



Facilitator's Training Manual

Dengue Clinical Management

“Dengue is one disease entity with different clinical presentations and often with unpredictable clinical evolution and outcome.”



World Health
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Western Pacific Region

Facilitator's Training Manual

Dengue Clinical Management



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Role of the facilitator in adult learning

The facilitator's role is to facilitate the learning experience of the adult participants. To that end, you should create a climate in which participants can accomplish course outcomes and explore personal real-life experiences to help them learn.

The *Dengue Clinical Management* training course runs over two days. The course content and activities necessitate a well-organized, strong facilitator who is able to guide, motivate and give clear explanations on the course content.

Facilitate and demonstrate:

- Help participants understand the objectives of the activities and how to use their training materials.
- Create an environment where the participants have fun while learning, as the experience enhances retention of messages and key information.
- Answer questions, explain and clarify in language the participants understand.
- Ensure participants are actively engaged in activities, finding out the answers for themselves, and are not mere recipients of information lectured by the facilitator.
- Facilitate group discussions, practical sessions and demonstrations.
- In the clinical sessions, explain what to do and model good clinical and communication skills.
- Assist the clinical instructor in the inpatient ward to help participants move through the activities and provide feedback (this is dependent on accessibility to a clinical area).
- Give guidance and feedback as needed during classroom and clinical sessions.

Manage and motivate:

- Plan ahead to familiarize yourself with the learning platform, activities and methods to be used and obtain all supplies needed each day.
- Meet with your co-facilitator to identify what the sessions require and who will prepare for which activities.
- Ensure the trainers and participants have clear and accurate expectations about the course.
- Practise case studies, demonstrations and other activities that are new for you.
- Emphasize the immediate usefulness and applicability for the materials presented.
- Recognize that adult participants are particularly receptive to information that will make a difference in their daily practice.
- Elicit personal experiences that are culturally sensitive and appropriate. Adult participants can bring a reservoir of experience to the course, and their contributions are an important resource for training programmes.
- Make an effort to learn participants' names early on and use their names whenever possible.
- Instead of talking with other trainers during the breaks, remain in the classroom and talk to participants.
- Be available after each session to answer questions and discuss concerns.
- Praise or thank participants when they perform an exercise well, participate in group discussions, and ask questions or help other participants.
- During the classroom presentations, maintain eye contact with the participants, move around the room, project your voice and ask a variety of questions.
- When there is a clinical session, review the tasks to be done and prepare the clinical staff.
- Make sure activities run to time.

Teaching the course:

You as a facilitator play a unique role in helping course participants confront the dynamics of dengue. Although you might be an expert in technical content and training, your role in this course extends beyond lecturing and providing information. You need to inform, support and acknowledge implementation issues within the social and cultural context of the existing training setting to ensure a successful experience for all dengue-training participants.

Purpose of the facilitator's manual





This facilitator's manual is designed to support the implementation of the *Dengue Clinical Management* training course. The guide contains specific instructions for the facilitator and provides:

- ✓ a detailed description of the clinical course of dengue illness, which reflects the dynamic and systemic nature of dengue that has crucial bearing on the patient's management;
- ✓ a detailed description of the basic pathophysiological changes of severe dengue (i.e. plasma leakage and hypovolaemia/shock) and guidance on the recognition of these changes and appropriate action of management;
- ✓ a brief discussion on WHO classification (1997) and its limitations;
- ✓ guidance on the differential diagnoses that can be confused with dengue or vice versa; they were described according to the stage of disease;
- ✓ a more focused guide on the disease monitoring in accordance with the dynamic changes as the disease progresses;
- ✓ emphasis on the importance of monitoring the plasma leakage (haemodynamic status of the patient, clinical signs of plasma leakage and haematocrit);
- ✓ a clearer algorithm for fluid management in cases of severe dengue; and
- ✓ emphasis on the importance of recognizing or suspecting significant occult bleed.

Keep the facilitator's manual with you each day as you prepare and deliver the information. Use it as a reference when delivering classroom presentations, but avoid reading directly from it during sessions.

Key to symbols

Four different images have been used to assist the facilitator in using the manual.

Image	Meaning or action
	Prompt for facilitator
	Special attention or warning
	Good practice or important fact
	Game or practical session

Format of the manual:

The user-friendly manual is divided into three days of training:

- **Day 1:** Dengue epidemiology, dengue transmission, dengue case recognition and the clinical course of dengue;
- **Day 2:** Clinical assessment and management;
- **Day 3:** Monitoring.

Each day comprises practical sessions that will contribute to the goals set out in the learning outcomes. At the start of each day, or chapter, there is a table summarizing the training content (containing short descriptions of the sessions and the time allotted for each of them), a list of objectives and a list of materials needed.

For each session, the manual puts forth a set of **key competencies** that summarizes what the participants will be able to **KNOW** and **UNDERSTAND** by the end of the session. Each activity has its own objective, so that the participants know why they are doing the activity.

Evaluation of participants:

Evaluation and monitoring of participants' progress will be a continuous process, rather than a "one-off" final written test.

Goal of the training:

To provide evidence-based guidance in the clinical management of dengue infection in both adult and paediatric patients.

Objectives:

- To improve recognition and diagnosis of dengue cases and provide appropriate care to patients.
- To identify severe dengue and carry out more focused close monitoring and prompt appropriate management.
- To provide guidance on appropriate and timely fluid management and the use of blood and blood products.
- To improve on early and accurate notification of dengue cases for prompt public health intervention.

Target group:

This training manual is targeted to primary care doctors, public health personnel, nurses, assistant medical officers, physicians and critical care providers involved in treating adult and paediatric patients with dengue fever, dengue haemorrhagic fever or dengue shock syndrome and other forms of severe dengue.

Health care setting:

It is suggested that outpatient primary care doctors and emergency department physicians undergo training in Modules 1 to 8B, and complete case studies 6 to 10.

Physicians, pediatricians and critical care physicians in the inpatient setting are suggested to undergo training in Modules 1 to 8D and complete all case studies.

Timetable

DAY 1

Day/Time	Session #	Duration	Activity	Facilitator	Method
Day 1: Module 1: Introduction of the training					
08:30	1	15 minutes	Registration of participants		Register/database
08:45	1.1	10 minutes	Official opening of the training and presentation of objectives		Announcement
08:55	1.2	15 minutes	Participant introductions and icebreaker		Game/group participation
09:10	1.3	15 minutes	Expectations of the training		Self-introductions
09:25	1.4	20 minutes	Ground rules and administrative announcements		Announcement
09:45	1.5	5 minutes	Programme of the day		Announcement
09:50		80 minutes (1 hour, 20 minutes)			
TEA BREAK 09:50–10:05 (15 minutes)					
Module 2: Epidemiology of dengue					
10:05	2.1	10 minutes	Dengue as an emerging disease		PPT
10:15	2.2	10 minutes	Dengue in the Western Pacific Region		PPT
10:25	2.3	5 minutes	Burden of disease		PPT
Module 3: Transmission of dengue					
10:30	3.1	10 minutes	Dengue virus		PPT
10:40	3.2	2 minutes	Other routes of transmission		PPT
10:42	3.3	2 minutes	Vertical transmission		PPT
10:44	3.4	1 minute	Primary prevention		PPT
10:45	CS1	15 minutes	Case Study #1		Case study
Module 4: Clinical course of disease					
11:00	4.1	2 minutes	Dengue: a dynamic disease		PPT
11:02	4.2	10 minutes	Clinical course of disease		PPT
11:12	4.3	4 minutes	Febrile phase		PPT
11:16	4.4	20 minutes	Critical phase		PPT
11:36	4.5	2 minutes	Recovery phase		PPT
11:38	4.6	7 minutes	Severe dengue		PPT
11:45		100 minutes (1 hour, 40 minutes)			
LUNCH BREAK 11:45–13:30 (1 hour, 45 minutes)					
13:30 Module 5: Case classification and differential diagnosis					
13:30	5.1	10 minutes	WHO case classification for dengue fever		PPT
13:40	5.2	20 minutes	Differential diagnosis for dengue fever		PPT
14:00	CS2–5	90 minutes	Case Studies #2, 3, 4, 5 (about 22 minutes each)		Case studies
15:30		120 minutes (2 hours)			
TEA BREAK 15:30–15:45 (15 minutes)					

Day/Time	Session #	Duration	Activity	Facilitator	Method
Module 6: Patient Assessment and Evaluation					
15:45	6.1	5 minutes	The 4 Steps		PPT
	6.2		Step 1		PPT
15:50	6.3	20 minutes	Step 2		PPT
16:10	6.4	5 minutes	Step 3		PPT
16:15	6.5	2 minutes	Step 4		PPT
Module 7: Outpatient management					
16:17	7.1	10 minutes	Epidemiological overview of health-seeking behaviours		PPT
16:27	7.2	4 minutes	Patient management: general overview		PPT
16:31	7.3	1 minute	Management of dengue: overview		PPT
16:32	7.4	10 minutes	Management of Group A		PPT
16:42	7.5	5 minutes	Management of Group B		PPT
16:47	7.6	5 minutes	Management of Group C		PPT
16:52	7.7	10 minutes	Improving clinical outcomes		PPT
17:02	7.8	15 minutes	Video		Audio-Visual
17:17	CS6–6C	45 minutes	Case Studies #6, 6B, 6C		Case studies
18:02		137 minutes (2 hours, 17 minutes)			
END OF DAY 1					

DAY 2

Day/Time	Session #	Duration	Activity	Facilitator	Method
Module 8A: Intravenous fluid principles					
08:30	8.1A	10 minutes	Principles of IV fluid therapy		
08:40	8.2A	2 minutes	When to start IV fluids		
08:42	8.3A	10 minutes	What IV fluids to give		
08:52	8.4A	4 minutes	How much IV fluid to give		
08:56	8.5A	4 minutes	When to stop IV fluids		
09:00	8.6A	10 minutes	Summary		
09:10	8.7A	10 minutes	Calculations & Quick Reference Tables		
09:20	CS7–8	30 minutes	Case Studies #7, 8		Case studies
Module 8B: Management of Group B					
09:50	8 B	20 minutes	Management of Group B		
10:10		100 minutes (1 hour, 40 minutes)			
TEA BREAK 10:10–10:25 (15 minutes)					
10:25	CS9	20 minutes	Case Study #9		Case study
10:45	RP1	90 minutes	Role-play part I		Role-play
12:15		110 minutes (1 hour, 50 minutes)			
LUNCH BREAK 12:15–13:30 (1 hour, 15 minutes)					
13:30	RP2	60 minutes	Role-play part II		Role-play

Day/Time	Session #	Duration	Activity	Facilitator	Method
14:30			Module 8C: Management of Group C		
14:30	8.1C	45 minutes	Emergency treatment		
15:15	CS10	50 minutes	Case Study #10		Case study
16:05		155 minutes (2 hours, 35 minutes)			
END OF DAY 2					

DAY 3

Day/Time	Session #	Duration	Activity	Facilitator	Method
			Module 8D: Monitoring and managing other aspects of dengue		
08:30	8.1D	5 minutes	Monitoring Group C patients		PPT
08:35	8.2D	5 minutes	Monitoring organ function		PPT
08:40	8.3D	15 minutes	Risks for bleeding		PPT
08:55	8.4D	15 minutes	Other complications: fluid overload		PPT
09:10	8.5D	5 minutes	Other issues: biochemistry, metabolic acidosis		PPT
09:15	8.6D	5 minutes	Supportive care		PPT
09:20	8.7D	5 minutes	Management of acute kidney		PPT
09:25	8.8D	5 minutes	Discharge criteria		PPT
09:30	CS11–12	60 minutes	Case Studies #11, 12		Case studies
10:30		120 minutes (2 hours)			
TEA BREAK 10:30–10:45 (15 MINUTES)					
10:45	CS13–16	120 minutes	Case Studies #13, 14, 15, 16		Case studies
12:45		120 minutes (2 hours)			
LUNCH BREAK 12:45–13:30 (1 hour, 15 minutes)					
13:30		60 minutes	Course Wrap-up		Group participation
14:30		60 minutes (1 hour)			
14:30 END OF DAY 3 & Course					

DAY 1



Objectives for Day 1

By the end of the day, participants will be able to:

- identify group peers and course facilitators;
- share expectations of the course and agree upon “ground rules”;
- understand administrative procedures and timings;
- understand dengue epidemiology;
- understand how the virus is transmitted;
- recognize suspected dengue cases and make the diagnosis;
- understand the clinical course of the dengue virus;
- advise on outpatient management; and
- know the differential diagnosis for dengue.

Materials required for Day 1



- Flip chart
- Marker pens
- Name tags
- PowerPoint (PPT) presentations (Modules 1–7)
- Practical session exercises (Case Studies #1–6C)
- Video
- Facilitator’s manual
- Participant handouts

MODULE 1: Introduction of the training

Day 1: Module 1: Introduction of the training



Time	Session	Activity
10 minutes	1.1	Official opening of training and course objectives
15 minutes	1.2	Participant introductions and icebreaker
15 minutes	1.3	Expectations of the training
20 minutes	1.4	Ground rules and administrative announcements
5 minutes	1.5	Programme of the day
65 minutes (1 hour, 5 minutes)	Break 15 minutes	

Module 1: Introduction of the training: key competencies

By the end of Module 1, the participants will KNOW/UNDERSTAND:

- what to expect from the three-day course;
- the ground rules for the training; and
- the objectives of the three-day training course.

Session 1.1: Official opening of the training and objectives of the course

	Duration	10 minutes
	Training method	Self-introduction of the facilitator Lecture

Steps: Introductions

- ” **Facilitator** introduces himself or herself and welcomes participants.
- ” **Facilitator** gives an overview of the objectives of the three-day training.

Facilitator's notes:



Dengue fever is the most rapidly spreading mosquito-borne viral disease of public health importance in the world. In the last 50 years, incidence has increased, 30-fold with increasing geographic expansion to new countries. Compared with nine reporting countries in the 1950s, the geographical distribution of dengue today covers more than 100 countries worldwide, with growing numbers of cases reported in rural settings. An estimated 50 million dengue infections occur annually, and approximately 2.5 billion people live in dengue-endemic countries. With the number of cases on the rise, dengue fever, or “break bone fever” as it is classically known, has become a major public health concern in the Western Pacific Region.

Objectives of the three-day training:

This three-day training course is designed to provide evidence-based guidance on the clinical management of dengue infection in both adult and paediatric patients. Specific objectives are:

- to improve recognition and diagnosis of dengue cases and provide the highest quality of care to patients;
- to identify severe dengue and carry out more focused close monitoring and prompt appropriate management;
- to provide guidance on appropriate and timely fluid management and the use of blood and blood products; and
- to improve on early and accurate notification of dengue cases for prompt public health intervention.

Session 1.2: Participant introductions and icebreaker

	Duration	15 minutes
	Training method	Practical icebreaker



Steps:

- 1. **Facilitator** explains there will be an icebreaker exercise to help participants get to know each other and energize them for the start of the course.

Rotating circles:

- 1. **Facilitator** asks participants to stand in two circles, one inside the other, with participants in the inner circle facing participants in the outer circle.
- 2. **Facilitator** asks participants to present themselves to the person they are facing and share the following information:
 - name
 - where they were born
 - where they are currently working
 - likes and dislikes
 - why they want to partake in the course.
- 3. Every 2 minutes, **facilitator** asks the participants in the outer circle to move one step to the right and share personal information with their next partner. After 10 minutes, **facilitator** invites the participants to recall the names of the people they met and two to three key pieces of information.
- 4. Continue until all participants have been introduced, asking different participants to volunteer information.
- 5. When seated, ask participants to write their names on the nametags and pin them on.



Session 1.3: Expectations of the training

	Duration	15 minutes
	Training method	Pairwise and plenary discussions

Steps:

- 1. **Facilitator** asks participants to partner with the person sitting next to them.
- 2. **Facilitator** encourages participants to discuss in pairs what they expect to learn from the course.
- 3. **Facilitator** asks participants to share their expectations and writes them on the flip chart.
- 4. **Facilitator** compares the expectations and points out those that are not in line with what will be learnt.
- 5. **Facilitator** explains that this three-day training course will cover all aspects of dengue fever. Participants will learn about the disease epidemiology, clinical and vector management of the disease, diagnosis and differential diagnosis and surveillance. The course will also have a practical component.

