KINGDOM OF CAMBODIA

Ministry of Health

2018

Facilitator's Manual on Clinical Management of Dengue and Dengue Hemorrhagic Fever

NATIONAL CENTRE FOR PARASITOLOGY,
ENTOMOLOGY AND MALARIA CONTROL

2018

Facilitator's Manual
on Clinical Management of Dengue and Dengue Hemorrhagic Fever

Foreword

The Facilitator's Manual was developed by Dr. Hasitha A. Tissera – Head, National Dengue Programme, Ministry of Health, Sri Lanka and Dr. Siripen Kalyanarooj – Consultant, WHO Collaborating Centre for Case Management of Dengue/DHF/DSS, Queen Sirikit National Institute of Child Health (QSNICH), Department of Medical Services, Ministry of Public Health, Thailand with the assistance of WHO Cambodia.
The need for a standardized manual for training was seen with the development of the new National Guidelines for Clinical Management of Dengue to provide a platform to train clinicians on the correct management of dengue to further reduce the morbidity and mortality due to Dengue/ DHF.
The manual is structured with a sample agenda/ program which can be adapted and changed depending on the number of training days, selected power point slides are given to guide the facilitators/lecturers to add or remove slides accordingly but will support with decision making and to streamline the lectures. It also provides case scenarios which will provide the participants to acquire necessary skills for management and for participatory learning.
National Centre for Parasitology, Entomology and Malaria Control (CNM), Ministry of Health would like to recognize the effort of the National Dengue Control Program, Clinical Subcommittee on Dengue Case Management, WHO and other stakeholders for their assistance in the development of this manual.

Dr. Huy Rekol
Director
National Centre for Parasitology,
Entomology and Malaria Control
(CNM)

Acronyms and abbreviations

CBC	Complete Blood Count
CFR	Case Fatality Rate
CNM/NDCP	Centre for Entomology & Parasitology
CRFT	Capillary Refilling Time
DEN	Dengue
DF	Dengue Fever
DHF	Dengue Hemorrhagic Fever
DSS	Dengue Shock Syndrome
DV	Dengue virus
FBC	Full blood Count
Hct	Hematocrit
HDU	High Dependency Unit
HLA	Human Leukocyte Antigen
ICU	Intensive Care Unit
INR	International Normalize Ratio
NS 1	Non-structural Protein 1
OPD	Out-patient Department
PCR	Polymerase Chain Reaction
PCV	Packed Cell Volume
PP	Power point
PT	Prothombin Time
PTT	Partial Thrombin Time
PPV	Positive Predictive Value
RP	Resource Person
ToT	Training of Trainers
TT	Tourniquet Test
WHO	World Health Organization

Glossary

Pathogenesis of a disease

The biological mechanism (or mechanisms) that lead to a disease

The term can also describe the origin and development of the disease, and whether it is acute, chronic, or recurrent

Disease Surveillance

The ongoing systematic collection and analysis of data and the provision of information which leads to action being taken to prevent and control a disease (usually one of an infectious nature)

Burden of Disease

The total effect of a disease on an individual or on society

Disease Transmission

The passing of a pathogen causing communicable disease from an infected host (individual or group) to a particular individual or group, regardless of whether the other individual was previously infected

Modulation

The normal capacity of cell adaptability to its environment

Disease outbreak

The occurrence of cases (of a disease) in excess of what would be normally expected in a defined community, geographical area or season

An outbreak may occur in a restricted geographical area, or may extend over several countries. It may last for a few days or weeks, or for several years

Pathophysiology

The functional changes associated with or resulting from disease or injury

Life cycle

The course of development al changes through which an organism passes from its inception through the stages at which it reproduces

Table of content

Part 1

Introduction

Dengue which was first detected in 1963 is now considered endemic in the country. It is a considerable health concern among clinicians and health administrators.

The number of cases of dengue although has seen an increase over the past 10 years; the case fatality has shown a decline in Cambodia.

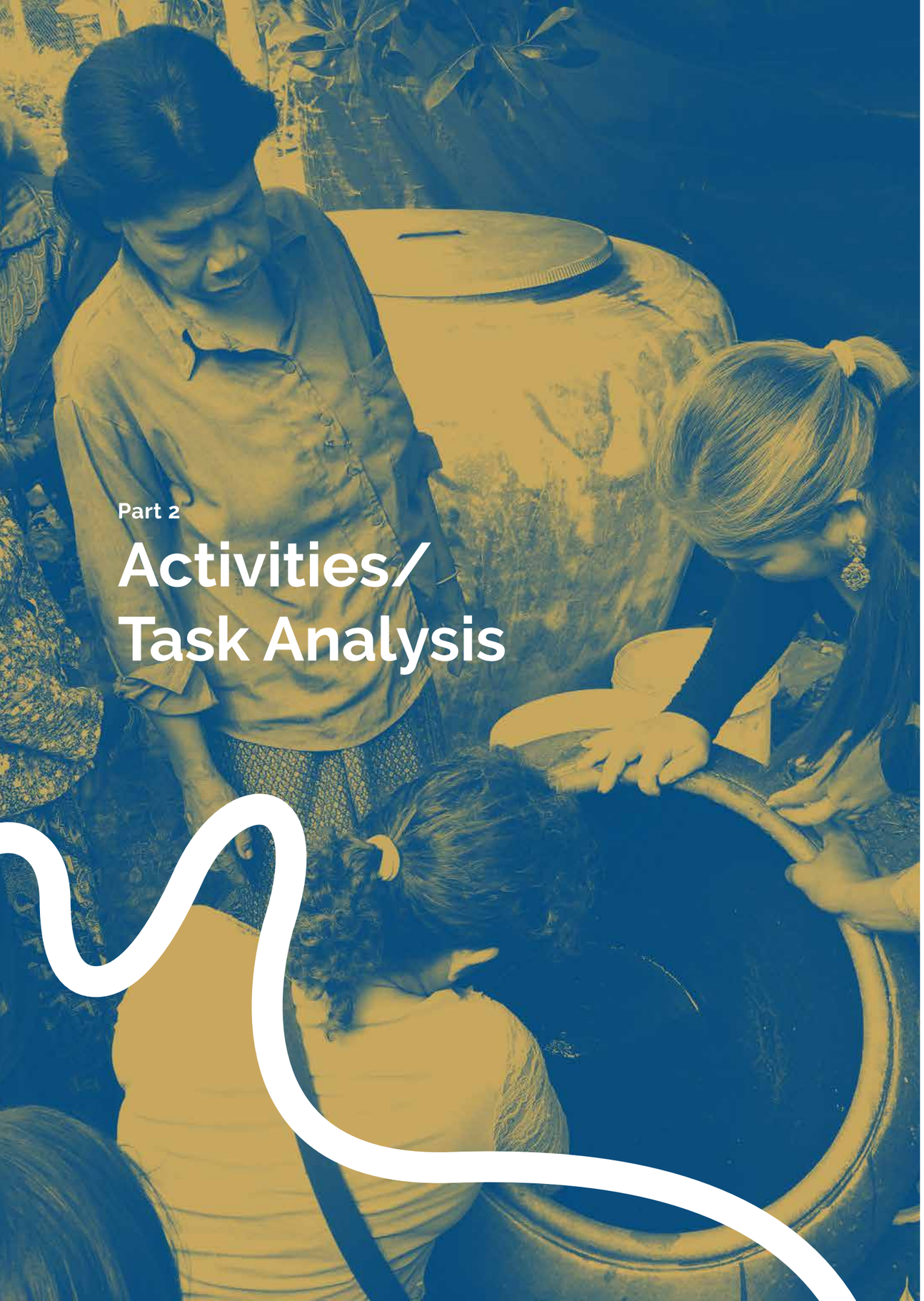
This Facilitator Manual to train clinicians was commissioned and developed to roll out dengue clinical management training in a standardized manner throughout the country according to the WHO clinical management principles and in align with the newly developed National Guideline for Clinical Management of Dengue (2018 version 3) of the Kingdom of Cambodia to sustain and also further reduce the mortality due to dengue and its complications.

The Objectives for development of the facilitator's manual are:

- To improve early clinical diagnosis of dengue patients (DF/ DHF/ DHS), by clinical and simple laboratory tests
- To provide appropriate care in line with the updated dengue management guidelines
- To understand the appropriate use of fluid (crystalloids/colloids – dextran 40 in 10% Normal Saline) and blood
- To enhance skills of clinical staff on notification of cases for early public health interventions

The complete facilitator's training course is scheduled for 3 days covering all important clinical aspects. The training is planned with lectures, case scenarios, role play and group discussions for maximum learning, participation by the participants and sharing of each other's knowledge and skills.

The evaluation of the training would be done through a pre/ post-test and through the distribution of an evaluation form to provide feedback on the individual sessions and the entire training program.



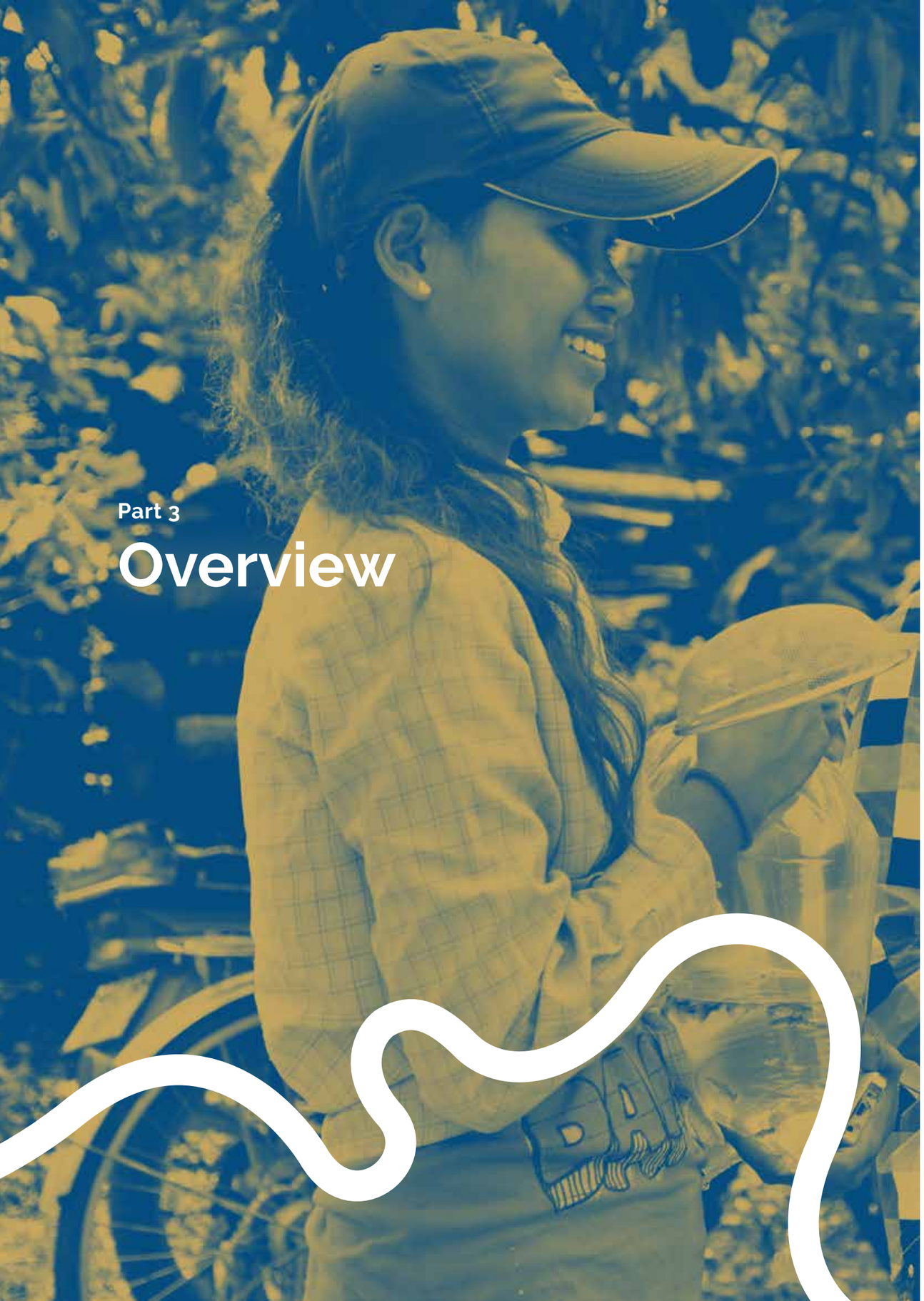
Part 2

Activities/ Task Analysis

Dengue case management: Training for the Trainers (TOT)

ACTIVITIES/TASKS	KNOWLEDGE	TARGET	EVALUATION	LECTURES
1 Improve clinical diagnosis of dengue patients				
1.1. Able to diagnose early dengue illnesses	Simple clinical and laboratory for making suspected dengue infections including RDT Kits	All	Remember, understanding, application	**1 - 4**
1.2. Able to classify dengue illness	Classifications of dengue: 1997/2011 and 2009	All	Remember & application	
1.2. Able to classify dengue illness	Classifications of dengue: 1997/2011 and 2009	All	Remember & application	
2 Provide appropriate care for dengue patients				
2.1. Able to manage dengue patients in febrile phase	Signs & symptoms of dengue illnesses	All -mainly OPD/ primary care	Remember, understanding & application	**5 - 6**
2.2. Able to identify more severe dengue cases to be referred or admitted	Warning signs including signs and symptoms of shock	All -mainly OPD/ primary care	Evaluate and analysis	
2.3. Able to give advice to suspected dengue patients, to families, community	Natural course of DF/ DHF/DSS, home management, prevention and control of Aedes mosquitoes	All -mainly OPD/ primary care	Remember, understanding & application	
3 Provide appropriate care for DHF/DSS in leakage/critical phase				
3.1. Able to use dengue monitoring charts	Parameters used for making decision for IV fluid administration	In-ward/ HDU/ ICU	Create, evaluate & analysis	**7 – 8**
3.2. Able to use proper type, amount and duration of IV fluid: crystalloid and colloidal solutions during leakage/ critical phase	Natural course of plasma leakage, properties, how to use and maximum dosage of colloid (dextran- 40)	In-ward/ HDU/ ICU	Create, evaluate & analysis	
3.3. Able to recognize, investigate and correct common complications	Common complications of DHF/DSS: ABCS	In-ward/ HDU/ ICU	Create, evaluate & analysis	**9 – 10, 12, 16, 17**
3.4. Able to recognize bleeding including concealed bleeding with early blood transfusion	Signs and symptoms of (concealed) bleeding Indications for blood transfusion	In-ward/ HDU/ ICU	Create, evaluate & analysis	
3.5. Able to manage complications of fluid overload	Detection of patients with fluid overload and the management	In-ward/ HDU/ ICU		
3.6. Able to recognize and manage high -risk dengue patients	High risk patients; infants, obesity, pregnancy, underlying diseases, bleeding, consciousness changes	All		

ACTIVITIES/TASKS	KNOWLEDGE	TARGET	EVALUATION	LECTURES
3.7. Able to recognize and manage DHF/DSS patients in convalescence phase; early and late (reabsorption) phase	Signs of recovery and management in convalescence phase	All		
3.8. Able to recognize and manage unusual dengue cases/EDS	Differential diagnosis of DSS with unusual manifestations from other kinds of shock, especially septic shock	All		**11**
4	*Enhance skills on notification of cases for early public health intervention*			
4.1. Able to make early diagnosis and submit timely report to the responsible authorities	Early warning system network and rapid response team	All		**12 – 14, 15**
4.2. Able to do the prevention and control of Aedes mosquitoes	Life cycle of Aedes mosquitoes, incubation period. Mechanical, biological and chemical control of Aedes mosquitoes and their larvae, pupae	All		**12 – 14, 15**



Part 3

Overview

Training schedule/agenda (details given in detailed Agenda below):

Day 1 – Overview and management of simple case of Dengue
Day 2 – Management of complications and difficult dengue cases
Day 3 – Management of EDS and discussions by participants (Q&A/scenarios/presentations)

Training methods

1. Power-point presentations (17 pp lectures)
2. Case scenarios (12 cases)
3. Role play
4. Group work and group presentations
5. Discussions (interactive sessions)

Place:

Suitable lecture hall with audio-visual facilities to accommodate participants

Duration:

A total of 3 days for the entire training

Participants: total of 25-30 participants per session

1. Sub-committee on clinical management of Dengue
2. Experts on Dengue case management from Dengue endemic Provinces (Primary, Secondary and tertiary care hospitals)

Trainers:

1. WHO consultants
2. Dengue Experts

Facilitators:

1. WHO staff
2. CNM staff

Evaluation

Following methods of evaluation will be used for short term evaluation:

1. Pre and post tests
2. Direct observation from case scenarios and interactive sessions
3. Questionnaires : a) evaluation of overall training b) evaluation of individual session

Long-term evaluation of participants will be based on following indicators over next 1-2 years:

- Number of follow-up training conducted by each participant/team
- Number of successful management of DHF/DSS cases
- Number of DHF/DSS with complications successfully managed
- Case fatality rate (CFR) of participants in the respective hospitals/units

National/ sub national level Dissemination of the training

The initial trainers who attend the ToT will take forward the task of training clinicians in their own Provinces/ Institutions.

Those who have had the 3 day training by the ToT facilitators would then be given the task of training other clinicians in each province and institution. The facilitators should evaluate the training program/s conducted by the trained clinicians by participating in the roll out trainings whenever possible at regular intervals.

Regular meetings should be conducted at national level to discuss issues related to rolling out the training program in their respective provinces/ institutions.

