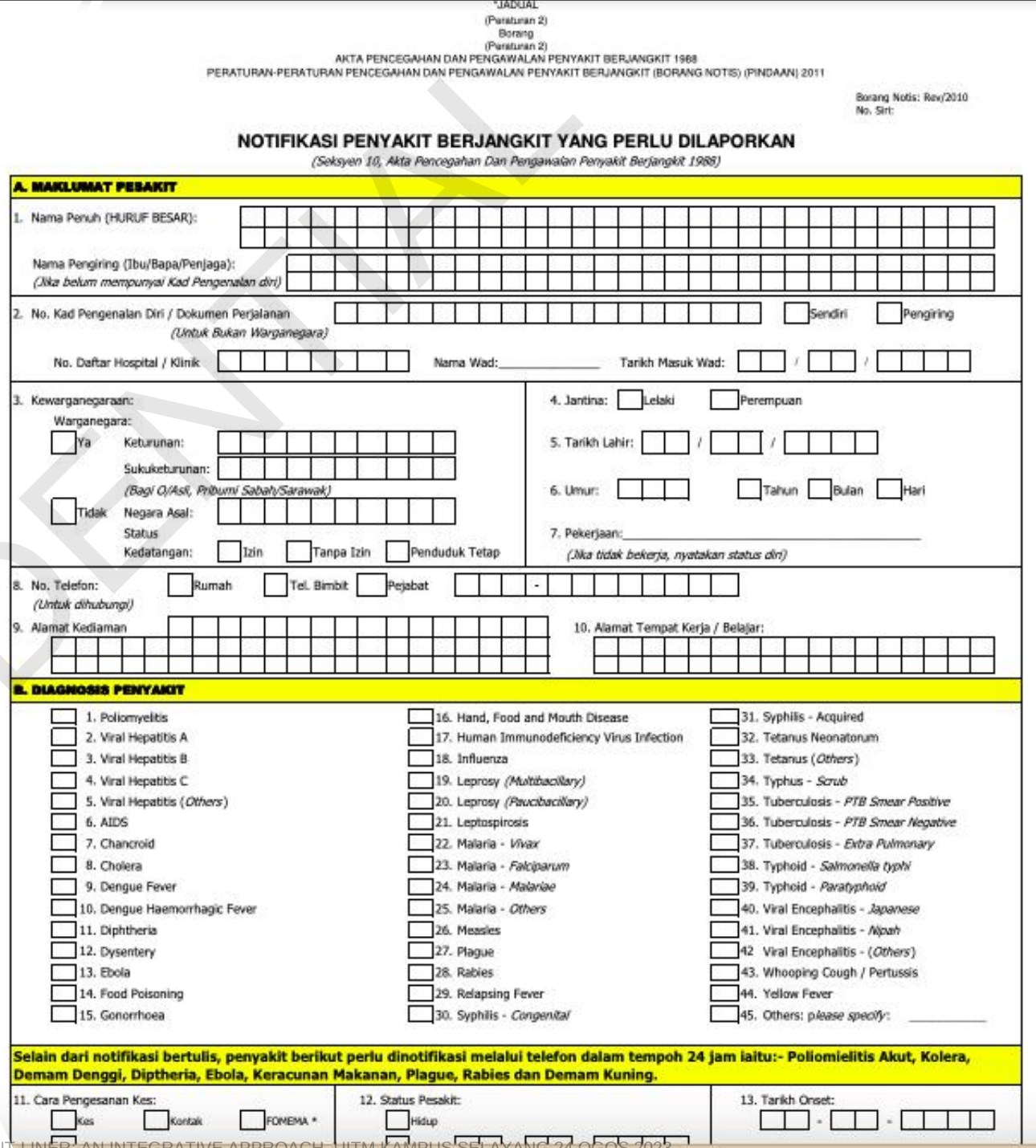
(Seksyen 2)

PENYAKIT-PENYAKIT BERJANGKIT

BAHAGIAN I

1. Batuk Kokol.
2. Campak.
3. *Chancroid.*
4. Demam Denggi dan Demam Denggi Berdarah
5. Demam Kuning.
6. Difteria.
7. Disenteri (Semua jenis).
8. Jangkitan Gonococcal (Semua jenis).
9. Keracunan Makanan.
10. Kolera.
11. Kusta.
12. Malaria.

