MOH/P/PAK/633.26(GU) - e

MINISTRY OF HEALTH MALAYSIA

NATIONAL DENGUE OUTBREAK

CONTINGENCY AND SURGE CAPACITY PLAN FOR MINISTRY OF HEALTH (MOH) HOSPITALS AND STATE HEALTH DEPARTMENT



MEDICAL DEVELOPMENT DIVISION
MINISTRY OF HEALTH MALAYSIA

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This document was developed by the Medical Services Unit, Medical Development Division and the subcommittee of National Dengue Outbreak Contingency and Surge Capacity Plan for Ministry of Health (MOH) Hospitals and State Health Departments

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National Dengue Outbreak Contingency and Surge Capacity Plan for Ministry of Health (MOH)

Hospitals and State Health Departments

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National Dengue Outbreak Contingency and Surge Capacity Plan for Ministry of Health (MOH) Hospitals and State Health Departments

MINISTRY OF HEALTH MALAYSIA

Medical Development Division

Ministry of Health Malaysia

MESSAGE FROM DIRECTOR GENERAL OF HEALTH

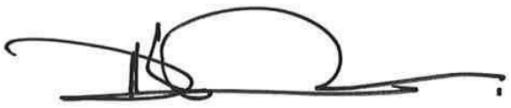
Dengue fever continues to pose a significant public health challenge in Malaysia, with cyclical outbreaks placing considerable strain on healthcare services, particularly within Ministry of Health (MOH) hospitals. The dynamic nature of dengue transmission, coupled with changing environmental and epidemiological factors, necessitates a coordinated, timely, and effective response at all levels of care.

The development of this National Dengue Outbreak Contingency and Surge Capacity Plan for MOH Hospitals and State Health Departments reflects our continued commitment to strengthening preparedness and response mechanisms in managing dengue cases, especially during periods of surge. This plan outlines strategic approaches to ensure optimal utilization of resources and streamline operational workflows to maintain quality and continuity of care.

It is imperative that all healthcare personnel remain vigilant, responsive, and adaptive in implementing the measures outlined in this document. Emphasis is placed on early detection, appropriate case management, efficient triaging, and interdepartmental coordination to mitigate complications and reduce mortality. Equally important is the need for strong collaboration between hospitals, public health units, and relevant stakeholders to ensure a unified and effective response.

I would like to extend my appreciation to all those involved in the development of this contingency plan. Your dedication and expertise are instrumental in reinforcing our health system's resilience against dengue outbreaks.

It is my hope that this document will serve as a practical guide and valuable reference for all MOH hospitals in managing dengue cases efficiently and effectively.



Datuk Dr. Mahathar bin Abd Wahab

Director General of Health

Ministry of Health Malaysia

MESSAGE FROM DEPUTY DIRECTOR GENERAL OF HEALTH (MEDICAL)

Dengue continues to be a major public health challenge in Malaysia, with periodic outbreaks placing significant pressure on healthcare services and resources. Effective preparedness and timely response are therefore essential to ensure that hospitals can continue to provide safe, quality care while managing increased patient demands during outbreaks.

The **National Dengue Outbreak Contingency and Surge Capacity Plan for Ministry of Health (MOH) Hospitals and State Health Departments** provides a structured framework to guide preparedness, surveillance, activation of response measures, and surge capacity management during periods of increased dengue transmission. It aims to strengthen coordination across MOH hospitals and State Health Departments, ensuring a timely, consistent, and effective response to dengue outbreaks.

The successful implementation of this plan requires the commitment and collaboration of all stakeholders. Through collective efforts and continuous preparedness, we can strengthen our healthcare system's resilience and contribute to reducing dengue-related morbidity and mortality.

I would like to express my sincere appreciation to all individuals and organisations involved in the development of this document. It is my hope that this plan will serve as a valuable guide in enhancing dengue outbreak preparedness and response across the country.



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ABBREVIATION

Abbreviation	Description
AAR	After Action Review
ABG	Arterial Blood Gas
AFI	Acute Febrile Illnesses
BMU	Bed Management Unit
BOR	Bed Occupancy Rate
CPRC	Crisis Preparedness and Response Centre
CPG	Clinical Practice Guidelines
CFR	Case Fatality Rate
DATS	Dengue Assessment Team
DMT	Dengue Management Team
DOCC	Dengue Operational Coordination Centre/ *Bilik Gerakan Denggi* (operated by public health)
ED	Emergency Department
EP	Emergency Physician
EMS	Emergency Medical Services
ETA	Estimated Time of Arrival
FBC	Full Blood Count
GP	General Practitioner
HDU	High Dependency Unit
HO	House Officer
ICU	Intensive Care Unit
JKN	Jabatan Kesihatan Negeri
KK	Klinik Kesihatan
KPI	Key Performance Indicator
MO	Medical Officer
MOH	Ministry of Health
MTC	Malaysian Triage Categories
MTS	Malaysian Triage Scale
NG MERS 999	Next Generation Medical Emergency Response System 999

NGO	Non-Governmental Organisation
PHDU	Pediatric High Dependency Unit
PICU	Pediatric Intensive Care Unit
PKD	Pejabat Kesihatan Daerah
POCT	Point-of-Care-Testing
PRO	Public Relation Officer
ROTEM	Rotational Thromboelastometry
TEG	Thromboelastography
UKA	Unit Kesihatan Awam
VBG	Venous Blood Gas

1. Introduction

Dengue fever remains one of the major public health challenges in Malaysia, with cyclical outbreaks causing significant morbidity, mortality, and strain on healthcare services nationwide. The increasing incidence of dengue infections, coupled with changing epidemiological patterns, urbanisation, climate variability, and population mobility, has contributed to the rising demand for hospital-based management of dengue cases, particularly during outbreak situations.

Hospitals under the Ministry of Health Malaysia (MOH) play a critical role in ensuring timely clinical management, effective patient flow, resource mobilisation, and coordinated emergency response during dengue outbreaks. Periods of surge in dengue admissions may overwhelm healthcare facilities, especially emergency departments, medical wards, intensive care units, laboratory services, blood banks, and critical care support systems. Therefore, a comprehensive and coordinated preparedness and response framework is essential to ensure continuity of safe, efficient, and quality healthcare services.

In view of these challenges, the MOH Malaysia has developed a document to provide a structured operational framework for preparedness, surveillance, activation of outbreak response measures, operational coordination, and healthcare surge management during dengue outbreaks.

The plan adopts an all-hazards and phased response approach, guided by outbreak severity and healthcare service impact, to ensure that appropriate escalation measures can be implemented systematically and proportionately. It also emphasises the importance of early preparedness, real-time situational awareness, multidisciplinary coordination, and optimisation of available resources to minimise morbidity and mortality associated with dengue infection.

In addition, this contingency plan serves as a reference for hospital directors, clinicians, healthcare workers, and supporting personnel in strengthening institutional readiness and operational resilience during periods of increased dengue transmission. The implementation of this plan is expected to enhance the overall capacity of MOH hospitals to respond effectively to dengue outbreaks while maintaining essential healthcare services for the population.

This document should be read in conjunction with existing national policies, clinical practice guidelines, disaster management directives, and relevant operational procedures issued by the MOH Malaysia and other relevant authorities.

2. Purpose

This document serves as a national operational framework for MOH hospitals and State Health Departments in strengthening preparedness, surveillance, escalation, operational coordination, and surge response during dengue outbreaks.

3. Objectives

To establish a structured, coordinated and timely dengue outbreak response that involves multiagency during periods of increased dengue transmission and outbreak situations to reduce dengue related mortality and morbidity.

3.1. Strengthen Preparedness

Strengthen the hospital's readiness to respond to dengue outbreaks through planning, and systematic coordination across all relevant departments.

3.2. Enhance Dengue Surveillance and Early Warning Systems

Establish effective surveillance mechanisms and evidence-based trigger thresholds to enable early detection of increasing dengue activity and timely escalation of response measures.

3.3. Ensure Timely Activation and Deactivation of Response Measures

Provide clear criteria for activation, escalation, de-escalation and recovery to support timely mobilisation of resources and coordinated outbreak management.

3.4. Strengthen Surge Capacity Management

Enhance hospitals capacity to manage surge through effective mobilisation of manpower, beds, equipment, laboratory services, blood products and other critical resources.

3.5. Standardise Clinical and Operational Response

Provide uniform guidance for triage, clinical management, patient monitoring in accordance with MOH's National Dengue Guidelines.

3.6. Maintain Continuity of Essential Health Services

Ensure that essential hospital operations and non-dengue services with minimal disruption during outbreak periods.

3.7. Strengthen Coordination, Communication and Reporting

Facilitate effective coordination and communication between hospital departments, District and State Health Offices, and the Crisis Preparedness and Response Centre (CPRC) for integrated outbreak management.