Part 4

Agenda

Co-facilitator: Clinicians from Cambodia and CNM Dengue Program

DAY1

TIME	DURATION	ACTIVITY	FACILITATOR	METHOD
8.30am	30 min	Registration Opening & welcoming remarks Presentation of Objectives Introduction of participants Participant's expectations Logistics & ground rules Program of the day	CNM/ NDCP	
9.00 am	20 min	Pre test		18 Q's
9.20 am	30 min	Introduction to the updated Dengue Management Guidelines	Chair of Sub-committee	PP Distribution of guidelines
9.45 am	15 min	Tea		
10.00 am	30 min	Epidemiology of Dengue (including burden of disease) – (Lect. No. 01)	Head of Dengue Program	PP
10.30 am	30 min	Overview of Dengue –part 1 (including classification, differential diagnosis, virology and pathogenesis) – (Lect. No. 02)		
	30 min	Overview of Dengue – part 2 (including management of febrile phase, clinical features of DHF, danger signs to watch for) – (Lect. No. 03)	Clinician	PP
11.30 am	30 min	Early clinical/simple lab diagnosis (CBC) and Confirmatory Diagnosis of Dengue (NS1/IgM/ IgG/PCR etc.) – (Lect. No. 04)		PP Presentation of cases
12.00 pm	30 min	Monitoring Dengue patients – (Lect. No. 05)		PP with e.g. of CBC in one case
12.30 pm	60 min	Lunch		
1.30 pm	30 min	Diagnosis of Leaking – Clinical Radiological & laboratory – (Lect. No. 06)	Clinician/ Radiologist	PP Radiology reports Case Discussion
2.00 pm	45 min	IV Fluid Management – (Lect. No. 07) - Principles - When to start - How much - What Fluids - When to stop - Giving Less	Clinician/s	PP with case scenarios

DAY1

TIME	DURATION	ACTIVITY	FACILITATOR	METHOD
2.45 pm	30 min	Introduction to TRIAGE/ Patient Assessment- (Lect.No. 08)		PP TRIAGE Guide distributed
3.15 pm	30 min	Tea Break		
3.45 pm	60 min	Case Scenarios & Discussion (Case No. 1-3 DF/ DHF/DSS)		PP Case Scenarios
4.45 pm	15 min	Wrap up Day 1		
5.00 pm		End of Day 1		

DAY 2

TIME	DURATION	ACTIVITY	FACILITATOR	METHOD
8.30am	15 min	Review of Day 1	Participant	
8.45 am	45 min	Common complications of DHF/DSS – ABCS assessment – (Lect. No. 09) & Case Scenario No. 4	Clinician/s	PP/ Case scenarios
9.30 am	60 min	Risk of bleeding Principles of blood transfusion (When to give blood/ How much to give) – (Lect. No. 10) & Case Scenario No. 5	Clinician	PP Case Presentation
10.30 am	15 min	Tea break		
10.45 am	90 min	Atypical Dengue cases: Multiple organ dysfunction/ co infections/ co-morbidities (Lect. No. 11) & Case Scenario No. 6 – 8	Clinician	PP Case Discussion
12.15 am	60 min	Lunch break		
1.15 pm	90 min	Dengue in high-risk patients: infancy, obesity, pregnancy (Lect. No. 12)	Clinician/ neonatologist/ Gynecologist	PP Case Presentation
2.45 pm	45 min	Case Discussion on Infants (Case Scenario No. 9)	Clinician/s	Distribution of cases – in ward patient records
3.30 pm	30 min	Tea break		
4.00 pm	60 min	Case Discussion on Pregnancy (Case Scenario No. 10)	Clinician/ neonatologist/ Gynaecologist	PP Case Presentation
5.00 pm		End of Day 2		

DAY 3

TIME	DURATION	ACTIVITY	FACILITATOR	METHOD
8.30am	15 min	Review of Day 2	Participant	
8.45 am	45 min	Indications for Referral to higher centers - (Lect. No. 13)	Clinician	PP Draft referral form distributed
9.30 am	30 min	Notification of dengue for public health control (Lect. No. 14)	Epidemiologist	PP Notification form distributed and demonstration to fill
10.00 am	30 min	Prevention and control of dengue (Lect. No. 15)	Epidemiologist/ Entomologist	PP Notification form distributed and demonstration to fill
10.30 am	15 min	Tea Break		
10.45 am	60 min	Case Discussion on Obesity/ EDS (Case Scenario No. 11-12)	Clinician	PP Case Presentation
11.45 pam	60 min	Conveying about the condition of a patient to relatives and Recovering at home – advice (Lect. No. 16)	Clinician	PP Role Play
12.45 pm	60 min	Lunch Break		
1.45 am	30 min	Pit Falls in the Management of Dengue/DHF (Lect. No. 17)	Clinician	PP
2.15pm	45 min	Q & A session (General)	Clinicians	Discussion
3.00 pm	45 min	Post Test & Discuss Answers	Clinicians	
3.45 pm	15 min	Evening Tea break		
4.00 pm	30 min	Review of Participants expectations Feedback	Resource Persons	Discussion
4.30 pm	15 min	Evaluation 1) Overall 2) Specific Lectures		Evaluation form distributed
4.45 pm	15 min	Closing ceremony Award of certificates to participants		Certificate to be designed
5.00 pm		End of Program		

Part 5

Lectures in details

DAY 1

Lecture 1

Epidemiology of Dengue

RP – Epidemiologist from CNM/NDCP, Cambodia

Epidemiology and Burden of Dengue: where are we?

Dengue: what we should know

- ***Distribution:*** *When* does disease occur? *Where* does disease occur? *Who* develops the disease? (*Time, place, person)*
- *Determinants: Vector, Host, Virus, environment etc…*
- *Control: Primary (Transmission interruption, Vaccine) and Secondary (early diagnosis and proactive management)*

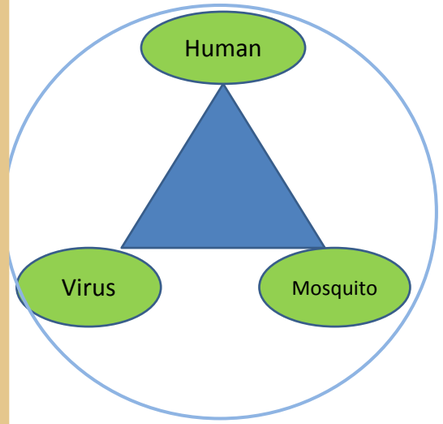
Dengue

- Most significant mosquito borne viral infection in the world
- Very common infection in tropics
- Large epidemics occur
- Wide spectrum of infection outcomes

Asymptomatic infection → Death

- High morbidity, relatively low mortality disease

Three Elements of Dengue



- Environmental factors
- Economic, social, political factors
- Control and preventive measures

Transmission Modulating Factors

Vector	Host (human)	Virus
Dispersion	Individual immnunity	Serotypes (Previous Circulation)
Density	Herd immnunity	Genetic differences
Deposited eggs	Sequential Infections	Virulence
↓	Individual factors	↓
Vector's competency	↓	Probability of Transmission
	Magnitude of the Epidemics (DF/DHF)	

4

Communicable Disease Surveillance

Goals:

- To monitor disease transmission to facilitate prevention
- To define disease dynamics (severity)
- To determine cost-effectiveness of preventive programs
- To estimate disease burden in the community

"Ideal surveillance system should monitor disease cases accurately and detect impending **epidemics** from a background of **endemic** disease to trigger **emergency preventive mechanism**"

Types of Surveillance Systems

- Routine reporting (passive)
- Enhanced Surveillance (active)
  - Community based prospective cohorts
  - OPD Fever reporting
  - Laboratory reporting

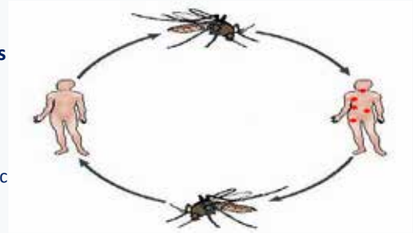
Dengue Life- Cycle

Mosquito acquires virus during feeding, virus replicates in mosquito

5 to 12 days (~ 10 days) incubation – Extrinsic

Mosquito infects susceptible person

-1 to 5 days viremic



Mosquito infects humans – virus in lymph nodes, other organs, blood

4 – 10 days incubation - Intrinsic

Mosquito acquires virus during feeding, virus replicates in mosquito

10 to 28 days infectious

Definition of disease surveillance

Systematic collection of data for action

Continuous collection, analysis, interpretation, and dissemination of systematically collected data on communicable diseases for use in **public health action** to reduce morbidity and mortality and to improve health

Surveillance Case Definition: Dengue Illness

An acute febrile illness of 2 -7 days duration with two or more of the following;

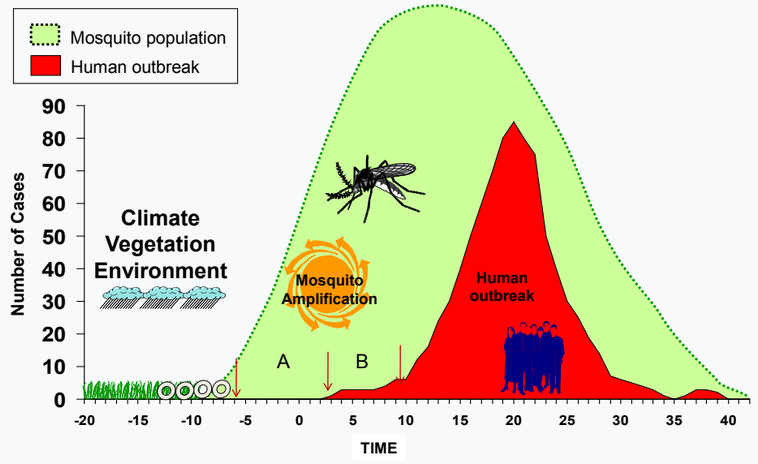
headache	*retro-orbital pain*
myalgia	*arthralgia*
flushed extremities	*tender hepatomegaly*
rash	*haemorrahagic manifestations*

leucopenia (<5000) *thrombocytopenia (<150)*

fever with 2 + 2

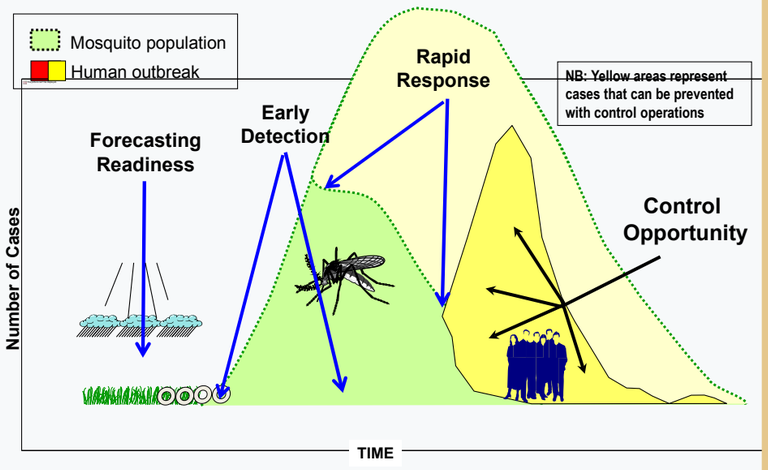
- Epidemiological (clustering)
- Laboratory (NS1/RT-PCR)

Outbreak alert and response



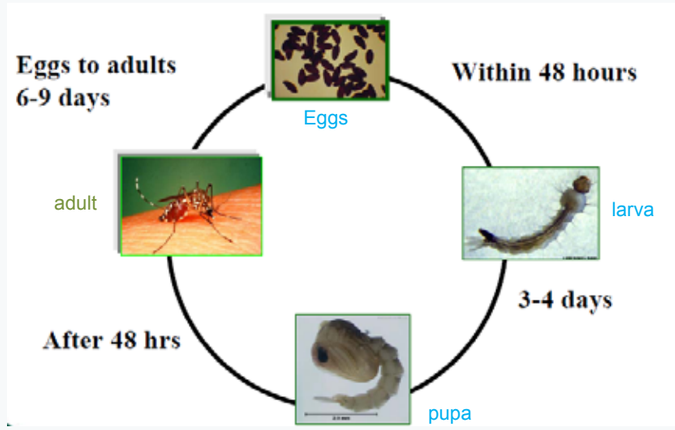
Slide courtesy of Dr. Renu Drager-Dayal, WHO, Geneva

Outbreak alert and response



Slide courtesy of Dr. Renu Drager-Dayal, WHO, Geneva

Life cycle of Vector



Vector Control
(Where/What/When)

- Where to attack - High–risk Areas
- What to attack - Common habitats
- When to attack - Rain fall, Climatic Features + Human behavior (Vector population data)

Overview of Dengue (Part I): classification, differential diagnosis, virology and pathogenesis

RP – Member of the Clinical Subcommittee, Cambodia

Dengue Classification

WHO SEARO 2011 (Leaking)

- **DF**
- **DHF**
- **DSS**
- **Expanded Dengue Syndrome**

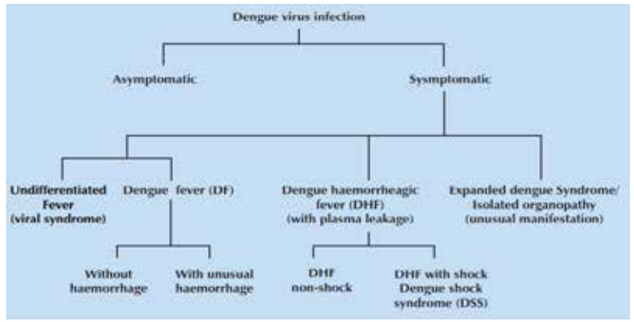
Plasma leakage

WHO TDR 2009 (Severity)

- Dengue (D)
- Dengue ± Warning signs (D ± WS)
- Severe Dengue (SD)

Warning signs

WHO SEARO - 2011



WHO TDR 2009 Classification (End points/ Severity based)

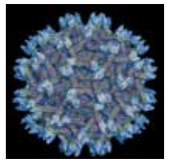
Case Classifications – in Clinical Practice

Majority of Clinicians prefer:

Dengue → DF
Dengue → DHF

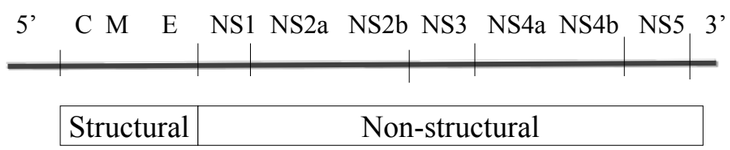
Consider DF and DHF as two entities where outcome is better

Dengue virus

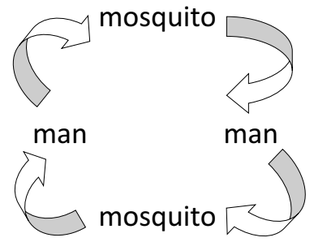


- **Classification**
  - Family: Flaviviridae
  - Genus: Flavivirus
- **Virus**
  - Enveloped virus with a surface protein (haemagglutinin)
  - Single stranded positive sense RNA genome
- **Serotypes**
  - Four serotypes DEN 1 to DEN 4 with multiple genotypes

Dengue virus genome



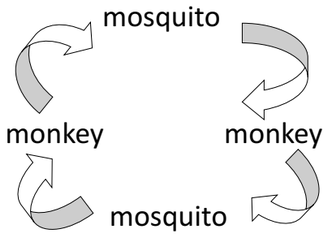
Urban /rural cycle



Aedes aegypti

Aedes albopictus

Forest cycle



Life cycle

Blood meal by a female mosquito

extrinsic incubation period
8 – 10 days

↓

replication in the mosquito
infected for life

↓

introduce the virus to human during a blood meal

intrinsic incubation period
4 – 6 days

↓

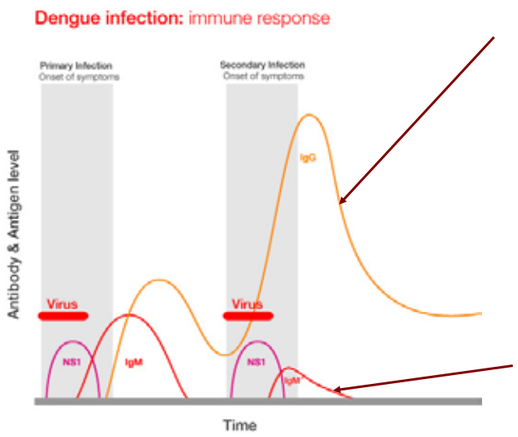
replication in the human

Primary dengue infection:

- When a person gets infected with a dengue virus for the first time
- Can be due to any of the 4 serotypes. Develop homotypic immunity.

Secondary (post primary) dengue infection:

- When a person gets infected with a dengue virus, other than the serotype that caused the primary dengue infection



IgG antibodies specific to the initial infecting DV serotype

IgM antibodies to the secondary infecting DV serotype

Source: Dr. Neelika Malavige, 2010

Pathogenesis of DF

Subcutaneous inoculation following mosquito bite →
Initial site of replication not sure ? dendritic cells →
Replication in regional lymph nodes →
Primary viraemia →
Spread to RE system & replication →
Secondary viraemia →
Onset of symptoms

Factors that contribute to the occurrence of severe dengue

Virus:

- All serotypes have been shown to cause DHF/DSS
- Certain genotypes have been associated with DHF other genotypes of the same serotype is associated with DF

Host genetic factors

- Individuals who have certain HLA types are thought to be at risk of developing severe dengue
- Severe dengue is quite uncommon among individuals of African origin ?