- Borang notifikasi



"JADUAL
(Peraturan 2)
Borang
(Peraturan 2)
AKTA PENCEGAHAN DAN PENGAWALAN PENYAKIT BERJANGKIT 1988
PERATURAN-PERATURAN PENCEGAHAN DAN PENGAWALAN PENYAKIT BERJANGKIT (BORANG NOTIS) (PINDAAN) 2011

Borang Notis: Rev/2010
No. Siri:

NOTIFIKASI PENYAKIT BERJANGKIT YANG PERLU DILAPORKAN

(Seksyen 10, Akta Pencegahan Dan Pengawalan Penyakit Berjangkit 1988)

A. MAKLUMAT PESAKIT

1. Nama Penuh (HURUF BESAR):

Nama Pengiring (Ibu/Bapa/Penjaga):
(Jika belum mempunyai Kad Pengenalan diri)

2. No. Kad Pengenalan Diri / Dokumen Perjalanan ☐ Sendiri ☐ Pengiring
(Untuk Bukan Warganegara)

No. Daftar Hospital / Klinik Nama Wad:_____ Tarikh Masuk Wad: / /

3. Kewarganegaraan:
Warganegara:
☐ Ya Keturunan:
Sukuketurunan:
(Bagi O/Asli, Pribumi Sabah/Sarawak)
☐ Tidak Negara Asal:
Status Kedatangan: ☐ Izin ☐ Tanpa Izin ☐ Penduduk Tetap

4. Jantina: ☐ Lelaki ☐ Perempuan

5. Tarikh Lahir: / /

6. Umur: ☐ Tahun ☐ Bulan ☐ Hari

7. Pekerjaan:_____
(Jika tidak bekerja, nyatakan status diri)

8. No. Telefon: ☐ Rumah ☐ Tel. Bimbit ☐ Pejabat -
(Untuk dihubungi)

9. Alamat Kediaman

10. Alamat Tempat Kerja / Belajar:

B. DIAGNOSIS PENYAKIT

☐ 1. Poliomyelitis	☐ 16. Hand, Food and Mouth Disease	☐ 31. Syphilis - Acquired
☐ 2. Viral Hepatitis A	☐ 17. Human Immunodeficiency Virus Infection	☐ 32. Tetanus Neonatorum
☐ 3. Viral Hepatitis B	☐ 18. Influenza	☐ 33. Tetanus (*Others*)
☐ 4. Viral Hepatitis C	☐ 19. Leprosy *(Multibacillary)*	☐ 34. Typhus - *Scrub*
☐ 5. Viral Hepatitis (*Others*)	☐ 20. Leprosy *(Paucibacillary)*	☐ 35. Tuberculosis - *PTB Smear Positive*
☐ 6. AIDS	☐ 21. Leptospirosis	☐ 36. Tuberculosis - *PTB Smear Negative*
☐ 7. Chancroid	☐ 22. Malaria - *Vivax*	☐ 37. Tuberculosis - *Extra Pulmonary*
☐ 8. Cholera	☐ 23. Malaria - *Falciparum*	☐ 38. Typhoid - *Salmonella typhi*
☐ 9. Dengue Fever	☐ 24. Malaria - *Malariae*	☐ 39. Typhoid - *Paratyphoid*
☐ 10. Dengue Haemorrhagic Fever	☐ 25. Malaria - *Others*	☐ 40. Viral Encephalitis - *Japanese*
☐ 11. Diphtheria	☐ 26. Measles	☐ 41. Viral Encephalitis - *Nipah*
☐ 12. Dysentery	☐ 27. Plague	☐ 42 Viral Encephalitis - (*Others*)
☐ 13. Ebola	☐ 28. Rabies	☐ 43. Whooping Cough / Pertussis
☐ 14. Food Poisoning	☐ 29. Relapsing Fever	☐ 44. Yellow Fever
☐ 15. Gonorrhoea	☐ 30. Syphilis - *Congenital*	☐ 45. Others: *please specify*: _____

Selain dari notifikasi bertulis, penyakit berikut perlu dinotifikasi melalui telefon dalam tempoh 24 jam iaitu:- Poliomielitis Akut, Kolera, Demam Denggi, Diptheria, Ebola, Keracunan Makanan, Plague, Rabies dan Demam Kuning.

11. Cara Pengesanan Kes:
☐ Kes ☐ Kontak ☐ FOMEMA *

12. Status Pesakit:
☐ Hidup

13. Tarikh Onset: - -

Take Home Message

- NS-1 – first 3 days can help to clinch diagnosis
- 10% may have NEG NS-1 even on the first 3 days – NEG may not be NEG
- Once diagnosis of DF is made – preparedness for storm
- Patient EDUCATION
- Drink adequately + electrolytes
- Na + K

Thank you