

Management of mass casualty incidents in the shock room: the role of the trauma team

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SUMMARY

Managing mass casualty incidents (MCI) is a challenging task, demanding coordination, teamwork, and expertise from healthcare professionals. MCIs can result from natural disasters, terrorist attacks, and mass shootings, which can lead to a large number of casualties and require an efficient and rapid response. The trauma team, comprising trauma surgeons, anesthesiologists, emergency physicians, nurses, radiologists, and technicians, plays a crucial role in managing major emergencies. Effective planning and guidelines are necessary to manage MCIs, and a company plan, such as Italy's PEMAF, should be created, validated, and implemented to organize the process. During an MCI, the trauma team should possess specific skills and interventions to stabilize patients quickly and efficiently, such as securing the airway, controlling the circulatory system, and managing bleeding. Effective triage protocols, such as START, must be used to prioritize patients and direct them to appropriate care centers, and patient sorting should continue even after accessing a facility. When dealing with MCI, it is essential to optimize patient flow while ensuring a minimum level of acceptable care, even when patient volume surpasses normal system capacity.

To manage MCIs, a well-established activation chain for the trauma team is necessary, including the triage nurse, head trauma surgeon, and director of the trauma team. Each healthcare facility should be aware of its capacity threshold, and the chief surgeon should alert the operating rooms and coordinate with the director to plan and verify the availability of operating rooms. Coordinated extra-hospital transport and triage are also necessary, and advanced multi-specialty facilities should transport stabilized patients or patients with low-severity to less crowded or lower-level care facilities when the patient load exceeds their capacities.

Key words: trauma team, shock room, mass casualty incidents

In a hospital emergency unit, managing Mass Casualty Incidents (MCI) is one of the most demanding and complex activities due to their sudden and unpredictable nature. MCIs can result from various events such as natural disasters, terrorist attacks, and mass shootings, causing damage to people and things and require a rapid and effective response to ensure survival¹⁻³. Given their potential to impact a large area and result in a high number of casualties, MCIs present a significant challenge in organizing rescue operations that can last for more than 24 hours, and create an imbalance between the demand for assistance and the capabilities of emergency systems⁴⁻⁶. In this context, the Trauma Team plays a crucial role in managing major emergencies in the shock room⁷. To effectively manage varying injuries during an MCI, a specialized emergency team with other professionals is essential. Effective planning before an emergency occurs is also crucial, with guidelines available to help manage different aspects of MCIs^{1,3,8,9}. Due to the unique characteristics of each healthcare

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system, creating a company plan, in Italy called PEMAF (“Piano Emergenza Massiccio Afflusso Feriti” or “Emergency Plan for Mass Influx of Injured”), with internal validation to ensure its successful implementation in the relevant clinical context, is at the moment probably the best way of organizing such processes. During an MCI, it is important to respect the roles and coordination of all parties involved. The protocols for MCI help prepare for large numbers of patients by mobilizing additional staff, setting up additional treatment areas, and implementing surge capacity plans, which ensure appropriate care is provided to all victims despite the overwhelming demand ^{1,3,5}.

The trauma team is a specialized group composed of trauma surgeons, anesthesiologists, emergency physicians, nurses, radiologists, technicians, and other experts with specific skills in managing traumatic emergencies. Their goal is to provide quick and efficient care for traumatized patients, reducing the risk of complications and increasing the chances of survival ⁷. In order to effectively respond to an MCI, it is crucial to have a well-established activation chain for the trauma team, which includes key figures such as the triage nurse who activates the response system, the head trauma surgeon who manages the patient in the shock room, and the director of the trauma team who assigns tasks and responsibilities to the staff, manages organizational aspects, and makes decisions regarding the order of operating room access for patients who require intervention ^{3,7}. The director is also responsible for declaring the end of the emergency. Each healthcare facility should be aware of its capacity threshold, which refers to its ability to receive patients with varying degrees of severity. The chief or head surgeon is responsible for alerting the operating rooms, activating other on-site surgeons, and coordinating with the director to plan and verify the availability of operating rooms. During patient flow, the chief surgeon prioritizes and accepts red code patients, performing life-saving maneuvers with the help of other general surgeons and activating other specialized professionals as needed. After being alerted, all other surgeons and specialists make themselves available to the director and head surgeon. They are then assigned various tasks such as patient acceptance and treatment in the emergency room or operating room, as well as managing already stabilized patients admitted to the ICU or general ward while waiting for surgical intervention, in cases where the operating rooms may be occupied. Managing MCI therefore demands a high level of teamwork and coordination among team members ³⁻⁹.