Immune factors

- Cross reacting antibodies or T cells from previous infection is associated with pathogenesis of DHF

Increased no of infected cells & virus load

↓

Enhanced immune response

↙ ↓ ↘

release of Cytokines | activation of clotting system | platelet destruction

Pathogenesis of DHF

Cross reactive antibodies bind to the 'new infecting virus'

↓

Form Ab-Ag complexes
Ab-Ag complexes attach to cells bearing receptors for the Fc portion of the Ab

↓

Facilitates entry of virus into the cells
Increase in viral replication in cells

Role of cross reactive T cells

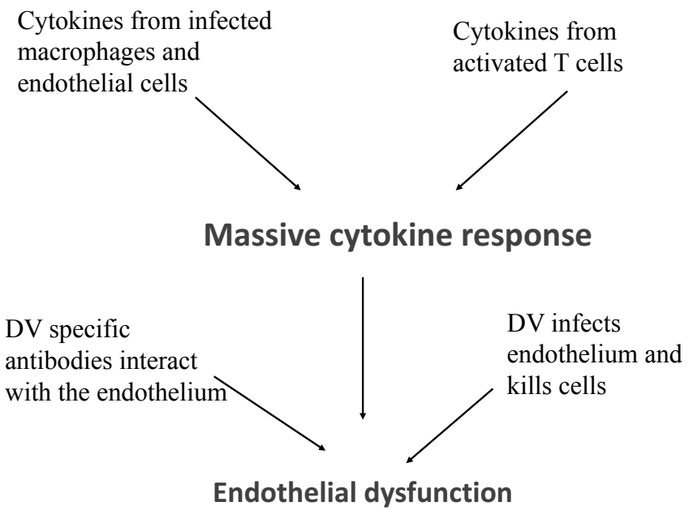
Cross reactive T cells react with the 'new infecting virus'

↓

T cell activation

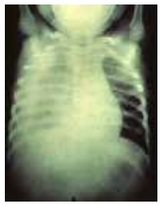
↓

Release of cytokines



Pathophysiological changes: Hallmarks of DHF/DSS

- Fluid leakage (pleural/ peritoneal)



- Abnormal Haemostasis

Causes of thrombocytopenia in DHF

- Low production (due to bone marrow suppression with virus / cytokines)
- Increased consumption
- Increased destruction – immune complex (DEN + Platelet) destroyed peripheraly

Causes of bleeding in DHF

- Endothelial dysfunction (capillary fragility)
- Thrombocytopenia
- Activation of the coagulation system (prolonged PTT/ TT)
- Disseminated intravascular coagulation
- Liver failure (prolonged PT, INR > 1.3)
- Stress ulcers, gastritis
- Drugs: Steroids, NSAIDS, Aspirin

Clinical Features of Dengue

1. Febrile
2. Critical
3. Recovery

OFI (Dengue like during acute phase)

- Influenza
- Leptospirosis
- Chikungunya fever, Zika
- Typhoid fever
- Viral Haemorrhagic Fevers (West Nile, CCHF)
- Enterovirus infections
- Malaria
- Other AFI
- Viral Infections

Most surveillance systems lack both sensitivity and specificity. These systems detect only a small proportion of total cases in the population

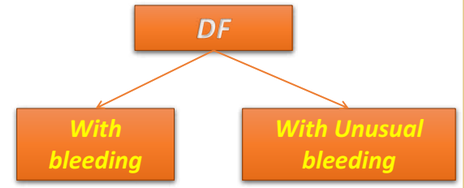
Severity Depends on;

- Degree of plasma leakage
- Degree of bleeding

Dengue Fever (DF)

- Usually benign
- Favorable outcome
- Complete recovery without sequelae

Unusual Bleeding



DHF

- **Good prognosis is achieved with early diagnosis of dengue infection**
- **Early detection of plasma leakage**
- **Early detection of significant bleeding**
- **Judicious fluid management with Meticulous monitoring, and early blood transfusion before organ injury/ failure**
- **Prevention/Early detection of complications**

↓

reduce case fatality.

Dengue fever

Febrile phase

• 2-7 DAYS

Convalescent phase

• 2-5 DAYS
• Longer in adults

Dengue haemorrhagic fever

Febrile phase

• 2-7 DAYS

Critical phase

• Leakage
• Lasts 24-48 hrs

Convalescent phase

• 2-5 DAYS
• Longer in adults

High-risk patients for Severe diseases

Infants
Elderly
Pregnancy
Obesity
Bleeding
Co-morbidities
Co-infections
Neurological Manifestations

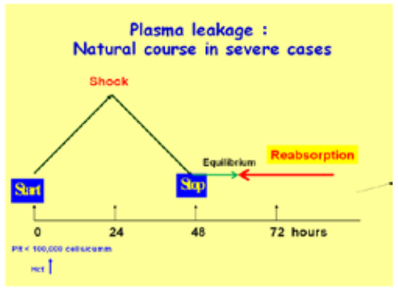
Pathophysiological hallmarks of DHF

- ***Altered vascular permeability***
  Plasma Leaking

- ***Abnormal Haemostasis***
  Bleeding

Pathophysiological hallmarks of DHF

Natural History of Plasma Leakage



Short Lived/ Transient

Selective

Fluctuating

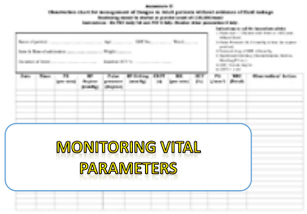
Re – distribution

Amount of fluid in the third space

Re-absorption in recovery

Markers of Critical Phase

- **Clinical**
  - •Defervescence
  - •Drowsy
  - •Loss of Appetite
- **Physiological**
  - •Rapid & weak pulse
  - •Narrow pulse pressure
  - •Hypotension
- **Haematological**
  - •Changes in CBC/FBC
  - Platelets <100,000
  - Hct ↑ towards 20%

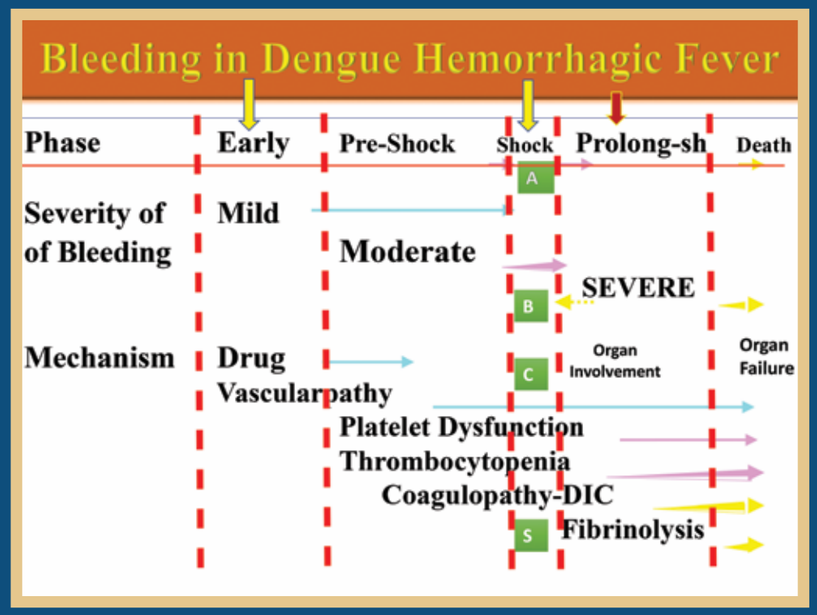


ONSET of Critical Phase can be …

- …when platelet cross 100,000 mark
- …when there is a rapid drop of Platelets
- …when PCV/Hct start rising

Evidence of Plasma Leakage

- **Rising Hct > 20 %**
- **Bio Chemical** –
  Se Albumin <3.5 g/dl (or drop of 0.5g/dl or < 4g/dl in obese)
  Se Cholesterol <100mg/dl (or drop of 20mg/dl)
- **Radiological evidence –**
  CXR
  USS
- **Clinical evidence of fluid → late**



Definition of Shock

- All the criteria of DHF with;
- Evidence of circulatory failure manifested by;
  - Rapid and weak pulse
  - Narrow pulse pressure < 20mmhg
- Hypotension for age
- Postural Hypotension
- SBP < 80mmhg for children < 5 yrs
- SBP 80 – 90mmhg for older children and adults
- Cold clammy extremities
- Restlessness
- Fainting

Prolonged shock

- **> 4 hours untreated**
  - ➢Liver failure- prognosis 50%
  - ➢Liver + Renal failure - prognosis10%
  - ➢3 organs failure (+respiratory failure) – Prognosis is a miracle!!!
- **10 hours untreated** - **Death**!!!

Lecture 4

Early clinical/simple laboratory diagnosis and Confirmatory Diagnosis of Dengue: including Complete Blood Count (CBC) and NS1/IgM/IgG/PCR tests etc.

RP – Member of the Clinical Subcommittee, Cambodia

Clinical Features

- Fever for 2 -3 days with two or more of the following symptoms;
  - *Aches and Pains*
    - *headache*
    - *retro-orbital pain*
    - *myalgia*
    - *arthralgia*
  - *Other non specific signs & symptoms*
    - *flushed extremities*
    - *tender hepatomegaly*
  - *rash*
  - *haemorrhagic manifestations (respiratory/ GI)*

Examination

- Positive Tourniquet Test (+TT)
- Blood Pressure & Pulse Pressure
- Pulse – rate and volume
- Peripheral circulation
  - Capillary Refill Time (CRFT)
  - Warm/ cold

Complete Blood Count - CBC

- Platelet Count ⬇ < 150 000
- WBC/DC < 5 000
- Neutrophil count ⬇
- HCT/ PCV ⬆

- NS1 Ag Positive
- Leukopenia + petechiae (+ TT) = Dengue Infection with 70 – 80% PPV

How to time the onset of critical phase?

	17th 8 am	18th 8 am	18th 8 pm	19th 8 am	19th 8 pm	20th 8 am	20th 8 pm	21st 8 am	21st 8 pm
WBC	3200	2800	1900	2900	3700	4500	6000	7000	7300
N %	53	41	31	26	25	31	33	43	58
L %	44	56	68	71	73	67	66	55	41
PCV %	39	36	39	42	43	39	44	43	38
Plt	121000	96000	94000	41000	22000	18000	12000	8000	19000

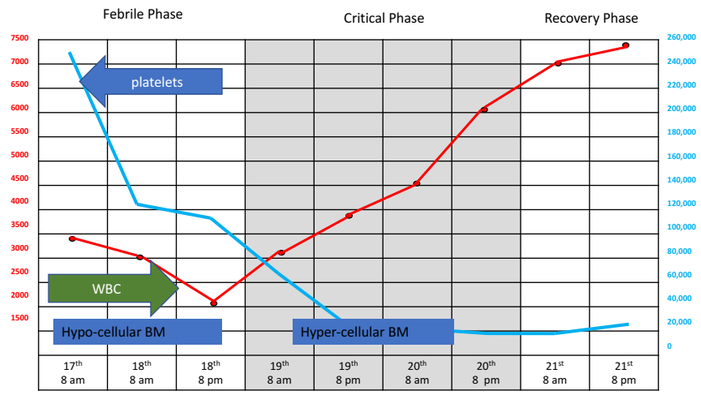
How to time the onset of critical phase?

	17th 8 am	18th 8 am	18th 8 pm	19th 8 am	19th 8 pm	20th 8 am	20th 8 pm	21st 8 am	21st 8 pm
WBC	3200	2800	1900	2900	3700	4500	6000	7000	7300
N %	53	41	31	26	25	31	33	43	58
L %	44	56	68	71	73	67	66	55	41
PCV %	39	36	39	42	43	39	44	43	38
Plt	252000	121000	110000	61000	22000	18000	12000	8000	19000

Onset

End

Timing the onset of critical period



Investigations

Date	07/07
Time	08.16 pm
WBC ($\times 10^3$)	1.64
PLT ($\times 10^3$)	119
HCT %	39.43
AST	
ALT	

NS1 (+)

DF? DHF?

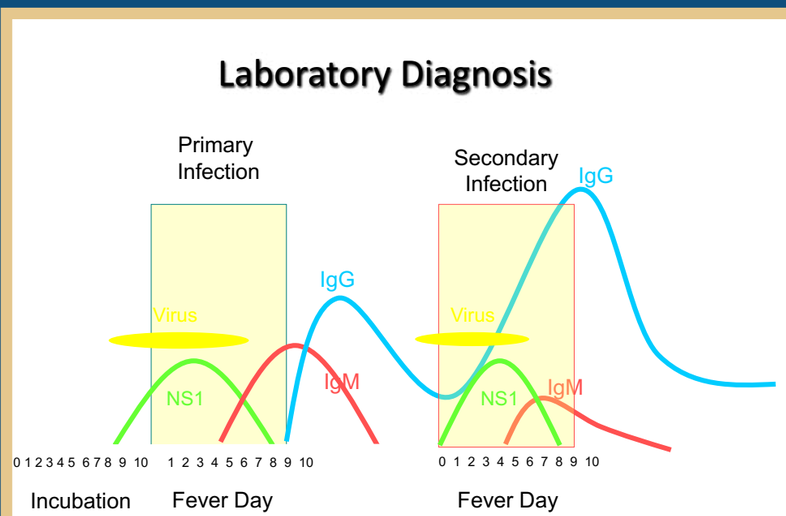
- *Defervescence*
- *Loss of appetite*
- *Haemodynamic changes*
- *Full Blood Count (CBC) changes*
  - *WBC*
  - *Plt*
  - *Hct/PCV*
- *USS Evidence*

Convalescence

- A – Appetite
- B – Bradycardia
- C – Convalescent rash/ Pruritus
- D - Diuresis

Diagnostic techniques

- Detection of Dengue viral antigen (NS1 Ag)
- Detection of the Dengue viral genome
- Isolation of the Dengue virus
- Detection of Dengue specific IgG and/ or IgM



No single point-of-care test available

Detection of Dengue viral antigens

Virus associated antigens

- IF assay with dengue specific monoclonal antibody (DFT) or serotype specific monoclonal antibody (IFT) for dengue antigen in virus infected cells
- ELISA with anti flavi or anti dengue antibody for dengue antigen in CC fluid / cells

Detect virus associated antigen. Low sensitivity when used directly on clinical specimens. High sensitivity on infected host system.

Non-structural antigen

- ELISA or Immune-chromatographic assay for NS1 antigen from patient's serum

Detect non-structural protein. Higher sensitivity during first 4 days of illness

Detection of Dengue viral genome

Detection PCR

RT-PCR

Consensus primers from NS3, NS5, NCR

Typing PCR

Nested / semi-nested PCR

Type specific primers

Table 4.1 Summary of operating characteristics and comparative costs of dengue diagnostic methods (9)

Diagnostic methods	Diagnosis of acute infection	Time to results	Specimen	Time of collection after onset of symptoms	Facilities	Cost
Viral isolation and serotype identification	Confirmed	1–2 weeks	Whole blood, serum, tissues	1–5 days	Mosquito or cell culture facilities, BSL-2/BSL-3* laboratory, fluorescence microscope or molecular biology equipment	$$$
Nucleic acid detection	Confirmed	1 or 2 days	Tissues, whole blood, serum, plasma	1–5 days	BSL-2 laboratory, equipment for molecular biology	$$$
Antigen detection	Not yet determined Confirmed	1 day >1 day	Serum Tissue for immunochemistry	1–6 days NA	ELISA facilities Facilities for histology	$$ $$$
IgM ELISA IgM rapid test	Probable	1–2 days 30 minutes	Serum, plasma, whole blood	After 5 days	ELISA facilities No additional supplies	$
IgG (paired sera) by ELISA, HI or neutralization test	Confirmed	7 days or more	Serum, plasma, whole blood	Acute sera, 1–5 days; convalescent after 15 days	ELISA facilities BSL-2 laboratory for neutralization assay	$

* Requirements may vary according to each country's national policies.