3.8. **Monitor, Evaluate and Improve Response Effectiveness**

Promote continuous monitoring, post-outbreak evaluation, clinical audits, mortality reviews and after-action reviews to strengthen future preparedness and response plans.

4. Scope

4.1. This contingency plan applies to all state, district, hospital departments and support services directly or indirectly involved in dengue preparedness, surveillance, clinical management, and operational coordination, including:

i. Emergency Department (ED)

ii. Medical Wards (including High Dependency Unit)

iii. Paediatric Wards

iv. Intensive Care Units (ICU)

v. Laboratory, Pharmacy, and Blood Bank

vi. *Unit Kesihatan Awam* (UKA)

vii. Hospital Administration and Support Services

viii. State and Hospital Dengue Champions

ix. Hospital Dengue Champion Team (*Jawatankuasa Denggi Peringkat Hospital*)

x. Hospital Dengue Management Team

5. Governance Structure

5.1. Hospital Level

Each hospital shall establish a **Dengue Champion Team** led by the Hospital Director and relevant clinical leads. Responsibilities include:

i. Hospital preparedness planning and surveillance monitoring

ii. Activation of contingency measures

iii. Operational coordination during outbreaks

iv. Clinical governance

v. Mortality review

Refer *Appendix 1: Term of Reference Hospital Dengue Champion Team, State Dengue Champion Team and State Dengue Champion.*

5.2. State Level

The **State Health Department (JKN), District Health Offices (PKD)** and **State Dengue Champion** shall coordinate dengue preparedness and outbreak response activities across hospitals within the state.

Responsibilities include:

i. State-level surge coordination

ii. Monitoring hospital capacity and outbreak trends

iii. Coordination between cluster hospitals

iv. Technical support and escalation management

v. Mobilisation of additional resources where required

5.3. National Level

The **Ministry of Health Malaysia** will provide overall strategic oversight and coordination for dengue outbreak preparedness and surge response. Responsibilities include:

i. National policy coordination

ii. Technical guidance and operational support

iii. Strategic resource mobilisation where necessary

6. Dengue Surveillance

6.1. Establishing an Effective Hospital Surveillance System

To ensure timely activation of the Dengue Outbreak Contingency plan, each hospital shall establish and maintain an effective hospital-based dengue surveillance system.

This surveillance system should include:

i. Designated Focal Personnel

Specific personnel within the Emergency and Medical Departments will be assigned to manage dengue surveillance.

ii. Data Collection and Monitoring

The designated focal personnel shall collect, compile and monitor data on all dengue-related admissions and monitor the occupancy census.

- Daily dengue admissions
- Dengue inpatient census
- Severe dengue cases
- ICU admissions
- Mortality trends

Data collection in ED may include:

- Acute febrile illnesses (AFI) attendance
- Dengue attendance including severe dengue
- Monitored bed utilisation
- Access block to medical or dengue ward
- Access block to ICU
- Sentinel death

6.2. Baseline Determination

i. **The baseline rate** represents the standard "business as usual" operations of a healthcare facility. During this time, no additional resources, staff, or enhanced protocols are needed to manage the dengue patient load. It signifies normal healthcare capacity and the use of standard operating procedures without activating any surge response.

ii. The baseline serves as the reference point for determining dengue alert escalation and de-escalation thresholds.

iii. **Baseline Characteristics**:

- Normal staffing levels are maintained.
- Standard bed allocation is sufficient.
- Routine laboratory processing times are observed.
- No overflow protocols are activated.
- Regular supply consumption rates are evident.
- Typical patient flow patterns are observed.

iv. The baseline rate (λ) shall subsequently be used in the calculation of dengue trigger thresholds as described in **Section 7.2**.

7. Trigger Threshold

7.1. Methodology

i. The trigger threshold methodology uses historical dengue data to calculate baseline rate of dengue admissions or inpatient census admission during normal operations. It then uses these baselines to determine escalation levels based on changing admission trends and inpatient burden.

ii. **Depending on the individual hospital, baseline rate and activation threshold can use either dengue cases or dengue admission** data. The formula listed in 7.2 details out usage of dengue cases to calculate the baseline of activation threshold.

7.2. Baseline Rate (λ) Formula

i. To determine the baseline rate (λ), hospitals should use a **minimum of three (3) months** of the most recent historical dengue surveillance data collected during normal operational ("business-as-usual") periods.

ii. This is to ensure that the calculated baseline accurately reflects routine hospital operational conditions and typical dengue service utilisation.

iii. The baseline rate may be determined using the following formula:

$$\lambda = \frac{\text{Total dengue cases during baseline periods}}{\text{Total baseline days}}$$

(Dengue cases = existing number of inpatients)

7.3. Suggested Trigger Threshold Formula

$$\textbf{Trigger Level} = \lambda + k\sqrt{\lambda}$$

Where:

λ =Historical baseline rate (census per day during business-as-usual periods)

√λ = Standard deviation (for Poisson distribution)

k = Escalation multiplier representing the standard deviation threshold for specific statistical confidence levels
(e.g., k=2 for approximately 95% confidence, k=3 for approximately 99.7% confidence).

7.4. Suggested Alert Trigger Threshold

Alert Level	Formula
Yellow Alert (Enhanced Surveillance)	$\lambda + 2\sqrt{\lambda}$
Orange Alert (Outbreak Response)	$\lambda + 3\sqrt{\lambda}$
Red Alert (Emergency Response)	$\lambda + 6\sqrt{\lambda}$

7.5. Example of Baseline Rate and Trigger Threshold Calculation

i. **Hospital A - Hospital with major dengue burden:**

- If Hospital A had 900 dengue cases over 90 baseline days, then:

  Baseline Rate Calculation (λ)

  $$= \frac{\text{Total dengue cases during baseline periods}}{\text{Total baseline days}}$$

  $$= \frac{900}{90}$$

  = 10 cases per day

- Thus, the **yellow to orange trigger level** would be:

  $= \lambda + 3\sqrt{\lambda}$

  $=10 + 3 (\sqrt{10}) = 10 + 3 (3.16)$

  = 19.4

- This means that an average of **≥ 19 dengue cases per day** in Hospital A, and sustained over **3–7 consecutive days**, would require activation of the dengue contingency plan (Yellow to Orange trigger).

***A wide range of 3-7 consecutive days is used to allow flexibility to accommodate variability in the number of cases which might happen during holiday periods and to accommodate for hospitals of different sizes and capacity in absorbing surges of admissions.*

Alert Level	Green	Yellow	Orange	Red
Suggested trigger points	-	2SD* above baseline	3SD	6SD
Trigger calculation based on daily dengue cases (sustained over 3–7 consecutive days)	10 dengue cases per day	≥ 16 dengue cases per day	≥ 19 dengue cases per day	≥ 29 dengue cases per day

ii. **<u>Hospital B - Hospital with minor dengue burden:</u>**

- If Hospital B had 270 dengue cases over 90 baseline days, then:

  Baseline Rate Calculation (λ)

  = $\frac{270}{90}$

  = 3 cases per day

- Thus, the **yellow to orange trigger level** would be:

  3 + 3 ($\sqrt{3}$) = 3 + 3 (1.73)

  = 8.2

- This means that an average of **≥ 8 dengue cases per day** in Hospital B, and sustained over **3–7 consecutive days**, would require activation of the dengue contingency plan (Yellow to Orange trigger).

Alert Level	Green	Yellow	Orange	Red
Suggested trigger points	-	2SD* above baseline	3SD	6SD
Trigger calculation based on daily dengue cases (sustained over 3–7 consecutive days**)**	3 dengue cases per day	≥ 6 dengue cases per day	≥ 8 dengue cases per day	≥ 13 dengue cases per day

Refer *Appendix 2: Guide for Trigger According to Number of Dengue Cases Per Day (sustained over 3–7 consecutive days)*

7.6. Activation Triggers in Emergency Department

i. The activation triggers combine both epidemiologic surge indicators and operational/functional strain indicators, as outbreak severity alone does not accurately reflect ED system stress.

ii. Escalation occurs when dengue or acute febrile illness attendance rises above expected baseline, AND/OR operational performance deteriorates. This prevents overactivation during mild epidemiologic rise AND under-recognition of dangerous operational collapse.
Refer *Appendix 4: Emergency Department Outbreak Activation*

7.7. Mathematical Formula for Deactivation Triggers

i. To objectively identify when dengue activity is reducing, hospitals should calculate a deactivation trigger threshold using the following formula:

$$\textbf{Deactivation Trigger} = \lambda + \sqrt{\lambda}$$

Where:

λ = Historical baseline rate (admissions or census per day during business-as-usual periods)

$\sqrt{\lambda}$ = Standard deviation (for Poisson distribution)

**For details, please refer to section 10*

8. Alert Level, Stage and Operational Status

The dengue alert system consists of four operational stages as outlined below:

Alert Level	Stage	Operational Status
Green	Preparedness	Routine preparedness and surveillance
Yellow	Enhanced Surveillance	Increased case detection and enhanced departmental monitoring @ early warning and preparedness escalation
Orange	Outbreak Response	Full hospital outbreak activation of contingency response and resource mobilisation
Red	Emergency Response	Maximum surge response requiring cluster-level coordination. States can consider transfer of patients to other hospitals or mobilisation of staff and resources from other hospitals.

