



Enhancing Quality of Disaster Preparedness and Response System in A Tertiary Care Hospital Sri Lanka: Lessons from a Mass Casualty Incident Review at District General Hospital Kegalle

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Abstract

This case study evaluates disaster preparedness and response at District General Hospital Kegalle, Sri Lanka, following a mass casualty incident. The study aims to assess hospital readiness, analyze gaps in existing protocols, and propose actionable improvements. Using a blend of post-event review meetings, key informant interviews, and document analysis, findings highlight prompt multidisciplinary engagement and director leadership as notable strengths. However, significant weaknesses were identified: low staff awareness of the Disaster Preparedness and Response Plan (DPRP), absence of job role cards, lack of regular drills, undefined disaster management responsibilities, and no formal allocation of these duties in medical officers' job descriptions. Infrastructure and communication limitations further hampered optimal response. Recommendations emphasize the need for the Ministry of Health to designate responsible units, formally integrate disaster management roles into job descriptions, and institutionalize drills and ongoing training. This study concludes that bridging policy and practice through clear human resource frameworks and targeted capacity building is vital to enhancing hospital resilience and effective mass casualty response in Sri Lanka.

Introduction and background

Disaster management in healthcare is generally categorized into four phases — mitigation, preparedness, response, and recovery. In the hospital setting, the immediate priority during a disaster is the response phase, where rapid emergency medical care must be delivered effectively. This requires all staff to possess appropriate knowledge, skills, and attitudes to respond efficiently under pressure.

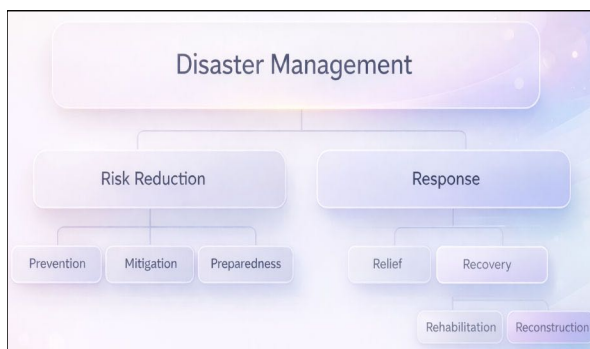


Figure 1: Phases of Disaster Management

In the context of disaster preparedness and response, an emergency refers to a situation requiring immediate intervention, while a casualty denotes a patient in need of urgent medical attention. A Mass Casualty Incident (MCI) is an event in which the number of casualties surpasses

the available resources of the initial responders (1). A disaster occurs when an incident overwhelms a community's capacity to cope with the situation using its own resources. The term coping capacity describes the ability of a facility or community to manage the adverse effects of an event using its existing skills and resources. The concept of disaster risk is often expressed as the relationship between the hazard and vulnerability, divided by capacity ($\text{Disaster Risk} = \text{Hazard} \times \text{Vulnerability} / \text{Capacity}$). Disaster Risk = Hazard $\times$ Vulnerability / Capacity, reflecting the extent to which a system can withstand and respond to adverse events (2).

Duties of disaster management at tertiary care hospitals are as follows:

- Conduct risk assessments with relevant stakeholders.
- Prepare the DPRP in collaboration with stakeholders.
- Human resource development through regular drills, desk reviews, and simulation activities.
- Issue job role cards to assigned staff.
- Arrange for replacements when staff with specific roles are transferred out.
- Ensure appropriate infrastructure is in place.
- Ensure necessary equipment is always ready.
- Conduct timely post-disaster response review meetings and update the system as needed.

Objective

General objective

To enhance quality of Disaster Preparedness and Response system in A Tertiary Care Hospital, Sri Lanka.

Specific Objectives

- To analyse the existing emergency preparedness and response plan and its governance for development in the tertiary care hospital.
- To assess and identify the problems during the Incident Response and Post Mass Casualty Incident Review Meeting in the tertiary care hospital.
- To generate feasible recommendations to enhance the Disaster Preparedness and Response in Tertiary care Hospitals Sri Lanka.

Literature review

Disaster management within healthcare is commonly structured around four phases: mitigation, preparedness, response, and recovery. In hospital contexts, the response phase is critical, demanding swift, coordinated medical intervention when emergencies arise (3). Effective disaster response requires all staff to understand their roles, possess relevant competencies, and remain adaptable under pressure (1). In Sri Lankan tertiary care hospitals, the Disaster Preparedness and Response Plan (DPRP) form the backbone of institutional readiness, dictating actions during mass casualty incidents (MCIs) - events where patient volume exceeds available resources and initial response capacity.