WHO 2009

IgM & IgG detection

- Semi-quantitative IgG & IgM detection (ELISA) also used in the classification of dengue cases to 1ry & 2ry infection.
- Quantitative detection of IgM / IgG / both by immune-chromatographic (ICT) format available

Use of diagnostic assays

1. Confirmation & differential diagnosis
2. Surveillance
3. Outbreak investigation
4. Research (academic research, vaccine development, clinical trials)

Laboratory Diagnosis is not a “must” in acute management

Value of Complete Blood Count (CBC)

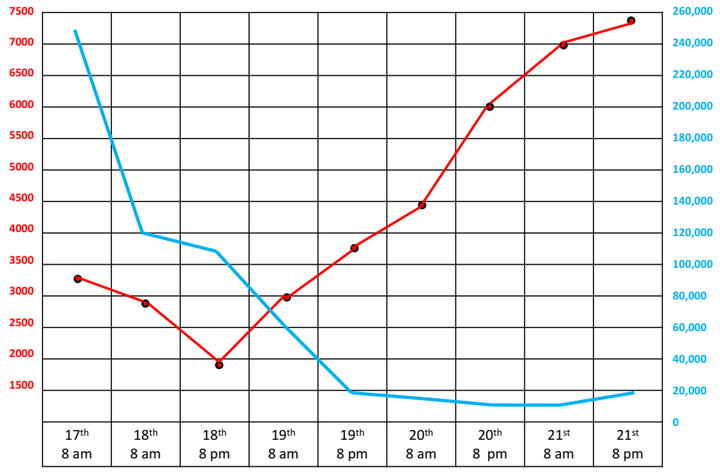
OPD level –

- CBC mandatory on all fever patients – from day 3 onwards
- Special patient categories – CBC on day 1 or first day of visit/contact (Pregnancy, Infancy, elderly, those with co-morbidities, etc.)
- CBC daily from day 3 if plt count ≥150,000/ mm^3
- CBC twice daily when plt count ≤150,000/ mm^3 (admission to hospital based on clinical judgment, warning signs and social reasons)
- **Admit all patients with plt count close to ≤100,000/ mm^3**

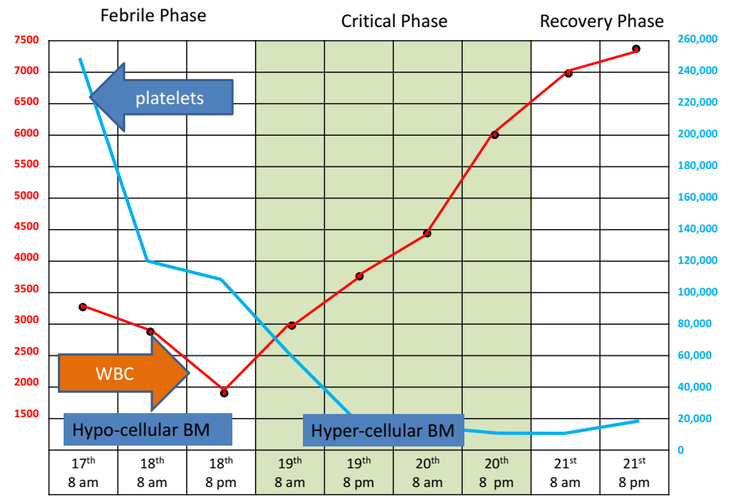
In-ward –

- CBC results to be available within 1 hr not later than 2 hrs for all DF/DHF patients

Timing the onset of critical period



Timing the onset of critical period



Q.1 Following chart indicate laboratory parameters of a 15year old boy suspected of dengue who was admitted on 1pm of Day 3 of fever which was a Saturday. Monday(Day5) afternoon at 2 pm, USS was done and confirmed R/sided pleural effusion and ascitis

Time	10pmD3	8amD4	3pmD4	9pmD4	5amD5	1pmD5	9pmD5
Platelet	162	134	112	92	66	57	44
WBC	2200	2030	1700	1520	2400	3100	4230
PCV	38	40	38	39	39	42	40

What is the best possible time where leaking phase could have started?

a) 10pm on Day3
b) 02pm on Day4
c) 06pm on Day4
d) 01am on Day5
e) 12pm on Day5

Q.2 Following laboratory parameters from a 14 year old boy who was diagnosed with DHF and was in latter part of leaking phase.

	D4 9pm	D5 5am	D5 1pm
Platelet	87	67	55
WBC	2300	2670	10 450
PCV	37	38	40

What is the most important clinical situation that needs to be considered in him at this stage based on above information?

a) Secondary bacterial infection
b) concealed bleeding
c) Entering to recovery phase
d) Normal phenomena in DHF
e) liver failure

Lecture 5

Monitoring of Dengue patients

RP – Member of the Clinical Subcommittee, Cambodia

Why Monitor Dengue Patients?

- To differentiate DHF from DF
- Computation of onset of Critical Phase of DHF
- Smooth manipulation of fluids averting prolonged shock and fluid overload
- Early detection of complications
- Recognition of unusual presentations

Monitoring

- Dengue Areas/ Unit – mosquito-free, mosquito net?
- Close monitoring; team work by nurses/ doctors
  - Clinical
  - Vital signs: BP, PR, RR, T
  - Hematocrit q 4-6 hrs during critical period
  - Urine output: 0.5 – 1 ml/kg/hr in normal persons
  - Urine output: 0.5 ml/kg/hr in obese, pregnancy and infants

  (OR 25 – 50 ml/ hr in adults)

Date / Time Scale:

Clinical

General Condition
Appetite
Vomiting
Bleeding
Other Signs/Symptoms
Temperature

Vital Signs
Indicators of

Fluid Therapy	*Peripheral Perfusion*
PR	Pulse Volume
RR	Skin Colour
BP / PP	Skin Temp. (w/c)
	CRFT

Hct

Urine Output
(based on IBW)

Fluid Therapy

Date / Time Scale:

Clinical

Afebrile
Restless
Irritable

Vital Signs
Indicators of

Fluid Therapy	*Peripheral Perfusion*
PR ↑	Pulse Volume – Poor
RR - N	Skin Colour – Normal
PP - < 20	Skin Temp – Cold
	CRFT - > 2 sec

Hct ↑

UOP ↓
< 0.5 ml/kg/hour

Fluid Therapy – Fluid Boluses

Documentation

- Critical Phase Commencing Date & Time –
  E.g. – 12/07/2011 at 2 p.m.
- Anticipated End Date & Time
  E.g. – 14/07/2011 at 2 p.m.
- Ideal Body weight – 33 kg
  Fluid Quota – M + 5% = 1760 + 1650
  = 3410 ml

Monitoring Chart for Dengue Patients

Instructions - Do CBC daily/bd and PCV 6 hrly. Monitor other parameters 3-4 hrly and when leaking detected monitoring every hour.

Case ▫ Refer ▫ Walk in
CPD ▫ Shock ▫ Non shock
IPD ▫ Shock ▫ Non shock

Indications to call for immediate advice
1. Pulse rate > 120/min with fever or >100/min without fever.
2. Pulse Pressure 20-30 mmHg or less (in supine position)
3. Postural drop of SBP >20mmHg.
4. Significant bleeding (Gastrointestinal, Uterus, Bleeding PV etc)
5. UOP <0.5ml /Kg/hr
6. CRFT >2 sec

Date	Time	BP	Temp	PR	RR	PP	RR	HCT (%)	Clinical/ Lab/ Treatment	Nursing Care/ Signs	INTAKE				OUTPUT		
											blood/ rate & Amount	IV Amount	Oral	Total	Urine/ Stool	Vomit /Bleed	Total

Purposes:
- **Early detection of Shock**
- **Accurate Fluid management**

CBC Day of Admission
Hct = WBC =
Plt = Lym =
PMN =

IBW = kgs.
Maintenance fluid =
M + 5% Deficit =

Date of Fever Day of Illness
TT
Liver
Bleeding
Epistaxis
Abdomen

Name Age HN AN
Ward Attending Physician
Pulse: S = Strong W = Weak N = No Pulse Palpable

Diagnosis of leaking – Clinical, Radiological and Laboratory

RP – Member of the Clinical Subcommittee (Clinician/Radiologist), Cambodia

Monitoring Chart for Dengue Patients

Instructions - Do CBC daily/bd and PCV 6 hrly. Monitor other parameters 3-4 hrly and when leaking detected monitoring every hour.

Case ¤ Refer ¤ Walk in

OPD ¤ Shock ¤ Non shock

IPD ¤ Shock ¤ Non shock

Indications to call for immediate advice

1. Pulse rate > 120/min with fever or >100/min without fever.
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5. UOP <0.5ml /Kg/hr
6. CRFT >2 sec

Date	Time	BP	Temp	PR	RR	PP	RR	HCT (%)	Clinical/ Lab/ Treatment	Nursing Care/ Signs	INTAKE				OUTPUT		
											ml/kg/ rate & Amount	IV Amount	Oral	Total	Urine/ Stool	Vomit /Bleed	Total

CBC Day of Admission

Hct = WBC =

Plt. = Lym =

PMN =

BW= kgs. Hight = cms

IBW = kgs.

Maintenance fluid =

M + 5% Deficit =

Date of Fever Day of Illness

TT

Liver

Bleeding

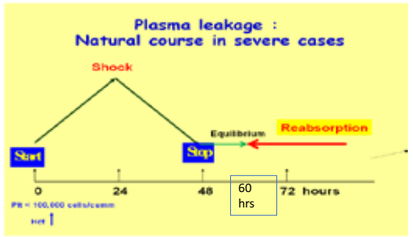
Epistaxis

Abdomen

Name Age HN AN

Ward Attending Physician

Pulse: S = Strong W = Weak N = No Pulse Palpable



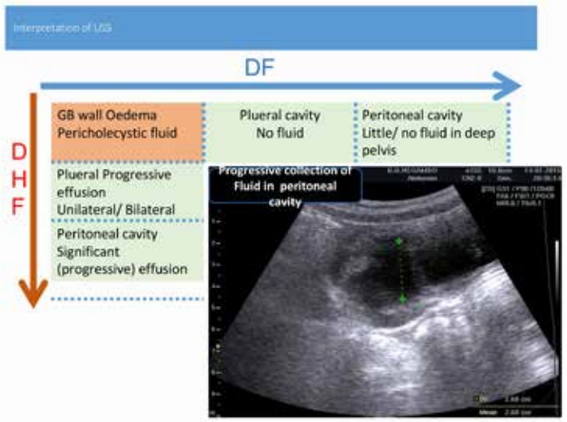
Pathophysiological hallmarks of DHF

Natural History of Plasma Leakage

- *Short Lived/ Transient*
- *Selective*
- *Fluctuating*
- *Re – distribution*
- *Amount of fluid in the third space*
- *Re-absorption in recovery*

Potential Leaker

- Patient with 2-3 day history of fever
- Platelet count less than 100,000 mm^3
- USS peri-cholecystic changes with no fluid in pleural/ peritoneal cavities
- Gallbladder oedema



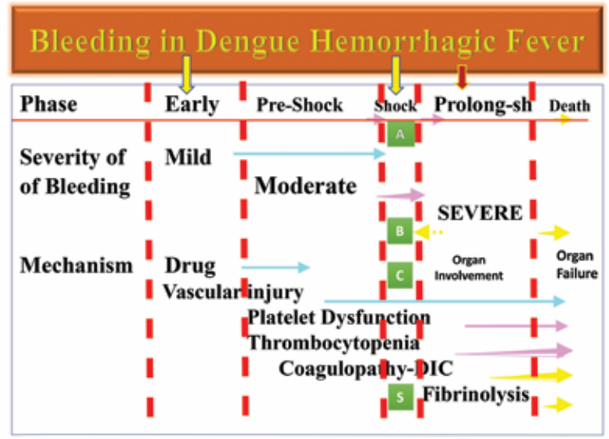
Lecture 7

IV Fluid Management: principles, when to start, how much, what fluids, when to stop and giving less

RP – Member of the Clinical Subcommittee, Cambodia

Pathophysiological hallmarks of DHF

- ***Altered vascular permeability***
  Plasma Leaking
- ***Abnormal Haemostasis***
  Bleeding



Warning Signs for Urgent Attention

- **No clinical improvement or worsening of the situation**
- **Persistent vomiting, not drinking**
- **Severe abdominal pain**
- **Lethargy and/or restlessness, sudden behavioral changes**
- **Bleeding**
- **Giddiness**
- **Pale, cold clammy hands and feet**
- **Less/no urine output for 4-6 hours**

Definition of Shock

All the **criteria of DHF with;**

- **Evidence of circulatory failure manifested by;**
  - **rapid and weak pulse**
  - **narrow pulse pressure ≤20mmHg**

- **Hypotension for age**
- **SBP <80mmHg for children <5yrs,**
- **SBP 80-90mmHg for older children &adults**
- **Cold clammy extremities**
- **Restlessness**

Dengue Haemorrhagic Fever

- **Fever or history of fever**
- **Bleeding Tendency**
  - **DHF without Shock**
  - **DHF with Shock**
- **Thrombocytopenia**
- **Objective of evidence of selective and progressive plasma leak**

Laboratory confirmation is not essential — Syndromic Diagnosis

Proper IV fluid management

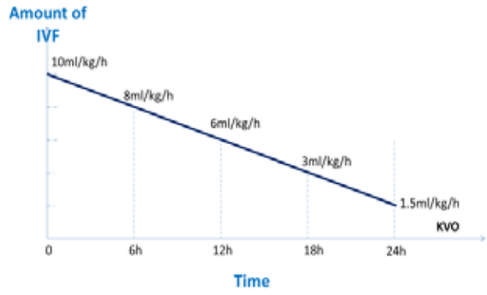
- Timing: when in critical period
  (Plt < 100,000 cells/ccumm.)
- Type: Isotonic salt solution, Colloidal solution (Plasma expander – Dextran-40)
- Rate: Adjust and titrate according to the monitoring parameters
- Amount: M + 5% Deficit
- Duration: 24-36 hrs for DSS and 48-60 hours for non-shock cases

Rate of IV fluid in adult compare to children

Note	Children Rate (ml/kg/hour)	Adult Rate (ml/hour)
Half the maintenance M/2	1.5	40-50
Maintenance (M)	3	80-100
M + 6% Deficit	6	100-120
M + 8% Deficit	8	120-150
M + 10% Deficit	10	300-500

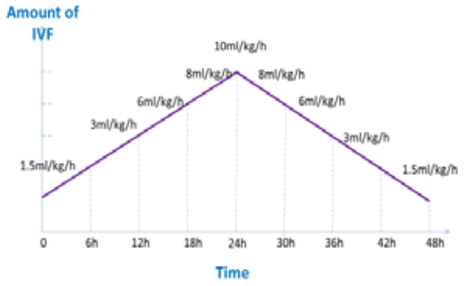
Pr. UNG Sophal 19

The rate of IVF in DSS according of the time of plasma leakage



Pr. UNG Sophal 18

The rate of IVF in non-shock DHF according of the time of plasma leakage



Pr. UNG Sophal 11

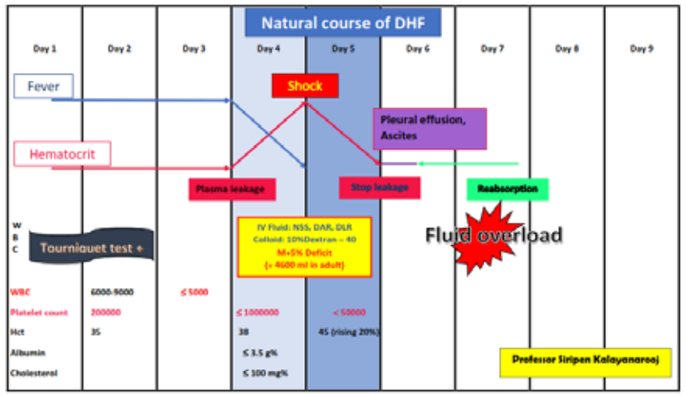
Monitoring

- Dengue Areas/ Unit – mosquito-free, mosquito net?
- Close monitoring; team work by nurses
  - Clinical
  - Vital signs: BP, PR, RR, T
  - Hematocrit q 4-6 hrs during critical period
  - Urine output: 0.5 ml/kg/hr

Lecture 8

Introduction to TRIAGE/Patient Assessment

RP – Member of the Clinical Subcommittee, Cambodia



Triage of fever patients with suspected dengue and criteria for admission

Suspected dengue patients seeking care need to be evaluated at Fever Room in the outpatient department based on symptoms and signs together with Full Blood Count according to the day of illness.

- Patients having fever with suspected dengue will be sent to the **Fever Room**.
- At the Fever Room, the decision on admission or ambulatory care will be taken by an experienced Medical Officer, depending on the clinical picture and the Full Blood Count (FBC) of the patient.
- Admissions will get priority according to the decision of the Medical Officer in the Fever Room.
- **RDT-NS1 positivity** is not an indication for hospital admission on Day 1 of fever.
- It is important to note that **NS1 negative result DOES NOT EXCLUDE DENGUE INFECTION.**

Essential criteria for admission

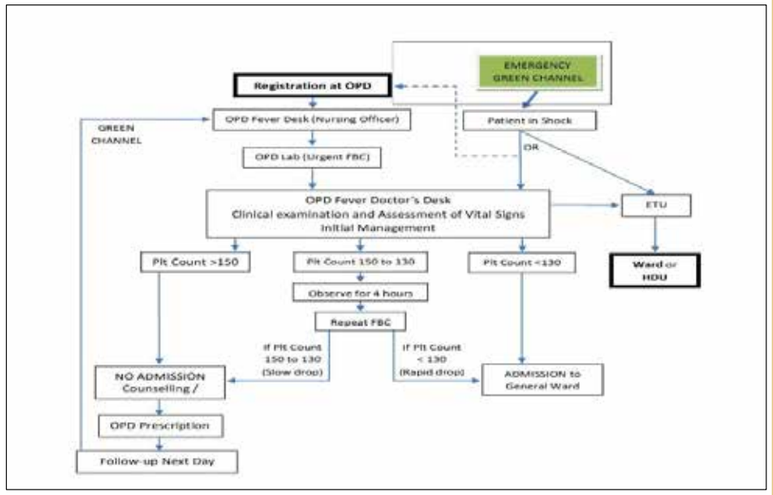
1. Patients platelet count less than 130 000/mm^3
2. If the Platelet Count is between 150 000 – 130 000/mm^3, the Medical Officer should make a decision depending on the clinical judgment. If the platelet count tested more than 4 hours ago is more than 130 000/ mm^3 the patient should be observed in the fever room and a repeat count should be done. If the repeat count is lower, decide on admission.
3. Fever for 3 or more days, and already not performed a Full Blood Count, patient should be observed in the fever room until the Full Blood Count report is available.
4. Rapid drop in Platelet Count over a short period of time (in 2 consecutive FBC reports) platelet count coming close to 150 000/mm^3.

5. Patient is clinically unwell especially when fever is settling with no clinical improvement as follows (**Warning Signs)** to be applied on or after 3rd day of illness
   - Weakness
   - Lethargy / restlessness
   - Severe headache
   - Persistent severe vomiting
   - Severe abdominal pain

6. Patient insisting on admission – get a senior opinion if necessary

7. Special conditions
   - Pregnant mothers (Preferably admit on day 01 of fever) – immediately when you suspect dengue
   - Children less than one and half years old (<18 months)
   - Elderly patients
   - Patients with co-morbid conditions like chronic renal disease, ischaemic heart disease or any other major medical problem
   - Severe diarrhoea or persistent vomiting- to avoid dehydration.