9. Dengue Contingency Plan Activation

9.1. Dengue Preparedness Criteria: Green Level

i. **Dedicated Dengue Beds**

- Designation of dengue-specific beds/ cubicles/ wards.
    - including ICU/ HDU dengue beds
- Designation of surge areas in ED which may include:
    - Portable triage counter
    - Fever centre
    - Dedicated dengue zone/corner
    - Outdoor tents
    - Hospital lobby
    - Additional surge beds in day care units, discharge lounges etc.
- Dengue documents should always be available and fully utilised (refer to the latest National Guideline for Clinical Management of Dengue or locally designed)
    - Dengue clerking sheet

- Dengue continuation sheet
- Dengue monitoring chart
- Dengue Clinical Practice Guidelines (CPG)
- Patient self IO charting (multilingual with pictogram)
- Multilingual patients' dengue orientation sheet/ video
- Notification requirement
- Dengue discharge summary template
- Dengue home advice leaflet
- Dengue follow-up card

ii. **Appointment of Dengue Champion Team** led by Hospital Director in compliance with MOH requirement.

iii. Timely **Dengue CPG Training** and dengue morbidity & mortality review

iv. **Designated Focal Personnel** to manage dengue surveillance

- Designated personnel (e.g., Bed Management Unit (BMU), ward sister, UKA, dengue ward sister) responsible for dengue surveillance will collect and compile data on all dengue admissions and monitor bed occupancy.
- To alert the Dengue Champion Team when there is an increasing trend in dengue cases.

v. **Equipment & lab services**

- Ensure the continuous availability of laboratory supplies and resources for testing

9.2. Dengue Outbreak Activation

(Refer table 3)

i. **Role of Dengue champion team**

- Advice Hospital Director for dengue contingency declaration.
- Initiate Dengue Operational Coordination centre (DOCC)/ *Bilik Gerakan Denggi*

ii. **Addition of Dedicated Dengue Beds**

- Expansion of dengue-specific beds which might require conversion of non-medical bed or using cluster hospitals

iii. **Manpower**

- Redeployment of staff (nurses, doctors, and paramedics) should be carried out according to the level of activation.

iv. **Work Processes**

- Protocolised and simplify the dengue referral pathway/ template for interfacility transfers and admission
- Protocolised Monitoring & Management (Refer *Appendix 3: Ward Protocol-Daily Workflow*
- Redesign priority lanes for sample collection, processing and transport for dengue cases, e.g.: FBC, VBG, lactate, blood products.
- Redesign Clinical Escalation Protocol
    - Red flag indicators for ward-to-ICU transfers
    - Defined criteria for HDU admissions
    - Step-down and discharge process from ICU/ward
    - Reevaluating intra and inter hospital dengue referral pathway to avoid delays
- Paediatric patient:
    - Need dedicated paediatric dengue zone/cubicle/ward during surge.
    - High-risk paediatric patients should be identified early for closer monitoring or lower threshold admission. (refer Clinical Practice Guidelines (CPG) for Management of Dengue in Children (Second Edition))
    - Suggested clear escalation pathway: ETD → paediatric ward → PHDU/PICU.
    - Predefined paediatric escalation criteria and PICU referral pathways should be established to ensure timely access to critical care support during dengue outbreaks.
- Emergency Department
    - Open and fill up all designated dengue surge areas
    - Mobilise human resource, assets, consumables and documents

- Implement enhanced triage measures. Refer *Appendix 5: Emergency Department Enhanced Triage Measures*
- Compile data, statistic and submit to DOCC
- Utilise surge registration system and real-time dengue monitoring dashboard (if available)

- Pre-Hospital Care
  - Pre-hospital care services play a critical role during dengue outbreaks through early recognition, risk stratification, pre-arrival notification, ambulance prioritisation, inter-facility transfer coordination, and timely transport of severe dengue patients to appropriate centres
  - It also controls the referral flow and prevents emergency department and hospital overcrowding. Refer *Appendix 6: Emergency Department Pre-Hospital Care Service.*

v. **Equipment**

Ensure the continuous availability of laboratory supplies and resources for testing (e.g., complete blood count, biochemistry profile, electrolytes, blood gas analysis, rapid combo test, serology testing and etc) either in main laboratory and/or as POCT

- ABG machine*
- FBC machine*
- Cardiac monitor
- Ultrasound machine*
- Infusion pumps
- Dropmate
- Drip set with regulator (consumables)
- Rotational Thromboelastometry (ROTEM)/ Thromboelastography (TEG) machines (where available)
- Dengue goodies for patients (leaflet, Self IO charting, water jug, measurement cup, urinal with measurement)
- Wheelchairs

- Patient's trolleys
- Patient's transport trolleys
- Canvas beds (for suitable patients)
- Chairs/ recliners
- Triage tents and backup power
- Ensure availability of paediatric-specific consumables and monitoring devices including infusion pumps, burettes, paediatric BP cuffs and respiratory support interfaces.

** priority for ED*

vi. **Transfusion service**

- To ensure sufficient availability of blood and blood products by regularly reviewing and reset the inventory levels of blood and blood products.
- To alert the Blood Collection and Supply Centre regarding the current inventory status.
- To maintain networking and coordination with other hospital transfusion laboratories.

(to be carried out in accordance with the capacities of the involved local setting)

vii. **Dengue Operational Coordination centre (DOCC)**

- A centralised command and data hub managed by the hospital's Public Health Unit or District Health Office.
- Communication and coordination with pre-hospital care, cluster hospitals, health clinics, private hospitals and general practitioners.
- Real-Time Data Monitoring & Reporting.
- Daily admission and severity status reporting.
- Excel-based or dashboard tracker for bed and case counts.
- Daily situation reports to state and federal health authorities.

viii. **Communication & Coordination Strategy**

- Establishment of internal communication channels. (e.g., WhatsApp groups)
- Daily staff briefing with key updates.
- All media communication through designated spokesperson. (eg: PRO hospital)

ix. **Additional service**

- Portable chest X-ray and ultrasound when indicated.
- Consider a dedicated phlebotomy team.
- Rapid lab (pathology and transfusion) response pathway.

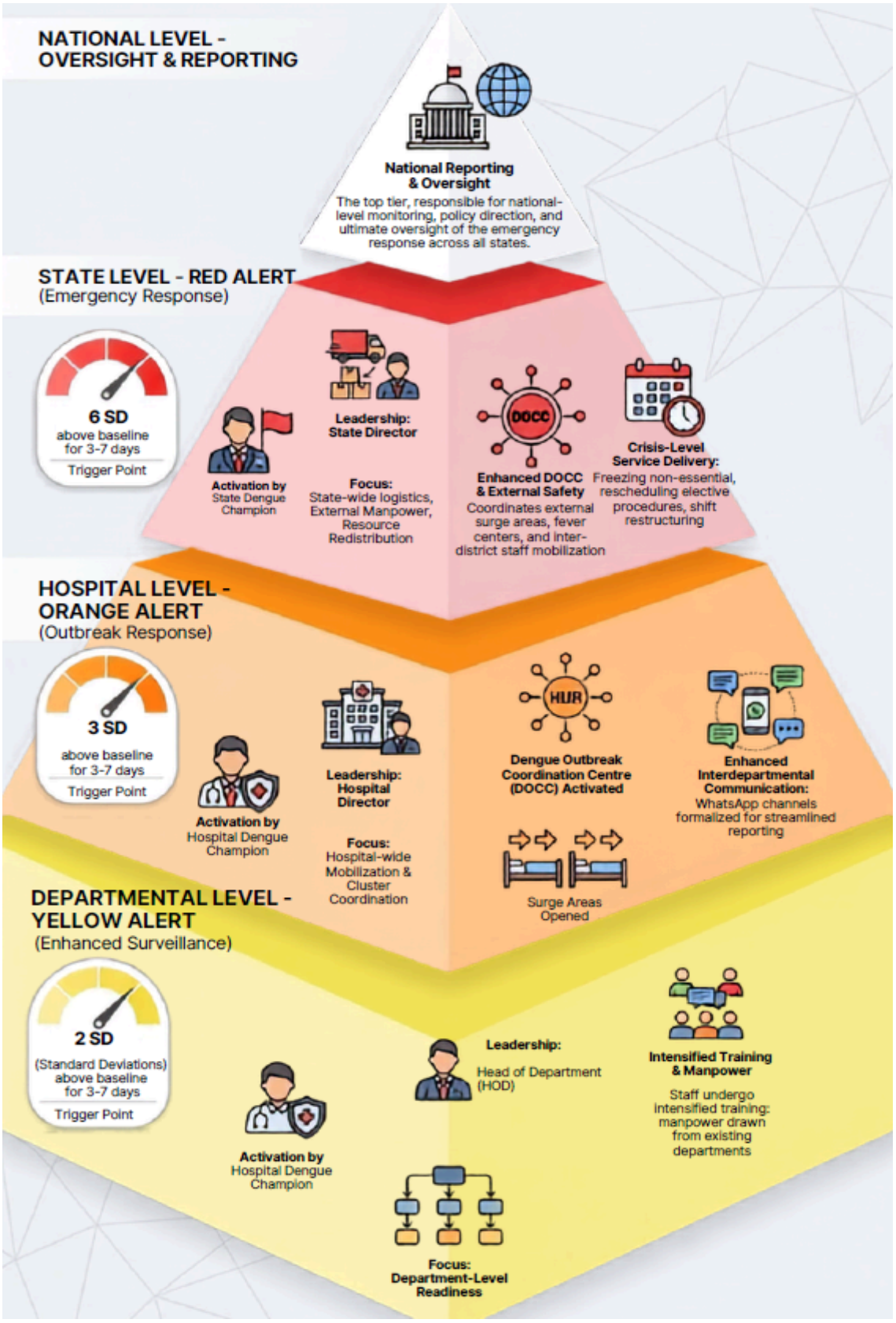
Table 2: Alert and Activation Level for Dengue Contingency Plan