Guidelines from the Ministry of Health Sri Lanka emphasize a clear framework for Accident & Emergency (A&E) preparedness, underscoring infrastructure, triage protocols, and team training as foundation elements (4). Literature reveals that MCIs often expose both strengths - such as rapid leadership actions and multidisciplinary engagement - and weaknesses, including gaps in human resource allocation, physical layout of triage areas, and communication systems. Studies by PAHO and WHO advocate for regular drills, simulations, and capacity-based reviews to validate protocols and maintain staff readiness. International best practice stresses the value of designated disaster management units within hospitals, formal job descriptions, and role cards distributed to all relevant staff—measures shown to improve accountability and streamline response (1).

Nationally, hospital job descriptions are collaboratively regulated by the Ministry of Health and the Public Service Commission, ensuring alignment with public sector standards and legal frameworks (5). Ongoing quality improvement mechanisms, such as after-action reviews and integration with CPD (Continuing Professional

Development) point systems, are recommended by the WHO Health Emergency Operations Center model to reinforce preparedness (6). Rewards, commendations, and formal psychosocial support for frontline responders further support resilience.

Overall, the literature highlights the importance of governance, infrastructure, ongoing staff training, cross-agency partnerships, and recognition systems in fostering disaster response capacity and boosting hospital resilience in Sri Lanka and beyond.

Methodology

This research employed a descriptive, qualitative case-study design conducted at District General Hospital (DGH) Kegalle. The target population consisted of staff members across multiple roles and departments. A convenient sampling approach was used, involving selected personnel from the Emergency Department (ED), Healthcare Quality and Safety (HQS) Unit, Administrative Unit (AU), and Planning Unit (PU). Interviews were also conducted with current and former Medical Officers (MOs) affiliated with the HQS Unit and those with disaster management training.

Within the ED, participants included the consultant emergency physician, medical officers, the nursing sister in charge, and nursing officers. Data from ED staff were collected through semi-structured key informant interviews focusing on disaster response roles, triage practices, space adequacy, communication flow, and familiarity with the Disaster Preparedness and Response Plan (DPRP). The physical infrastructure of the ED and hospital facilities related to the Accident and Emergency concept were systematically observed, guided by Ministry of Health recommendations, with attention to patient flow, entry points, triage space, and congestion.

Secondary sources, including DPRP documents, meeting minutes, and relevant bed head tickets (BHTs), were reviewed to assess plan availability, revision history, assigned responsibilities, activation procedures, and alignment with observed practices. Key informants such as the hospital Director, Deputy Directors, and the Administrative Officer were also interviewed to explore governance, decision-making, coordination mechanisms, and administrative challenges.

Data collection methods comprised direct observation, key informant interviews, desk reviews, focus group discussions (FGD), nominal group techniques (NGT), and document analysis. FGDs were used to identify system gaps and generate solutions, while NGT was applied to prioritize problems and conduct Why-Why root cause analysis. Data were analysed using thematic content analysis, with coding and triangulation

across data sources to identify recurrent patterns and system-level gaps.

Ethical clearance was obtained through institutional administrative approval. Verbal consent was obtained from all participants. No personal identifiers were recorded, anonymity was maintained, and data were used solely for academic and quality-improvement purposes in accordance with institutional policy.

Case Distription

Hospital Context

DGH Kegalle is a tertiary care hospital with 801 beds, 84 units, and 1,560 staff, providing 24 specialty services. Annual activity includes 76,687 admissions and 264,568 OPD visits. Facilities include 18 wards, 32 clinics, 9 ETU bays, 10 operating theatres, 2 ICUs, 3 NICUs, 13 labour rooms, a dialysis unit, an oxygen plant, and a blood bank.

Despite this considerable service capacity, the hospital does not have a dedicated Accident & Emergency (A&E) building. The current ETU functions as the A&E but is poorly located for optimal emergency and disaster response.

The specialist cadre includes an Emergency Physician, two General Surgeons, two Orthopaedics Surgeons, an Eye Surgeon, an ENT Surgeon, a Transfusion Physician, an Oral and Maxillofacial Surgeon, a psychiatrist, two Anesthetists, two Radiologists, and a Judicial Medicine Consultant.

This combination of strong clinical capacity and structural limitations defines the hospital's coping ability during disasters and underlines the need to ensure that the DPRP activation threshold is accurate and evidence-based.

Incident and Review Meeting Overview

A major road traffic accident occurred in the Galigamuwa area-under the Kegalle Police Division-when a private bus on the Kegalle to Ratnapura route collided with a Sri Lanka Transport Board (SLTB) bus traveling from Weragoda to Kegalle. The incident resulted in multiple casualties, with the first patient arriving at District General Hospital (DGH) Kegalle at 5:47am. Among the 28 individuals admitted, seventeen were initially managed in the Emergency Treatment Unit (ETU) - serving as the hospital's Accident and Emergency (A&E) facility - while the remaining eleven were admitted directly to wards.