8. Patients with special social circumstances - e.g. living alone, living far from health facility without reliable means of transport, poor compliance, VIP, mass media



Criteria for ambulatory care

Patients with a **platelet count more than 130 000 / mm^3 (tested within 2 hours)** and clinically stable.

Management

Symptomatic

- No specific treatment
- No anti – Dengue drugs
- No immune modulators(anti plasma leakage)

Monitoring

- Steroid is not effective
- No vaccine available

Instructions to be given in order to ensure ambulatory care

1.<u>Physical Rest</u>

Physical rest is highly recommended.
Staying at home without exerting yourself.

2.**<u>Fever control</u>**

· Paracetamol only(Correct dose/Duration)

· Do not use NSAIDs**(Ibuprofen, Diclofenac, Mefenamic acid, Celecoxib)**

· No steroids such as **Prednisolone, Dexamethasone etc**.

· Use tepid sponging to bring down the fever in between the Paracetamol dosing. Soak a clean towel in moderately warm water, then squeeze the excess water away and wipe the body to reduce fever.

Instructions Cts....

3.when and how often should the Full Blood Count (FBC) be repeated?

· Do the FBC in 8-12 hour intervals.

· See the report at least within 2 hours.

· If the platelet count has reached a low value nearing 130,000/mm^3, consider admission.

· Encourage the patient to bring all the blood investigation reports done during this fever episode.

4. Food

· If you have appetite take a soft light diet.
· Avoid taking red or brown colour food or drinks. This may mimic blood stained stools or vomitus.

Instructions Cts....

5. Fluids

· Fluids should include not only water but certain electrolyte solutions such as fruit juice, white rice kanji, “Jeewani”, king coconut etc.
· Drink enough fluids to maintain a normal urine output.
· If the body weight,between **30 to 50 kilograms,** take fluids **double** the body weight in milliliters (ml) per hour.
· If the weight is **below** 30kg or above 50 kg, change the fluid intake as shown below:

Body Weight	Fluid Volume per hour
5kg	20ml
10kg	40ml
20kg	60ml
30kg	70ml
40kg	80ml
50kg	100ml
>50kg	100ml

Instructions Cts....

6. <u>Urine Output</u>

- Ensure adequate amount of fluids are taken to produce a **urine volume per hour** in **milliliter (ml)** equal to your body weight in kilograms to prevent dehydration.
- Ensure urine measurement at least every **four hourly** to calculate the output.
- Passing urine slightly more than the above expected amount is not a problem.
- If the urine output is less than the expected amount, you should consume more fluids to maintain the above urine output.
- If the patient is feeling thirsty, taking additional fluids up to **3-4 times per day** is allowed until the thirst subsides. But if thirst continues, report to you as early as possible.

Instructions Cts....

Body weight	Urine output per hour	Urine output per four hours
20kg	20ml	80ml
40kg	40ml	160ml
60kg	60ml	240ml

Instructions Cts....

Record fluid intake and the amount of urine passed with the time
Use the following format:

Date and Time	Consumed fluids(ml)	Date and time	Urine amount (ml)

Warning signs to seek immediate medical advice

- Continued vomiting and diarrhoea (which can result in dehydration)
- Lethargy/restlessness
- Bleeding from any site
- Severe headache
- Severe abdominal pain

If you feel any additional discomfort, please seek medical advice.
Unlike in other conditions, settling of fever is not a sign of recovery in Dengue. Complications may arise as the fever settles.

Lecture 9

Common complications of DHF/DSS – ABCS assessment

RP – Member of the Clinical Subcommittee, Cambodia

Patients with complications ...

Usually due to
PROLONGED SHOCK
FLUID OVERLOAD
BLEEDING

Causes of death in DHF patients

- **Prolonged shock**
  - **Delayed diagnosis/ delayed resuscitation**
  - Late presentation
- **Fluid overload**
  - Use of hypotonic saline
  - Given excess fluids
  - Given more than time of leakage
- **Massive bleeding**
  - Not given blood transfusion
  - Delayed blood transfusion
- **Unusual manifestations**
  - Encephalopathy
  - Underlying co-morbidity
  - Dual infection

Prolonged shock

- > 10 hours untreated - Death!!!
- > 4 hours untreated
  - Liver failure- prognosis 50%
  - Liver + Renal failure - prognosis10%
  - 3 organs failure (+respiratory failure) – Prognosis is a miracle!!!

Fluid overload

- Use of hypotonic saline
- Given excess fluids
- Given more than time of leakage
- Not using colloidal solution when indicates
- Not giving blood when there is concealed bleeding

Complicated DHF

- When a pt is deteriorating with no response to fluid therapy….

A: Acidosis
B: Bleeding
C: Calcium
S: Sugar

Acidosis

- Acidosis is common in profound shock
- Prolonged acidosis makes patients may advance to DIC
- Correct acidosis if pH is <7.35 and if HCO^{3-} level <15 mmol/l
- One may use empirical NaHCO3 1ml/kgs slow bolus (max 10ml) diluted in equal volume

Hypocalcaemia

- Every patient with complicated DHF has hypocalcaemia.
- Dengue patients who develop convulsions are likely to have hypocalcaemia.(*may give them empirical calcium)*
- Detection of hypocalcaemia:
  - Measure serum Ca^{2+} level
  - Corrected QT interval in ECG

When to give calcium?

- If the patient is complicated , and deteriorating or not showing expected improvement to fluid Rx think of hypocalcaemia.
- Give empirical calcium to such pts
  - Dose 1ml/kg of 10% Ca Gluconate slow bolus diluted in N saline over 10-15 min(look for bradycaria while pushing slowly) **Max: 10ml**. Can even give every 6Hrs if pt is not improving

Correct Hypoglycaemia

Platelet transfusion-

- when platelets are low may need but only in very exceptional circumstances
  - (Thailand only in <0.4% of pts with DHF)
  - Each platelet pack is 50-150ml → contribute to fluid overload
  - No prophylaxis plt. transfusion
  - At the initial phase the platelet drop >.100,000 is due to BM suppression but later when it drops <100,000 the cause is increase platelet consumption and the BM become hypercellular with increase production

Recombinant factor VII

- 1 dose = 1,500 USD in a 10-kgs patient
- No use in cases with prolonged shock and multiple organs failure
- Consider in cases with bleeding where the cause is not prolonged shock

  BUT other reason: peptic ulcer, trauma etc

11

Place of dopamine and dobutamine...

- Very limited in DHF
- May do harm than good by giving a false impression about BP
- When using1st make sure that there is enough intravascular volume

  shown by increased CVP

12

Management of encephalopathy

- Most of the patients with encephalopathy are due to hepatic encephalopathy. The principle treatment of hepatic encephalopathy is to prevent increase in intra cranial pressure.

The following are recommendations for supportive therapy

- **Adequate airway oxygenation with O2 therapy. Intubation may be needed for those with respiratory failure or in semi-coma/coma**
- **Prevent/ reduction of ICP by**
  - Minimal IV fluid to maintain adequate intra vascular volume, ideally total IV fluid should not > 80% maintenance
  - Switch to colloids earlier if continue to have a rising Hct and a large volume of IV is needed in cases with severe plasma leakage
  - Administer diuretic if indicated in cases with signs and symptoms of fluid leakage
  - Consider steroid to reduce ICP. Dexamethazone 0.5 mg/kg/day IV every 6-8 hours is recommended
  - Hyperventilation
- Decrease ammonia production

- **Maintain blood sugar level > 60 mg/dl. Recommend glucose infusion rate between 4-6 ml/kg/h**
- **Correct acid-base and electrolyte balance eg. Correct hypernatremia, hypo/ hyper kalemia, hypocalcemia and acidosis**
- **Vit K IV administration: 3 mg for < 1y, 5 mg for < 5y, 10mg for > 5y and adults**
- **Anti convulstants should be given for control of seizures: phenobarbital, dilantin and diazemam as indicated**
- **Transfuse blood, preferably fresh packed red cells as indicated. Other blood components as plt, FFP may not be given because the fluid overload may cause increased ICP**
- **Empirical antibiotic therapy may be indicated if suspected superimposed bacterial infections**

- H2 blockers or Proton pump inhibitors may be given to alleviate GI bleeding
- Avoid unnecessary drugs because most drugs have to be metabolised by the liver
- Consider plasmapheresis or hemodialysis or renal replacement therapy in cases with clinical detereioration

Other Complications

- Co-Infections
- Hypernatraemia/ Hypokaelemia
- Renal Failure

RP – Member of the Clinical Subcommittee, Cambodia

Massive bleeding

May be due to;

- Not given blood transfusion
- Delayed blood transfusion
- Prolonged shock/ hypoxia

When to suspect bleeding ?

- When PCV drop without clinical improvement
- Even with bleeding the PCV drop may take time(4-5hrs). When the pt does not show improvement important to do repeat PCVs frequently!
- Severe metabolic acidosis and end-organ dysfunction despite adequate fluid replacement

Factors contribute to bleeding in DHF/DSS patients

- Capillary fragility - only minor bleeding e.g. skin bleeding (petechiae)
- Thrombocytopenia - only with trauma, no spontaneous bleeding in DHF/ DSS
- Coagulopathy - DIC – prolonged PTT, TT (massive bleeding after prolonged shock - advanced DIC)
- Liver failure - prolonged PT (results from prolonged shock)

How to manage bleeding

- Use PRC or WB
- If there is fluid overload(most frequently) use PRC as 5ml/kg at once and repeat only if needed depending on the response
- If there is no fluid overload use 10ml/kg of WB
- Even if bleeding is likely and if PCV is >45% do not give blood without bringing down the PCV first by giving a colloid.

..how to Mx bleeding

- 5ml/kg of PRC or 10ml/kg of WB will increase PCV by 5%
  - *Eg.10 year old girl with PCV of 26% in shock..*
  - *Base line PCV in a 10 yr old 36% but if in shock it will be up by 20%→ 43%. There is 17% deficit which need 3 PRC transfusions*

Increased WBC/DC can be due to;

BBH

- **B**leeding
- **B**acterial infection
- **H**epatitis

Septic shock vs Dengue shock

DSS	Septic Shock
Platelet usually ≤ 50,000 cells/cumm	Platelet is usually normal at presentation of shock and may drop later
ESR/CRP is normal	ESR/CRP is raised
Pulse is small volume, narrow pulse pressure is common	Hypotension is common
Usually leukopenia, but leukocytosis are observed in complicated cases	Usually leukocytosis
Evidence of plasma leakage: pleural effusion and/or ascites	No evidence of plasma leakage
LFT: Hypoalbuminemia (Albumin < 3.5 gm% or < 4 gm% in obese person) with rapid rise in AST, up to > 10,000 U within 12-24 hs	LFT: No hypoalbuminemia and may see mild elevation of AST, usually not > 500 U

Atypical Dengue Cases – Multiple organ dysfunction/ co-infections/ co-morbidities

RP – Member of the Clinical Subcommittee, Cambodia

Unusual Dengue (Expanded Dengue Syndrome/EDS)

EDS

- Unusual Dengue is a rare occurrence (<1%)
- Patients develop clinical features which are different to what is seen in DF/DHF

EDS

Manifestations include;

(A) neurological features;

- Encephalitis
- other neurological manifestations such as Guillain-Barre Syndrome, Polyneuropathy, Transverse myelitis, Neuro-opthalmic involvement

(B) Isolated Organ Involvement such as hepatic, renal, cardiac or other organ involvement

Associated with underlying co-morbidities (e.g. chronic liver disease) or co-infections (e.g. other viral infections)

- EDS has be differentiated from prolonged shock in DHF leading to multi-organ failure
- Prolonged shock results in single or multi organ failure as liver, renal and/or cardiac/respiratory which may be common in clinical practice and has to be differentiated from EDS

EDS

- EDS and Prolonged shock leading to MOF should be evaluated extensively by clinical events, treatment given and the response to treatment in order to differentiate the two

EDS

- Unusual Dengue could be with or without plasma leak (in DF or DHF)
- Treatment should be directed towards DF/DHF and specific organ management

Lecture 12

Dengue in high-risk patients – infancy, obesity, pregnancy

RP – Member of the Clinical Subcommittee, Cambodia

High risk patients

- Infants, Elderly
- Obese patients
- Prolonged shock
- Significant Bleeding
- Encephalopathy
- Underlying diseases
- Pregnancy

Infancy

- Present with unusual presentations – convulsions & diarrhea
- Convulsions – subtle, onset few days after high fever/ when temperature coming down
- DSS – only sign may be unstoppable crying

- Important – do CBC before spinal tap or administration of hypotonic salt solution
- Leakage – 12 – 24 hrs (shorter than older patients)

Obesity

- Limited lung capacity (including infants/ pregnant women)
- Important – strict IV fluid management
- UOP – 0.5ml/kg/hr

Pregnancy

- Management depends on –
  - The Phase of the illness
  - The Gestation of the patient

  Febrile Phase
- Gestational age > 28 – 32 weeks – early LSCS
- Gestational age 24 – 28 weeks – Dexamethazone given 2 days before the LSCS
- Gestational Age < 24 weeks – observe mother closely for plasma leakage
- If critical phase – decide with multi-diciplinary team

Lecture 13

Indications for Referral to higher centers

RP – Member of the Clinical Subcommittee, Cambodia

Indications to call for immediate advice (Pre-shock stage)

- Pulse rate >120/min with fever or >100/min without fever
- Pulse Pressure 25-20mmHg or less (in supine position)
- Postural drop of SBP 20mmHg
- Significant bleeding (Haemetemesis, Malena, Bleeding pv etc.)
- UOP <0.5ml/Kg/hr
- CRFT >2sec

Indications for transfer

- Health Centre to referral hospital - All patients suspected of dengue
- Lower level referral to higher level referral hospital –
  - Age < 1yr
  - Pt. with underlying diseases
  - Heart Patients
  - DHF Grade IV or DSS
  - If no blood bank with significant bleeding
  - Unusual manifestations – altered conciousness, stupor, convulsions, coma

Transfer to HDU/ ICU – what to consider?

- Leaking stopped or not
- Complication/s observed
- Stage of DHF

When to transfer to Larger Facility

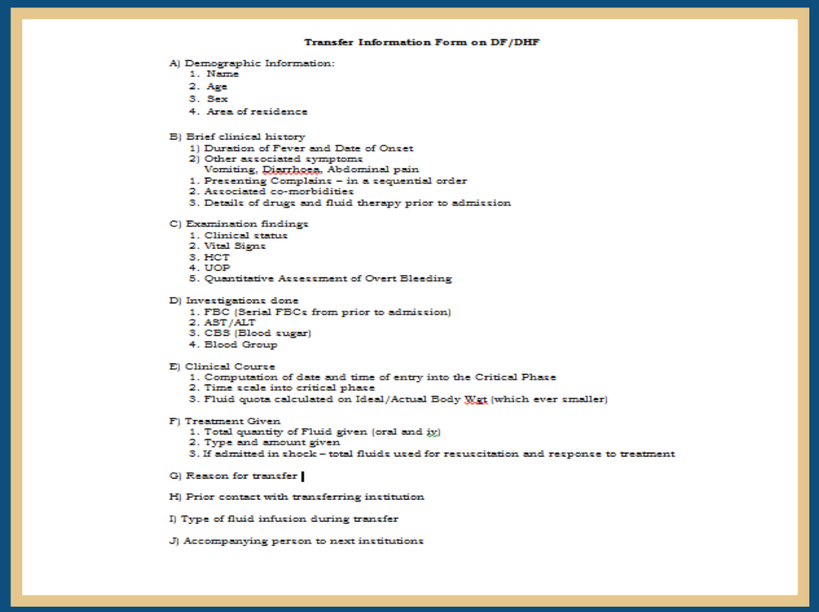
- DHF with following;
  - One dose of colloid with high HCT
  - Repeat shock more than 3 hours
  - No response to IV fluid therapy
- Patient with DHF with signs of fluid overload
- Relatives concerned or not adequate personnel to manage

Transferring patients to Larger institution – what to do?