Session 1.4: Ground rules and administrative announcements

	Duration	Ground rules: 15 minutes Announcements: 5 minutes Total: 20 minutes
	Training method	Pairwise and plenary discussions Announcements

Steps:

- 1. **Facilitator** asks participants to remain in their pairs.
- 2. **Facilitator** asks participants to think about ground rules that can guide the training and create a comfortable learning environment.
- 3. **Facilitator** gives participants 2 minutes to discuss possible ground rules with partner.
- 4. **Facilitator** asks participants to share their expectations and writes them on the flip chart. These should remain in view for the duration of the course.
- 5. Timekeeping should be included in the rules: the **group or facilitator** nominates a timekeeper for the day – in accordance with the programme for the day.
- 6. **Facilitator** concludes by saying that the rules will help them work together as a team. Rules can be added or revised at any time if the situation arises.
- 7. The group can introduce fun “punishments” (e.g. sing a song) or fines (e.g. buys everyone a juice) for breaking the ground rules.

Administrative announcements:

- 1. **Facilitator** informs participants of the daily schedule (e.g. starting and finishing times, tea and lunch breaks).
- 2. **Facilitator** announces arrangements for payment of per diems, transport allowance, etc.
- 3. **Facilitator** informs participants of sleeping arrangements, transportation, etc.
- 4. **Facilitator** distributes training package and informs participants to bring the training package with them to plenary each day and to clinical sessions.
- 5. **Facilitator** goes through the contents of the training package as follows:
 - note pad
 - pen
 - lecture notes
 - practical session case studies.
- 6. **Facilitator** asks if anyone has an incomplete package and, if necessary, hands out the training materials required to complete the package.
- 7. **Facilitator** asks participants if they have any questions regarding the dengue training or any other concerns.
- 8. **Facilitator** presents the programme of the day.
- 9. **Facilitator** invites participants to break for tea.

TEA BREAK

MODULE 2: Epidemiology of dengue

Day 1: Module 2: Epidemiology of dengue



Time	Session	Activity
10 minutes	2.1	Dengue as an emerging disease
10 minutes	2.2	Dengue in the Western Pacific Region
5 minutes	2.3	Burden of disease
25 minutes		

Module 2: Epidemiology: key competencies

By the end of Module 2, the participants will KNOW/UNDERSTAND:

- how and when the dengue virus emerged;
- the epidemiology of dengue with specific reference to the Western Pacific Region;
- how the dengue virus affects global health and socioeconomic status (i.e. burden of disease).

Module 2: Epidemiology of dengue

	Duration	25 minutes
	Training method	Lecture

Steps:

- 🗣️ **Facilitator** ensures PPT projector is in place and working.
- 🗣️ **Facilitator** welcomes students to the first lecture of the training, reminds students of agreed ground rules, and makes note of timing for the module.
- 🗣️ **Facilitator** asks students to take out training package and go to session 2.1.
- 🗣️ **Facilitator** tells participants that they are going to talk about the epidemiology of dengue.
- 🗣️ **Facilitator** asks participants if they know how and where dengue originated, and acknowledges participants' responses.
- 🗣️ **Facilitator** leads the session.

Facilitator's notes:

SLIDE 1: Cover slide

SESSION 2.1 EPIDEMIOLOGY: DENGUE AS AN EMERGING DISEASE

SLIDE 2: Dengue as an emerging disease

Facilitator explains:

Four dengue viruses originated in monkeys and independently jumped to humans in Africa or South-East Asia between 100 and 800 years ago. Dengue remained a relatively minor, geographically restricted disease until the middle of the 20th century. The disruption of the Second World War – in particular the coincidental transport of *Aedes* mosquitoes around the world in cargo – is thought to have played a crucial role in the dissemination of the viruses.

During the 19th century, dengue was considered a sporadic disease that caused epidemics at long intervals, a reflection of the slow pace of transport and limited travel at that time.

Dengue and dengue haemorrhagic fever are present in urban and suburban areas in the Americas, South-East Asia, the Eastern Mediterranean Region and the Western Pacific Region. In Africa, dengue fever is present mainly in rural areas.

- ✓ Dengue hemorrhagic fever was first documented in the 1950s during epidemics in the Philippines and Thailand.
- ✓ Today, dengue ranks as the most important mosquito-borne viral disease in the world. In the last 50 years, incidence has increased 30-fold.
- ✓ An estimated 2.5 billion people live in more than 100 dengue-endemic countries and areas.
- ✓ Up to 50 million infections occur annually with 500 000 cases of dengue haemorrhagic fever and 22 000 deaths mainly among children.
- ✓ Prior to 1970, only nine countries had experienced cases of dengue fever; since then, the number has increased more than four-fold and continues to rise.

SLIDE 3: Dengue as an emerging disease (cont.)

Facilitator explains:

Several factors have combined to produce epidemiological conditions in developing countries in the tropics and subtropics that favour viral transmission by the main mosquito vector, *Aedes aegypti*:

- rapid population growth;
- rural–urban migration;
- inadequate basic urban infrastructure (e.g. unreliable water supply leading householders to store water in containers close to homes); and
- increase in volume of solid waste, such as discarded plastic containers and other abandoned items, which provide larval habitats in urban areas.

SESSION 2.2 DENGUE IN THE WESTERN PACIFIC REGION

SLIDES 4 & 5: Dengue in the Western Pacific Region

🗣️ **Facilitator** explains:

- ✓ Dengue has emerged as a serious public health problem in the Western Pacific Region.
- ✓ Since the last major pandemic in 1998, epidemics have recurred in much of the area.
- ✓ All four dengue virus serotypes are present in the Region (DEN 1, DEN 2, DEN 3, DEN 4).
- ✓ Cambodia and the Philippines report large numbers of children affected with the dengue virus (up to 75% of cases are children younger than 15 years old).
- ✓ Dengue occurs throughout the year, but rates increase 1–2 months after the onset of the rainy season in June.
- ✓ Shipments of tyres and tourism have been implicated for the emergence in this Region.
- ✓ Lack of reporting remains an important challenge in dengue prevention and control.
- ✓ Overall case management has improved in the Western Pacific Region, leading to a decrease in case fatality rates.

🗣️ **Facilitator** provides an overview of reported cases from the 37 countries and areas that make up the Western Pacific Region:

Between 2000 and 2010, 1 779 529 cases were reported in Cambodia, Malaysia, the Philippines and Viet Nam – the four countries in the Western Pacific Region with the highest numbers of cases and deaths. The combined death toll for these four countries was 7235. Compared with other countries in the Region, the number of cases and deaths were the highest in the Philippines in 2010 (135 355 cases and 793 deaths). Overall, case management has improved in the Western Pacific Region, leading to a decrease in case fatality rates.

Dengue has spread throughout the Pacific. Between 2000 and 2010, the six most affected Pacific island countries and areas were New Caledonia (16 659 cases), French Polynesia (8442 cases), Cook Islands (3991 cases), Kiribati (2982 cases), American Samoa (2512 cases) and Palau (2493 cases). There were 44 deaths in the six island countries.

New Caledonia and French Polynesia experienced severe dengue outbreaks in 2009, with a total of 11 089 cases.

Historically, dengue has been reported predominantly among urban and peri-urban populations where high population density facilitates transmission. However, evidence from recent outbreaks, as seen in Cambodia in 2007, suggests that they are now occurring in rural areas.

SESSION 2.3 BURDEN OF DISEASE

SLIDE 6: Disease burden

🗣️ **Facilitator** explains:

Dengue inflicts a significant health, economic and social burden on the populations of endemic areas. Globally, an estimated 528 disability-adjusted life years (DALYs) were lost to dengue in 2001.

- ✓ It is difficult to carry out mathematical modelling for estimation of burden of disease because of data inaccuracies.
- ✓ The number of cases reported annually to WHO ranged from 0.4 million to 1.3 million during the period 1996–2005.
- ✓ Underreporting and misdiagnosis are obstacles to understanding the full burden of dengue.

Studies on the cost of dengue were conducted in eight countries in 2005–2006: five in the Americas and three in Asia. As dengue also affected household members who helped care for the dengue patient, an average episode represented 14.8 lost days for ambulatory patients and 18.9 lost days for hospitalized patients. The overall cost of a non-fatal ambulatory case averaged US\$ 514, while the cost of a non-fatal hospitalized case averaged US\$ 1491, almost three times the cost of an ambulatory case. Combining the ambulatory and hospitalized patients and factoring in the risk of death, the overall average cost of a dengue case is US\$ 828. These conservative estimates ignore not only the underreporting of cases but also the substantial costs associated with dengue surveillance and vector control programmes. Also, severely ill patients may require intensive care including intravenous fluids, blood or plasma transfusion and medicines.

Dengue afflicts all levels of society, but the burden may be higher among the poor who grow up in communities with inadequate water supply and solid waste infrastructure, and where conditions are most favourable for multiplication of *Ae. aegypti*. Children are also at a higher risk of dengue.

SLIDE 7: Dengue wards in the Western Pacific Region

MODULE 3: Transmission of dengue and primary prevention

Day 1: Module 3: Transmission



Time	Session	Activity
10 minutes	3.1	Dengue virus
2 minutes	3.2	Other routes of transmission
2 minutes	3.3	Vertical transmission
1 minute	3.4	Primary prevention
15 minutes	CS1	Case Study #1
30 minutes		

MODULE 3: Transmission: key competencies

By the end of Module 3, the participants will KNOW/UNDERSTAND:

- the various routes of dengue virus transmission; and
- how to prevent dengue transmission.

MODULE 3: Transmission of dengue and primary prevention

	Duration	30 minutes (calculated as roughly 1 minute per slide)
	Training method	Lecture Practical session (Case Study #1)

Steps:

- 🗣️ **Facilitator** introduces Module 3: Transmission of dengue and primary prevention. During this session we will look at the following:
 - Session 3.1: Dengue virus
 - Session 3.2: Other routes of transmission
 - Session 3.3: Vertical transmission
 - Session 3.4: Primary prevention
 - Session CS1: Case Study #1.
- 🗣️ **Facilitator** informs participants there will be a practical session.
- 🗣️ **Facilitator** informs participants of approximate duration of the session.

Facilitator's notes:

SESSION 3.1: DENGUE VIRUS

SLIDE 1: Cover slide

SLIDE 2: Dengue virus

- 🗣️ **Facilitator** explains:
 - ✓ Dengue virus (DENV) is a single-stranded RNA virus comprising four distinct serotypes (DENV 1-4 inclusive).
 - ✓ The Dengue virus is members of the *Flaviviridae* family in the *Flavivirus* genus, which includes several viruses that pose a threat to public health.

MODULE 3: Transmission of dengue and primary prevention

SLIDE 3: Dengue virus (cont.)

“ **Facilitator** explains:

- ✓ All four serotypes cause the full spectrum of disease (from asymptomatic to severe disease).
- ✓ Infection confers lifelong serotype-specific immunity (e.g. someone infected with DENV-1 cannot be reinfected with DENV-1).
- ✓ Infection confers short-term cross-immunity against other serotypes (full protection for two months after infection with DENV).
- ✓ A person can have four infections in lifetime.

SLIDE 4: Transmission of dengue virus

“ **Facilitator** explains:

- ✓ The various serotypes of the dengue virus are transmitted from human to human through the bites of infected *Aedes* mosquitoes, principally *Ae. aegypti*.
- ✓ *Ae. aegypti* is one of the most efficient vectors for arboviruses because it is highly anthropophilic (prefers human beings over other animals), frequently bites several times before completing oogenesis, and thrives in close proximity to humans.
- ✓ Humans are the main reservoir of the virus, though studies have shown that monkeys are the jungle reservoir in Malaysia and Africa.
- ✓ *Ae. aegypti* remain infected for life (ranging from 3 weeks to 3 months, but typically 1 month in nature).
- ✓ This mosquito is a tropical and subtropical species widely distributed around the world, mostly between latitudes 35°N and 35°S. These geographical limits correspond approximately to a winter isotherm of 10°C. *Ae. aegypti* has been found as far north as 45°N, but such invasions have occurred during warmer months and the mosquitoes have not survived the winters. Also, because of lower temperatures, *Ae. aegypti* is relatively uncommon at elevations above 1000 metres.

SLIDES 5–9: Transmission of the virus – human-to-human transmission via the bite of infected mosquito

“ **Facilitator** explains:

- ✓ Humans are the main amplifying host of the virus. The dengue virus, when circulating in the blood of viraemic humans, is ingested by female mosquitoes during feeding. The virus then infects the mosquito midgut and subsequently spreads systemically over a period of 8 to 12 days. After this extrinsic incubation period, the virus can be transmitted to other humans during subsequent probing or feeding. The extrinsic incubation period is influenced in part by environmental conditions, especially ambient temperature. Thereafter, the mosquito remains infective for the rest of its life.
- ✓ Although there is some evidence of transovarial transmission of dengue virus in *Ae. aegypti*, mosquitoes are usually only infected by biting a viraemic person.
- ✓ Higher ambient temperatures (i.e. hot summer weather) reduce the extrinsic incubation period or the time required for the virus to replicate and disseminate in the mosquito. As such, less time is needed for the virus to reach the mosquito's salivary glands and be transmitted to humans. If a mosquito becomes infectious faster because temperatures are warmer, it has a greater chance of infecting a human before it dies.

MODULE 3: Transmission of dengue and primary prevention

SLIDE 10: Breeding areas and transmission

🗣️ **Facilitator** explains:

- ✓ Immature stages are found in water-filled habitats (e.g. water jugs, plant pots) that are mainly associated with human dwellings).
- ✓ Most female *Ae. aegypti* mosquitoes spend their lifetime in or around the houses where they emerge as adults.
- ✓ People rather than mosquitoes rapidly move the virus within and between communities.
- ✓ Dengue outbreaks are often attributed to *Ae. albopictus* and *Ae. polynesiensis*.

SLIDE 11: Life-cycle of *Aedes aegypti*

🗣️ **Facilitator** explains:

- ✓ Adult mosquito — Female lays an average of 100–120 eggs inside containers (above water) five times in her lifetime.
- ✓ Eggs can survive for up to 6 months (so can survive dry season). Eggs hatch when submerged in water; this process takes less than 24 hours. It is important to not just empty water from containers but also remove eggs; otherwise, eggs will simply hatch when the container is filled back up with rainwater.
- ✓ Larvae develop into pupae in approximately 6 days.
- ✓ Pupae develop into adults in another 2 days.
- ✓ The total time for development is dependent upon water temperature and food supply, and typically ranges from 4 to 10 days. Larvae die at temperatures below 10°C and above 44°C .

SESSION 3.2: OTHER ROUTES OF TRANSMISSION

SLIDE 12: Other routes of transmission

🗣️ **Facilitator** presents:

- ✓ Evidence of transmission of dengue via receipt of donor organs or tissue:
 - One report of transmission following a bone marrow transplant in Puerto Rico.
 - One report of transmission following a renal transplant.
- ✓ Evidence of transmission of dengue through receipt of blood products:
 - One symptomatic recipient after RBC transfusion in China.
 - Two PCR+ symptomatic recipients and one IgM+ asymptomatic recipient in Singapore.
- ✓ Evidence of occupational exposure in a health care setting:
 - Five published reports of percutaneous transmission after needle-stick injuries.
 - Two published reports of mucocutaneous transmission after being splashed in face with blood.

🗣️ **Facilitator** explains:

- ✓ If you suspect dengue, use standard universal precautions.
- ✓ DENV is known to be transmitted via occupational exposure to infected blood (e.g. needle stick injury, blood splashed in eyes).
- ✓ It is unknown if DENV can be transmitted via contaminated instruments.
- ✓ DENV is not spread via respiratory droplets, saliva or sexual contact.
- ✓ Prevent febrile, viraemic inpatients from being bitten by mosquitoes (e.g. bed net, screened room).