Triage in the ETU classified patients as follows: four patients were assigned to Category 1 (Life threatening), four to Category 2 (Imminently Life threatening), and nine to Category 3 (Potentially Life threatening). Once initial stabilization was completed, patients were allocated to Surgical-Female Ward and Surgical Male Ward, with others directed to Casualty Operating Theatre-C and

Major Surgical Operating Theatre-B as required.

To ensure a timely and coordinated response, a review meeting was organized within 24 hours of the incident, held on 22 July 2025. This meeting was chaired by the hospital Director and attended by Deputy Directors, the Administrative Officer, consultants, and representatives from the involved wards. The agenda focused on evaluating patient flow and clinical management, identifying challenges encountered during the response, discussing practical solutions and recommendations, and enhancing disaster preparedness and response plan for future mass casualty events.

Results

Post-Mass Casualty Incident Review Meeting (PMCI RM) Findings

Strengths:

- Timely meeting enabling accurate event recall.
- Multidisciplinary participation encouraged open dialogue.
- Identification of equipment shortages (e.g., spinal boards).
- Agreement to update DPRP.
- Supportive leadership of Director DGH Kegalle

Weaknesses:

- Lack of awareness among staff members on existing DPRP during the meeting
- MCI is not compared with existing DPRP during the meeting.
- Absence of key stakeholders limited review comprehensiveness.
- No formal commendations or psychosocial support to frontline staff.
- Limited external agency involvement (police and public transport sectors).

Key informant interview findings

- Most staff were not aware of the DPRP.
- Job role cards were not issued to relevant staff
- Activation of mass casualty response was not declared as specified in the DPRP
- There was no officially allocated responsibility for disaster management duties such as developing the DPRP and conducting drills and simulations
- Nursing staff in the ETU perceived that the space in the ETU was inadequate to respond to mass casualties.
- Consultants emphasized the inadequacy of space for conducting proper triage.

Documentary reviews findings

- DPRP has been developed on 2019 and redeveloped on 2021 by medical officers who were trainees in the Diploma in Disaster Management.

- The mass casualty activation message was prepared, but the telephone operator was not ready to disseminate it as specified in the DPRP.
- No formal circulars were issued, and no units were formally, systematically, or directly assigned disaster management functions by the Ministry of Health.
- Disaster management duties, such as preparing the DPRP and conducting drills and simulations, are not included in the duty list of any specified unit medical officer by the Ministry of Health

Observation findings:

- The casualty patient flow path to the ETU was not suitable for rapid movement, as recommended by the Ministry of Health's A&E concept.
- The entrance for patients to both the ETU and OPD was the same, causing congestion.
- Construction of the master-planned A&E building was discontinued without completion.

Problems analysis

Identified problems:

1. Lack of awareness of DPRP among key stakeholders
2. No updates or drills conducted on DPRP
3. Absence of key stakeholders in the post-event meeting
4. Comparison against the existing DPRP did not clearly occur in the post-event meeting
5. Limited external agency involvement (ambulance, police)
6. Inadequate communication systems during incident response
7. Lack of triage performance at the time of the incident
8. Inadequate space for triage
9. Improper activation of mass casualty incident

Problem prioritization:

Nominal group technic has been used to prioritization of problem. Key stakeholders have been involved in this process and "Lack of awareness among staff members on existing DPRP" has been selected as a prioritized problem.

Root cause analysis of prioritized problem:

Root cause analysis was conducted using a Why-Why analysis approach during the Nominal Group Technique session, systematically exploring underlying reasons related to human resource governance, communication gaps, training deficiencies, and the absence of formal role allocation.

Recommendations

Based on the prioritized problem and findings from the Post-Mass Casualty Incident Review

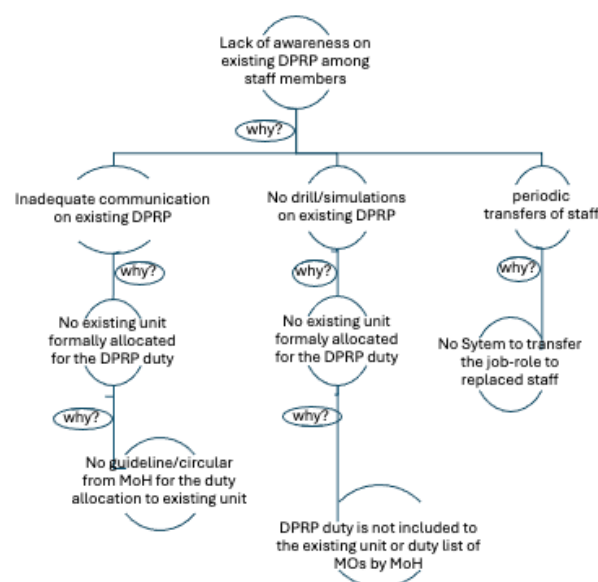


Figure 2: Root cause analysis; 'Why-Why' Diagram

Meeting, key informant interviews, document review, and observations, the following recommendations were developed through a focus group discussion with an expert panel.