	Alert level/ Activation Level			
Elements	**Green**	**Yellow**	**Orange**	**Red**
Stage	Preparedness	Enhanced Surveillance	Outbreak Response	Emergency Response
Activation threshold	-	Hospital Dengue Champion	Hospital Dengue Champion	State Dengue Champion
Action & Responsibility	-	Head of Department	Hospital Director	State Director
Suggested trigger points	-	2SD* above baseline for 3-7 days	3SD above baseline for 3-7 days	6SD above baseline for 3-7 days
Training	Routine dengue training	Intensified dengue training	Just in time dengue training	Just in time dengue training
Manpower	Existing manpower	From within existing departments	➢ Hospital level mobilisation ➢ Consider extra mobilisation of staff from cluster hospitals ➢ Consider freeze non essential leave,non urgent surgical procedures and courses	➢ External manpower needed ➢ Consider freeze non essential leave, non urgent surgical procedures and courses
Emergency Department	➢ Identify designated surge areas ➢ Continuous surveillance on ED triggers ➢ Assets and consumables monitoring	➢ Open intra-departmental surge area ➢ Implement dengue fast-lane/ bypass initiatives ➢ Review dashboard every shift ➢ Asset and consumables monitoring weekly	➢ Open external surge areas ➢ Establish fever centre ➢ Exercise enhanced triage measures ➢ Deploy dedicated Dengue Assessment Team (DATS) for clinical management ➢ Activate pre-hospital care surge strategies ➢ Review dashboard 4 hourly ➢ Asset and consumable monitoring twice daily	➢ Full ED surge activation with crisis-level oversight ➢ Surge patient registration ➢ Deploy non-clinical area into makeshift treatment area ➢ External manpower with shift restructuring ➢ Hourly dashboard review ➢ Asset and consumable monitoring every shift

			➢ Compile data and statistics and communicate with DOCC	
Dengue Zone	Existing dengue dedicated beds	Dedicated dengue beds/cubicles	Dedicated dengue cubicle/ ward	Expansion of existing dedicated ward
Logistic management of supplies (including pharmaceutical)	Medical/ ETD/ paediatric Department	Medical/ ETD/ paediatric Department	Hospital/ Cluster hospitals	District/ state
Cases Monitoring & Communication	Routine	Alert hospital to identify potential staff for deployment	➢ Activate *DOCC* ➢ Alert district/state level ➢ Enhance Interdepartmental communication channels example: WhatsApp	➢ Enhanced *DOCC* ➢ Enhance Interdepartmental communication channels
Risk Communication	Routine	Routine	Public service announcement regarding possible increased waiting time & disruption of routine services	Determined by State Dengue Champion Team
Service Delivery	Routine care	Routine care	**Consider** ➢ Rescheduling clinic appointment and elective procedures ➢ Redirection of green zone cases to nearby KK ➢ Extending operational hours for KK ➢ Transfer of stable inpatients to cluster hospitals	Determined by State Dengue Champion Team
Suggested deactivation trigger points	-	Below the activation threshold for 7-14 days	Below the activation threshold for 7-14 days	Below the activation threshold for 7-14 days

SD = √λ = Square root of historical baseline rate (admissions or census per day during business-as-usual periods)

Diagram 1: Dengue Emergency Response: Escalation & governance Framework



National Dengue Outbreak Contingency and Surge Capacity Plan for Ministry of Health (MOH) Hospitals and State Health Departments

10. Deactivation Trigger & Post-Outbreak

10.1. Deactivation Triggers

The dengue contingency plan should be **deactivated** when the dengue admission numbers reduce. Deactivation is based on either one of these two main parameters.

i. **New Admissions Deactivation Trigger**

- Dengue cases consistently maintained at or below the facility or cluster's trigger level for 7-14 consecutive days.
- The specific deactivation time may vary based on hospital capacity.
- **Deactivation Level**: Below the activation threshold of the historical baseline rate of daily dengue admissions.

ii. **Inpatient Census Deactivation Trigger**

- Sustained dengue inpatient load maintained at or below the hospitals or cluster's trigger level for 7-14 consecutive days.
- Deactivation timing is flexible, depending on hospital capacity.
- **Deactivation Level**: Below the activation threshold of the historical baseline rate of daily dengue inpatient census.

10.2. Conduct After-Action Review (AAR)- Suggested for Orange and Red Outbreak

Refer *Appendix 7: Post Dengue Outbreak After Action Review (AAR) Template*

i. After Action Review (AAR) is conducted to systematically evaluate the effectiveness of preparedness, response strategies, clinical management practices, surveillance systems, and resource mobilization during the dengue outbreak period.

ii. The review aims to identify strengths, gaps, and operational challenges encountered, particularly in areas related to capacity, coordination, and clinical competency.

iii. Findings from this review will inform targeted improvements in outbreak preparedness, strengthen health system resilience, and

enhance the quality of dengue case management in future surge situations.

10.3. Review Morbidity, Mortality, Resource Utilisation, Staff Feedback -Suggested for Orange and Red Outbreak

i. This review aims to analyse trends in case severity, complications, and fatal outcomes, with particular attention to timeliness of diagnosis, adequacy of clinical management, referral pathways, and health system capacity.

ii. By examining contributory factors at patient, facility, and system levels, the findings will guide targeted strategies to reduce severe dengue cases and prevent avoidable mortality in future outbreaks.

10.4. Outbreak Summary Reporting -Suggested for Orange and Red Outbreak

i. A reporting summary must be submitted to the Hospital Director. *Refer Appendix 8: Dengue Post-outbreak Report Template*

ii. The summary report provides an overview of the outbreak's epidemiological trends, response activities, healthcare system impact, and key outcomes, including morbidity and mortality patterns. It highlights major achievements, operational challenges, and critical lessons learned throughout the outbreak period.

iii. The purpose of this report is to inform stakeholders, strengthen future preparedness and response planning, and enhance the overall effectiveness of dengue prevention and control strategies.

11. Roles & Responsibilities

Table 3: Roles and Responsibilities

State Level Committee	
Role	**Responsibilities**
State Health Department Level	a. Chair and coordinate the State Dengue Champion Team Meeting, State Dengue Audit Meeting, and State Dengue Mortality Meeting. b. Supervise the implementation of the hospital Dengue Contingency Plan and coordinate actions among cluster hospitals and private healthcare facilities, where required. c. Monitor the function of the Dengue Operational Coordination Centre (DOCC). d. Monitor dengue clinical management performance, including key indicators, dengue mortality, clinical audits, training, and facility preparedness at the state level. e. Identify operational gaps, coordinate and implement the cluster/ state hospital preparedness plan to strengthen the dengue response. (Depending on the State Health Department Director orders)
State Dengue Champion	a. Serve as technical advisor and coordinate improvements in state dengue case management. b. Coordinate the implementation and updating of the dengue clinical preparedness plan and clinical management by cluster at all levels. c. Provide support in dengue clinical management at cluster level. d. Carry out planning, training, and resource utilisation management for dengue clinical management. e. Conduct monitoring, evaluation, and clinical audit of facility preparedness, patient flow, and existing resource requirements for improvement purposes.