MODULE 3: Transmission of dengue and primary prevention

SESSION 3.3: VERTICAL TRANSMISSION


SLIDES 13 & 14: Vertical transmission

SESSION 3.4: PRIMARY PREVENTION WITHIN THE HOME

SLIDE 15: Primary prevention measures



 **Facilitator** explains:

- ✓ Prevention is not limited to the mosquito-repellent products suggested on slide 15.
- ✓ Prevent being bitten.
- ✓ Prevent mosquitoes from breeding in your home and patio.
- ✓ Get rid of water in flower vases, uncovered barrels, buckets and discarded tyres on a weekly basis.
- ✓ Fix septic tanks and seal toilets that are not used often.

 **Facilitator** tells participants: "We will now have a practical session consisting of a case study (CS1), after which we will move to Module 4 of the course, where we will discuss the Clinical Course of the Disease, before breaking for lunch."

Case Study #1

SESSION CS1: Case Study #1

Objective	Enhance understanding of vertical transmission of dengue.	
Materials	Case Study #1 (1 CS/each participant)	
	Duration	15 minutes
	Training method	Individual study

Steps:

- ✓ **Facilitator** hands out Case Study #1 (1 CS/participant).
- ✓ **Facilitator** informs participants that they will have 10 minutes to complete the case study.
- ✓ After 10 minutes, **facilitator** discusses the case study, clarifies any misunderstandings and answers any questions that may arise as a result of the assignment.

MODULE 4: Clinical course of disease

Day 1: Module 4: Clinical course of disease



Time	Session	Activity
2 minutes	4.1	Dengue: a dynamic disease
10 minutes	4.2	Clinical course of disease
4 minutes	4.3	Febrile phase
20 minutes	4.4	Critical phase
2 minutes	4.5	Recovery phase
7 minutes	4.6	Severe dengue
45 minutes		

MODULE 4: Clinical course of disease: key competencies

By the end of Module 4, the participants will KNOW/UNDERSTAND:

- how to differentiate between the phases of illness, i.e. febrile, critical and recovery; and
- how the disease progresses to severe dengue.

MODULE 4. Clinical course of disease

	Duration	45 minutes
	Training method	Lecture

Steps:

- 🗣️ **Facilitator** introduces Module 4: Clinical course of disease. During this session we will look at the following:
 - Session 4.1: Dengue: a dynamic disease
 - Session 4.2: Clinical course of disease
 - Session 4.3: Febrile phase
 - Session 4.4: Critical phase
 - Session 4.5: Recovery phase
 - Session 4.6: Severe dengue.
- 🗣️ **Facilitator** informs participants of session objectives.

Facilitator's notes:

SESSION 4.1: DENGUE: A DYNAMIC DISEASE

SLIDE 1: Cover slide

SLIDE 2: Clinical course of dengue

- 🗣️ **Facilitator** explains:
 - ✓ Many doctors regard dengue as a platelet count disease; however, this is incorrect.
 - ✓ During the viraemic phase, the virus enters the blood stream and travels to all parts of the body affecting:
 - muscles (myalgia);
 - gastrointestinal system;
 - reticulo-endothelial system;

- deep into the bone marrow, causing arrest of bone marrow cells resulting in reduced white cell and platelet counts; and causing:
- loss of appetite;
- nausea; and
- headaches.

⚠ The effects of dengue are systemic.

⚠ Dengue is not a disease of the platelets.

💬 **Facilitator** asks participants: “What is meant by dynamic disease?”

💬 **Facilitator** clarifies participant’s answers and explains:

- ✓ The signs and symptoms of dengue, like other infectious diseases, “unravel” in a time-dependent fashion.
- ✓ However, in the case of dengue, this “unravelling” or progression of the disease is much faster, i.e. a matter of days during the febrile phase and accelerating to a matter of hours during the critical phase. This is what makes the disease dynamic.

SESSION 4.2: CLINICAL COURSE OF DISEASE

SLIDE 3: Clinical course of dengue

💬 **Facilitator** explains:

- ⚠ Incubation Period: After the mosquito bite and injection of an inoculum of dengue virus, the virus multiplies during the next 3 to 5 days before being released into the circulation, resulting in an abrupt onset of illness and viraemia.
- ⚠ The febrile phase: Starts with the onset of symptoms related to viraemia, such as high fever, headache, myalgia, body aches, nausea, rash, etc.
- ⚠ The critical phase: Commences around the time of defervescence, when body temperature drops to less than 38oC and remains below this level.
- ⚠ The critical phase is heralded by warning signs that signify the advent of significant plasma leakage (due to increased vascular permeability).
- ⚠ Plasma leakage may be severe enough to cause hypovolaemic shock, and if treatment is delayed at this stage, it may lead to bleeding.
- ⚠ Fluid reabsorption takes place during the recovery phase.

SLIDE 4:

- 💬 **Facilitator** explains that the next 4 slides show schematic diagram of the clinical course of severe dengue.
- ✓ The top row of numbers shows days of illness: day 0 to day 10; the second row, the febrile, critical and recovery phases and the estimated time-lines and duration of each phase.
- ✓ These manifestations are related to the presence of virus and antibodies (serology) and their interactions.
- ✓ Equipped with a good understanding of the clinical course of severe dengue, you will be able to navigate your patients through the different phases of illness.
- ✓ In addition, recognizing the different phases will help you to identify the clinical issues and manage them appropriately.
- 💬 **Facilitator** tells participants that the following three slides will explain the three phases of the disease.

SLIDE 5:

🗣️ **Facilitator** explains:

- ✓ Fever begins abruptly after incubation period and remains high without antipyretics.
- ✓ The fever lasts 3 to 5 days and coincides with viraemia.
- ✓ As antibodies clear the virus, viraemia level decreases and temperature begins to come down. This is known as defervescence, i.e. temperature remains below 38°C without antipyretics.

⚠️ At this time, when the temperature is coming down, the disease declares its severity.

🗣️ **Facilitator** explains two possible scenarios:

- ⚠️ For patients with dengue without warning signs, defervescence is accompanied by improvement in general well-being and appetite.
- ⚠️ For some patients, as the temperature comes down, instead of feeling better as they would with other viral illnesses, they begin to feel worse, and experience the warning signs and effects of vascular permeability.

Defervescence marks the start of the critical phase (the orange column).

- ⚠️ The temperature may continue to decrease to subnormal levels in patients who experience shock.
- ⚠️ The duration of plasma leakage is about 24 to 48 hours.
- ⚠️ Towards the end of this period, some patients may experience another bout of fever, thus giving the fever pattern a biphasic or saddleback picture.
- ⚠️ It is important to note that not all patients will become afebrile during the critical phase.

🗣️ **Facilitator** explains that the upward-slanting line at the bottom of this slide shows the antibody response to dengue.

- ⚠️ Dengue IgM is negative in the early febrile phase but becomes increasingly positive; similarly, the IgG response, is very increased in secondary dengue infections.
- ⚠️ Adults and older children may experience high temperatures through the plasma leakage phase, a total of 7 to 10 days, before the fever subsides during the reabsorption phase.

SLIDE 6:

🗣️ **Facilitator** asks participants, "How will you recognize the plasma leakage phase?"

🗣️ **Facilitator** gives participants a few minutes to respond, then goes on to explain:

- ✓ There are three important laboratory changes that may indicate the plasma leakage phase:
 1. **White blood count (WBC):** Starts to decrease towards day 3 or day 4 of illness and continues to decrease into the start of the critical phase.
 2. **Platelet count:** May have been normal in the first 1 to 2 days of illness but then starts to decrease. With the advent of significant plasma leakage, the platelet count decreases even more precipitously until it is below 100 000, and in severe cases, the platelet count continues to decrease well below 50 000 and stays in that range throughout the critical phase, before recovering during the recovery phase.

3. **Haematocrit (HCT):** If measured in the early febrile phase (day 1 to 3 of illness), HCT would be normal and should be used as the patient's own baseline for later comparisons. However, with the onset of significant plasma leakage, without intravenous or oral fluid therapy, HCT would increase sharply—the change in HCT from baseline being proportional to the degree of plasma leakage. However, this sharp increase in HCT would be blunted or may not be observed in patients receiving prior intravenous fluid therapy or in those with the ability to maintain adequate oral intake. Therefore, the interpretation of HCT should take into account the context of oral or intravenous fluid therapy and urine output, important components in history-taking. Without fluid therapy (either oral or intravenous), HCT would continue to rise with further plasma leakage to as high as 20% above the baseline or more, e.g. from a baseline of 0.40 to 0.48 or higher. By this time, the patient would have developed features of hypovolaemia or even hypovolemic shock. The reduction in HCT would be caused by either intravenous fluid therapy (volume resuscitation), in which case the patient would improve clinically, or severe bleeding, in which case the patient would experience severe hypovolaemic shock. The HCT could fall below the baseline if excessive intravenous fluid therapy had been administered during the critical phase and during the reabsorption phase. In these scenarios, the patient would be stable with adequate peripheral perfusion. On the other hand, if the patient has had severe bleeding, the HCT could also be reduced with intravenous fluid therapy, but his or her clinical condition would not be stable at all. By now, you would appreciate that of the three major components of the complete blood count, the most challenging to understand is the HCT because of fluid therapy, either intravenous therapy by the doctor or the patient's oral fluids according to his thirst mechanism. Unravelling and understanding these events and the corresponding serial haematocrits in "real-time", is critical to further management of fluids.

SLIDE 7:

“” **Facilitator** explains the potential clinical issues in a patient with dengue:

- ⚠️ dehydration (febrile phase);
- ⚠️ hypovolaemia and shock due to plasma leakage and bleeding (critical phase);
- ⚠️ fluid overload due to fluid reabsorption or excessive IV therapy; and
- ⚠️ organ impairment, which usually occurs in conjunction with severe plasma leakage but could be an entity on its own and occur at any time, but commonly during the critical and recovery phases.

SESSION 4.3: FEBRILE PHASE

SLIDE 8: Vignette of febrile phase

SESSION 4.4: CRITICAL PHASE

SLIDE 9: Transition from febrile phase to critical phase

“” **Facilitator** explains:

- ✓ The critical phase usually runs from day 4 to day 7 of illness.
- ✓ The phase could start as early as day 3 or as late as day 7 or 8.
- ✓ The phase coincides with defervescence .

Development of warning signs: Identify dengue patients already in shock or at risk of developing shock. The onset of leukopenia is usually 24 hours before the rapid decrease in platelet count. Although leukopenia is not predictive of plasma leakage, it should alert the physician to the possibility that the febrile patient could have dengue.

A rapid decrease in platelet count and a rising trend in haematocrit typically occur shortly before or at defervescence.

SLIDE 10: Pearls and pitfalls: abdominal pain

🗣️ **Facilitator** explains:

- ⚠️ Abdominal pain should be considered a warning sign when it becomes the chief or solo complaint of the patient.
- ⚠️ The pain could be located in the right hypochondrium (liver or gall bladder region) or central abdomen or right iliac fossa.
- ⚠️ In some patients, abdominal pain could be as severe as in a surgical abdomen.
- ⚠️ If in doubt, check the CBC for leucopenia, thrombocytopenia and/or raised HCT.
- ⚠️ Be aware of the pitfalls: after several hours of vigorous intravenous fluid therapy, patients with increased capillary permeability will develop ascites. The liver may become congested from too much intravenous fluid and together with ascites, the abdomen will become tense and cause the patient to experience abdominal pain. Please do not consider this abdominal pain to be a warning sign of shock. These are signs of fluid overload. Further IV fluid therapy may cause acute pulmonary oedema.

SLIDE 11: Persistent vomiting

🗣️ **Facilitator** explains:

- ✓ Vomiting is a common symptom in viral illnesses and in the early febrile phase of dengue.
- ✓ Vomiting may be an important issue for adult patients on regular medications, e.g., antihypertensives. For such patients, normal blood pressure in the absence of their antihypertensives and a 40mm Hg decrease from baseline SBP indicates hypotension.

SLIDE 12: Lethargy

🗣️ **Facilitator** explains:

- ✓ Lethargy is common in the early febrile phase.
- ✓ As the illness progresses into the critical phase, the patient becomes increasingly lethargic.
- ✓ Most parents will complain that their child looks very weak.
- ⚠️ Lethargy is a warning sign of shock or impending shock. Restlessness is a danger sign of severe shock and cerebral hypoperfusion.

SLIDE 13: Mucosal bleeding

🗣️ **Facilitator** explains:

- ⚠️ Mucosal bleeding may be due to thrombocytopenia or platelet dysfunction.
- ✓ Fluid accumulation: Plasma leakage is present to some degree in most dengue patients.
- ✓ In most cases of moderate plasma leakage, patients would have to receive intravenous fluid therapy before fluid accumulation becomes clinically evident.
- ⚠️ However, in cases of severe plasma leakage, pleural effusion may be detected on the right hemithorax by clinical examination or chest radiograph, even before IV therapy.

SLIDE 14: Laboratory warning signs

SLIDE 15: What happens during the critical phase?

- 🗣️ **Facilitator** reads through the slide with participants until animation number 4 (about total white cell count), and then explains the following:
- ⚠️ The total white cell count may increase (instead of leukopenia) in patients with severe disease at this stage. This is a normal reaction to severe emotional or physical stress.
- 🗣️ **Facilitator** continues reading the rest of the slide.

SLIDE 16: Do all dengue patients enter critical phase?

SESSION 4.5: RECOVERY PHASE

SLIDE 17: Vignette of recovery phase

SLIDE 18: Summary of clinical problems during each phase

SESSION 4.6: SEVERE DENGUE

SLIDES 19–21: When to consider severe dengue?

- 🗣️ **Facilitator** adds:
- ✓ Pre-existing ulcers or prior ingestion of anti-inflammatory agents may predispose a patient to severe bleeding.

SLIDE 22: Pearls and pitfalls: dengue shock

- 🗣️ **Facilitator** reads through the first 4 animations and explains that the disease evolves with time.
- 🗣️ At animation 5, **Facilitator** reads: Once a stable patient develops plasma leakage, within a few hours the patient will experience warning signs; after more hours of warning signs and on-going plasma leakage, the patient develops compensated shock. A few hours later, this will be followed by hypotensive shock if no treatment is given. If after hypotension occurs no treatment is given, within several minutes, the patient may have a cardiac arrest. The disease accelerates during the critical phase, especially when shock sets in.
- 🗣️ **Facilitator** continues with animations 6 and 7.
- 🗣️ At animation 8, the **Facilitator** asks – why is it easy to miss a dengue shock?
- 🗣️ **Facilitator** continues to read the rest of the slide.
- 🗣️ **Facilitator** informs participants that this is the end of the morning's sessions.
- 🗣️ **Facilitator** asks participants if they have any questions.
- 🗣️ **Facilitator** invites participants to break for lunch and asks them to reconvene at 13:30.

BREAK FOR LUNCH

MODULE 5: Case classification and differential diagnosis

Day 1: MODULE 5: Case classification and differential diagnosis



Time	Session	Activity
10 minutes	5.1	WHO case classification for dengue fever
20 minutes	5.2	Differential diagnosis for dengue fever
~22 minutes	CS2	Case Study #2
~22 minutes	CS3	Case Study #3
~22 minutes	CS4	Case Study #4
~22 minutes	CS5	Case Study #5
120 minutes (2 hours)		

MODULE 5: Case classification & differential diagnosis: key competencies

By the end of Module 5, the participants will KNOW/UNDERSTAND:

- how to classify dengue cases by severity of disease; and
- how to differentiate dengue from other diseases.

MODULE 5: Case classification & differential diagnosis

	Duration	120 minutes (30 minutes lecture, 90 minutes case studies)
	Training method	Lecture Practical sessions (Case Studies #2, 3, 4, 5)

Steps:

- 🗣️ **Facilitator** welcomes participants back from lunch and asks them to retake their seats.
- 🗣️ **Facilitator** tells participants that they will move on to Module 5 and talk about the case classification and differential diagnosis for dengue. During this session we will look at:
 - Session 5.1: WHO case classification for dengue fever
 - Session 5.2: Differential diagnosis for dengue fever
 - Sessions CS2-CS5: Case Studies #2, 3, 4 and 5.
- 🗣️ **Facilitator** informs participants of session objectives.
- 🗣️ **Facilitator** informs participants there will be practical sessions/case studies.