- Obtain advice form receiving clinician
- Phase of illness
- Fluid therapy given – daily fluid balance
- Investigation Results
- Send copies of temperature and monitoring charts
- Reason for Transfer

Referral Form should include

- Demographic Information
- Brief Clinical History
- Examination findings
- Investigations summary
- Clinical Course
- Treatment Given
- Type of fluid infusion during transfer
- Reason for transfer



Transfer Information Form on DF/DHF

A) Demographic Information:
1. Name
2. Age
3. Sex
4. Area of residence

B) Brief clinical history
1) Duration of Fever and Date of Onset
2) Other associated symptoms
Vomiting, Diarrhoea, Abdominal pain
1. Presenting Complaints – in a sequential order
2. Associated co-morbidities
3. Details of drugs and fluid therapy prior to admission

C) Examination findings
1. Clinical status
2. Vital Signs
3. HCT
4. UOP
5. Quantitative Assessment of Overt Bleeding

D) Investigations done
1. FBC (Serial FBCs from prior to admission)
2. AST/ALT
3. CBS (Blood sugar)
4. Blood Group

E) Clinical Course
1. Computation of date and time of entry into the Critical Phase
2. Time scale into critical phase
3. Fluid quota calculated on Ideal/Actual Body Wgt (which ever smaller)

F) Treatment Given
1. Total quantity of Fluid given (oral and iv)
2. Type and amount given
3. If admitted in shock – total fluids used for resuscitation and response to treatment

G) Reason for transfer

H) Prior contact with transferring institution

I) Type of fluid infusion during transfer

J) Accompanying person to next institutions

Notification of dengue for public health control

RP – Member of the Clinical Subcommittee (Epidemiologist/
Public Health Physician), Cambodia

Dengue Surveillance

Definition of disease surveillance

Systematic collection of data for action

Continuous collection, analysis, interpretation, and dissemination of systematically collected data on communicable diseases for use in **public health action** to reduce morbidity and mortality and to improve health

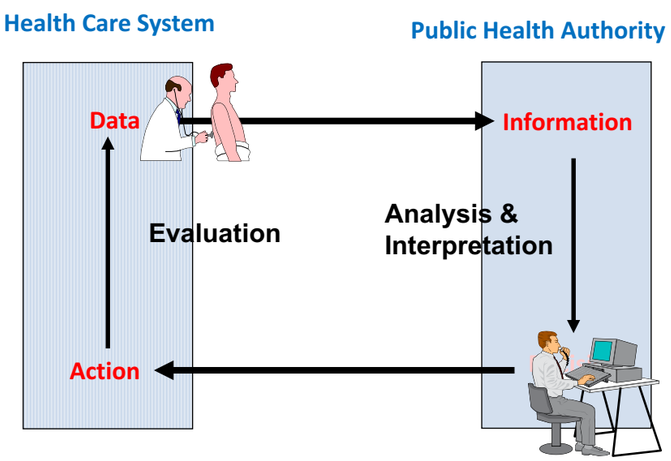
Communicable Disease Surveillance

Goals:

- To monitor disease transmission to facilitate prevention
- To define disease dynamics (severity)
- To determine cost-effectiveness of preventive programs
- To estimate disease burden in the community

"Ideal surveillance system should monitor disease cases accurately and detect impending **epidemics** from a background of **endemic** disease to trigger **emergency preventive mechanism**"

Surveillance



Types of Surveillance Systems

- Routine reporting (passive)

- Enhanced Surveillance (active)
  - Community based prospective cohorts
  - OPD Fever reporting
  - Laboratory reporting

Notification Form

Notification for DF/ DHF/ DSS

Name of Institution/ Hospital: ----------

Name of Patient: ----------

Age: ---------- yrs Sex: ----------

DOA: ----- (D) ----- (M) ---------- (Y)

1st day of fever (Date): --------(D) ------- (M) ---------(Y)

Ward No: ----------

Patient Record No: ----------

Investigations (if available): ----------

Address of Patient: ----------

Contact phone number: ----------

Tentative Diagnosis: ----------

Name of the person notifying about the disease/ illness: ----------

Notification of patients

Cambodia has the potential to report cases of dengue through several systems:

- National Dengue Control Program (NDCP) implemented enhanced sentinel surveillance system
- Communicable Disease Control Department (CDC) has established syndromic case surveillance system (CAMEWARN)
- Health Management Information System (HMIS) reporting confirmed cases and deaths.

Dengue Prevention and Control

Possible Interventions

- Primary Prevention:

(A) Reduce disease transmission (interruption) – solidifying evidence based vector control approach;

- improved entomological assistance
- adult vector control

(B) Vaccine – preparation for vaccine introduction when become available (earliest 2015) – ***need to plan now***

Possible Interventions...

- Secondary Prevention:

(A) Early case detection – Iry care & pvt. sector through improved diagnostics:
- Complete Blood Count
- NS1 (cost implications)

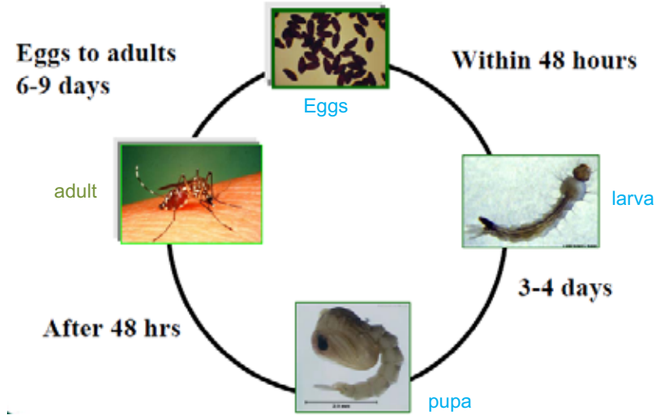
(B) Improving Clinical Management
- reducing disease severity
- reducing case fatality

The Mosquito Vectors

- ***Aedes aegypti (high capacity)***
  - **Well adapted to transmit DENV**
    - **Human blood meal**
    - **Breeds year round**
  - **Day biter**
  - **Breeds near human habitation**

- ***Aedes albopictus (low capacity)***
  - **Less adapted to transmit DENV**
    - **Multiple animal blood meals**
    - **Goes into diapause when cold**
  - **Day biter**
  - **Breeds near human habitatio**

Life cycle of Vector



Domestic Containers (95% breeding)

Habitat	Container Type
Water Storage Containers	Barrels, Cisterns, Tanks, Jars etc.
Unwanted Containers	Bottles, buckets, drums, pots, pans, tins, rubber tyres, etc.
Ornamental Containers	Flower vases, flower pots, garden pools
Water Drainage Installations	Roof gutters, Catch basins, cesspools, gullies, manholes, storm drains, Sumps, Water-pipes, Sewer inlets
Construction Site Containers	Cement-mixers, Concrete blocks, Scrap iron, ground pools, discarded containers, etc.

Indices used to assess the levels of *Aedes* infestations

House Index (HI) : percentage of houses infested with larvae and/or pupae

HI[PI] : Number of houses infested X 100
Number of houses inspected

Container Index (CI) : percentage of water-holding containers infested with larvae or pupae

CI : Number of positive containers X 100
Number of containers inspected

Breteau Index (BI) : Number of containers infested with larvae or pupae per 100 houses inspected

BI : Number of positive containers X 100
Number of houses inspected

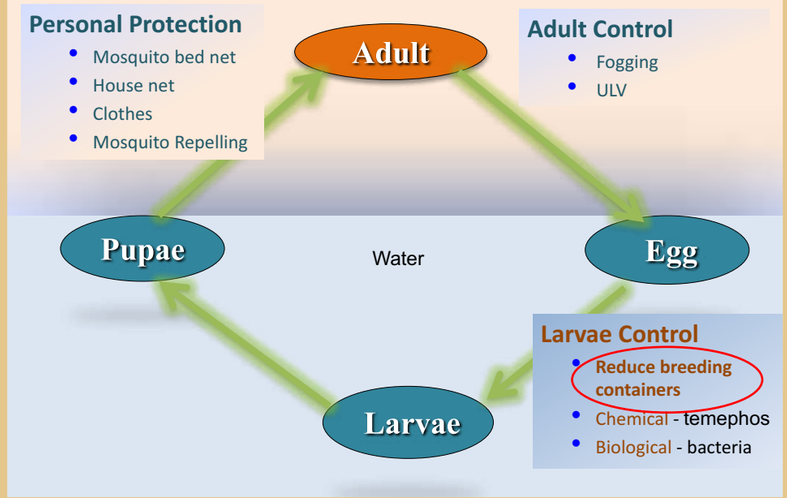
Vector Control
(Where/What/When)

- Where to attack - High–risk Areas
- What to attack - Common habitats
- When to attack - Rain fall, Climatic Features + Human behavior (Vector population data)

Integrated Vector Management

Source reduction →	•Top down” •“Bottom up”
Kill larvae →	•Larvicide •Biological agent
Kill adults →	•Residual adulticide •Aerosol adulticide

Options for Vector Control



3 R System for Waste?

- R 1 – **Reduce** – minimizing waste generation
- R 2 – **Reuse** – minimizing discarding material
- R 3 – **Recycle** – reprocessing discarded material

Role of Public Health Staff

- Building partnerships for change – intersectoral collaboration
- Disease surveillance (developing spot maps, clustering of cases, early outbreak detection)
- Coordinate Vector surveillance & control
- Coordinated elimination of potential breeding places
- Waste separation practices – '3 R' System

Conveying about patients condition to family

- Explain in detail about the clinical course of the illness, process of dengue management and the condition of the patient in a simple language
- Always try to answer the queries of the relatives as much as possible and reassure them

Recovery Signs

A- Improved Appetite
B- Presence of Bradycardia
C- Convalescence rash/Constitutional symptoms
D- Diuresis

Convalescence Phase

A – Appetite

B - Bradicardia

C – convalescence Rash / Pruritus

D – Diuresis

Discharge

- Fever free for at least 24hrs without antipyretics
- Good general condition with improving appetite
- Normal PCV at baseline value or 35-40% if baseline unknown
- No distress from pleural effusions
- No ascites
- Platelet count >50,000 mm^3
- No complications

Looking after at Home

- Minimal physical & mental rest
- Adequate fluids(Milk, Fruit juices, Kanji, ORS) – Adults 2000cc/day.
- Avoid Red/black coloured fluids
- Psychological support/Counseling

Lecture 17

Pit Falls in the Management of Dengue/DHF

RP – Member of the Clinical Subcommittee, Cambodia

Pit Falls and Investigation of Dengue Deaths

Pit Falls in DHF patients

- Delay admission: missed Dx, (asDF) not Follow up wbc/plts, Hct in DHF case that come early in febrile phase
- Over use of: aspirin.ibuprophen for high fever; antiemetics,
- steroid etc that may have impact on liver/bleeding
- Fluid overload: not using colloidal(dextran),
- Acidosis and electrolyte not corrected,
- Not recognize concealed bleeding early
- Not recognize shock: as most pts-are in good consciousness, often with narrow PP e.g 100/80mmHg at onset of shock leads to prolonged shock, DIC & bleeding
- Do not adjust IV rate according to the rate of leakage (leading to shock or fluid overload)
- Improper use of blood components: Plt, FFP given instead of Fresh Whole Blood/Packed Red Cells in case of bleeding, or Plts Tx as prophylaxis for bleeding
- Prolong shock –massive bleeding: multiple organ failure

Avoid in Dengue

- Avoid non-steroidal anti inflammatory drugs (NSAIDS): such as Ibuprofen, diclofenac sodium, mefenamic acid
- Avoid steroids: prednisolone, dexamethsaone
- Avoid Paracetamol overdose in Children

Institutional Dengue Death Review

- All dengue related deaths should be immediately reported to the Central Unit by phone/fax/e-mail (during the next working day)
- Head of the institution/hospital is responsible to carry out a technical dengue death review within one month from the occurrence of all such deaths

Participants of Institutional Dengue Death Review should be:

- Head of the Institution or representative
- Relevant clinicians (Paediatricians/Physicians, etc.)
- Senior grade medical officers (Registrar/SHO)
- Relevant House Officers
- Judicial Medical Officer (JMO)
- Microbiologist/Histopathologist/Haematologist
- Hospital Matron
- Ward sister in-charge
- Infection Control Nursing Officer
- Any other relevant officer

Information to be presented at the Institutional Dengue Death Review

- Brief History and Clinical course while in hospital with special reference to condition on admission(walking-in patient heamodynamically stable/in shock) and associated co-morbidities and complications

- laboratory investigations specially the beginning and the end of critical phase computed with the sequential changes in FBC (CBC)

- Management of the patient specially giving attention to;

- The Fluid management issues including calculation of fluid quota and the spread of crystalloids and colloids during the entire critical period in relation to monitoring.

- Patient presenting in shock details of resuscitation and post resuscitation management

Information to be presented at the Institutional Dengue Death Review…

- Summary of monitoring:

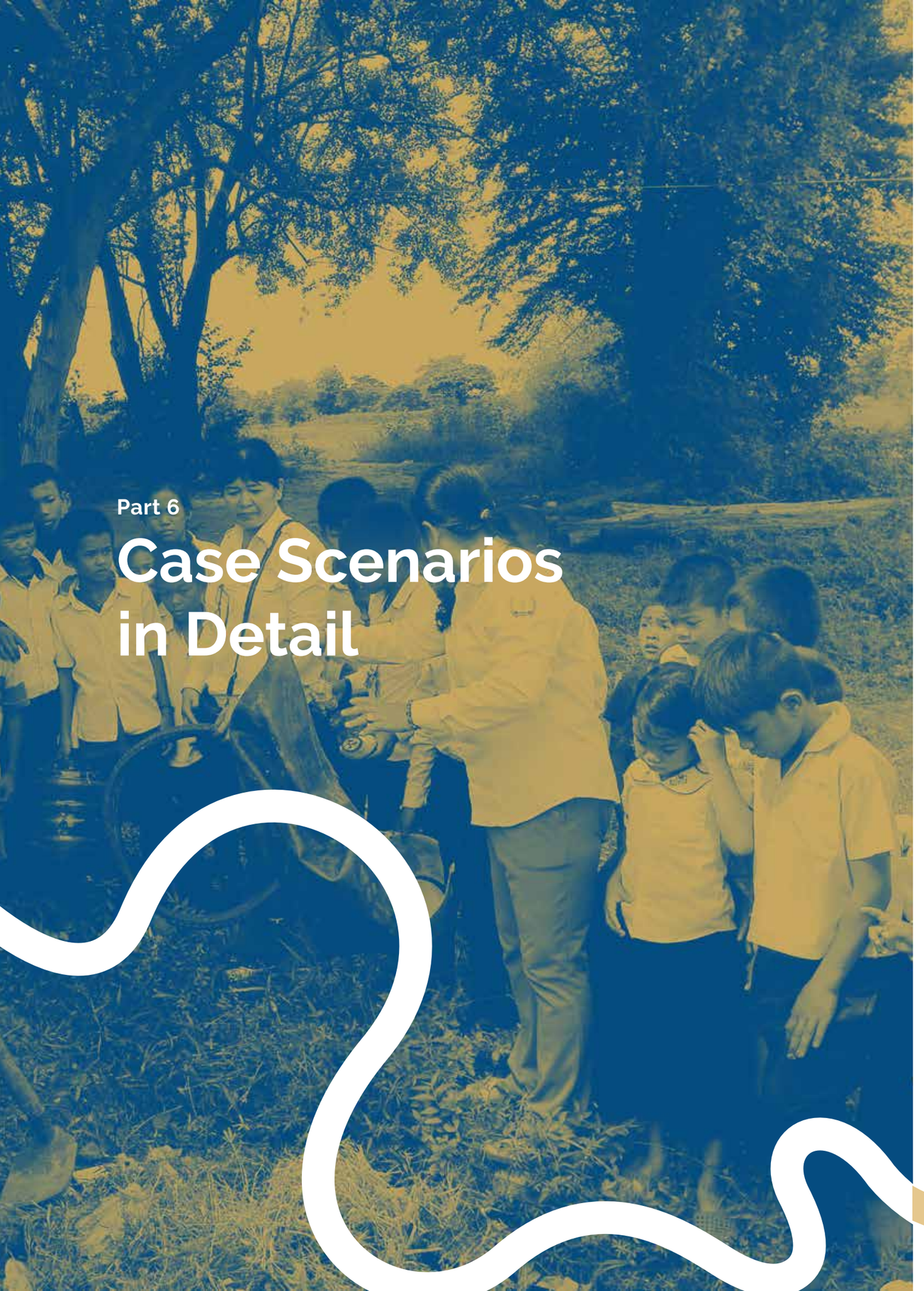
a) Clinical,

b) Vital signs - basic parameters (pulse, BP, PP) and indicators of peripheral perfusion (skin colour, skin temperature, CRFT),

c) Serial HCT and,

d) UOP on the weight use for fluid calculation (ml/kg/hr)

- Adjuvant therapy – A, B, C, S assessment (A – Acidosis, B – Bleeding, C – Calcium and other electrolytes, S – Sugar)
- Assessment of organ involvement (e.g. Liver, Renal functions)
- Serology / other confirmatory tests
- Post mortem findings if autopsy done
- Probable cause of Death:
- Underlying primary cause (e.g: Fluid Overload /Prolonged Shock or both)
- Consequences of primary cause (e.g: pulmonary oedema due to fluid overload, multi organ failure due to prolonged shock)
- Unusual dengue with single organ involvement
- Place of managing the patient in sequential order (ETU > HDU > ICU)
- Any additional information could be added depending on the necessity



Part 6

Case Scenarios in Detail

DAY 1

1-3: Cases of DF/DHF/DSS

Case 1 – DF

A 7-year-old child with fever for 3 days presented to the hospital with vomiting and abdominal pain developed on day of admission. Due to high fever Mother had given the child paracetamol 500mg 6 hourly for 1 day. Previous week neighbour's child also had confirmed Dengue illness.

On examination – Flushed face, Fever 39 oC, mild dehydration, warm peripheries, pulse – 120/ min, BP – 110/70 mmHg, CRFT < 2 sec and liver palpable 1cm and tender.
Investigations- NS 1 +, CBC - HB - 16.4 mg/dl, HCT - 38.5, Platelet - 125,000, WBC - 4200 N 47%, L 52%, CRP -1.44, SGOT -195 and SGPT -62.

Questions to be answered ?

- What are the important inferences from this information ?
- What is your tentative diagnosis ?
- What is your next course of action ?

Case 2 - DHF

A 27-year-old male patient presented to ward with 4 days fever. Body weight 85kg.

Complained of arthralgia, Myalgia, LOA, Loose stools. UOP was good. Was treated by a GP for body aches with paracetamol. Patient was nebulized once for wheezing but he was not a known asthmatic.

On admission Investigation Findings - NS1 Ag- Positive, Platelet count 43 000 and WBC 4.7 x 103
HCT after admission was 48.5%

On examination – febrile, BP – 110/80 mmHg, PR – 80bpm, RR – 20bpm, CRFT - <2S, R/Air entry – Reduced and Hepatic Tenderness++

Questions to be answered ?