Hospital Level Committee	
Role	**Responsibilities**
Hospital Director	a. Appoint members of the Hospital Dengue Champion Team, comprising coordinators from departments and units directly involved in dengue patient management, according to hospital needs. b. Chair the Dengue Champion Team Meeting, Dengue Audit Meeting, and hospital Dengue Mortality Meeting. c. Activate the hospital Dengue Contingency Plan. d. Activate the hospital Dengue Operational Coordination Centre (DOCC) from Orange Alert. e. Activate open bed policy, where applicable. f. Open dedicated cubicles or wards to cohort dengue patients as needed. g. Identify operational gaps and implement the hospital preparedness plan. h. Manage human resource requirements, bed capacity, equipment, and logistics during an increase in dengue cases. i. Liaise and coordinate with the relevant executive officers to ensure smooth implementation of actions. j. Determine the need for involvement of the Public Relations Officer (PRO) for communication and information management to the public.
Hospital Dengue Champion	a. Provide advice on dengue management planning at hospital level and appropriate resource allocation. b. Coordinate implementation and communication between the Dengue Management Team (DMT) and the Dengue Champion Team. c. Lead and mobilise the operations of the Dengue Management Team (DMT) at hospital level. d. Coordinate patient management flow, an appropriate referral system, and implementation of protocol-based work processes during an increase in dengue cases. e. Ensure compliance with the Ministry of Health Malaysia (MOH) Clinical Guidelines in all wards.

	f. Coordinate implementation of continuous medical education (CME) and ongoing practical training for clinical and nursing staff at the facility. g. Conduct internal clinical audits and periodic case reviews to reduce complications and prevent deaths due to dengue.
Head of Public Health Unit/ Unit with related functions	a. Act as the secretariat for the Dengue Champion Team Meeting, Dengue Audit Meeting, and hospital Dengue Mortality Meeting. b. Coordinate dengue case notifications according to Ministry of Health Malaysia (MOH) reporting requirements. c. Coordinate Dengue Operational Coordination Centre (DOCC) activities for monitoring and surveillance of hospital dengue indicators such as admission rate, length of stay, bed utilisation, critical cases, and deaths. d. Coordinate information sharing and communication between the hospital, District Health Office (PKD), and State Health Department (JKN). e. Coordinate implementation of the After-Action Review (AAR) at hospital level after a surge in cases or a dengue outbreak to identify strengths, weaknesses, and improvement actions.
Head of Medical/ Head of ICU/ paediatric department	a. Appoint members for Dengue Management Team* which consist of ID physician and or IM physician, anaesthesiologist, paediatrician, EP and dedicated MO/HO.
Head of Emergency Department	a. Establish command and control, assisted by ED Dengue Champion Team b. Coordinate pre-hospital care dengue surge strategies with the head of state of emergency services c. Implement enhanced triage measures d. Consider mobile triage, fever centre and dedicated dengue beds/ zone e. Deployment of Dengue Assessment Team (DATS) f. Ensure adequate manpower, assets and consumables g. Establish mode of monitoring i.e. real-time dashboard

	h. Provide intensive dengue training according to the latest dengue CPG. i. Ensure mortality and morbidity review and feedback for prevention j. Coordinate ED dengue data and statistics compilation and submission to DOCC
Chief Hospital Nursing Supervisor	a. Report dengue patient admission data to the Public Health Unit (UKA) b. Ensure sufficient nursing manpower during an increase in cases or a dengue outbreak. c. Carrying out the instruction of open beds according to policy. d. Ensure dengue wards are equipped with adequate facilities, equipment, and supplies for patient management. e. Strengthen continuous training on dengue management for paramedical staff based on the latest Clinical Practice Guidelines (CPG) for Dengue.
Head of pathology	a. Identify critical laboratory supply and resource requirements and ensure their continuous availability. b. Identify supporting laboratory officers and/or alternative laboratories to ensure service continuity in the event of increased workload or service disruption. c. Ensure effective mechanisms for rapid and accurate delivery of laboratory results to support patient clinical management and dengue surveillance activities.
Head of Transfusion Services Department/Unit	a. Serve as the Transfusion Service Coordinator b. Ensure an adequate and continuous supply of blood and blood products for dengue patient management needs. c. Prioritise preparation of blood and blood products for emergency transfusion and life-threatening cases, such as patients with bleeding or in critical condition.

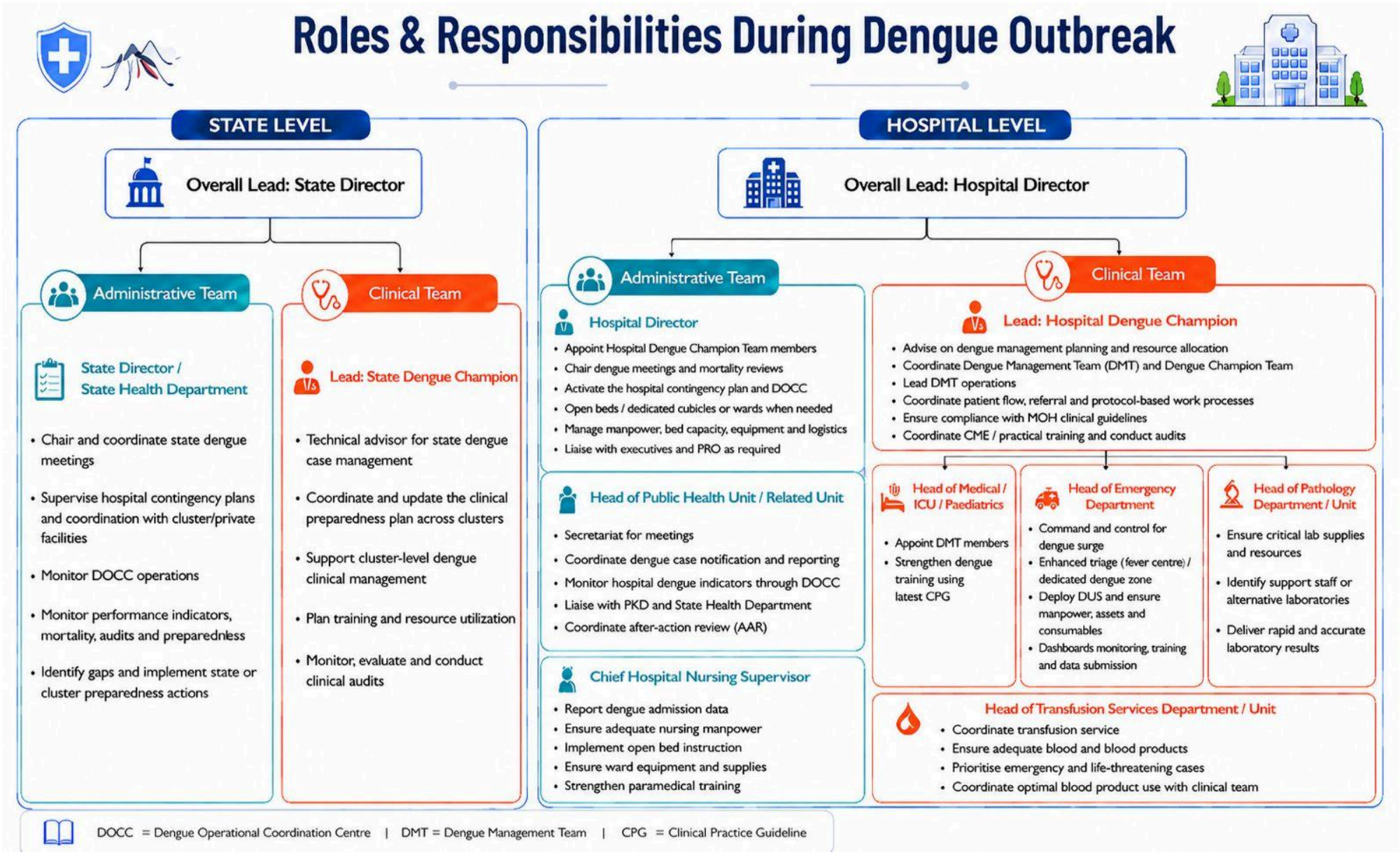
	d. Strengthen communication and coordination with the clinical team to ensure optimal use of blood and blood products according to clinical priority.

*Dengue Champion Team

A multidisciplinary hospital committee responsible for strengthening the clinical management of dengue through coordinated planning, monitoring, training, clinical audits, and continuous quality improvement to ensure optimal patient care.*Dengue

**Management Team (DMT)

A dedicated multidisciplinary clinical team comprising doctors, specialists, and nurses who are deployed full-time to provide coordinated and comprehensive care for dengue patients during outbreaks.