Facilitator's notes:

SESSION 5.1: CASE CLASSIFICATION

SLIDE 1: Cover slide

SLIDE 2: Dengue case classification by severity

- 🗣️ **Facilitator** explains:
 - ✓ Dengue has a wide spectrum of clinical presentations, often with unpredictable clinical evolution and outcomes. While most patients recover following a self-limiting, non-severe clinical course, a small proportion progresses to severe disease, mostly characterized by plasma leakage with or without haemorrhage. In November 2009, WHO proposed a dengue case classification system, supported by a set of clinical and/or laboratory parameters, that shows a clear-cut difference between patients with severe dengue and those with non-severe dengue.

MODULE 5: Case classification & differential diagnosis

- ✓ Classification into levels of severity could potentially help clinicians decide as to when and how intensively the patient should be observed and treated.

SLIDE 3: Dengue case classifications (2009)

🗣️ **Facilitator** explains:

- ✓ With the new WHO classification scheme, dengue is classified as either dengue or severe dengue.
- ⚠️ Within the pool of patients with dengue, emphasis is on whether or not the patient develops warning signs as the disease progresses.
- ⚠️ With these features, the new classification scheme also indirectly reflects the dynamic nature of dengue.

SLIDE 4: Dengue case definition (2009)

🗣️ **Facilitator** explains:

- ⚠️ It is important to note that the first step of classifying a patient is to make sure that the patient meets the definition for “probable dengue”.
- ⚠️ With the new classification, probable dengue is recognized/suspected based on:
 - ✓ live in and/or travelled to a dengue-endemic area;
 - ✓ fever **and two** of the following criteria:
 - ✓ nausea, vomiting (**new addition to case classification**);
 - ✓ rash (existing criterion in 1997 case definition);
 - ✓ aches and pains = headache + eye pain + myalgia + arthralgia (**new addition to case classification**);
 - ✓ tourniquet test positive (existing criterion in 1997 case definition as haemorrhagic manifestation);
 - ✓ leucopenia (existing criterion); and
 - ✓ any warning sign (**new addition to case classification**).

SLIDE 5: Dengue case classification (2009)

🗣️ **Facilitator** explains:

- ✓ In November 2009, WHO proposed dengue classification.
- ✓ Dengue is classified by severity: dengue ± warning signs or severe dengue.
- ✓ The patient’s classification changes as the illness progresses with time.
- ✓ A patient with “probable dengue” should be followed up to see whether he or she develops warning signs or severe dengue. It is usually from day 3 to day 6 of illness, coinciding with defervescence, that the patient will either improve or get worse.
- ✓ If the patient’s temperature comes down and general condition improves, then he or she has “dengue without warning signs”.
- ✓ If the patient develops the warning signs during the transition from febrile to afebrile phases, there is a high risk of developing severe dengue (thick arrow from purple to orange ovals).
- ✓ Dengue patients with warning signs require close medical attention.

SESSION 5.2: DIFFERENTIAL DIAGNOSIS FOR DENGUE FEVER

SLIDE 6: Dengue mimics many clinical syndromes

🗣️ **Facilitator** explains:

- ✓ Dengue fever is non-specific and presents like many other diseases; therefore, before we go any further, we should consider the differential diagnosis for dengue fever.
- ✓ Clinical and laboratory pictures of dengue change as the disease progresses from the febrile phase to the critical phase and evolves into the recovery phase.
- ✓ Understanding the dynamic and systemic nature of dengue and its unique manifestations as the disease progresses from one phase to another is crucial in order to differentiate dengue from other diseases.

SLIDE 7: Conditions that mimic the febrile phase of dengue

🗣️ **Facilitator** explains:

- ✓ Patients may present to clinicians at any phase of dengue illness.
- ✓ In the early febrile phase, it is not easy to differentiate dengue from other febrile illnesses as its clinical features mimic many other febrile illnesses.
- ✓ Collecting a thorough history is a very important, possibly the most important, step in making a differential diagnosis of acute, non-specific febrile illness.
- ✓ History of living in or travelling to hotspot dengue area, history of fogging or history of dengue cases in the family or neighbourhood
- ✓ History of trekking or contact with contaminated water source should alert one to the possibility of leptospirosis, typhus (or other rickettsial disease) or melioidosis (especially if the patient has diabetes mellitus).
- ✓ History of travel to areas within Malaysia or other countries that are endemic for malaria or other tropical diseases
- ✓ History of exposure to bloodborne diseases (HIV, hepatitis B and C, syphilis)
- ✓ History of exposure to unhygienically prepared food or water should alert clinicians of typhoid and other waterborne diseases.
- ✓ History of recent contact with children who have had measles or rubella
- ✓ History of relapsing and remitting fever should alert one to a more chronic disease such as an autoimmune disease (e.g. systemic lupus erythematosus or SLE).
- ✓ Family history of any medical conditions, e.g. diabetes mellitus and autoimmune diseases, is also important.
- ✓ A comprehensive history of the patient's co-morbidities (diabetes mellitus, hypertension, ischemic heart disease, etc.) is essential not only to establish differential diagnosis but also to manage a patient co-infected with dengue.

SLIDE 8: Conditions that mimic the critical phase of dengue

🗣️ **Facilitator** explains the unique features of dengue during the critical phase.

- ✓ As dengue disease progresses into the critical phase, it becomes easier and clearer to recognize; attention should be paid on the development of "warning signs" (with or without shock) and the typical laboratory changes that may occur.

MODULE 5: Case classification & differential diagnosis

- ✓ Typically, progressive leukopenia would be accompanied by progressive thrombocytopenia and rising HCT/PCV if the patient was to develop plasma leakage.
- ✓ Typically, liver transaminases would be elevated, with AST elevated higher than ALT in dengue as compared to other diseases.
- ✓ However, these features are not exclusive to dengue.
- ✓ Surgical as well as medical conditions could mimic dengue during the critical phase.

🗣️ **Facilitator** asks participants to name other diseases that could mimic dengue.

🗣️ **Facilitator** allows a few moments for participants to respond.

🗣️ **Facilitator** explains:

✓ Dengue patients may present with abdominal pain with or without vomiting as a warning sign during the critical phase. This pain could be mistaken as surgical or other medical acute abdomen.

✓ Dengue patients in the critical phase, particularly those with shock, often have acidotic breathing that can mimic other conditions.

🗣️ **Facilitator** reads a long list of other conditions that could be confused with dengue in the critical phase or vice versa.

SLIDES 9 & 10: Differentiating dengue from leptospirosis

🗣️ **Facilitator** explains:

✓ In Puerto Rico (2007), 8 of 14 laboratory-negative dengue fatal cases tested laboratory-positive for leptospirosis when the physician suspected dengue.

🗣️ **Facilitator** explains differentiating features between dengue and leptospirosis.

SLIDES 11 & 12: Differentiating dengue from malaria and chikungunya

🗣️ **Facilitator** explains differentiating features among dengue, malaria and chikungunya.

SLIDE 13: Differentiating dengue from surgical acute abdomen

🗣️ **Facilitator** explains differentiating features between dengue and surgical acute abdomen.

SLIDE 14: Differentiating dengue shock from septic shock



🗣️ **Facilitator** explains differentiating features between dengue shock and septic shock.

⚠️ Facilitator emphasizes the “5-in-1 magic touch of peripheral perfusion” is extremely important in distinguishing septic shock from dengue shock.

🗣️ **Facilitator** informs participants that they will now have a practical session, working on four case studies (total time allowed to complete all case studies is 90 minutes).

Case Studies #2, 3, 4 and 5

SESSIONS CS2–CS5: Case Studies #2, 3, 4 and 5

Objective	How to differentiate dengue from other diseases	
Materials	Case Studies #2, 3, 4 and 5	
	Duration	90 minutes (10 minutes group work/12 minutes feedback—total 22 minutes per case study)
	Training method	Group work

Steps:

- 🗣️ **Facilitator** asks for participants to form four groups and to select one rapporteur per group.
- 🗣️ **Facilitator** hands out Case Studies #2, 3, 4 and 5 to each group.
- 🗣️ **Facilitator** explains that each group will have 10 minutes to complete each case study (total 40 minutes) and about 12 minutes to present each case study to the class (total 48 minutes).
- 🗣️ **Facilitator** explains that they will address one case study at a time.
- 🗣️ **Facilitator** asks each group to work on Case Study #2.
- 🗣️ After 10 minutes, **facilitator** asks rapporteurs from each group to present their findings to the class (12 minutes for each group);
- 🗣️ After each group has shared, **facilitator** asks each group to go to the next case study (#3), using the same method as above until all case studies have been completed and each group has shared its findings.
- 🗣️ Participants may use their notes from the presentation as reference.
- 🗣️ **Facilitator** invites participants to break for tea and requests them to return promptly in 15 minutes.

TEA BREAK

MODULE 6: Patient assessment & evaluation

Day 1: MODULE 6: Patient assessment & evaluation



Time	Session	Activity
5 minutes	6.1	The 4 Steps
	6.2	Step 1
20 minutes	6.3	Step 2
5 minutes	6.4	Step 3
2 minutes	6.5	Step 4
32 minutes		

MODULE 6: Patient assessment & evaluation: key competencies

By the end of Module 6, the participants will KNOW/UNDERSTAND:

- how to take a patient history;
- how to perform a clinical examination of a patient with suspected dengue;
- what investigations need to be made a part of the clinical assessment; and
- how to diagnose dengue and identify the phase of disease and severity of illness.

Module 6: Patient assessment & evaluation

	Duration	30 minutes
	Training method	Lecture

Steps:

- 🗣️ **Facilitator** welcomes participants back from the tea break and asks them to retake their seats.
- 🗣️ **Facilitator** tells participants that they will move on to Module 6 and talk about how to evaluate a patient with suspected dengue. During this session we will look at:
 - Session 6.1: The 4 steps
 - Session 6.2: Step 1
 - Session 6.3: Step 2
 - Session 6.4: Step 3
 - Session 6.5: Step 4.
- 🗣️ **Facilitator** informs participants of session objectives.

Facilitator's notes:

SESSION 6.1: THE 4 STEPS

SLIDE 1: Cover slide

SLIDE 2: The 4 Steps

- 🗣️ **Facilitator** explains:
 - ✓ The clinical encounter is an important opportunity to forge a positive patient–physician relationship that will ensure the patient not only follows the physician's advice but also returns for further follow-up visits.

SESSION 6.2: STEP 1

SLIDES 3 & 4: History taking

🗣️ **Facilitator** explains:

✓ It is good practice to try to ascertain the duration of the fever as well as date of onset of illness.

🗣️ For slide 3, **Facilitator** explains:

✓ A patient's history should include:

1. Date of onset of fever (date is preferable to the number of days of fever);
2. Other symptoms and severity. The severity of symptoms will affect the 3 golden questions: a) oral fluid intake – quantity and types of fluids; b) urine output – quantify in terms of frequency and estimated volume, time of most recent voiding; and c) types of activities performed during this illness, e.g., could the patient go to school, work, market, etc. These three issues, though not specific to dengue, give a good idea of the hydration state and how well the patient copes with the illness.
3. Other fluid losses – such as vomiting or diarrhoea
4. Presence of warning signs

🗣️ For slide 4, **Facilitator** explains other relevant histories (Questions 6 to 10) and then asks: "Why ask about risk factors in question 8?"

SESSION 6.3: STEP 2

SLIDES 5: Clinical examination

🗣️ **Facilitator** explains:

✓ Clinical examination should be performed carefully and thoroughly.

✓ A patient with dengue shock looks deceptively "well and stable" because of their lucid conscious level.

✓ This is particularly so in older children and young adults whose compensatory mechanism could be up-regulated to maintain perfusion to brain.

✓ With practice, the physical examination can be skilfully accomplished fairly quickly.

✓ How does the patient look? What is his or her state of alertness? Bear in mind that conscious level is affected only in late dengue shock.

✓ Hydration state is best assessed by the patient's history, not by skin turgor or dryness of mucosa.

✓ Pay attention to the patient's haemodynamic state and breathing pattern, and check for abdominal tenderness and hepatomegaly.

✓ Look for rash and haemorrhagic manifestations (e.g. petechiae and bruises at venepuncture sites) in limbs and trunk.

✓ A tourniquet test should be done if previously negative or if no spontaneous bleeding manifestations are present.

SLIDE 6: Haemodynamic assessment

- 🗣️ **Facilitator** asks: “How do we perform haemodynamic assessment?”
- 🗣️ **Facilitator** explains how nine essential parameters can be divided into four sections:
 1. Peripheral perfusion
 2. Cardiac output information
 3. Organ perfusion: 3a – brain perfusion; 3b – kidney perfusion
 4. Respiratory compensation for metabolic acidosis in tissue hypoxia
- ✔️ By holding the patient’s hand, you can assess five out of nine parameters: (1) colour, (2) capillary refill time, (3) temperature of extremities, (4) volume of pulse, and (5) pulse rate.

SLIDE 7: A stable haemodynamic situation

SLIDES 8–10: Haemodynamic changes in compensated shock

- 🗣️ **Facilitator** explains:
 - ✔️ When significant plasma leakage sets in, physiologic compensatory mechanisms are up-regulated in an attempt to maintain adequate circulation to vital organs such as the brain and heart.
 - ✔️ Up-regulation of these mechanisms is responsible for producing the clinical features of shock as a continuum of time and volume of plasma leakage.
 - ✔️ In the initial stages of shock, peripheral vasoconstriction together with tachycardia maintains the systolic blood pressure at normal or elevated levels (compensated shock).
 - ✔️ However, peripheral vasoconstriction causes reduced skin perfusion resulting in cool/cold extremities, delayed capillary refill time >2 seconds and weak volume peripheral pulses.
 - ✔️ With increasing plasma volume loss, peripheral vascular resistance increases, the diastolic pressure rises towards the systolic pressure and the pulse pressure (difference between systolic and diastolic pressure) narrows.
 - ✔️ Shock should be considered if the pulse pressure is ≤ 20 mm Hg, for example 110/90 mm Hg, or the patient shows signs of poor peripheral perfusion (cold extremities, delayed capillary refill), weak peripheral pulses and tachycardia.
 - ✔️ A compensated metabolic acidosis (normal pH with low carbon dioxide tension and low bicarbonate level) is observed as “quiet” tachypnoea, i.e. without increased effort.
- ⚠️ At this point, brain perfusion is being maintained, giving an appearance of “conscious and alert” mental state. Without examining the peripheral circulation, it is easy to underestimate the critical state of the patient.
- ⚠️ It is common to be deceived by the clarity of the patient’s conscious level into thinking that the dengue patient looks stable.
- ⚠️ This is because cerebral perfusion is maintained at an adequate level but at the expense of non-vital organs, such as skin and kidneys.
- ⚠️ Brain perfusion will be compromised only at the late stage of dengue shock. Therefore, to detect shock in the early stages, it is essential to examine the perfusion of non-vital organs.
- ✔️ Note that in compensated shock, changes are seen in all parameters except the conscious level and systolic pressure.

SLIDE 11: Haemodynamic changes in hypotensive shock

🗣️ **Facilitator** explains the critical signs:

- ⚠️ Worsening hypovolaemic shock manifests as increasing tachycardia and peripheral vasoconstriction.
- ⚠️ Not only are the extremities cold and cyanosed, but the limbs become mottled, cold and clammy.
- ⚠️ By this stage, the breathing becomes more rapid and increases in depth, a compensation for the metabolic acidosis (Kussmaul's breathing).
- ⚠️ Finally, there is decompensation and both systolic and diastolic blood pressures disappear suddenly and dramatically; the patient becomes hypotensive.
- ⚠️ At this time, the peripheral pulses disappear while the central pulse (femoral) will be weak.
- ⚠️ Hypotension develops when physiologic attempts to maintain systolic blood pressure and perfusion are no longer effective.