The evaluation process should identify patients who require immediate intervention for catastrophic bleeding, such as the application of tourniquets or pelvic binders, followed by the ABCDE protocol with continuous reassessment until the patient is stabilized and can be directed to advanced diagnostics or the operating room for treatment ^{1,3}. The foundation of damage control surgery should guide treatment, with the goal of stabilizing the greatest number of patients during the acute phase of the

emergency. To ensure the best possible outcome for a patient experiencing MCI, trauma team specialists in the shock room must possess a specific set of life-saving interventions ². These include the ability to secure the airway and breathing, which may involve guaranteeing access to intubation or a surgical airway, performing decompressive mini-thoracotomies, applying dressings to chest wounds, or inserting chest tubes, and utilizing positive pressure ventilation. Achieving adequate vascular access is paramount for controlling the circulatory system, which may involve obtaining peripheral, central, or intraosseous access based on the patient’s infusion needs and hemodynamic stability. Immediate control of bleeding is critical and can be achieved using a range of methods such as external compression, blood transfusions, pelvic packing, and REBOA, with the aim of quickly transporting the patient to the operating room or interventional radiology suite ¹⁻³. Collaboration with a neurosurgeon is critical for the evacuation and management of intracranial hemorrhages.

When dealing with a MCI, it is crucial to optimize patient care flow, accelerating the system while still ensuring a minimum level of acceptable care, even when patient volume surpasses normal system capacity ⁶⁻⁸. To achieve this, specific triage protocols (e.g., START) are used to determine priorities and direct patients to different care centers. Effective response during an MCI requires efficient rescue operations for the extraction and initial first aid treatment of the injured, as well as coordinated extra-hospital transport and triage, allowing appropriate allocation of patients to facilities based on their severity and capacity ^{6,7}. Patient sorting during an MCI should continue even after accessing a facility. Advanced multi-specialty facilities that have successfully treated and stabilized patients or have reached capacity with low-severity patients should transport them to less crowded or lower-level care facilities. In cases where the patient load exceeds the capacities of the entire territorial system, coordinators must cooperate with similar systems in nearby regions that were not affected by the event and transport patients to distant facilities to ensure they receive necessary care ^{1,6-9}. Additionally, rapid diagnostic protocols, such as EFAST, are vital in quickly and thoroughly evaluating patients to identify those who require second-level diagnostics or immediate intervention. In such cases (ONLY stable or stabilized patients), also the optimization of image acquisition protocols (such as RIPIT), can be utilized to reduce the time needed to scan a patient, enabling faster diagnostic processing and more second-level diagnostic evaluations, maximizing diagnostic information from CT acquisition ¹⁰. Otherwise, during an MCI, to ensure that all patients receive a minimum acceptable level of care, CT could be utilized as a priority for patients with suspected severe head trauma ¹⁰.

In summary, mass casualty injuries are events in which many people are injured or killed in a single incident, requiring coordination and rapid response from emergency responders and healthcare providers. Effective triage and care coordination

are critical to ensure that all victims receive appropriate care and that the system is not overwhelmed. The trauma team is the cornerstone of the most advanced levels of care in MCIs, managing access to the shock room and triaging critically ill patients to operating rooms, intensive care units, or, when possible, returning them to observation with a reduced level of care after appropriate diagnosis and stabilization.

Conflict of interest statement

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Author contributions

RB, FC did the literature review and wrote the manuscript.

Ethical consideration

No humans or animals are involved in these studies, therefore ethical approval is not needed.

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