Roles & Responsibilities During Dengue Outbreak
STATE LEVEL
Overall Lead: State Director
Administrative Team
State Director / State Health Department
• Chair and coordinate state dengue meetings
• Supervise hospital contingency plans and coordination with cluster/private facilities
• Monitor DOCC operations
• Monitor performance indicators, mortality, audits and preparedness
• Identify gaps and implement state or cluster preparedness actions
Clinical Team
Lead: State Dengue Champion
• Technical advisor for state dengue case management
• Coordinate and update the clinical preparedness plan across clusters
• Support cluster-level dengue clinical management
• Plan training and resource utilization
• Monitor, evaluate and conduct clinical audits
HOSPITAL LEVEL
Overall Lead: Hospital Director
Administrative Team
Hospital Director
• Appoint Hospital Dengue Champion Team members
• Chair dengue meetings and mortality reviews
• Activate the hospital contingency plan and DOCC
• Open beds / dedicated cubicles or wards when needed
• Manage manpower, bed capacity, equipment and logistics
• Liaise with executives and PRO as required
Head of Public Health Unit / Related Unit
• Secretariat for meetings
• Coordinate dengue case notification and reporting
• Monitor hospital dengue indicators through DOCC
• Liaise with PKD and State Health Department
• Coordinate after-action review (AAR)
Chief Hospital Nursing Supervisor
• Report dengue admission data
• Ensure adequate nursing manpower
• Implement open bed instruction
• Ensure ward equipment and supplies
• Strengthen paramedical training
Clinical Team
Lead: Hospital Dengue Champion
• Advise on dengue management planning and resource allocation
• Coordinate Dengue Management Team (DMT) and Dengue Champion Team
• Lead DMT operations
• Coordinate patient flow, referral and protocol-based work processes
• Ensure compliance with MOH clinical guidelines
• Coordinate CME / practical training and conduct audits
Head of Medical / ICU / Paediatrics
• Appoint DMT members
• Strengthen dengue training using latest CPG
Head of Emergency Department
• Command and control for dengue surge
• Enhanced triage (fever centre) / dedicated dengue zone
• Deploy DUS and ensure manpower, assets and consumables
• Dashboards monitoring, training and data submission
Head of Pathology Department / Unit
• Ensure critical lab supplies and resources
• Identify support staff or alternative laboratories
• Deliver rapid and accurate laboratory results
Head of Transfusion Services Department / Unit
• Coordinate transfusion service
• Ensure adequate blood and blood products
• Prioritise emergency and life-threatening cases
• Coordinate optimal blood product use with clinical team
DOCC = Dengue Operational Coordination Centre | DMT = Dengue Management Team | CPG = Clinical Practice Guideline

REFERENCES

1. Fretheim A, Tomic O. Statistical process control and interrupted time series: a golden opportunity for impact evaluation in quality improvement. BMJ Quality & Safety 2015;24:748-752.
2. World Health Organization. (2016). Chapter 4 Outbreak Response. In Technical handbook for dengue surveillance, dengue outbreak prediction/detection and outbreak response (pp. 29-32). World Health Organization.

APPENDIX

1. TERM OF REFERENCE
2. GUIDE FOR TRIGGER ACCORDING TO NUMBER OF DENGUE CASES PER DAY (SUSTAINED OVER 3–7 CONSECUTIVE DAYS)
3. WARD PROTOCOL-DAILY WORKFLOW
4. EMERGENCY DEPARTMENT OUTBREAK ACTIVATION
5. EMERGENCY DEPARTMENT ENHANCED TRIAGE MEASURES
6. EMERGENCY DEPARTMENT PRE-HOSPITAL CARE SERVICE
7. POST-DENGUE SURGE AFTER ACTION REVIEW (AAR) TEMPLATE
8. DENGUE POST-OUTBREAK REPORT TEMPLATE

1. TERM OF REFERENCE

A. *Dengue Champion Team* untuk Pengukuhan Pengurusan Klinikal Denggi di Peringkat Negeri
B. *Dengue Champion Team* untuk Pengukuhan Pengurusan Klinikal Denggi di Peringkat Hospital
C. *State Dengue Champion*

A. Terma Rujukan *Dengue Champion Team* Untuk Pengukuhan Pengurusan Klinikal Denggi Di Peringkat Negeri

1. Jawatankuasa dipengerusikan oleh Pengarah Kesihatan Negeri dan Timbalan Pengarah (Perubatan) sebagai Timbalan Pengerusi.
2. Ahli Jawatankuasa yang dilantik terdiri daripada pengarah-pengarah hospital dan pakar-pakar klinikal yang dilantik.
3. Tanggungjawab:-
    i. Membuat perancangan serta mengemaskini Pelan Kontingensi Denggi di peringkat negeri terutamanya dalam memastikan pengurusan katil pesakit dan tenaga kerja kesihatan adalah secara optima. Pelan ini tidak terhad digunakan semasa berlakunya wabak sahaja malah digunakan semasa berlakunya peningkatan kes di hospital-hospital KKM di bawah selian.
    ii. Memantau *Dengue Champion Team* di peringkat hospital supaya perhubungan dapat diselaraskan dari masa ke semasa.
    iii. Menjalankan audit klinikal denggi di hospital-hospital yang mempunyai kadar kematian denggi yang tinggi
    iv. Mengkoordinasi latihan perawatan denggi peringkat negeri mengikut CPG denggi yang terkini kepada kakitangan kesihatan di hospital-hospital KKM di bawah seliaan.

B. Terma Rujukan *Dengue Champion Team* Untuk Pengukuhan Pengurusan Klinikal Denggi Di Peringkat Hospital

1. Jawatankuasa dipengerusikan oleh Pengarah Hospital dan Timbalan Pengarah(Perubatan) sebagai Timbalan Pengerusi.

2. Ahli Jawatankuasa yang dilantik terdiri daripada disiplin yang terîibat dalam pengurusan pesakit denggi di hospital.

3. Tanggungjawab:-

    i. Membuat perancangan serta mengemaskini Pelan Kontingensi Denggi di peringkat hospital dan menyelaraskannya dengan Pelan Kontingensi Denggi peringkat negeri dalam memastikan pengurusan katil pesakit dan tenaga kerja kesihatan adalah secara optima. Pelan ini tidak terhad digunakan semasa berlakunya wabak sahaja malah digunakan semasa berlakunya peningkatan kes di hospital.

    ii. Menjalankan pemantauan pengurusan dan perawatan kes denggi di hospital dengan menjalankan audit klinikal denggi peringkat hospital.

    iii. Mengkoordinasi latihan perawatan denggi peringkat hospital mengikut CPG denggi yang terkini kepada kakitangan hospital.

    iv. Melaksanakan semakan kematian denggi di peringkat hospital bagi mengenalpasti kelemahan dan menjalanŁan penambahbaikan dengan segera

C. Terma Rujukan *State Dengue Champion*

1. Berperanan sebagai penyelaras kepada pengurusan rawatan klinikal denggi di peringkat negeri merangkumi perancangan pengurusan klinikal, latihan anggota serta pengurusan sumber.

2. Sebagai penasihat teknikal kepada Jabatan Kesihatan Negeri (JKN) dalam menambahbaik perawatan denggi di fasiliti kesihatan di negeri masing-masing, merangkumi skop:

    i. Perancangan pelan kesiapsiagaan denggi
    ii. Pelaksanaan tindakan pemantapan perawatan denggi
    iii. Pemantauan pencapaian
    iv. Penilaian dan audit

3. Memberi input teknikal dan membantu penyelarasan di peringkat JKN dan hospital dalam menghadapi peningkatan kes denggi seperti penambahbaikan aliran pesakit, perawatan pesakit, keperluan peralatan perubatan dan bukan perubatan, peruntukan, dan penggunaan sumber manusia secara optimum.

4. Membincang dan mengusulkan cadangan penambahbaikan kepada isu-isu berbangkit berkaitan pengurusan klinikal denggi di negeri bersama dengan pihak JKN dan pakar-pakar klinikal berkaitan.

5. Bekerjasama dengan JKN, Pengarah Hospital dan pakar-pakar klinikal untuk memastikan *Dengue Management Team* (DMT) diwujudkan di hospital-hospital di negeri masing-masing, dengan ahli jawatankuasa dilantik oleh JKN bagi tempoh ditetapkan.

6. Memberi khidmat nasihat teknikal dari masa ke masa bagi memastikan aktiviti pengendalian pesakit di hospital melalui *Dengue Management Team* (DMT) adalah mengikut garis panduan KKM.

7. Menyelaras perancangan dan pelaksanaan latihan bersama dengan pasukan pakar klinikal, DMT dan JKN untuk pengurusan rawatan klinikal denggi bagi anggota-anggota kesihatan di hospital di negeri masing-masing untuk memastikan anggota kesihatan menerima latihan mengikut panduan amalan klinikal terkini dan modul yang ditetapkan.