SLIDE 12: Hemodynamic Assessment – Hypotensive Shock

🗣️ **Facilitator** explains:

- ⚠️ One key clinical sign of this deterioration is a change in mental state as brain perfusion declines. The patient becomes restless, confused and extremely lethargic. Seizures may occur. Agitation may alternate with lethargy.
- ⚠️ Early ominous signs of cortical hypoperfusion in infants and children are failure to recognize, focus or make eye contact with parents and failure to respond to painful stimuli such as venepuncture.
- ⚠️ Parents may be the first to recognize these signs, but they may be unable to describe them other than to say something is wrong. Listen to parents!
- ⚠️ On the other hand, children and young adults have been known to have clear mental status even in profound shock, and adults have been known to be able to work until the stage of profound shock.
- ⚠️ Hypotension is a late finding and signals an imminent total cardiorespiratory collapse.

SLIDE 13: Haemodynamic Assessment – Monitoring Urine Output

🗣️ **Facilitator** explains:

- ✓ The urine output reflects renal blood flow and perfusion. Close monitoring of urine output is thus an important aspect of haemodynamic monitoring.
- ✓ In the outpatient setting, the patient should drink enough fluids to pass urine about 4 to 6 times a day.
- ✓ In early shock state, with reduced renal perfusion, kidneys conserve fluids by reducing urine volume. In severe shock, no urine is produced.
- ✓ An indwelling catheter will give an accurate measurement. The minimal amount of urine for a dengue shock patient is about 0.5 ml/kg/hr. If the urine output is more than this amount and the patient is stable, you should consider reducing the IV fluid therapy.
- ⚠️ Do remember that patients with uncontrolled diabetes or hyperglycaemia may produce inappropriately large quantities of urine (glycosuria). This should not be considered adequate at all. In fact, the shock becomes worse because of glycosuria.

SLIDE 14: Haemodynamic Assessment – Hypotensive Shock (cont.)

SLIDE 15: Definition of hypotension

Module 6: Patient assessment & evaluation

SLIDE 16: Pearls in clinical examination of dengue patients

- 🗣️ **Facilitator** asks participants, “Why is it important to touch the patient?”
- 🗣️ **Facilitator** explains:
- ✓ Holding the patient’s hand is a quick way to evaluate the peripheral perfusion. In less than 30 seconds, you can tell whether the peripheral perfusion is normal, reduced or very reduced.

SLIDE 17: Hemodynamic Assessment – Holding patient’s hand

- 🗣️ **Facilitator** explains:
- ✓ By holding the patient’s hand, you can assess (CCTV-R): (1) colour, (2) capillary refill time, (3) temperature of extremities, (4) pulse volume, and (5) pulse rate.

SLIDE 18: The “5-in-1 maneuver” magic touch

SLIDE 19 & 20: Pitfalls in clinical examination of dengue patients

- 🗣️ For slide 19, **Facilitator** explains:
- ⚠️ Vasoconstriction causing cold extremities and delayed capillary refill is the body’s attempt to increase its temperature to the level set by the “thermostat”.
- ⚠️ Tachycardia is part of the febrile package.
- ⚠️ Some doctors would erroneously consider this patient to be in shock.
- ⚠️ Shock is very unlikely in the first 3 days of illness.
- ⚠️ When dengue patients go into shock, the body temperature is most likely to be either normal or subnormal.
- ⚠️ In a life-threatening situation such as shock, many systems in the body will work together to ensure survival. Hence, the “package of compensatory mechanisms” should be present.
- 🗣️ For slide 20, **Facilitator** reminds the audience to always look at the BIG PICTURE before “zooming in” to details.
- ✓ History – When was fever onset? In which phase of disease is the patient?
- ✓ What was the patient’s fluid intake and urine output?
- ✓ Any warning signs?
- ✓ What was the patient’s pulse volume?
- ✓ Remember: Clinical features come as a “package”, not in isolation.
- ✓ If still in doubt, do a complete blood count.

SESSION 6.4: STEP 3

SLIDES 21 & 22: Investigations

- 🗣️ **Facilitator** explains:
- ✓ HCT performed in the first three days of illness establishes the patient’s own baseline.
- ✓ A rapid decrease in platelet count in parallel with a rising haematocrit, compared to the baseline, is suggestive of progress to the plasma leakage/critical phase of the disease. In the absence of the patient’s baseline, age-specific population haematocrit levels could be used as a surrogate during the critical phase.
- ✓ A decreasing WBC count followed by decreasing platelet count by day 3 or 4 of illness makes dengue very likely.

Module 6: Patient assessment & evaluation

- ✓ For most cases, a complete blood count (CBC) with haematocrit (HCT) is all that is necessary to monitor the patient.
 - ✓ The following components should be noted:
 - HCT
 - white blood cell (WBC) count
 - platelet count.
- (Note: All may be within the normal range in the first one to two days of fever)

SLIDE 23: Investigations (cont.)

🗣️ **Facilitator** explains:

- ✓ All febrile patients should get a baseline CBC at the first visit:
 - If resources are limited, a CBC should be done for febrile patients with poor oral intake and/or poor urine output.
 - A normal CBC in the febrile phase does not exclude dengue.
- ✓ The following patients should get a CBC on subsequent visits:
 - ✓ all patients with warning signs (urgently);
 - ✓ all patients with fever for more than three days; and
 - ✓ all patients with circulatory disturbance/shock (these patients should have a full blood count and a glucose check urgently).
- ⚠️ Patients should be referred for immediate medical consultation when the following conditions are present:
 - ✓ rising HCT or high HCT;
 - ✓ leucopenia and/or thrombocytopenia;
 - ✓ presence of warning signs and shock.

SLIDE 24: Investigations (cont.)

🗣️ **Facilitator** explains:

- ✓ Dengue diagnostic tests are generally not available in most outpatient settings. Laboratory confirmation of dengue is not necessary for acute management but may be valuable because some patients progress over a short period from mild to severe disease and sometimes to death.
- ✓ Laboratory confirmation is recommended for patients with unusual manifestations and suspected dengue deaths.
- ✓ Additional tests should be considered as indicated (and if available), including tests of liver function, glucose, serum electrolytes, urea and creatinine, bicarbonate or lactate, cardiac enzymes, ECG and urine-specific gravity.

SESSION 6.5: STEP 4

SLIDES 25 & 26: Diagnosis, phase of disease and severity

Facilitator explains the assessment rationale:

- ✓ Is it dengue? It is difficult to distinguish dengue from non-dengue viral illnesses during the first 2 to 3 days of fever. If dengue is suspected, it is best to inform the patient about your thoughts so that s/he would be more likely to follow your advice and return for follow-up visits.
- ✓ Which phase of dengue (febrile/critical/recovery)? If dengue is suspected, you have to decide which phase of illness he or she is in. In the outpatient setting, you should be monitoring for the transition for febrile to critical phase as well.
- ✓ What is the hydration state? The history of oral fluid intake and urine output is more reliable than the physical sign of reduced skin turgor and dry coated tongue.
- ✓ Dengue warning signs should be assessed.
- ✓ You should be very clear about the hemodynamic state.
- ✓ Decide on the best medical plan...

Facilitator asks if there are any points for clarification before moving on to Module 7.

MODULE 7: Outpatient management

Day 1: MODULE 7: Outpatient management



Time	Session	Activity
10 minutes	7.1	Epidemiological overview of health-seeking behaviours
4 minutes	7.2	Patient management: general overview
1 minute	7.3	Management of dengue: overview
10 minutes	7.4	Management of Group A
5 minutes	7.5	Management of Group B
5 minutes	7.6	Management of Group C
10 minutes	7.7	Improving clinical outcomes
15 minutes	7.8	Video
15 minutes	CS6	Case Study #6
15 minutes	CS6B	Case Study #6B
15 minutes	CS6C	Case Study #6C
105 minutes		

MODULE 7: Outpatient management: key competencies

By the end of Module 7, the participants will KNOW/UNDERSTAND:

- the health-seeking behaviours of dengue patients;
- the general management of dengue patients in groups, A, B and C;
- how to improve clinical outcomes; and
- how to ensure good doctor–patient relationships.

Module 7: Outpatient management

	Duration	105 minutes (1 hour, 45 minutes)
	Training method	Lecture Video Practical sessions (Case Studies #6, 6B, 6C)

Steps:

🗣️ **Facilitator** tells participants that they will move on to Module 7 and talk about how to manage patients who do not require hospitalization. During this session we will look at:

- Session 7.1: Epidemiological overview of health-seeking behaviours
- Session 7.2: Patient management: general overview
- Session 7.3: Management of dengue: overview
- Session 7.4: Management of Group A
- Session 7.5: Management of Group B
- Session 7.6: Management of Group C
- Session 7.7: Improving clinical outcomes
- Session 7.8: Video
- Session CS6-6C: Case Studies #6, 6B, 6C

🗣️ **Facilitator** informs participants of session objectives.

Module 7: Outpatient management

Facilitator's notes:

SESSION 7.1: EPIDEMIOLOGICAL OVERVIEW OF HEALTH-SEEKING BEHAVIOUR PATTERNS

SLIDE 1: Cover slide

SLIDE 2: Dengue deaths by age groups

SLIDE 3: Entering the clinic – health seeking behaviour

SLIDE 4: Dengue illness onset and admission

SLIDE 5: Duration between admission and death

SLIDE 6: Reality check #1

- 🗣️ **Facilitator** asks the participants, “Why do patients die if they seek medical treatment early?”
- 🗣️ **Facilitator** gives the participants a few minutes to answer, then goes to Slide 7.

SLIDE 7: Reality checks #2 and #3

- 🗣️ **Facilitator** explains:
 - ✓ In early febrile phase: symptoms are superficially non-specific – not unlike other viral illnesses—and CBC is still seemingly normal.
 - ✓ Even if dengue is recognized, it is not possible to predict its course.
 - ✓ The take-home message is to SUSPECT dengue in all febrile patients and to INFORM patients about it.
 - ✓ Severe dengue occurs in only a small proportion of dengue infections.
 - ✓ In the absence of prediction tools, daily ambulatory assessment during the febrile phase is essential to detect patients developing severe dengue and avoid unnecessary admissions.
 - ✓ Early detection and management of shock save lives.

SESSION 7.2: PATIENT MANAGEMENT: GENERAL OVERVIEW

SLIDE 8: General facts of management

- 🗣️ **Facilitator** explains:
 - ✓ The standard of care for treatment of dengue is supportive management with intravenous rehydration when necessary.
 - ✓ The bad news is there is no curative treatment or effective vaccine yet, but the good news is there are a number of good candidate vaccines entering phase 1, 2 and 3 clinical trials.
 - ✓ The bad news is dengue can be fatal (estimates of CFR as high as 20% for severe dengue), but the good news is timely initiation of proper treatment could reduce CFR less than 1%.
 - ✓ Front-line doctors should be aware of the epidemiology of the area served by the health facility.
 - ✓ When you suspect that a patient may have dengue, he or she should be informed of the possibility of dengue. A patient who is informed early will be more likely to comply with treatment.
 - ✓ Disease notification of suspected case is essential to assist vector control efforts and inform the public.

Module 7: Outpatient management

SLIDE 9: How to save lives

SESSION 7.3: MANAGEMENT OF DENGUE: OVERVIEW

SLIDE 10: Management of dengue

 **Facilitator** explains:

- ✓ Management decisions depend on clinical manifestations and other circumstances.
- ✓ Patients may:
 1. Be sent home – Group A
 2. Be referred for in-hospital management – Group B
 3. Require emergency treatment and urgent referral – Group C

SESSION 7.4: MANAGEMENT OF GROUP A

SLIDE 11: Outpatient management: Group A

SLIDES 12 & 13: Keys to good home care

 **Facilitator** explains:

- ✓ Eliminate mosquitoes and breeding places in and around the home.
- ✓ Patient should ideally be in a screened room or nursed under a bednet while febrile (to prevent further spread of disease; common to see cases clustered in households and neighbourhoods).

SLIDES 14 & 15: Mosquito breeding sites in the home

SLIDE 16: Pearls in home care

 **Facilitator** explains WHO's position on the use of steroids.

- ✓ Currently WHO, PAHO and CDC do NOT recommend the use of steroids in the management of dengue.
- ✓ All clinical trials of steroid use have been conducted among children with DSS.
- ✓ Combined results show no evidence of effectiveness.
- ✓ The Cochrane Collaboration and others have advocated against using steroids except in the clinical trial setting.
- ✓ Steroids are used in sepsis because of adrenal suppression and relative deficiency of endogenous steroids.
- ✓ Studies in septic patients have shown increased mortality with steroid administration to patients with normal or high levels of cortisol, which is the situation in dengue haemorrhagic fever.
- ✓ Steroids are a risk factor for developing stress ulceration and upper gastrointestinal bleeding in critically ill patients; they increase the risk of secondary infection and can derange glucose homeostasis (hyperglycaemia associated with poor outcome in ICU patients).

SESSION 7.5: MANAGEMENT OF GROUP B

SLIDE 17: Management of Group B

SESSION 7.6: MANAGEMENT OF GROUP C

SLIDE 18: Management of Group C

SLIDE 19: Summary of management of Groups A, B and C

Module 7: Outpatient management

SESSION 7.7: IMPROVING CLINICAL OUTCOMES

SLIDE 20: Saving lives with simple steps

🗣️ **Facilitator** explains:

- ✓ The most important step in the process of clinical care is the patient–physician encounter.
- ✓ Dengue patients could be vulnerable or even fearful if the media have highlighted dengue deaths.
- ✓ Health-care providers in the outpatient department have only one opportunity to form a solid connection and produce a successful clinical encounter.
- ✓ The clinical encounter affects trust, patient understanding and follow-up, all vital for a positive clinical outcome.
- ✓ As health-care providers, we are in control of this step. If we do not succeed, patients will default on advice and follow-up or seek treatment elsewhere.


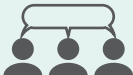
SLIDE 21: Ensuring good patient–physician relationships

SLIDE 22: Saving lives with simple steps (cont.)

- 🗣️ **Facilitator** informs participants that this concludes Module 7.
- 🗣️ **Facilitator** informs participants that they will now watch a short video, lasting approximately 15 minutes.
- 🗣️ **Facilitator** informs the participants that the video will be followed by a practical exercise in the form of a case study (#6).
- 🗣️ **Facilitator** sets up the video and asks participants to dim the lights and/or close the curtains.

Case Studies #6, 6B, 6C

SESSION CS6-CS6C: Case Studies #6, 6B & 6C

Objective	Know how to manage a dengue patient without warning signs.	
Materials	Case Studies #6, 6B & 6C	
	Duration	45 minutes (15 minutes for each case study)
	Training method	Group work

Steps:

- 🗣️ **Facilitator** asks participants to form four groups and select a rapporteur for each group.
- ✓ **Facilitator** presents each step of a case study on screen, asks each group to discuss and decide on a response to be given by their rapporteur.
- ✓ Each rapporteur has a few minutes to share with the class. This process repeats until the case is resolved.
- ✓ Each case study should last about 15 minutes.
- ✓ **Facilitator** praises correct answers and gently corrects wrong answers.
- 🗣️ At 18:02, **facilitator** wishes participants a pleasant evening.

END OF DAY 1

DAY 2



Objectives for Day 2

At the end of the day, participants will be able to:

- understand the principles and consequences of administering intravenous fluids; and
- know how to manage a dengue patient in Group B.

Materials required for Day 2



- Flip chart
- Marker pens
- PowerPoint presentations (Modules 8A, 8B and 8C)
- Practical session exercises (Case Studies #7, 8, 9 and 10)
- Facilitator's manual
- Participant handouts

Day 2: Modules 8A, 8B and 8C and role-plays

Time	Session	Activity
10 minutes	8.1A	Principles of IV fluid therapy
2 minutes	8.2A	When to start IV fluids
10 minutes	8.3A	What IV fluids to give
4 minutes	8.4A	How much IV fluid to give
4 minutes	8.5A	When to stop IV fluids
10 minutes	8.6A	Summary
10 minutes	8.7A	Calculations & Quick Reference Tables
30 minutes	CS7 & CS8	Case Studies #7 & 8
20 minutes	8B	Management of Group B
20 minutes	CS9	Case Study #9
90 minutes	RP1	Role-play part I
60 minutes	RP2	Role-play II
45 minutes	8C	Management of Group C
50 minutes	CS10	Case Study #10
365 minutes (6 hours, 5 minutes)		



MODULE 8A: IV fluid principles

MODULE 8A: Intravenous fluid principles

By the end of Module 8A the participants will KNOW/UNDERSTAND:

- when to administer IV fluids;
- how much IV fluid to administer;
- what kind of IV fluids to give;
- when to stop IV therapy; and
- how to calculate fluid intake.