- What would you suspect with the above history ?
- What are the investigations you want to do in this patient next ?
- What parameters would you monitor closely ?
- How would you manage this patient ?

Case 3 – DSS

A 14-year-old child was brought to hospital complaining of fever and vomiting x 3days. When taken to GP was diagnosed as Gastroenteritis and treated for fever with Mefenamic acid 250mg x tds. Mother had noticed child was cold & giddy on standing, but ignored thinking due to poor food intake & severe vomiting.

On examination – Looks very ill, conscious, and drowsy. HR 163/min [Monitor], pulse not palpable, BP un-recordable, Peripheries ice cold & clammy, CRFT 4 sec and flank dullness ++

No UOP even with catheterization.

Investigations - Bedside ultra sound scan - moderate R/S pleural effusion+ and ascites+

PCV – 59%

Questions to be answered ?

- What is your probable diagnosis ?
- What management would have worsened the condition ?
- How would you manage this child ?

DAY 2

4: Common complications of DHF/DSS – ABCS assessment

Case 4 – Fluid overload

A 3 1/2-year-old previously healthy girl with a body weight of 15kg (IBW also 15kg) presented to hospital with a history of 3 days fever. Her NS1 was positive on day 2.

She was not dehydrated but was feeling very thirsty and the mother had given her several cups of water instead of giving electrolyte solution.

At hospital she was afebrile on Day 4. HR 140/min, BP 95/65mmHg (PP= 30mmHg), Platelet count 80,000, HCT 46%. Peripheries were cold (CRFT <2 seconds), Her USS revealed R/S mild pleural effusion.

Due to cold extremities and high HCT she was given a full 10ml/Kg bolus of iv N saline. Followed by N Saline 7ml/kg for another 1 hr. Followed by a full bolus of Dextran 40 and another 2 hrs of N Saline 7ml/kg.

Her HCT remained high despite high rate of fluid therapy. Her total fluid quota for the entire critical phase was exhausted by 18hrs (103% fluid quota used).

She developed Dyspnea, Tachypnea (RR 60/min), and had gross ascites.

At this stage her repeat USS revealed large pleural effusion in the R lung with small effusion in L side, with gross ascites and small pericardial effusion.

Questions to be answered ?

- Comment on the fluid therapy of this patient ?
- What complications has she developed ?
- How would you manage this patient from this moment ?

5: Risk of bleeding and Principles of blood transfusion

Case 5 – Risk of bleeding and Principles of blood transfusion

A 19-year-old male, obese but otherwise healthy patient admitted on day 4 of illness with a history of fever for 3 days.

He presented in a collapsed state with melaena and was found to be afebrile, irritable, confused with cold extremities. Pulse was not palpable and BP un-recordable.

He had been treated 2 days before at the OPD of a private hospital for fever. CBC done at that time had revealed WBC 3.6x103; PLT 160 x103; PCV 47% and was **prescribed both oral Diclofenac Na and Dexamethasone.**

Questions to be answered ?

- How would you resuscitate this patient ?
- How would you investigate and what complications do you anticipate in this patient ?

According to the mother patient had not passed urine for 8 hrs and did not produce any fresh urine when catheterized. On admission Dengue RDT NS1 was positive.

He was admitted to the ETU and resuscitated with O2 and NS fast drip followed up with 500cc NS over 1 hr. He was also given IV Vit. K and IV Tranexamic acid.

VBG revealed severe metabolic acidosis. On resuscitation with Normal Saline rapid bolus followed by 500 Normal Saline over 1hr he produced some urine. After initial resuscitation, his BP was recorded at 70/55mmHg on the monitor, HR 130/min with poor volume. Although he became conscious transiently with the fluid resuscitation, he remained irritable and confused.

- What is the working diagnosis ?
- How would you further investigate and manage this patient now ?
- How would you assess the response to your management (HCT, Vital signs, Clinical, Urine output) ?
- If no response to your management what do you consider now ?

6-8: Multiple organ dysfunction/co infections/ co-morbidities

Case 6 – Dengue Leaking and Bleeding (Complicated DSS with leaking & bleeding both)

A 20-year-old healthy female admitted to a teaching hospital in shock. She gave a history of fever for 3 days, headache arthralgia, myalgia and vomiting. On the day of admission, she had severe abdominal pain, profuse vomiting and fainting attacks.

A General Practitioner had referred this patient to hospital with a 500cc Normal saline drip while it was still on. On referral form BP 80/60mmHg (PP 20mmHg). Her NS1 was positive.
On admission CBC revealed WBC - 3.3x103, platelet - 40 000.

On examination she had no fever, mildly dehydrated and her HR was 120/min, low volume pulse (radial pulse not palpable). BP 70/60mmHg (PP 10mmHg), tender RHC with reduced air entry to R lung base.
Her in-ward HCT was 35%.

She was resuscitated with 500cc normal saline bolus. Followed by Dextran 40 500cc bolus.

Questions to be answered ?

- What is your assessment of this patient on admission to the Teaching Hospital ?
- What investigations would you like to perform now ?
- Comment on management of this GP and the resuscitation done at the teaching hospital ?

Case 7 – Dengue with Multiple organ dysfunctions

A 17-year-old previously healthy girl presented with fever for 3 days, with arthralgia, myalgia, nausea, vomiting to Hospital. On admission she was ill looking, dehydrated, but hemodynamically stable.

On admission Platelet 70,000, and NS1 Ag positive.

While in the ward patient went into shock with narrow PP. After resuscitating with 500 ml of N/saline over 1 hour patient was sent for us scan to Radiology without an IV drip.

Thereafter, fluid intake was reduced hourly (7 – 5 – 3 hourly basis) and maintained at 2 ml/ kg for further 7 hours. During this period there was persistent tachycardia and UOP had reduced.

Subsequently, patient developed complications such as acidosis, bleeding, DIC and liver failure. Patient was then transferred to a higher facility for further management.

While in the higher facility, where patient was treated for above complications and ventilated, she developed renal failure and was started on for renal replacement therapy.

Questions to be answered ?

- What are the complications this patient had developed ?
- What would be the reason/ cause for the above condition ?
- How would you have better managed to prevent the complications ?

Case 8 – Dengue with Co-morbidities

58-year-old female with Hypertension, Sero-positive Rheumatoid arthritis and CKD developed fever for 3 days, arthalgia, myalgia and headache and was feeling dizzy on admission. On admission no fever, air entry was reduced on right side with right upper quadrant tenderness and was in shock with narrow pulse pressure (HR – 82, BP - 90/70mmHg).

She was resuscitated with normal saline 500ml over 1 hour and tailed off fluid for 3 hours with 350ml -> 250ml -> 150ml thereafter maintained 100ml for several hrs both oral and IV. In the further management of this patient dextran 40 bolus and blood transfusions were given according to the heart rate. BP and pulse pressure fluctuations. However, urine output remained very low throughout the period.

Questions to be answered ?

- What are the other conditions that need to be considered when treating this lady ?
- What par meters should be considered in this lady ?
- How would you improve on this management plan ?

Case 9 – Dengue in Infancy

A 7-month-old healthy baby admitted to hospital with a history of fever for 4 days with irritability, poor oral intake and vomiting. His actual body weight was 11kg (Ideal body wt 7kgs)

Clinical examination revealed no involvement of CNS.

His NS1 Antigen test was positive on day 3. Family history with the elder sister treated for DHF a week ago.

Next day after admission his CBC revealed WBC of 6.4x103, Platelets 95x103, HCT 46% and USS showed mild R/S pleural effusion.

AST = 150, ALT= 60

Questions to be answered ?

- What is your diagnosis ?
- What are the important points to consider in managing this infant ?
- How would you calculate his fluid quota and urine output during the critical phase ?

After 12 hours of fluid therapy patient started taking breast milk. His urine output became 1.2ml/kg/hr. PP which was 30 to begin with widened up to 40. His HR which was 120/min increased up to 140/min. Platelet count which was 29x103 increased to 36x103 after 6 hrs. At this time HCT increased up to 48%.

- How would you interpret the above findings ?

Case 10 – Dengue in pregnancy

A 34-year-old pregnant mother with POA of 32 weeks, referred by a VOG to the medical unit of a Private Hospital with fever and backache for 2 days and positive NS1. On examination she was febrile, heart rate - 120, BP - 110/70 mmHg, Lungs - Clear, Abdomen - NAD. USS showed no evidence of leaking.

She remained Hemodynmically stable for next 2 days without any evidence of leaking. On day 4 of admission she was febrile, PR - 110, BP - 100/80 mmHg (PP – 20 mmHg). Evening she complained of epigastric pain with blood pressure of 100/90 mmHg and PR - 110. She was admitted to ICU with the pulse pressure of 10 mmHg and prolonged shock.

After fluid therapy, on admission to ICU BP 120/80 mmHg, right side pleural effusion. USS showed evidence of leaking.

Questions to be answered ?

- What is your diagnosis ?
- How would you manage this pregnant lady ?

11-12: Dengue in Obese patient and Expanded Dengue Syndrome (EDS)

Case 11 – Obesity and Dengue

A 13 years old Girl, eldest of three siblings who is obese (Wt 68.5kg - 99th centile) is admitted to the ward.

She presented on third day of fever. Complained of cough/vomiting/ loose stools/Abdominal pain. On examination was Ill looking and febrile. CRFT<2sec, PR -140/min, BP -100/70mmhg and R/S Reduced air entry, Hepatomegaly 3cm.

Investigations - NS1 positive, WBC/DC – 6.71 x 10^3, Neutrophils – 57%, HCT – 44.6%, Hb – 13.3g/dl

Questions to be answered ?

- How would you calculate the fluid quota and urine output in the patient during leaking period ?
- What other factors you need to consider when managing this child ?
- How would you manage ?

Case 12 – Expanded Dengue Syndrome (EDS)

A 9-year-old boy presented to hospital on day 1 of fever with behavioral change, headache and vomiting. He was immunized previously against JE.

On examination Obese, Febrile child, drowsy and disoriented with neck stiffness.

His eye opening was spontaneous, spoke inappropriate words and localized the pain. GCS was 12

CVS, RS and abdomen were normal.

WBC 16.1 x10^6 with N=71% L=22%, Hb 13g/dl, HCT 39.7%, PLT count 332,000mm^3

Dengue NS1 +ve

Clinical Diagnosis of Meningo-encephalitis was made.

Questions to be answered ?

- What is your diagnosis ?
- How would you manage this child ?

On day 2 of admission patient developed hallucinations. A non-contrast CT scan of the brain showed Cerebral Oedema. EEG showed diffused background slowing in the range of delta/theta compatible with encephalitis.

- Now what is your further investigate and manage this patient ?
- How would you monitor this patient further for evaluation of dengue illness ?

Patient showed clinical improvement by day 5. But, fever spikes continued. WBC at this stage showed leucopenia 3.4x10 6 and thrombocytopenia 15x10 6 and rise in HCT (43.8%). USS revealed pericolysisitc fluid with mild ascites and R/S pleural effusion. CSF revealed no cellular response but dengue IgM and IgG were detected.

- How would you manage this patient ?

Note: This child made a complete recovery after 10 days.

Part 7

Pre and Post test

Training of Trainers (ToT)

Following clinical features suggestive of early suspected cases of dengue EXCEPT ?

1. Progressive leukopenia
2. Aches and pain
3. Nose bleeding
4. Rash
5. Cough and running nose

Answer 5

A 6-year-old boy, 20 kgs was seen at The ER with un-recordable pulse, tender Hepatomegaly. He was afebrile from early this morning. His Hct - 48%, WBC 4,560, Platelet 45 000/dl. What is the likely diagnosis for him ?

1. Dengue Fever
2. DHF grade II
3. DHF Grade III
4. DHF grade IV
5. Expanded Dengue Syndrome

Answer 4

The immediate management for the above child include. More than one answers is accepted ?

1. Bolus of normal saline 20 ml/kg over 15 minutes
2. Dextarn-40 10 ml/kg/hr
3. NSS 10 ml/kg IV bolus (as fast as possible)
4. Check blood sugar and correct if hypoglycemia
5. Give NaHCO3, 20-40 ml IV push slowly

Answer 3 & 4

What is the best way to detect that a suspected dengue patient has DHF ?

1. Ultra sound scan showing pleural/peritoneal effusions
2. A rise of PCV towards 20% from the base line
3. A positive tourniquet test together with leukopenia
4. A rapid drop in the platelet count below 50,000
5. physical signs suggestive of pleural effusion /ascites on clinical examination

Answer 1

If a patient in a dengue endemic area is admitted to a hospital on day 2 of fever with a history of taking NSAIDs on day 1 of fever ?

1. There is no need to worry as the patient is obviously in the febrile phase
2. It is better to treat the patient with a prophylaxis regime as for peptic ulcers
3. Inform patient immediately that the prognosis is poor
4. No need to worry if the patient is asymptomatic
5. Watchful waiting for GI bleeding is the best option

Answer 5

Following clinical features are suggestive of the onset of critical stage of the disease ?

1. Progressive leukopenia
2. Temperature dropping to 37.5–38 oC or less
3. Persistent vomiting and abdominal pain
4. Generalized pruritus
5. Bradycardia and electrocardiographic changes

Answer 3

Following suspected dengue patients should be admitted to hospital (warning signs) if they have ?
EXCEPT

1. Pabdominal pain or tenderness
2. Lethargy, restlessness
3. Difficulties in coming to hospital
4. Mild dehydration on day 2 of illness
5. Persistent vomiting

Answer 4

Following chart indicate laboratory parameters of a 9 years old boy suspected of dengue who was admitted at 1pm of Day 3 of fever which was a Saturday. Monday (Day5) afternoon at 2 pm, USS was done and confirmed R/sided pleural effusion and ascites.
When is the good time to use the dengue critical monitoring charts with clinical, vital signs, Hct and urine output records ?

TIME		PLATELET		WBC		PVC	
10pmD3	5amD5	162	66	2200	2400	38	39
8amD4	1pmD5	134	57	2030	3100	40	42
3pmD4	9pmD5	112	44	1700	4230	38	40
9pmD4		92		1520		39	

1. Day 3
2. Day 4, 8 AM
3. Day 4, 3 PM
4. Day 4, 9 PM
5. Day 5, 5AM

Answer 3

Which of the following is (are) TRUE regarding management of fluid over loaded dengue patients?
More than one answers is accepted ?

1. If BP is normal and patient is in reabsorption phase – stop fluid & give frusemide
2. Lasix given at mid bolus of dextran-40 in leaking phase is effective to draw some pleural effusion/ascites back into the circulation (medical reabsorption) so that this excess fluid is depleted out of the body by the actions of frusemide (without dextran-40, patients may develop shock because frusemide depletes only intra-vascular volume!)
3. If in shock and HCT is high give dextran and lasix and followed by blood transfusion
4. Slow transfusion of platelets should be given
5. Pleural effusions should be drained as soon as possible

Answer 1 & 2

Following laboratory parameters from a 14-year old 30kg boy who was admitted with the diagnosis of DHF ? yesterday. He has received 5%D/NSS rate 3-5 ml/kg/hr since admission and his vital signs are stable except for rapid pulse of 130/min.

TIME	PLATELET	WBC	PVC
D4 9pm	87	47	35
D5 5am	2300	2670	10 450
D5 1pm	37	38	40

What is the least likely clinical complication that needs to be considered in him at this stage based on above information ?

1. Concealed bleeding
2. Hypoglycemia
3. Acidosis
4. Fluid overload
5. Hypocalcemia

Answer 4

Following clinical conditions require blood transfusions in suspected dengue patients ?

1. Hypotensive shock with low/normal HCT on admission
2. Rapid rise of HCT after first fluid bolus
3. Shock not responding to 40-60 ml/kg fluid bolus
4. Persisting metabolic acidosis with normal blood pressure
5. Platelet count less than 20 000/mm^3

Answer 1

An 8-month-old girl was admitted on day 5 of her illness with persistent crying. She was observed to have a few attacks of brief tonic seizure before she was taken to the hospital. She had fever for 4 days and the fever subsided last night. She also had a few loose stool last night. Last week, her older brother was admitted to a hospital with the diagnosis of DSS and was just discharged home 2 days ago.

The initial important investigation is

1. CBC
2. Lumbar Puncture
3. Electrolyte
4. LFT
5. Emergency CT scan

Answer 1

Signs of recovery is EXCEPT

1. Increase in appetite
2. Sinus bradycardia
3. Convalescence rash/pruritus
4. Dyspnea/tachypnea
5. Diuresis (increase in amount of urine > 1 ml/kg/hr in children and > 50 ml/hr in adults)

Answer D

An obese but previously healthy, 14-year-old girl was taken to the ER with no measurable BP, confused and restlessness. She had a history of a few days of fever, nausea, vomiting and complained of some abdominal pain. Today she did not come out of her room for lunch and dinner as usual. She just took paracetamol and did not go to see the doctor. Mother found her lying in bed with cold clammy extremities so she was taken to the ER at 21 PM. Physical Examination revealed a confused and irritable young girl with no BP, PR 120/min weak, RR 22/min, T 37.8 oC. What is the differential diagnosis of this girl with profound shock ? **EXCEPT**

1. Septic shock
2. Anaphylactic Shock
3. Hypoglycemic shock
4. Hypovolemic shock
5. Dengue Shock Syndrome

Answer 2

The above case, after 500 ml of NSS IV push, her BP became measurable 80/50 mmHg so IV rate was reduced to 80 ml/hr. CBC revealed Hct 42%, WBC 16,500, Platelet count 30,000 cumm., PMN 75%, L 23%, AL 2%. Total protein / albumin = 5.3/ 2.8 gm%, BUN = 26, Creatinin = 1.5 mg%, AST/ALT = 1,459/167. Blood sugar 58 mg%. What is the most likely diagnosis for her ?