Recommendations Based on PMCIRM Findings

1. Future post-incident review meetings should ensure participation of all relevant internal and external stakeholders, including ambulance services and police.
2. The existing "Commendation and Censures" mechanism should be utilized to formally recognize staff involved in mass casualty responses.
3. Formal psychosocial support mechanisms should be established for healthcare workers following mass casualty incidents.
4. After-action reviews should be embedded into ongoing hospital quality improvement processes in alignment with WHO HEOC guidance.

Recommendations Based on Key Informant Interview Findings

5. The Ministry of Health (MoH) should officially designate a responsible unit at the tertiary care hospital level to coordinate disaster management functions.
6. Disaster management responsibilities should be formally incorporated into job descriptions of Medical Officers and relevant staff, with guidance from the Disaster Preparedness and Response Division or Health Emergency Operations Centre.
7. Internal hospital-level appointments for DPRP roles should be formalized through official appointment letters issued by the Head of Institution, with clear handover and cancellation mechanisms when staff are transferred.

Recommendations Based on Document Review Findings

8. Regular disaster related capacity building activities, including drills, simulations, desk reviews, and workshops should be institutionalized and linked to the national CPD points system.
9. DPRP activation criteria and thresholds should be reviewed and validated through capacity-based drills.

Recommendations Based on Observation Findings

10. Completion of the planned Accident and Emergency (A&E) building should be prioritized within the annual capital budget.

Discussion

This audit's findings align with both international and national literature on hospital disaster preparedness and mass casualty incident (MCI) response. Best practices emphasize timely, multidisciplinary reviews and continuous equipment and protocol updates—strengths observed in this setting. WHO and PAHO guidance similarly identify early after-action reviews and coordinated team responses as critical for accurate recall and system improvement (1,3). However, several gaps emerged. Limited staff awareness of the Disaster Preparedness and Response Plan (DPRP), absence of job role cards, and inconsistent activation of MCI protocols mirror challenges reported in developing health systems. Comparable deficiencies in staff familiarity with disaster plans have been documented in hospital-based MCI evaluations (1,6).

A notable deviation from guidelines is the absence of formal disaster management units and official job descriptions for disaster-related roles (6). Literature indicates that such job descriptions should originate from the Ministry of Health and be incorporated into duty lists of medical officers assigned to relevant units, such as the Healthcare Quality and Safety or Planning Units (7). WHO HEOC guidance likewise stresses that clearly defined organizational structures and written role assignments are essential for sustained preparedness and accountability (6).

Limited involvement of external agencies and weak communication systems, highlighted in global recommendations, are compounded locally by administrative and resource constraints. WHO and PAHO guidance emphasize intersectoral coordination with ambulance services, police, and transport authorities during MCIs—an area found to be weak in this case study (1,3). Additional constraints, including frequent staff rotations without systematic handover and incomplete infrastructure development (e.g., discontinued A&E buildings), further reduce disaster readiness, reflecting challenges commonly reported in low- and middle-income country hospital settings (3,4).

Conclusion

This case study evaluated disaster preparedness and response at a tertiary care hospital in Sri Lanka, analyzing operational readiness during a mass casualty incident and subsequent review meeting. The objectives—to assess emergency plans, identify gaps, and generate actionable recommendations—were met through observation, interviews, and document review.

Key findings highlight prompt multidisciplinary engagement and leadership commitment as strengths. However, gaps persist in staff awareness of the Disaster Preparedness and Response Plan (DPRP), absence of job role cards, lack of updates and drills, and unclear disaster management responsibilities, particularly among medical officers. Disaster duties were not systematically included in unit job descriptions, and formal circulars on disaster roles were lacking.

The key insight is the need for the Ministry of Health to clearly assign responsibility within existing hospital units (such as the Healthcare Quality and Safety or Planning Units) and formally include disaster management duties in medical officers' job descriptions. Addressing these gaps, alongside improving communication, updating activation protocols, and strengthening capacity building, will enhance institutional readiness.

Overall, aligning hospital practice with national policy and international standards through clear governance and human resource frameworks is essential for effective preparedness and response to future mass casualty incidents.

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