MODULE 8A: IV fluid principles

	Duration	80 minutes (including 30 minutes for case studies)
	Training method	Lecture Practical sessions (Case Studies #7 & 8)

Steps:

- ” **Facilitator** welcomes participants back for the second day of training.
- ” **Facilitator** hands out Case Study #1 results to the participants.
- ” **Facilitator** introduces Module 8A: Intravenous fluid principles. During this session we will look at the following:
 - Session 8.1A: Principles of IV fluid therapy
 - Session 8.2A: When to start IV fluids
 - Session 8.3A: What IV fluids to give
 - Session 8.4A: How much IV fluid to give
 - Session 8.5A: When to stop IV fluids
 - Session 8.6A: Summary
 - Session 8.7A: Calculations & Quick Reference Tables
 - Session CS7 & CS8: Case Studies #7 and 8.
- ” **Facilitator** informs participants that there will be practical sessions/case studies.

Facilitator's notes:

SESSION 8.1A: Principles of IV fluid therapy

SLIDE 1: IV fluid principles

- ” **Facilitator** explains:
 - ✓ Before we embark on inpatient management of dengue, it is important to understand the principles of IV fluid therapy. Increased capillary permeability poses a major challenge to IV fluid management.

SLIDE 2: Factors that change haematocrit levels in dengue

“ **Facilitator** explains:

- ✓ Increased emphasis has been placed on observing haematocrit levels, vital signs and haemodynamic status in Group B, and warning signs in Group C patients.
- ✓ It is important to understand the factors that change HCT during the dengue illness and treatment.
- ✓ These factors can be divided into (1) disease progression, (2) treatment, and (3) disease progression and treatment, which may cause an increase or decrease or no change in HCT levels.

SLIDE 3: Factors that change HCT levels: disease progression

“ **Facilitator** explains:

- ✓ In the absence of IV fluid therapy, increased capillary permeability will increase HCT up to a level proportionate to the quantity of plasma leakage.
- ✓ However, if bleeding occurred after this time, (usually because fluid resuscitation was delayed), then HCT values would start to decline gradually and may eventually reach the baseline level again.
- ✓ Thus, HCT levels may appear unchanged from the baseline when plasma leakage and significant bleeding occur.
- ✓ During the recovery phase, fluid reabsorbed into the circulation will cause haemodilution and decrease HCT.

SLIDE 4: Factors that change HCT levels: treatment

“ **Facilitator** explains:

- “ Blood transfusions will increase HCT depending on the volume of transfusion and whether whole blood or packed cells were used.
- “ IV fluid therapy with crystalloids or colloids will decrease HCT levels; the decrease in HCT will be more pronounced and sustained with colloid therapy.

SLIDE 5: Factors that change HCT levels: disease and treatment

“ **Facilitator** explains:

- ✓ If a blood transfusion is erroneously given when there is ongoing plasma leakage, HCT could rise to very high levels; this rise could be misinterpreted as severe plasma leakage, resulting in the doctor prescribing much more fluid.
- ✓ On the other hand, if IV crystalloids or colloids are given to a patient with plasma leakage plus bleeding, HCT will decrease. A more pronounced decrease in HCT will be observed with colloids than with crystalloids.
- ✓ If plasma leakage and IV therapy are concurrent, there may be no change in the HCT level, but fluid accumulation will occur.
- ✓ Finally, a blood transfusion could restore HCT to its baseline level.

SLIDE 6: Medical management

- 🗣️ **Facilitator** asks, “What do all these mean?”
- 🗣️ **Facilitator** explains:
 - ✓ It means that HCT should not be interpreted on its own!
 - ✓ It could be dangerous if HCT becomes the main driver of IV fluid therapy and haemodynamic evaluation is relegated to a secondary role or ignored.
 - ✓ Some clinicians use platelet count as the main driver of dengue management, leading to multiple transfusions of platelets. HCT should not become the new “platelet count”.

SLIDE 7: Interpretation of rising or persistently high HCT

- 🗣️ **Facilitator** explains:
 - ✓ HCT should always be interpreted together with vital signs and haemodynamic state.
 - ✓ A rising or persistently high HCT, combined with:
 - unstable vital signs (particularly narrowing of pulse pressure, tachycardia, metabolic acidosis, poor urine output), indicates active plasma leakage and need for further fluid replacement; or
 - stable haemodynamic status and adequate urine output, indicates the patient does not require extra IV fluid.
 - ✓ Continue to monitor HCT closely; it should start to fall within 24 hours as the plasma leakage stops.
- 🗣️ **Facilitator** asks participants to re-cap what they understood by “unstable” and “stable haemodynamic” state.
- 🗣️ **Facilitator** gives participants a few minutes to share their understanding.

SLIDE 8: Interpretation of a decrease in HCT

- 🗣️ **Facilitator** explains:
 - ✓ A decreasing or low HCT, together with:
 - unstable vital signs (particularly narrowing of pulse pressure, tachycardia, metabolic acidosis, poor urine output), indicates major haemorrhage and need for urgent blood transfusion;
 - stable haemodynamic status and adequate urine output, indicates haemodilution and/or reabsorption of extravasated fluids; IV fluids must be discontinued immediately to avoid pulmonary oedema.

SESSION 8.2A: WHEN TO START IV FLUIDS

SLIDE 9: When to start and stop IV fluid therapy

- 🗣️ **Facilitator** explains IV fluid therapy for each phase of the disease.

Febrile phase:

- ✓ It is advisable to limit IV fluid therapy.
- ✓ Early initiation of IV therapy during this stage may lead to fluid overload.
- ✓ Instead, encourage patient to drink.
- ✓ If IV fluids are used to treat dehydration, discontinue it as soon as the patient is able to drink.

MODULE 8A: IV fluid principles

Plasma leakage phase:

- ✓ IV fluid therapy is important during this phase.
- ✓ However, IV fluid therapy is required for only 24 to 48 hours.
- ✓ For patients who present with shock, IV fluid therapy might be less than 48 hours because capillary permeability must have started for a few hours before presentation.

Recovery phase:

- ✓ Extravasated fluids remain in body and need to be reabsorbed.
- ✓ IV fluid therapy should be stopped for this to happen.
- ⚠ It is useful to remember that IV fluid therapy is not the same for dengue as it is for acute gastroenteritis (actual loss of fluid from body).
- ⚠ In dengue plasma leakage, extravasated fluid remains in the body; excessive accumulation will cause great discomfort and breathing difficulties.

SESSION 8.3A: WHAT IV FLUIDS TO GIVE

SLIDE 10: What type of IV fluid therapy should we use?

🗣 **Facilitator** uses animation guide and explains:

- ✓ Based on three randomized controlled trials comparing the different types of fluid resuscitation regimes for children with dengue shock, there is no clear advantage to the use of colloids over crystalloids in terms of the overall outcome.
- ✓ However, colloids may be the preferred choice if the blood pressure has to be restored urgently, i.e. in patients with pulse pressure less than 10 mm Hg.
- ✓ An ideal physiological fluid is one that closely resembles the extracellular and intracellular fluids compartments.
- ✓ However, available fluids have their own limitations when used in large quantities.
- ✓ Therefore, it is advisable to understand the limitations of these solutions to avoid their respective complications.

Facilitator describes the table on Slide 10:

- ✓ The table shows the main electrolyte components of commonly used isotonic crystalloids.
- ✓ The osmolarity of saline is similar to that of plasma.
- ✓ Note the sodium and chloride content of normal saline – using large quantities may cause hyperchloremic acidosis, which may be mistaken for acidosis due to shock.
- ✓ Ringer's lactate solution and Hartmann's solution have lower chloride levels but also lower sodium levels, which makes them less useful in dengue shock patients with hyponatraemia.
- ✓ In practice, it is usual to start with normal saline for one or two boluses.
- ✓ If more saline is required, check serum chloride level, and if it is increasing and causing acidosis, then it is advisable to alternate with Ringer's lactate or Hartmann's solution.

SLIDE 11: What IV fluids should not be used?

- 🗣️ **Facilitator** asks participants, “Why not use glucose solutions?”
- 🗣️ **Facilitator** give participants a few moments to answer, then explains:
 - ✓ Patients with shock experience physiological stress.
 - ✓ High levels of cortisol and adrenergic hormones cause blood glucose levels to be elevated.
 - ✓ Young infants with poor feeding and reduced glycogen reserves or those with severe liver impairment may experience hypoglycaemia.
 - ✓ It is important to check blood glucose level regularly and correct with smaller volumes of 1–2 ml/kg of Dextrose 10% and maintain it within the normal range with a slow glucose infusion.
- 🗣️ **Facilitator** asks participants, “Why not give fresh frozen plasma or albumin?”
- 🗣️ **Facilitator** gives participants a few moments to respond, then explains:
 - ✓ Fresh frozen plasma and albumin also leak out during the critical period.

SLIDE 12: Why isotonic fluids?

- 🗣️ **Facilitator** explains:
 - ✓ The goal of IV fluid therapy in treating dengue patients is to keep as much fluid as possible in the intravascular space to minimize fluid accumulation and risk of fluid overload.
 - ✓ Whereas 1 litre of 0.45 NaCl results in only 83 cc staying in the intravascular space and the rest being redistributed into intracellular and interstitial compartments, 1 litre of 0.9 NaCl results in 250 cc (25%) staying in the intravascular space.
 - ✓ Therefore, the use of hypotonic fluids leads to perpetuation of shock with fluid overload in the extravascular compartment.

SLIDE 13: What happens in the critical phase?

- 🗣️ **Facilitator** explains that in a capillary leak situation:
 - ✓ vascular space contracts while extracellular fluid (ECF) expands;
 - ✓ infusion of isotonic crystalloids leads to further expansion of ECF; and
 - ✓ infusion of hypotonic solution leads to further expansion of both ECF and intracellular fluid (ICF), resulting in increased total body water.

SLIDE 14: Colloid therapy in dengue shock

- 🗣️ **Facilitator** explains:
 - ✓ Colloids are given for hypotensive shock, repeated shock, after >20–30 ml/kg of crystalloids, or when HCT does not decrease.
 - ✓ Colloids are larger molecules that do not pass across diffusional barriers as readily as crystalloids.
 - ✓ Colloids have a greater tendency to stay put in the vascular space and expand the plasma volume than crystalloids.
 - ✓ The use of colloid therapy may be able to avoid excessive use of crystalloids.

SLIDE 15: Why use colloid therapy in dengue shock?

🗣️ **Facilitator** explains:

- ✓ In situations where significant bleeding has occurred, a bolus of colloid will bring about a more pronounced reduction in HCT.
- ✓ Types of colloids: gelatin-based, dextran-based and starch-based solutions.

Side-effects:

- ⚠️ One of the biggest concerns regarding the use of colloids is their impact on coagulation. Theoretically, dextran binds to von Willebrand factor/Factor VIII complex and impairs coagulation the most.
- ⚠️ However, this outcome was not observed to have clinical significance in fluid resuscitation in dengue shock.
- ⚠️ Gelatin has the least effect on coagulation but the highest risk of allergic reactions. Allergic reactions such as fever, chills and rigors have also been observed in Dextran 70;
- ⚠️ Dextran 40 can potentially cause an osmotic renal injury in hypovolaemic patients.

SESSION 8.4A: HOW MUCH IV FLUID TO GIVE

SLIDE 16: How much fluid to give and how fast?

🗣️ **Facilitator** explains:

- ⚠️ It is crucial not to overdo IV fluid therapy in dengue patients because of capillary permeability.
- ⚠️ Always titrate the volume and rate of infusion of resuscitation fluid according to the patient's haemodynamic state and age.
- ⚠️ You must not delay IV infusion when there is shock, but give only just enough IV fluid to correct the shock.

🗣️ **Facilitator** asks participants, "What does 'titrate IV fluid to haemodynamic state' mean?"

🗣️ **Facilitator** gives participants a few moments to respond, then explains:

- ⚠️ After every bolus of fluid, immediately reassess the haemodynamic responses. This will tell you whether to reduce or continue reducing the IV infusion rate and thus prevent excessive fluid accumulation.
- ⚠️ After correction of shock, do a step-wise reduction of IV fluids whenever the haemodynamic state is stable and when the rate of plasma leakage decreases towards the end of the critical phase.

Indicated by:

- ⚠️ improving haemodynamic signs;
- ⚠️ increasing urine output;
- ⚠️ adequate oral fluid intake; and
- ⚠️ HCT decreases below baseline value in a stable patient (i.e. patient has normal SBP, pulse pressure, HR).

MODULE 8A: IV fluid principles

SLIDE 17: How much fluid to give and how fast? (cont.)

Facilitator explains:

- ⚠ The more severe the shock, the larger the volume of fluid and faster the infusion rate required to bring the patient out of shock.
- ⚠ Hypotensive shock is more severe than compensated shock.
- ⚠ Hence, the rate of infusion should be faster and the volume of resuscitation fluid should be larger for patients in hypotensive shock than in compensated shock.
- ⚠ If the blood pressure is maintained but signs of reduced perfusion are already present, it is prudent to infuse a small volume over a slightly long period of time in order not to overdo the IV fluid therapy.
- ⚠ Children have more body water than adults and the capillary permeability is more pronounced in children than in adults. Hence, children will usually require a larger volume of IV fluids.

SESSION 8.5A: WHEN TO STOP IV FLUIDS

SLIDE 18: When to stop IV fluids

Facilitator explains:

- ✓ Stopping IV therapy is an important milestone in dengue management.
- ✓ Doctors are keen to start IV fluid therapy, but some are reluctant to stop it.
- ✓ A step-wise reduction of the IV fluid infusion rate will eventually lead to the stopping of IV fluid therapy.
- ✓ However, several circumstances (shown on slide) may demand a faster reduction or a definite stop to IVF therapy.

SESSION 8.6A: SUMMARY

SLIDE 19: Summary of IV fluid therapy

Facilitator summarizes as follows:

- ✓ Timely judicious administration of the correct amount and type of IV fluid is the keystone to dengue clinical management.
- ✓ It is important to strike a balance between giving too much and not enough IV fluid.
- ✓ The goal is to improve circulation and tissue perfusion to the point that HCT decreases to normal, capillary refill time is less than 2 seconds, heart rate normalizes, urine output is adequate (but not excessive) and blood pressure and pulse pressure normalize.

SESSION 8.7A: CALCULATIONS & QUICK REFERENCE TABLES

SLIDE 20: Calculations for normal maintenance of IV fluid infusion



SLIDE 21: Calculations for overweight and obese patients

SLIDE 22: Calculations for overweight and obese children



SLIDES 23–25: Quick reference tables

Facilitator asks participants if they have any questions before moving on to the case studies.

Case Studies #7 & 8

SESSION CS7–CS8: Case Studies #7 & 8		
Objective	Ensure correct management of the outpatient	
Materials	Case Studies #7 & 8	
	Duration	30 minutes (15 minutes for each case study)
	Training method	Individual work
<p>Steps:</p> <ul style="list-style-type: none">1. Facilitator hands out Case Studies #7 & 8 to each participant.2. Facilitator tells participants they have 15 minutes to complete each case study on their own.3. After 30 minutes, the facilitator asks participants to hand in their case study responses.		