1. Septic shock
2. Expanded Dengue Syndrome (Dengue Shock Syndrome with liver failure and concealed bleeding)
3. Hypovolemic shock
4. Cardiogenic shock
5. Hypoglycemic shock

Answer 2

A 23-year-old, 34 weeks of gestation got high fever with NS1Ag positive on the third day of her illness was admitted to a tertiary care hospital. She has poor appetite with a few bouts of vomiting. Her Hct = 38%, WBC 3,900, Platelet count 132,000 cells/cumm. What is the appropriate management for her ? Explain the reason.

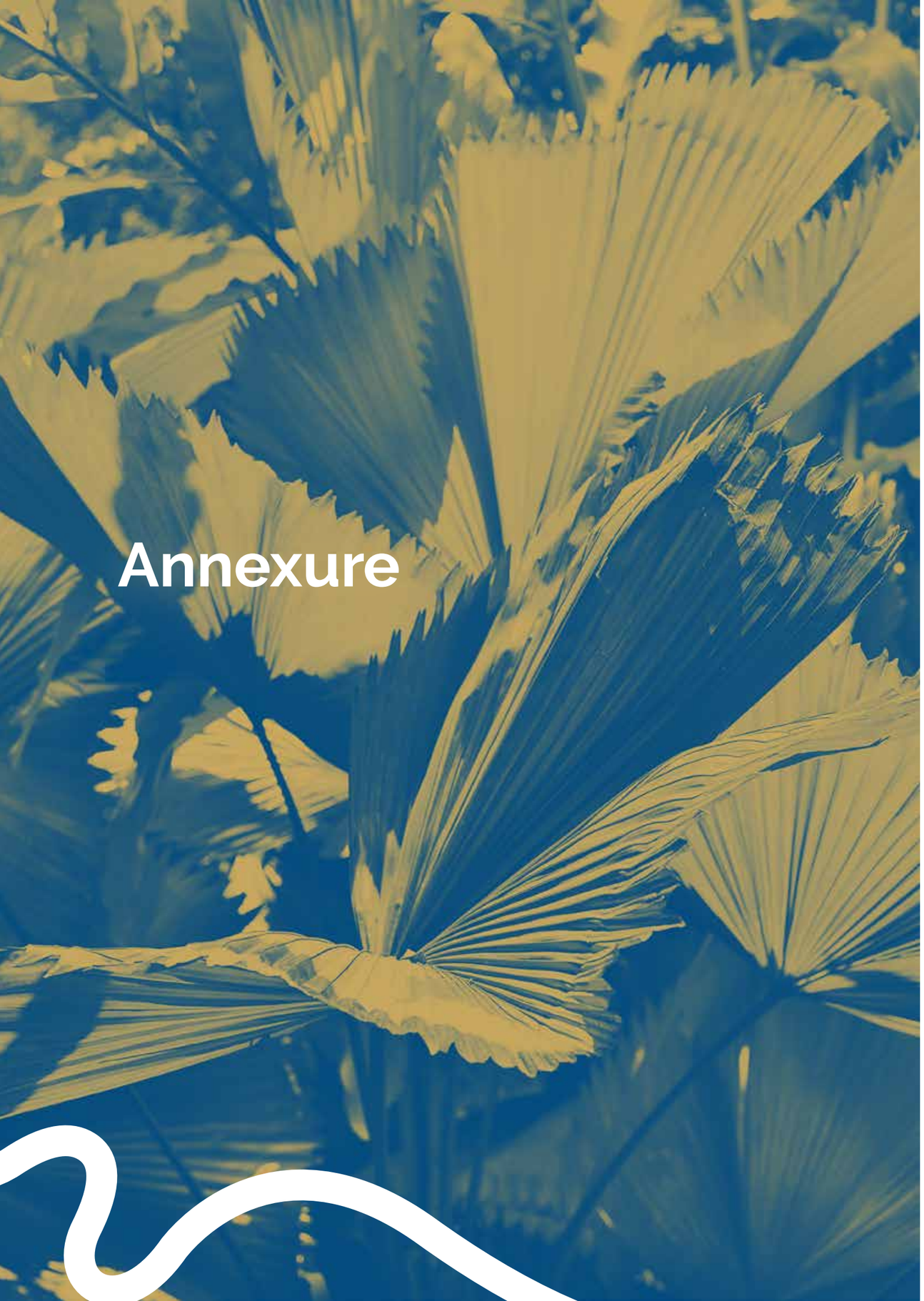
1. Give 5%D/NSS rate 80 ml/hr and close monitoring her vital signs every 4 hours with CBC twice a day.
2. Give 5% D/NSS rate 20 ml/hr, force more oral ORS and close monitoring her vital signs every 4 hours with CBC twice a day.
3. Give 5% D/NSS rate 40 ml/hr and consult Obstetrician for immediate C/S.
4. Give 5% D/NSS rate 80 ml/hr and consult Obstetrician for induction of labor.
5. Send her home and ask for follow up the next day.

Answer 2 & 3

The following are True regarding Dengue Surveillance EXCEPT;

1. One of the key objectives is to detect outbreaks quickly for early intervention.
2. Helps to monitor trends in distribution and spread over time and geographically.
3. Syndromic disease surveillance should not be part a Dengue surveillance program.
4. Sentinel surveillance system helps to capture higher quality of data compared to passive surveillance.
5. Good surveillance system facilitates to evaluate effectiveness of control programs/clinical management.

Answer 3



Annexure

Annexure 1
Evaluation forms

Annexure 2
Ambulatory care – patient information

Annexure 3
Monitoring Chart for Dengue Patients

Annexure 4
Notification Form

Annexure 1

Evaluation forms

A. Evaluation form of Overall Training

Please indicate your preference according to following

1. Excellent
2. Good
3. Fair
4.Poor
NA

NO	ITEM	RATING				
		1	2	3	4	NA
1	Training objectives met					
2	Training methodologies					
3	Materials distributed - content/number					
4	Facilitator Participation					
5	Time Frame work for the training					
6	Opportunities to ask questions and share experience					
7	Meeting arrangements					
8	Administrative support					
9	Food					
10	Travel arrangements					
11	Accommodation					

1. Will the training be useful in providing better care to your patients

a. Yes ☐

If Yes, how will you use it ?

b. No ☐

If No, please explain

2. Which 2 sessions were the most helpful/ interesting and why ?

3. Which 2 sessions were the least helpful/ interesting, why and give suggestions for improvement ?

B. Evaluation form for Specific Lectures & Scenarios

Please indicate your preference according to following

1. Excellent
2. Good
3. Fair
4.Poor
NA

NO	ITEM	RATING				
		1	2	3	4	NA
1	Epidemiology of Dengue					
2	Overview of dengue part I					
3	Overview of dengue Part II					
4	Early clinical, simple lab diagnosis of Dengue					
5	Monitoring of dengue patients					
6	Diagnosis of leaking					
7	IV fluid management					
8	Introduction to OPD triage					
9	Common complications of DHF/DSS					
10	Risk of Bleeding					
11	Atypical dengue cases					
12	Dengue in high risk patients					
13	Indications for referral					
14	Notification of dengue for public health control					
15	Prevention and control of dengue					
16	Conveying about the condition of a patient to relatives and recovering at home					
17	Pitfalls in the management of dengue/DHF/DSS					
18	Case scenarios					
19	Group work					
20	Role play					
21	Discussion					

Note:

Annexure 2

Ambulatory care – patient information

A. Essential criteria for admission

1. Patients platelet count less than 100 000/mm^3

2. If the Platelet Count is between 150000 – 100000/mm^3, the Medical Officer should make a is close to 130 000/ mm^3 the patient should be observed in the fever room and a repeat count should be done. If the repeat count is lower, decide on admission.

3. Fever for 3 or more days, and already not performed a Full Blood Count, patient should be observed in the fever room until the Complete Blood Count report is available.

4. Rapid drop in Platelet Count over a short period of time (in 2 consecutive CBC reports) platelet count coming close to 100 000/mm^3

5. Patient is clinically unwell especially when fever is settling with deteriorating symptoms as follows (Warning Signs) to be applied on or after 3rd day of illness;

   - Weakness
   - Lethargy / restlessness
   - Severe headache
   - Persistent severe vomiting
   - Severe abdominal pain

6. Patient insisting on admission – get a senior opinion if necessary

7. Special conditions;

   - Pregnant mothers (Preferably admit on day 01)
   - Children less than one and half years old (<18 months)
   - Elderly patients
   - Patients with co-morbid conditions like chronic renal disease, ischaemic heart disease or any
   - other major medical problem
   - Severe diarrhoea or persistent vomiting- to avoid dehydration.

8. Patients with adverse social circumstances - e.g. living alone, living far from health facility without reliable means of transport, poor compliance etc.

B. Criteria for ambulatory care

Patients with a platelet count more than 100 000 / mm^3 (tested within 2 hours) and clinically stable.

Advices during ambulatory care

1. Suitably document clinical signs and symptoms together with the Complete Blood Count report.

2. When and how often should the Full Blood Count to be repeated ?

   - Platelet Count 150 000 – 200 000 / mm^3 repeat daily

– Platelet < 150,000/mm^3 repeat the count 2 to 3 times per day (If the Platelet drop in subsequent count is slow - repeat the count 2 times per day and if it is rapid, 3 times per day)

3. What to eat and drink ?

   - If appetite is good take a light and nutritious diet more frequently
   - The fluids should include not only water, but certain electrolyte solutions such as fruit juice, white rice kanji, Oral Rehydration Solution (ORS), coconut juice. These solutions are better than taking only water.
   - Do not consume red or brown color foods or beverages to avoid confusion in blood stained vomiting
   - Unless medically advised, other dietary restrictions are not generally recommended

4. How to maintain the urine output ?

   - Consume recommended amount of fluids to maintain the usual normal urine output.
   - Amount needed for a child in one hour is approximately double the ideal body weight in milliliters with the maximum limit of 100 ml. The fluid amount for an average adult is 2 to 2.5 liters per day (unless there is vomiting/diarrhoea).
   - If the patient is feeling thirsty taking additional fluid up to 4 times/day is allowed but if needing more should seek medical advice again.
   - Patient should measure the urine output every 4 hourly. Ensure they pass at least about 1ml/kg / hour urine (which equals approximate ideal body weight). If the urine output is less than this, patient should consume more fluids to maintain the above urine output.

   N.B. – Diabetics with poor glycemic control may pass more urine even without adequate hydration. These patients need special attention.

5. How to control fever ?

   - Fever should be controlled in children with Paracetamol (Dose 15- 20 / kg body weight) only. 15mg / kg dose – four times per day or 20 mg / kg dose – three times per day
   - In adults Paracetamol should be given not exceeding 2 tablets 6 hourly (reduce dose for patients with lower body weight).
   - Paracetamol dose should not exceed 60 mg/ kg /day.
   - The gap between 2 doses of Paracetamol should be at least 4 - 6 hours
   - If fever is not adequately subsiding in between Paracetamol doses, using a fan and sponging with moderately warm water is recommended.
   - Patient should with minimal clothes under a bed net.
   - Make sure under no circumstances should NSAIDs be used to bring down the fever even for patients who are on these medications for chronic conditions.

6. Care at home ?

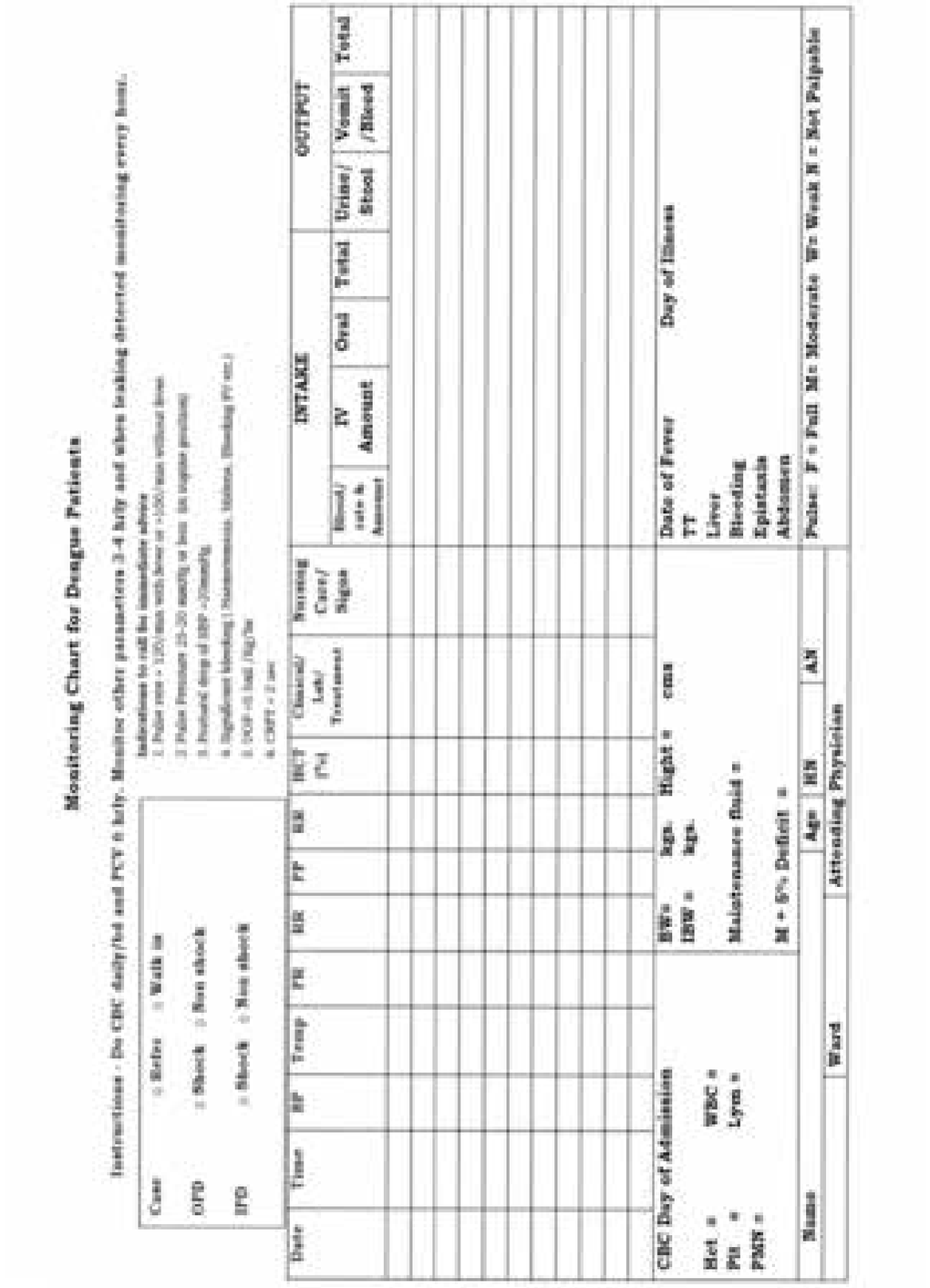
   - Physical rest is highly recommended. Patients should be preferably at home, resting.
   - Make sure patients are not left alone at home. There has to be somebody to look after them.

7. Symptoms like repeated vomiting, diarrhoea can lead to dehydration. Such patients should seek immediate treatment without waiting for the next Full Blood Count ?

8. Patients should avoid other medications especially Steroids during the fever episode. Patients who are on special medications like Warfarin, Aspirin and Clopidogrel should seek medical advice whether to continue these drugs as they are not recommended during Dengue fever.

Annexure 3

Monitoring Chart for Dengue Patients



Monitoring Chart for Dengue Patients

Instructions - Do CBC daily/bd and PCV 6 hrly. Monitor other parameters 3-4 hrly and when leaking detected monitoring every hour.

Case : ◇ Refer ◇ Walk in
OPD : ◇ Shock ◇ Non shock
IPD : ◇ Shock ◇ Non shock

Date	Time	BP	Temp	PR	RR	FF	Wt	HCT (%)	Clinical/ Lab/ Treatment	Nursing Care/ Signs	INTAKE Blood/ c/c & Amount	INTAKE IV Amount	INTAKE Oral	INTAKE Total	OUTPUT Urine/ Stool	OUTPUT Vomit /Blood	OUTPUT Total

CBC Day of Admission
Hct = WBC =
Plt = Lym =
PMN =

BW= Hight = cms
IBW = kgs.
Maintenance fluid =
M + 6% Deficit =

Date of Fever
TT
Liver
Bleeding
Epistaxis
Abdomen

Day of Illness

Pulse: P = Full M= Moderate W= Weak N = Not Palpable

Name | Age | MN | AN
Attending Physician
Ward

Annexure 4

Notification Form

Notification for DF/ DHF/ DSS

Name of Institution/ Hospital: .....

Name of Patient: .....

Age: ..... yrs Sex: .....

DOA: ..... (D)..... (M)..... (Y)

1st day of fever (Date): ..... (D) ..... (M)..... (Y)

Ward No: .....

Patient Record No: .....

Investigations (if available):.....

.....

.....

Address of Patient: .....

.....

.....

Contact phone number: .....

Tentative Diagnosis: .....

Name of the person notifying about the disease/ illness: .....

Signature

Designation: .....

Date:.....

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Facilitator's Manual

on Clinical Management of Dengue
and Dengue Hemorrhagic Fever
2018