

Editorial

Blood management in disasters and emergency situations: ensuring continuity of blood supply and transfusion services

Supattra Mitundee

Regional Blood Centre XII, Songkhla Province, Thai Red Cross Society

Introduction

Disasters and emergency situations may arise from natural events, human-influenced factors, or direct human actions. A disaster is defined as a sudden event causing significant damage, loss, or destruction, whereas an emergency refers to an unforeseen occurrence requiring immediate intervention due to potential danger. During such events, the demand for blood and blood components may increase substantially. Ensuring an adequate and safe blood supply is therefore critical for the effective management of affected populations¹. However, maintaining this supply is often challenging, as disasters can disrupt healthcare infrastructure, transportation systems, and service delivery^{1,3}. Recent large-scale crises, including floods and armed conflicts, have highlighted the importance of coordinated response mechanisms and preparedness planning². Disaster management is commonly conceptualized as a continuous cycle consisting of four interrelated phases: mitigation, preparedness, response, and recovery² (Figure 1).

This review aims to provide an overview of blood management strategies across these phases, with a focus on ensuring continuity of transfusion services during emergencies.

1. Mitigation

The mitigation phase includes actions taken prior to a disaster to prevent or reduce its impact. It begins with vulnerability assessments to identify critical risks within the blood supply system³. Modelling and simulation approaches, widely utilized by the World Health Organization, support decision-making by predicting potential scenarios and guiding mitigation strategies¹.

In blood establishments, mitigation measures include infrastructure assessment and ensuring the reliability of essential systems such as electricity, water supply, communication networks, and temperature-controlled storage³. Emergency preparedness elements, including evacuation routes and fire safety systems, must also be regularly evaluated. Strategic stock management is essential to ensure continuity of operations. Blood services should maintain adequate reserves of critical supplies, taking into account shelf-life limitations and storage requirements¹. Resource-sharing at local, national, and regional levels can further strengthen system resilience. Human resource management, including staff rotation and cross-training, is also crucial. Additionally, cybersecurity plays an important role in protecting digital systems, ensuring data backup, and maintaining operational continuity.



Figure 1 The significance of the emergency management cycle is that all communities are in at least one phase of emergency

Correspondence should be addressed to Supattra Mitundee, Regional Blood Centre XII, Songkhla, Thai Red Cross Society, Hat Yai, Songkhla 30110

2. Preparedness

The preparedness phase involves planning and capacity-building activities conducted before a disaster occurs. Comprehensive emergency preparedness planning is essential to safeguard the availability and safety of the blood supply¹.

Preparedness requires a coordinated, multidisciplinary approach with clearly defined roles and responsibilities². Emergency plans must be documented, communicated effectively, and regularly tested through simulation exercises. Education and training of personnel are critical to ensure effective implementation. Maintaining communication with registered blood donors is also essential to enable rapid mobilization when needed¹. Collaboration between blood centres and hospitals is necessary to ensure coordinated responses during emergencies³. Business continuity planning (BCP) is a key component of preparedness. A robust BCP outlines strategies to maintain or rapidly restore essential services following disruption. Business impact analysis (BIA) should identify critical functions, required resources, and acceptable recovery timeframes¹.

3. Response and Recovery

3.1 Response phase

The primary objective of the response phase is to ensure the continuous availability of safe blood and blood components during an emergency¹. Effective incident management should prioritize personnel safety while minimizing disruption to services². The transfusion response must be integrated into the broader healthcare and emergency response systems¹. Initial situation assessment is essential to determine the scale and nature of the response. Activities should be guided by the severity and duration of the emergency². In clinical practice, prioritization of blood use and restrictive transfusion strategies are essential during shortages to optimize patient outcomes. Transfusion

services should focus on life-saving interventions and critical care needs. Temporary blood service models may be implemented, including portable units, mobile services, temporary facilities, or adapted fixed centres, depending on the situation⁵.

3.2 Recovery phase

The recovery phase focuses on restoring blood services to normal operations as efficiently as possible. It includes evaluation of system performance, identification of gaps, and implementation of corrective actions¹. Post-event analysis is essential to assess compliance with emergency plans and improve future preparedness. Long-term resilience requires sustained investment in governance, regulatory frameworks, workforce capacity, infrastructure, financing, and quality management systems⁴. The blood transfusion system must be recognized as an integral part of the healthcare system.

Conclusion

Disasters present not only challenges but also opportunities to strengthen health systems. Lessons learned from previous events should inform future planning, including the design and location of blood establishments to enhance resilience⁴. Strategies such as infrastructure reconstruction, development of new facilities, and retrofitting of existing structures should be considered based on risk assessments and available resources.

In emergency situations, temporary measures for blood provision may be required, including the establishment of portable, mobile, or temporary transfusion services⁵. Ultimately, ensuring a resilient blood supply system requires long-term commitment, strategic planning, and integration within the broader healthcare framework. Continuous improvement based on past experiences will enhance preparedness and response capacity for future emergencies.

References

1. World Health Organization. *Guidance on ensuring a sufficient supply of safe blood and blood components during emergencies*. Geneva: World Health Organization; 2023.
2. Federal Emergency Management Agency. *Livestock in disasters: unit 4. Disaster management in the United States*. Hyattsville (MD): FEMA; 2013.
3. World Health Organization. *The role of laboratories and blood banks in disaster situations*. Geneva: World Health Organization; 2002.
4. Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB, et al., editors. *Disease control priorities in developing countries*. 2nd ed. Washington (DC): World Bank; Oxford University Press; 2006.
5. World Health Organization. *Regional Office for the Eastern Mediterranean. Health laboratory facilities in emergency and disaster situations*. 2nd ed. Cairo: WHO Regional Office for the Eastern Mediterranean; 2017.