MODULE 8B: Management of Group B

Module 8B: Management of Group B		
	Duration	20 minutes
	Training method	Lecture Practical session (Case Study #9)
<p>Facilitator's notes:</p> <h2>SESSION 8.1B: MANAGEMENT OF GROUP B</h2> <h3>SLIDE 1: Management of Group B patients</h3> <hr/> <h3>SLIDE 2: Summary of management of treatment groups</h3> <p>Facilitator explains:</p> <ul style="list-style-type: none">✓ This slide is a reminder of the types of patients who should be categorized into treatment Groups A, B and C.✓ Disease notification of suspected case to assist vector control efforts and to inform the public. <hr/> <h3>SLIDE 3: Inpatient management</h3> <p>Facilitator explains:</p> <ul style="list-style-type: none">✓ Group B patients are those with warning signs but not in shock.✓ Patients in shock should be treated as Group C patients.✓ Try to obtain a HCT sample before starting IV fluid therapy.✓ Start with isotonic crystalloids; administer 5 to 7 ml/kg/hour for 1 to 2 hours.✓ Follow up with a reassessment of the patient's haemodynamic status.✓ If the patient's clinical condition has improved or oral intake has improved, reduce IV fluids using a step-wise approach.✓ Continue to monitor patient until he or she is out of the critical phase.✓ IV fluids should be stopped within 24 to 48 hours. <hr/> <h3>SLIDE 4: Group B: Dengue with warning signs (not in shock) - no improvement after first bolus.</h3> <p>Facilitator explains:</p> <ul style="list-style-type: none">✓ Reassess hemodynamic state after 2 hours of IVF: vital signs, 5-in-1 magic touch and urine volume.✓ If patient's condition has not improved, check HCT.✓ If HCT is increasing or still high, increase IV crystalloids to 5–10 ml/kg for another 1 to 2 hours.✓ A reassessment of the hemodynamic state should be repeated. <hr/> <h3>SLIDE 5: Group B: Dengue with warning signs (not in shock) - no improvement after first bolus (cont.)</h3> <p>Facilitator explains:</p> <ul style="list-style-type: none">✓ If the patient's haemodynamic state improves after a higher second bolus of fluid, carry out a step-wise reduction of IV fluids as shown in green boxes.✓ However, if after the first 2 hours of IV fluid therapy the patient does not improve, and a HCT check shows a decreasing HCT, look for evidence of bleeding and consider moving to the algorithm for Group C patients.		

SLIDE 6: Dengue with warning signs – What do you monitor?

🗣️ **Facilitator** adds:

- ⚠️ Young children have less hepatic reserve and may need glucose added to IV fluids earlier than adults.

SLIDE 7: Dengue with co-existing conditions but without warning signs

SLIDE 8: Dengue with co-existing conditions but without warning signs (cont.)



🗣️ **Facilitator** invites participants to break for tea and asks them to reconvene in 15 minutes.

TEA BREAK

🗣️ **Facilitator** welcomes participants back from the tea break and states, “We will now work on Case Study #9.”

Case Study #9

SESSION CS9: Case Study #9

Objective	How to correctly manage the dengue patient with warning signs	
Materials	Case Study #9	
	Duration	20 minutes
	Training method	Individual work



Steps:

- 🗣️ **Facilitator** hands Case Study #9 to each participant.
- 🗣️ **Facilitator** tells participants they have 10 minutes to complete the case study on their own.
- 🗣️ After 10 minutes the **facilitator** goes over the case study and provides correct answers.
- 🗣️ **Facilitator** tells participants, “We will now conduct to a role-play exercise before heading to lunch.”

LUNCH

🗣️ **Facilitator** welcomes participants back from lunch.

🗣️ **Facilitator** tells participants, “We will now move on to the second role-play.”

Instructions for Role-Plays I & II are provided separately.



MODULE 8C: Management of Group C

MODULE 8C: Management of Group C

By the end of Module 8C, the participants will KNOW/UNDERSTAND:

- how to manage the Group C patient.

Module 8C: Management of Group C

	Duration	95 minutes (45-minute lecture, 50 minutes for Case Study #10)
	Training method	Lecture Practical session (Case Study #10)

Facilitator's notes:

SESSION 8.1C: EMERGENCY TREATMENT

SLIDE 1: Management of Group C: severe dengue

 **Facilitator** explains:

- ✓ Group C patients require emergency treatment and urgent referral when they have severe dengue.

SLIDES 2: Emergency treatment for patient in compensated shock

 **Facilitator** explains:

- ✓ One initial high crystalloid bolus of 20cc/kg is not where physicians run into trouble.
- ⚠ Avoid reflex repeat boluses of 20cc/kg, followed by 20cc/kg, and another 20cc/kg. This by definition is refractory shock.
- ⚠ Physicians need to think before giving large boluses to dengue patients.
- ⚠ They are not your dehydrated child with acute gastroenteritis.
- ⚠ Patients may need an early colloid infusion or a blood product depending on what the vital signs and haematocrit are telling you.

SLIDE 3: Emergency treatment for patient in compensated shock - improvement after first bolus

- ✓ Each bolus of fluid should be followed by a clinical assessment of hemodynamic state - vital signs and peripheral perfusion.
- ✓ If patient improves after first bolus, reduce IVF gradually in step-wise manner. (Do not reduce straight-away to maintenance rate.) For example, if the patient required a bolus of 10 ml/kg over 1 hour to achieve improvement, then IVF rate should be reduced to 7 ml/kg/hr for another 1 to 2 hours.
- ✓ Clinical assessment and HCT should be repeated every 3 to 6 hours to ensure that hemodynamic stability is maintained as IVF rate is being reduced step-wise. Improvement is accompanied by reducing trend in HCT.
- ✓ Do remember that plasma leakage is still on-going for perhaps another 24 to 36 hours. Only by closely monitoring the clinical situation will you identify the need for further boluses – such as with tachycardia, reduced peripheral perfusion, etc.

- ✓ However after every step-up in IVF rate there should be a reassessment to ensure improvement and then a step-down again in IVF rate.
- ✓ Improved oral intake and urine output are good indicators of a stable hemodynamic state. It is important to further reduce IVF rate so that it can be stopped by 24-48 hours of defervescence or onset of shock.

SLIDE 4: Emergency treatment for patient in compensated shock - no improvement after first bolus

- ✓ After the first bolus of fluid, the patient does not show signs of improvement, do a HCT check.
- ✓ If HCT is still high or increases, this indicates further plasma leakage.
- ✓ A larger bolus of crystalloid, ranging from 10 to 20 ml/kg/hr, should be given. It is important to switch to a **colloid solution** if this is a repeat shock situation where several previous boluses have been given.
- ✓ Every bolus should be followed by a clinical assessment of the hemodynamic response.
- ✓ If the hemodynamic state improves, IVF should be reduced to 7–10 ml/kg/hr for another 1–2 hours, followed by a step-wise reduction in IVF rate.
- ✓ However, if the patient does not show improvement, then a recheck of HCT is indicated.

SLIDES 5: Emergency treatment - bleeding?

🗣️ **Facilitator** explains:

- ✓ After the first bolus of fluid, if the patient does not show signs of improvement, do a HCT check.
- ✓ A decreased or lower than normal baseline HCT in a patient with unstable hemodynamic state should make you suspicious of significant bleeding.
- ✓ Look for signs of severe bleeding – orogastric tube could be passed. Check for previous failed venepuncture attempts or menorrhagia or post-partum bleeding where relevant.
- ✓ If severe bleeding is present, for example, uterine blood loss after delivery or copious coffee grounds in gastric aspirate, then fresh whole blood or fresh packed red cells (less than 5 to 7 days old) should be transfused urgently to restore tissue oxygenation.
- ✓ While waiting for blood to be available, give a small volume of colloid. Discontinue colloid infusion when blood is transfused to avoid fluid overload.
- ✓ The hemodynamic state will improve after the blood transfusion. Step-wise reduction of IVF rate should be carried out.

SLIDE 6: Emergency treatment - bleeding (cont.)

🗣️ **Facilitator** explains:

- ✓ After the first bolus of fluid, if the patient does not show signs of improvement, check HCT to determine if it is low or decreasing.
- ✓ If no severe overt blood loss is identified, give a bolus of colloid (10–20 ml/kg) over 1 hour.
- ✓ Follow up with a re-evaluation of haemodynamic state.
- ✓ If haemodynamic state improves, continue with step-wise reduction of IV fluids.
- ✓ However, if haemodynamic state does not show any stability after the colloid infusion, transfuse fresh blood urgently (as in previous slide). The HCT level will be reduced significantly.

SLIDE 7: Emergency treatment – summary

🗣️ **Facilitator** summarizes as follows:

- ✓ A rapid bolus of IV fluids should always be followed immediately by a clinical evaluation of the haemodynamic responses to that bolus.
- ✓ If patient improves, do a step-wise reduction of IV fluids, with regular monitoring of haemodynamics and HCT.
- ✓ If HCT is still high, give a second bolus of crystalloid or switch to colloid. Re-assess for improvement. If improved, continue with step-wise reduction.
- ✓ If HCT is low, suspect significant bleeding and look for it.
- ✓ If positive, transfuse fresh blood as soon as possible. If not, repeat a bolus of colloid.
- ✓ Re-evaluate. If improved, continue step-wise reduction. If no improvement, transfuse fresh blood urgently.

SLIDE 8: Summary of management of dengue

🗣️ **Facilitator** explains:

- ✓ Notify authorities of suspected case to assist vector control efforts and to inform the public.

🗣️ **Facilitator** warns:

- ⚠️ The fluid management algorithm for hypotensive shock is similar to that in compensated shock except for
 - ✓ larger initial volume given within a shorter period of time;
 - ✓ after initial improvement, a further 10 ml/kg/hr for 1 hour, followed by step-wise reduction in IVF with frequent reassessment;
 - ✓ earlier use of colloids if available;
 - ✓ to look actively for possible bleeding; and
 - ✓ prophylactic platelet transfusion not indicated.

Slide 9: Haemodynamic assessment - continuum of haemodynamic changes

Slides 10–15: Emergency treatment for patient in hypotensive shock

🗣️ **Facilitator** uses animation guide and talks through the slide.

SLIDE 16: Emergency treatment summary: compensated shock and hypotensive shock comparisons

🗣️ **Facilitator** warns:

- ⚠️ Note the similar principles of IVF – clinical assessment of haemodynamic state directs IVF therapy, HCT is only to guide – to use colloid or crystalloid or think about bleeding.
- ⚠️ Try to obtain blood samples for CBC, grouping and cross-matching blood for all shock patients.
- ⚠️ After a bolus of fluid is given, assess haemodynamic state.
- ⚠️ If improved, step-wise reduce the IVF rate (green boxes and arrows).
- ⚠️ If clinical state does not improve, check HCT.
- ⚠️ If HCT is raised, then repeat a bolus of crystalloid or colloid. Remember when you should switch to colloid (orange boxes and arrows).
- ⚠️ If HCT is low or coming down, then suspect bleeding and follow the pink boxes and arrows.

SLIDE 17: Pitfalls in navigation

🗣️ **Facilitator** warns:

⚠️ The principles of fluid management are simple, but it is easy to get them wrong!

🗣️ **Facilitator** reads the case study from the slide.

🗣️ **Facilitator** encourages responses from the participants.

🗣️ **Facilitator** provides explanation.

SLIDE 18: Group C pitfalls

🗣️ **Facilitator** points to red star (decreased HCT) and green star (improved but no HCT value).

SLIDE 19: Pitfalls in navigation (cont.)

🗣️ **Facilitator** uses animation and reads continuation.

SLIDE 20: Group C pitfalls (cont.)

🗣️ **Facilitator** points to the green stars and warns:

⚠️ This is one of ways patients become overloaded with fluid. HCT has replaced platelet count as the target of dengue management.

⚠️ The reason for the big drop in HCT from 55% to 43% is because HCT was sampled immediately after a large bolus of fluid, but the patient is stable.

⚠️ Had the clinician waited for another 10 to 20 minutes after completion of bolus before repeating HCT level, it might be higher than 43%, after redistribution into the extravascular space. However, the most important point to bear in mind is that the patient is stable after the bolus.



SLIDE 21: How to avoid the trap?

🗣️ **Facilitator** warns:

✓ The only way not to be caught in this trap is to focus first on haemodynamic evaluation, then consult HCT when the patient is unstable.

🗣️ **Facilitator** informs participants, "We will now focus on Case Study #10."

Case Study #10

SESSION CS10: Case Study #10		
Objective	Correctly manage a patient with dengue shock in the emergency department	
Materials	Case Study #10	
	Duration	50 minutes
	Training method	Group work
Steps: <ul style="list-style-type: none">🗨️ Facilitator asks participants to form four groups and select a rapporteur for each group.✓ Facilitator presents each step of the case study on screen, asks each group to discuss and decide on a response to be given by their rapporteur.✓ Each rapporteur has a few minutes to share with the class. This process repeats until the case is resolved.✓ Facilitator praises correct answers and gently corrects wrong answers.✓ Facilitator informs participants, "This is the end of Day 2. Have a nice evening and see you tomorrow!"		

DAY 3



Objectives for Day 3

At the end of the day, participants will be able to:

- know how to manage a dengue patient in Group C.

Materials required for Day 3



- Flip chart
- Marker pens
- PowerPoint presentations (Module D)
- Practical session exercises (Case Studies #11, 12, 13, 14, 15 and 16)
- Facilitator's manual
- Participant handouts

MODULE 8D: Monitoring and managing other aspects of dengue

Time	Session	Activity
5 minutes	8.1D	Monitoring Group C patients
5 minutes	8.2D	Monitoring organ function
15 minutes	8.3D	Risks for bleeding
15 minutes	8.4D	Other complications: fluid overload
5 minutes	8.5D	Other issues: biochemistry, metabolic acidosis, nosocomial infections
5 minutes	8.6D	Supportive care
15 minutes	8.7D	Management of acute kidney
5 minutes	8.8D	Discharge criteria
3 hours	CS11–CS16	Case Studies # 11–16
4 hours, 10 minutes		



MODULE 8D: Monitoring and managing other aspects of dengue

MODULE 8D: Monitoring and managing other aspects of dengue

By the end of Module 8D, participants will KNOW/UNDERSTAND:

- how to monitor a dengue patient in group C;
- how to manage the medical complications of dengue including glucose and electrolyte disturbances; and
- when the patient is ready to be discharged from hospital.

Module 8D: Monitoring and managing other aspects of dengue

	Duration	75 minutes (1 hour 15 minutes) plus 3 hours of practical work with break in between.
	Training method	Lecture Practical sessions (case studies # 11–16)

Facilitator's notes:

SESSION 8.1D: MONITORING GROUP C PATIENTS

SLIDE 1: Monitoring and management of other aspects of dengue

SLIDES 2 & 3: Group C: monitoring and action

 **Facilitator** explains:

- ✓ Detailed fluid balance should be maintained.
- ✓ In general, the higher the infusion rate the more frequently the patient should be monitored and reviewed in order to avoid fluid overload while ensuring adequate fluid replacement.
- ✓ Parameters to be monitored include vital signs and peripheral perfusion: CCTV-R = Colour, capillary refill time, temperature of extremities, pulse volume and pulse rate..
- ✓ Observations should be made every 15–30 minutes until the patient is out of shock, then move to every 1–2 hours.
- ✓ If resources are available, insertion of arterial lines can be very useful when patient is in shock as estimation of blood pressure by cuff is commonly inaccurate. Arterial catheters allow for continuous BP measurements and frequent blood sampling.
- ✓ Monitoring of ECG and pulse oximetry should be available in the high dependency and intensive care units (HDU/ICU).
- ✓ Nursing care needs to be of the highest standard, and strict monitoring of the patient's condition is paramount.

SLIDE 4: Pearls: Group C monitoring and action

 **Facilitator** explains:

- ✓ It is useful to estimate the start of significant plasma leakage by reviewing the patient's history and CBC.
- ✓ The time of onset of warning signs or dizziness/syncope or defervescence or thrombocytopenia or rising HCT give a fair indication of the start of plasma leakage.
- ✓ If the patient presents in shock, assume plasma leakage started at least a few hours before presentation. In this case, it is better to use warning signs.

- ✓ Project 36 hours and 48 hours from this time point. At 24 to 36 hours, IVF should be reduced so that it can be discontinued by 48 hours from the estimated start of plasma leakage.
- ✓ Before this time, plasma leakage is still active. Further boluses of fluids may be required.
- ✓ Volume and rate of infusion should be titrated to haemodynamic responses. Step-wise reduce IV fluids if patient improves.
- ✓ A detailed chart of all input and outputs should be maintained and reviewed regularly.
- ✓ Empower parents or patients to record all oral fluid intake and urine output. Review this chart!