8. Merancang dan memastikan pemantauan dan penilaian serta audit dilaksanakan di peringkat hospital dan negeri masing-masing sekiranya perlu bagi menambahbaik perkhidmatan dan perawatan.

9. Menyelaraskan bersama JKN pelaksanaan audit klinikal denggi sekiranya perlu supaya penemuan audit dapat digunakan untuk penambahbaikan pengurusan pesakit dan perawatan denggi serta mengurangkan morbiditi dan mortaliti.

2. GUIDE FOR TRIGGER ACCORDING TO NUMBER OF DENGUE CASES PER DAY (SUSTAINED OVER 3–7 CONSECUTIVE DAYS)

Baseline dengue cases (per day)	Yellow (Enhanced Surveillance)	Orange (Outbreak Response)	Red (Emergency Response)
	2SD* above baseline	3SD	6SD
3	6	8	13
6	11	13	21
10	16	19	29
15	23	27	38
25	35	40	55
50	64	71	92

3. WARD PROTOCOL-DAILY WORKFLOW

Time	HO and MO	Specialist	Staff nurse
6.00am	Blood taking		**Observation** Identify warning signs/ unstable cases
7.30am	**Rounds** ➢ Trace and review blood & investigations ➢ Identify any overnight issues. ➢ Discharge plans (Total discharge and KIV discharge) ➢ Expedite/up triage ill dengue cases		
8.00am		**Rounds** Troubleshooting rounds with HO/MO	
10.00am			**Observation** Identify warning signs/ unstable cases
11.00am			
12.00pm	Complete discharges		
13.00pm	Blood taking		**Observation** Identify warning signs/ unstable case
14.00pm	**Rounds** ➢ Trace and review blood & investigations ➢ Identify any overnight issues ➢ Discharge plans (Total discharge and KIV discharge) ➢ Expedite/up triage ill dengue cases		
15.00pm		**Rounds** Troubleshooting rounds with HO/MO	

18.00pm			**Observation** Identify warning signs/ unstable cases
19.00pm	**Rounds** ➢ Trace and review blood & investigations ➢ Identify any overnight issues ➢ Discharge plans (Total discharge and KIV discharge) ➢ Expedite/up triage ill dengue cases		
20.00pm		**Rounds** Troubleshooting rounds with HO/MO	
21.00pm			
22.00pm			**Observation** Identify warning signs/ unstable cases
23.00pm			
24.00pm			
1.00am			
2.00am			**Observation** Identify warning signs/ unstable cases
6.00am	Blood taking		**Observation** Identify warning signs/ unstable cases

4. EMERGENCY DEPARTMENT OUTBREAK ACTIVATION

i. The activation of the ED contingency plan relies on both epidemiologic surge and operational strain indicators, as outbreak severity alone does not accurately reflect the stress of the ED system.

ii. Escalation occurs when dengue attendance rises above the expected baseline, **AND/OR** when operational strain is detected. This prevents overactivation during mild epidemiologic rise AND under-recognition of dangerous ED operational collapse.

iii. The principle is based on the concept that:

Surge severity ∝ Epidemiological Load x Operational Strain

iv. **Epidemiologic load** can be calculated based on

- Yellow = seasonal baseline x 1.5
- Orange = seasonal baseline x 2.0
- Red = seasonal baseline x 3

v. **Operational strain** can be determined based on;

Occupancy Rate= ED Census/ ED Treatment Capacity

Where:

- <0.8 = Stable
- 1.0 = crowded
- 1.5 = severe crowding
- 2.0 = dangerous operational strain

vi. Thresholds are operationally derived based on established ED overcrowding principles, emphasising on the monitored-bed saturation, prolonged ED stay, boarding burden, and critical care access delays, which are associated with adverse patient outcomes.

vii. The thresholds combine multiple triggers which include:

Epidemiologic triggers

- Attendance
- Severity

Operational triggers

- Bed occupancy
- Access block
- Access to ICU beds
- Sentinel event/ unexpected mortality

viii. **Suggested Trigger Thresholds for ED Outbreak Activation**

Indicator	Yellow Alert	Orange Alert	Red Alert
AFI/ Dengue Attendance	1.5 x seasonal baseline	2.0 x seasonal baseline	3.0 x seasonal baseline
Severe Dengue Attendance	1.5 x seasonal baseline	2.0 x seasonal baseline, or Cluster of shock/ bleeding cases	3.0 x seasonal baseline, or Multiple concurrent resuscitation
Dengue Bed Occupancy Rate (if available)	100% occupied, and No spillover to non-dengue beds	150% occupied, or Spillover to non-dengue beds	200% occupied, or Spillover to non-monitored areas
Monitored Bed Occupancy Rate	30% occupied by dengue patients, with BOR 70-80%	50% occupied by dengue patients, with BOR 80-90%	80% occupied by dengue patients, with BOR 100%
Dengue Ward Access Block	10% of admission boarded> 6h, or Any patient> 12h	20% of admission boarded> 6h, or Any patient> 24h	30% of admission boarded> 6h, or Multiple patients> 24h
ICU Access Block	10% of ICU admission boarded> 4h, or Any ICU wait >8h	20% of ICU admission boarded> 4h, or Any ICU wait> 12h	30% of ICU admission boarded> 4h, or Any ICU wait for > 24h, or Cluster of ICU access block
Sentinel Event	Any unexpected dengue death in ED	Repeated death	Multiple dengue death

ix. **All quantitative epidemiologic and operational triggers should sustain for 48–72 hours prior to activation** unless overridden by sentinel events, catastrophic system strain, or immediate patient safety threats requiring urgent escalation. Persistent or recurrent trigger breaches within a 48–72-hour period may also justify activation.

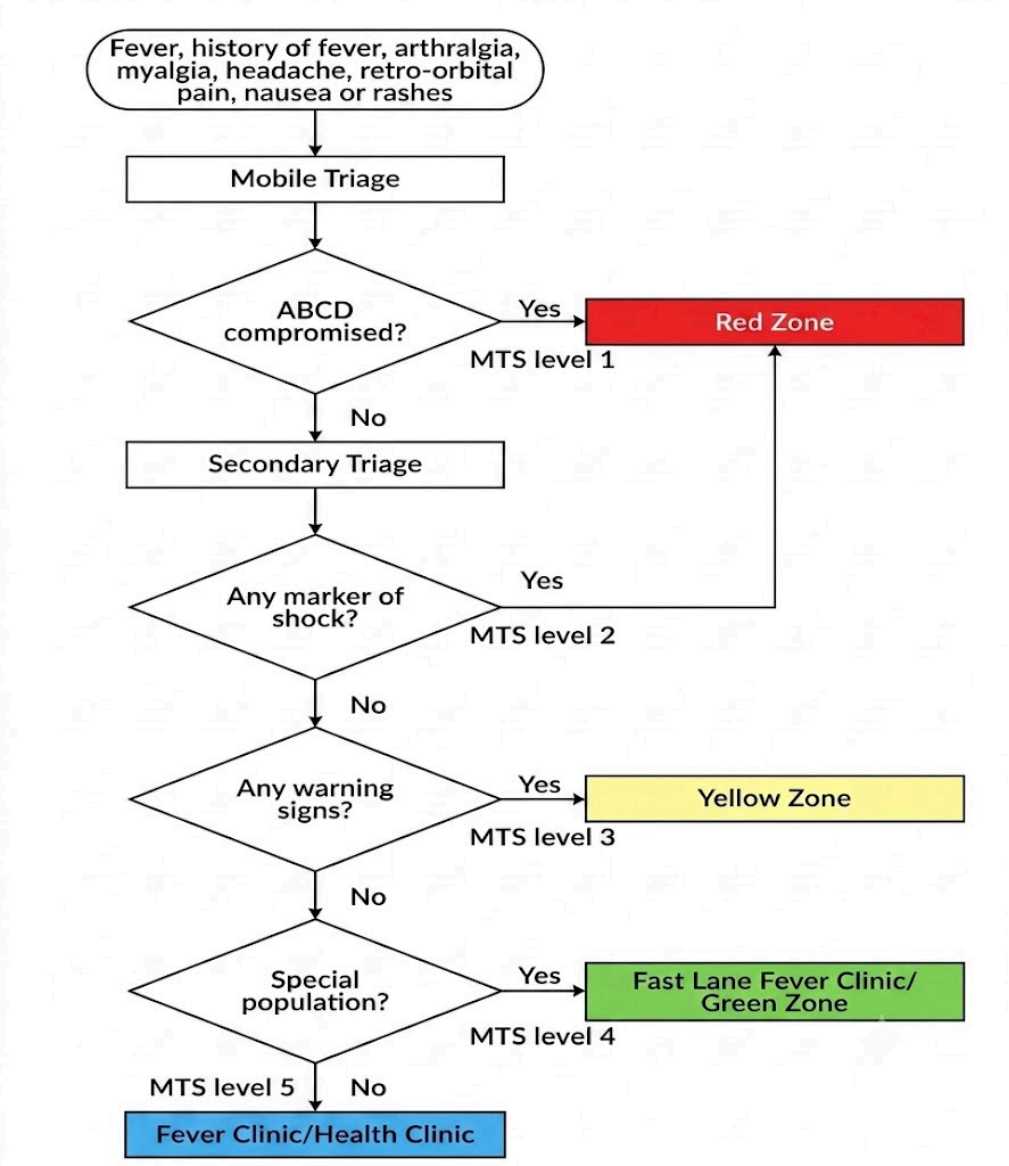
x. De-escalation should occur only when:
- Epidemiological indicators show sustained improvement **AND**
- Operational strain indicators normalize **AND**
- Critical care access stabilizes