SLIDE 5: Pearls: Group C monitoring and action (cont.)

- 🗣️ **Facilitator** uses animation guide and talks through the slide.

SLIDE 6. Pitfall: Group C monitoring and action

- 🗣️ **Facilitator** uses animation guide and talks through the slide.

SESSION 8.2D: MONITORING ORGAN FUNCTION

SLIDE 7. Monitoring organ function

- 🗣️ **Facilitator** uses animation guide and talks through the slide

SESSION 8.3D: RISKS FOR BLEEDING

SLIDE 8: Risks for bleeding

- 🗣️ **Facilitator** warns:

- ⚠️ Patients with minor bleeds stabilize after fluid resuscitation and do not have severe bleeds, even with very low platelet counts.
- ⚠️ The major bleeds are the main concerns.
- ⚠️ Hypotensive shock and renal or liver failure and/or severe and persistent metabolic acidosis are signs of a major bleed.

- 🗣️ **Facilitator** reminds participants, “Things come as a package.” You may not see the occult bleed, but you can see the liver/renal failure and metabolic acidosis. So these are clues that there is an occult bleed.

SLIDE 9: Group C: Haemorrhagic complications

SLIDE 10: Pearls: How to recognize severe bleeding

- 🗣️ **Facilitator** explains:

- ✓ Almost all significant bleeds occur internally, usually in the gastrointestinal tract, and clinical recognition of a bleed can be significantly delayed.

- ⚠️ Suspect this possibility if the patient has unstable haemodynamic state PLUS any one of the following:

- persistent and/or severe overt bleeding, regardless of the HCT level
- a decreased HCT after fluid resuscitation, especially with colloids
- hypotensive shock with low/normal HCT before fluid resuscitation
- refractory shock
- persistent metabolic acidosis.

- ⚠️ Recognize this possibility as soon as possible rather than after giving several boluses of IV fluid with no effective haemodynamic response or waiting until you see the actual bleeding or the HCT has become very low.
- ⚠️ It might be too late then because shock would have been very prolonged and too much fluid accumulation in 3rd space makes breathing very difficult.
- ✓ First, consider actual bleeding that is overt, such as in immediate post-partum period or massive haematemesis.
- ✓ The HCT may not have decreased (if not much IV fluid has been given), but this amount of blood loss should be replaced immediately. Try to catch up with further blood losses.

Be alert if there is a decreased or low HCT after fluid resuscitation and patient is not achieving haemodynamic stability (refer to algorithm).

- ⚠️ Hypotensive shock is more severe than compensated shock. If it is entirely due to plasma leakage, HCT should be very high, perhaps high 50s or even 60s in hypotension before IV fluid resuscitation.
- ⚠️ If you notice that HCT is only mildly or moderately elevated in hypotensive shock before IV fluid therapy, you should suspect significant bleeding.
- ⚠️ Refractory shock – unable to achieve lasting haemodynamic stability despite several fluid boluses (crystalloids or colloids).
- ✓ Other components of the occult bleeding “package” are an unstable patient with persistent metabolic acidosis and severe organ impairment (the kidney is especially susceptible to hypovolaemic shock).

SLIDES 11 & 12: Group C: Emergency treatment of haemorrhagic complications

SLIDE 13: Prophylactic platelet transfusions

SLIDE 14: Pathophysiology of thrombocytopenia

🗣️ **Facilitator** explains:

- ✓ In dengue virus infections, there are several mechanisms by which platelets are either destroyed or production is suppressed.
- ✓ First, there is bone marrow suppression early in the course of the disease (as there is with other viral infections).
- ✓ In addition, there is peripheral immune mediated platelet destruction via dengue virus binding to platelets in the presence of dengue virus antibodies.
- ✓ Until this process is turned off, giving platelets is not helpful.
- ✓ Platelets aggregate to endothelium infected with dengue virus, inducing aggregation, lysis and platelet destruction or clearance by macrophages.
- ✓ Another possible mechanism is haemophagocytosis.
- ✓ Even when a patient is actively bleeding, platelets are not helpful. It is better to keep up with blood loss by blood transfusion.

SESSION 8.4D: OTHER COMPLICATIONS: FLUID OVERLOAD

SLIDE 15: Other complications

🗣️ **Facilitator** explains:

- ✓ Fluid accumulation and overload is bound to happen in dengue disease and management.
- ✓ However, if care is not taken it can be excessive and will lead to life-threatening complications.
- ✓ Excessive fluid accumulation is caused by a combination of increased capillary leak PLUS one or more of the following factors:
 1. Excessive and/or too rapid IVF
 2. Use of hypotonic rather than isotonic fluids
 3. Transfusion of fresh frozen plasma, platelet concentrates and cryoprecipitate to correct coagulation parameters.
 4. Continuation of IVF after period of plasma leakage
 5. Co-morbid states such as congenital or ischaemic heart disease, chronic lung disease and renal disease where the threshold to tolerate excessive fluid is much lower.
- ✓ Often, the problem comes as a package.

SLIDE 16: Clinical features of fluid overload

🗣️ **Facilitator** explains:

- ✓ Fluid accumulation causes pleural effusion and ascites.
- ✓ As fluid accumulation increases, the patient experiences increasing breathing difficulty.
- ✓ Any metabolic acidosis due to unresolved shock would add to the breathing difficulties.
- ✓ In the late stage, raised JVP, wheezing, severe shortness of breath, hypertension and bounding pulses indicate severe expansion of the intravascular volume.
- ⚠️ Liver congestion can cause epigastric or abdominal pain and could be misinterpreted as a warning sign with disastrous consequences.
- ⚠️ If IVF is not discontinued immediately, pulmonary edema causes hypoxemia. Heart failure may occur if the heart is extremely dilated.
- ⚠️ Hemodynamic instability and cardio-respiratory failure will follow if this is misinterpreted as hypovolemia.
- ✓ Pulmonary edema - cough with pink frothy sputum + crepitations, cyanosis.

SLIDE 17: Case 1, Scenario 1

🗣️ **Facilitator** reads the case study from the slide.

🗣️ **Facilitator** discusses the following issues with the participants:

- ✓ Does the patient fulfil the criteria for “probable dengue”?
- ✓ What do haemodynamic findings indicate? – Afebrile but tachycardia
- ✓ In which phase of disease would you put the patient?
- ✓ What is the cause of shock? – Plasma leakage, high HCT, very low platelet counts.
- ✓ What do you think of the volume of IV fluids? – Probably second bolus should be less and at lower rate.
- ✓ What would be the indication for blood transfusion?
- ✓ This patient received 1200 ml X 2 = 2400 ml of fluid followed by blood transfusion.

SLIDE 18: Case 1, Scenario 1 (cont.)

- 🗣️ **Facilitator** informs participants about the patient presented in the case study:
- ✓ Six hours after shock presentation, he had received 2900 ml of IV fluids:
 - 20 ml/kg crystalloids
 - 20 ml/kg colloids
 - 500 ml whole blood transfusion
- ✓ His haemodynamic state is good – good peripheral perfusion – good pulse volume, warm extremities, brisk capillary refill time.
- ✓ Reduced breath sounds on the right base suggest right pleural effusion.
- ✓ Positive fluid balance of 2200 cc was noticed within 6 hours of presentation.
- ✓ Chest X-ray indicated cardiomegaly.
- ✓ Congested pulmonary vessels with “bat wings” appearance.
- ✓ Blunted costophrenic angle suggests pleural effusion.
- ✓ ABG is also suggestive of stable circulation.
- ✓ Intravascular compartment has been expanded too much.
- ✓ “Package of intravascular volume expansion”: Haemodynamic parameters indicate stability – good perfusion, vital signs, urine output, chest X-ray showing cardiomegaly and normal ABG.

SLIDE 19: Case 1, Scenario 2

- 🗣️ **Facilitator** explains to the participants what followed:
- ✓ IV fluid therapy continued for another 20 hours (total of 26 hours from presentation in shock).
- ✓ The patient complained of shortness of breath and was wheezing.
- ✓ Physical exam showed he was alert, tachypnoeic, and showing signs of tachycardia, hypertension and generalized rhonchi. Chest X-ray showed cardiomegaly and severe pulmonary oedema.
- ✓ I/O chart - positive balance of 5500 ml
- ✓ Acid-base balance – normal
- ✓ Average urine output – 1.7 ml/kg/hr
- 🗣️ **Facilitator** asks participants, “What is the volume of intravascular fluid compartment?”

- 🗣️ **Facilitator** explains:
- ✓ Intravascular volume is even more expanded than in scenario 1 – higher blood pressure, good peripheral perfusion and even larger positive fluid balance.
- ✓ Note that tachycardia and pulmonary oedema indicate that patient will not be able to tolerate any further IV fluids.
- 🗣️ **Facilitator** presents the second case study to the participants ahead of showing slide 20.
- ✓ A 6-year-old girl was admitted on day 5 of illness with warning signs.
- ✓ About 20 hours after admission, the patient developed shock and received several boluses of fluids including blood transfusion.
- ✓ About 45 hours after her admission, she was still in poor state and had a positive fluid balance of 4200 ml.

SLIDE 20: Case 2

🗣️ **Facilitator** shares the findings of the chest X-ray with the participants:

- ✓ large pleural effusion;
- ✓ small heart and right heart border is hardly visible.

🗣️ **Facilitator** explains:

- ✓ Patient was intubated for severe respiratory distress from metabolic acidosis and fluid accumulation.
- ✓ She was very acidotic.
- ✓ Patient has small intravascular compartment; most of fluid given has leaked into 3rd space.
- ✓ Children have more leaky capillaries than adults.
- ✓ Average urine output was 0.5 ml/kg/hr. She had several hours of oliguria.

SLIDE 21: Additional investigations performed on case 2

SLIDE 22: Management of fluid overload

🗣️ **Facilitator** explains:

- ✓ The first step in managing fluid overload is to determine the status of the intravascular volume: Is it expanded or contracted?
- ✓ This is done by tracking all fluids given since admission PLUS:
 - reviewing the haemodynamic responses to each fluid bolus;
 - monitoring HCT before and after bolus;
 - monitoring urine output; and
 - monitoring any other fluid/blood losses.
- ✓ Chest radiograph may reveal the heart size and state of pulmonary vessels.
- ✓ An echocardiogram may be able to estimate the Left Ventricle End Diastolic Diameter.
- ✓ Acid-base balance. By reviewing all these factors you can develop a composite picture of the intravascular volume compartment – whether it is contracted or expanded.
- ✓ The next step is to determine the phase of illness: Is the patient close to recovery/reabsorption phase or still in the critical phase?

SLIDE 23: Management of fluid overload in a stable patient

🗣️ **Facilitator** explains:

- ✓ Based on previous evaluations, if the patient is stable, the intravascular volume is well filled.

🗣️ **Facilitator** asks participants, “Is the patient out of the critical phase yet?”

- ✓ If the patient is not yet out of the critical phase, it is not advisable to stop fluids altogether.
- ✓ A step-wise reduction should be carried out as per algorithm.
- ✓ During this phase, do not use diuretics and monitor IVF with care.
- ✓ An example of this is Case 1, Scenario 1 (6 hours after shock presentation). The patient was stable, had good urine output and had a big heart on the chest X-ray.
- ✓ If the patient is at the end of the critical phase or is already in the recovery phase, then all IV fluids should be stopped.
- ✓ An example is Case 1, Scenario 2 (26 hours after shock presentation). The patient had >5L positive balance, good peripheral perfusion, hypertensive, etc.
- ✓ Small doses of furosemide – 0.1 to 0.5 mg/kg/dose – may help relieve the fluid congestion.

🗣️ **Facilitator** asks participants, "What would the HCT level be?"

- ✓ Depends on what doctor has given – fluids or blood!
- ✓ If the patient has received only crystalloids or colloids, then HCT should be normal or on the low side. If he or she has received blood transfusion, HCT may be increased.

SLIDE 24: Management of fluid overload: stopping IV fluids

SLIDES 25 & 26: Management of fluid overload in an unstable patient

🗣️ **Facilitator** explains:

- ✓ When an unstable patient has fluid overload, the administered fluid continues to leak into the extravascular compartment while the intravascular compartment remains contracted.
- ✓ For example, Case 2 had severe capillary permeability and remained in hypovolaemic shock despite several boluses of fluid.
- ✓ Check HCT:
- ✓ If HCT is high, use colloids at a slower infusion rate of 5 to 10 ml/kg/hour until patient improves. Then do step-wise reduction.
- ✓ If HCT is low or normal, transfuse fresh whole blood or packed cells urgently.
- ✓ After improvement, do step-wise reduction with colloids.
- ✓ Both colloids and fresh blood may be required to stabilize the patient.

SESSION 8.5D: Other issues: biochemistry, metabolic acidosis, nosocomial infections

Slides 27 & 28: Other issues to be managed

SESSION 8.6D: SUPPORTIVE CARE

Slides 29 & 30: Supportive care and adjunct therapy

SESSION 8.7D: MANAGEMENT OF ACUTE KIDNEY

Slide 31: Management of acute kidney injury

SESSION 8.8D: DISCHARGE CRITERIA

Slide 32: Discharge criteria


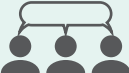
🗣️ **Facilitator** tells participants, "That concludes the lectures for the course. We will now work on two case studies, after which we will break for tea."

Case Studies #11, 12, 13, 14, 15 and 16

Day 3: Case Study Schedule

Time	Session	Activity
30 minutes	CS11	Case Study #11
30 minutes	CS12	Case Study #12
TEA BREAK		
30 minutes	CS13	Case Study #13
30 minutes	CS14	Case Study #14
30 minutes	CS15	Case Study #15
30 minutes	CS16	Case Study #16
LUNCH BREAK		

SESSIONS CS11–CS16: Case Studies # 11, 12, 13 , 14, 15 & 16

Objective	How to correctly manage the patient with severe dengue, with complications.	
Materials	Case Studies #11,12, 13, 14, 15, 16 (total 6 case studies)	
	Duration	3 hours with 15-minute tea break in between Facilitator is the time-keeper!
	Training method	Group work

Steps:

- ✓ **Facilitator** divides the participants into four groups and asks each group to select a rapporteur.
- ✓ **Facilitator** presents each step of a case study on screen, asks each group to discuss and decide on a response to be given by their rapporteur.
- ✓ Each rapporteur has a few minutes to share with the class. This process repeats until the case is resolved.
- ✓ Case studies #11 and 12 can be done before taking a break.
- ✓ **Facilitator** praises correct answers and gently corrects wrong answers.
- ✓ After completing Case Study #12, the **Facilitator** announces, “We will now break for tea. Please return promptly in 15 minutes, after which time we will continue to work through Case Studies #13, 14, 15 and 16.

TEA BREAK

- ” **Facilitator** welcomes participants back from the tea break and asks them to go back into their groups to continue the case study assignments.
- ” **Facilitator** informs the groups that, “ We will continue using the same method we used to complete the case studies before the tea break, until Case Studies #13, 14, 15 and 16 have been completed.
- ” **Facilitator** invites participants to lunch and requests participants to return at 13:30 for the course wrap-up.

LUNCH

Course Wrap-up (60 minutes)



- 🗨️ **Facilitator** welcomes participants back from lunch.
- 🗨️ **Facilitator** concludes the course in a few words.
- 🗨️ **Facilitator** hands out a piece of paper and asks for participants' feedback, informing them that any information shared will be kept strictly confidential.
- 🗨️ **Facilitator** asks participants to answer the following questions:
 1. What did you enjoy most about the course?
 2. What did you enjoy least about the course?
 3. Were there any sessions that you think were not relevant to the course?
 4. Are there any topics you think should be added to the course?
 5. Were the case studies useful to aid your learning?
 6. In your opinion do you think:
 - a. the number of case studies was just right;
 - b. there were too many case studies; or
 - c. there were not enough case studies.
 7. What do you think should have been done differently?
 8. Would you recommend the course?
- 🗨️ **Facilitator** thanks participants and expresses hope that what they have learnt will help them to improve patient outcomes!



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