5. EMERGENCY DEPARTMENT ENHANCED TRIAGE MEASURES

Enhanced Triage Measures

- Assign EP/ Registrar/Senior MO at triage zone
- Utilise Malaysian Triage Categories (MTC) and Dengue CPG to facilitate triage decision
- Employ colour-coded identifier (wristbands, tags, badges or stickers) to identify high-risk dengue groups
- Impose mandatory reassessment interval for waiting dengue patients (30-60 minutes for dengue warning signs)
- Monitor patient's waiting time

Dengue Triage and Management Algorithm



6. EMERGENCY DEPARTMENT PRE-HOSPITAL CARE SERVICE

Communication Mandates During Outbreak

Case Severity	Notification	Action
Dengue with Warning Signs/ Unstable co-morbidities	DOCC	Prioritization for observation, fast-lane entry, prevent deterioration in waiting area
Severe Dengue/DSS	DOCC, EP	Pre-arrival alert to resuscitation team, to prepare beds and crash carts

i. Referral initiation – Referring doctor

ii. Referral coordination – ED & DOCC

iii. Transport coordination – NG MERS 999

iv. Receiving preparation – Emergency/ Medical departments

Ambulance Surge Strategy

All ambulance activations must be coordinated through the Next Generation Medical Emergency Response System 999 (NG MERS 999), which serves as the single command and control centre for EMS dispatch.

i. Prioritise severe dengue/ DSS cases as high-priority dispatch

ii. Assign the nearest appropriate ambulance resource

iii. Provide pre-arrival notification to receiving hospital with priority coding

iv. Monitor transport status and estimated time of arrival (ETA)

v. Support inter-facility transfer coordination during surge conditions

vi. Prioritise Type A/ B ambulance for severe dengue cases

vii. For stable patients, deploy:
   - PKD vans
   - NGO/ volunteer ambulances under MOH temporary credentialing
   - Private ambulance
   - Self-transfer

Recommended Pre-Hospital Care Priority Code

Priority	Clinical Condition	Transport
Priority 1	Suspected severe dengue/DSS (Group C)	Immediate ambulance dispatch
Priority 2	Dengue with warning signs/ Unstable co-morbidities (Group B2)	Scheduled ambulance
Priority 3	Stable dengue with co-morbidities (Group B1)	Non-ambulance transport

i. Self-transfer is permitted only if ALL criteria are met:
- Hemodynamically stable
- Approved by referring doctor
- Accepted by receiving facility

ii. Staggered transfer

- Use referral scheduling system for non-severe dengue admissions
    - Example: Each KK is allocated a maximum of 3 scheduled patient referrals to the ED every hour

- DOCC & ED shall:
    - Allocate referral slots dynamically
    - Monitor compliance
    - Override slot restriction for severe dengue
    - Coordinate diversion if capacity exceeded

- Minimum referral dataset must include:
    - Day of illness
    - Warning signs
    - Vital signs
    - Hemodynamic status
    - Latest results or trend of platelet and haematocrit
    - Co-morbidities
    - Current treatment

- To prevent ETD overcrowding during surge conditions, DOCC shall implement controlled referral scheduling in coordination with pre-hospital care;
    - Allocate referral slots based on real-time capacity
    - Monitor ED load and beds availability
    - Coordinate referral timing with referring facilities
    - Prevent uncontrolled patient influx

- Hospital Diversion Protocol
    - Activated when ED or hospital capacity exceeds safe threshold
    - Coordinated by DOCC
    - Based on real-time dashboard
    - NG MERS 999 shall redirect referrals to:
        - Alternate MOH hospital
        - District hospitals
        - Designated dengue surge centres

Inter-Facility Referral and Communication Framework

Tool	Purpose
Dengue Referral Form	Standardised key info (category, vitals, lab, time of onset)
Dengue WhatsApp Group	Between hospital and referring health facilities
Real-Time Hospital Capacity Dashboard	To guide referral location (ED vs District Hospital), diversion
Triage Priority Code: RED = Severe dengue, YELLOW = Warning Signs, ORANGE = Comorbid	Clear communication with ED

Summary Of Best Practices

Action	Responsible Party
Notify DOCC for all warning signs/ comorbidities	KK/GP/other referring hospital
Notify DOCC and Emergency Physician for severe dengue	KK/GP/other referring hospital
Activate ambulance dispatch only for severe patients	KK/GP/other hospital pre-hospital care dispatcher by NG MERS 999
Implement referral slot scheduling for stable patients to reduce overload	KK/GP
Utilise volunteer medical transport networks	MOH + District Health Office/NGO/Private Ambulance

7. POST-DENGUE SURGE AFTER ACTION REVIEW (AAR) TEMPLATE

1. Basic Information

- Outbreak location:
- Outbreak period:
- Epidemiological week:
- Total cases:
- Total severe dengue cases:
- Total deaths:
- Date of AAR session:
- Chairperson:
- Participants (agencies/departments):

2. Objectives of the AAR

- To evaluate preparedness and response effectiveness.
- To identify strengths and best practices.
- To identify gaps and root causes of challenges.
- To recommend corrective and preventive actions.
- To strengthen future dengue contingency planning.

3. Outbreak Overview

3.1 Epidemiological Summary

- Case trend (epi curve)
- Age distribution
- Severe dengue proportion
- CFR (Case Fatality Rate)
- Comparison with previous surge

3.2 Timeline of Key Events

Level of activation:	Date of activation:	Date of deactivation	Total dengue cases	Total of severe dengue cases	Mortality
Green to Yellow					
Yellow to Orange					
Orange to Red					

4. What Was Expected to Happen?

- Activation of dengue contingency plan
- Early case detection and notification
- Adequate bed and manpower allocation

5. What Actually Happened?

Summarize actual response in:

- Surveillance & reporting
- Clinical case management
- Laboratory services
- Hospital capacity - human resource & equipments
- Logistics & supplies
- Communication & media handling
- Inter-departmental coordination

6. Strengths

Examples:

- Good ICU surge planning
- Strong inter-departmental collaboration
- Effective resources mobilization

7. Gaps & Challenges

Examples:

7.1 Clinical Management

- Delayed recognition of warning signs
- Inadequate triaging
- Inconsistent fluid management
- ICU bed shortages

7.2 Facilities & Resources

- Bed capacity overwhelmed
- Insufficient HDU/ICU monitoring equipment
- Inadequate laboratory turnaround time
- Manpower fatigue / burnout

7.3 Communication

- Delayed risk communication
- Public misinformation
- Poor documentation

8. Root Cause Analysis (when applicable)

9. Lessons Learned

10. Recommendations & Action Plan

Issue Identified	Corrective Action	Responsible Unit	Timeline	KPI

Examples:

- Conduct annual dengue simulation drill.
- Establish a surge manpower pool.
- Improve ICU monitoring capacity.
- Develop dengue rapid response Standard Operating Procedure (SOP).
- Strengthen mortality audit process.

11. Conclusion

Summarize:

- Overall response rating
- Key improvement priorities
- Commitment to strengthen preparedness

8. DENGUE POST-OUTBREAK REPORT TEMPLATE

Name of Facility / District / State: _____

Date of Report: _____

Outbreak Period: _____

Prepared by: _____

1. Executive Summary

- Brief overview of the dengue outbreak
- Key statistics (total cases, peak period, mortality)
- Summary of key interventions and outcomes
- Lessons learned

2. Background

- Historical dengue data (e.g., past outbreaks)

3. Outbreak Description

- Start of Outbreak: _____
- Total Cases Reported: _____
- Total Deaths (if any): _____
- Case Fatality Rate (CFR): _____

4. Outbreak Response and Interventions

5. Challenges Encountered

- Delay in detection or reporting
- Manpower constraints
- Resource limitations

6. Outcomes

- Time to control from detection

7. Recommendations

- Strengthen surveillance and early warning
- Resource planning (HR, logistics)



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