

An Introduction to Mass Gathering Medicine

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Until now, Mass Gathering Medicine has been largely defined by what it is not. Not Sports Medicine. Not Emergency Medicine. Not Emergency Medical Services (EMS). Not Urgent Care. Not Guerilla Medicine. Not Battlefield Medicine. The notion of Mass Gathering Medicine, though, becomes easier to define when thinking of it as something more than a field of medicine. Mass Gathering Medicine describes both a niche of expertise, and a way of thinking, organizing, and anticipating [1]. This book, therefore, aims to define and describe Mass Gathering Medicine as a means of planning and providing for the medical needs of communities in temporary communion.

Beginnings: The Development and Evolution of Prehospital Medical Care

The first consistent use of ambulances and field hospitals occurred in the Napoleonic wars, over 100 years before organized EMS systems emerged. Baron Dominique Jean Larrey, a French military surgeon, is credited with the invention of the battlefield ambulance, a horse-drawn cart which he termed a “flying ambulance.” These flying ambulances were able to rapidly maneuver across the battlefield, pick up wounded soldiers, and transport them to field hospitals immediately adjacent to the zone of hostilities. The concept of triage, again attributed to Larrey, was practiced in these field hospitals, providing early stabilizing care prior to transfer to an established hospital, usually housed in a convent or monastery behind the lines. The ambulance and field hospital were developed further during the American Civil War. Subsequently, the invention and mass production of the automobile near the turn of the twentieth century provided for more rapid evacuation and transport of injured soldiers and civilians.

In World War II, jeeps moved injured soldiers to aid stations where basic care was rendered before evacuation to hospitals. The Korean Conflict, in the early 1950s, brought the next major development in emergency medical care and transport when the US military introduced the use of helicopters to rapidly evacuate wounded soldiers from the battlefield to a definitive care facility, termed a mobile army surgical hospital, or MASH unit. Further refinements of this model occurred during the Vietnam War.

As hostilities continued in southeast Asia and battlefield medicine advanced and evolved, the US civilian population was experiencing high rates of death and severe disability resulting from motor vehicle crashes. In 1966, the National Academy of Sciences delivered a report entitled *Accidental Death and Disability: The Neglected Disease of Modern Society* to President Lyndon B. Johnson. The report, termed “The White Paper” in EMS circles, identified accidental injuries as the “leading cause of death in the first half of life’s span,” and noted that more Americans died in motor vehicle crashes than were killed in recent military conflicts. Further, the report stated that a severely injured person would likely receive better care in a combat zone than on a civilian street in the United States. Finally, “The White Paper” documented a lack of consistent training, standards of operation, and so on, among existing ambulance and public safety services, and therefore recommended the standardization of emergency training for “rescue squad personnel, policemen, firemen and ambulance attendants.” This standardization led to the first nationally recognized curriculum for the emergency medical technician-ambulance (EMT-A) in 1971. Two years later, the Emergency Medical Services Act provided federal guidelines and funding for the development of regional EMS systems. The modern EMS system was born.

The concept of advanced life support delivery via EMS was introduced several years later. Regional

public services systems such as Los Angeles County in California, New York City, and Belfast in Northern Ireland, among other areas of the world, were experimenting with the concept of highly trained EMTs extending the capabilities of a physician into the pre-hospital setting and providing a high level of care before the patient arrived in the hospital. In the 1970s, the paramedic concept was popularized by the television program *Emergency* in the United States. This TV drama followed the daily career of a paramedic unit and engine company stationed in Los Angeles County Fire Station 51. These fictional paramedics worked closely with emergency physicians and nurses in an established emergency department at Rampart General Hospital where physicians provided medical guidance via radiotelephone and viewed cardiac telemetry and other mobile diagnostics. This TV series played a significant role in the further development of today's advanced life support EMS system, with an emphasis on communication and the importance of working closely with hospital-based, dedicated emergency healthcare providers, including physicians and nurses.

Emergence of a Philosophy: The Birth of Mass Gathering Medicine

As emergency medical services systems matured, various additional applications were developed beyond the traditional EMS response to medical and traumatic emergencies in the community. One application was the use of EMS resources at mass gathering events. An early example of EMS staffing of mass gathering situations included the traditional ambulance standby for the weekly high school football game, county fair, or municipal celebration [2, 3]. This was simple from a logistical and planning perspective. Essentially, an on-duty ambulance would be prepositioned at such an event and poised for response. However, these ambulances were also often responsible for emergency calls beyond the mass gathering venue.

As EMS systems grew and added medical capabilities, deployments at mass gathering events similarly increased in complexity. Based on early experiences, including notable stadium disasters associated with European football, EMS professionals in the mass gathering space realized that, while they were the natural medical personnel to staff such events, a direct translation of "traditional response"

emergency medical services philosophy, personnel, and equipment was not the most appropriate approach [4]. Altered strategies of medical care and mission were required to adapt existing approaches and create new systems of care. Medical guidelines required changes. New or altered equipment was needed. Additional personnel were often required [5].

Mission Goals of Mass Gathering Medicine

The underlying philosophy of mass gathering deployment focuses on the assumption that the responsibility for increased need for care created by the venue and/or event lies with the medical team staffing the event. Related to this philosophy, the medical deployment at a mass gathering event has several important goals, including:

- (1) provision of medical care to spectators, ranging from routine care, allowing release back to the venue, up to and including resuscitation and stabilization of major illness or injury followed by evacuation to a definitive care facility;
- (2) additional medical care delivery to venue VIPs and their staff;
- (3) reduced burden on local EMS and hospital emergency departments; and
- (4) venue-oriented risk management and reduction.

These goals are, of course, interrelated.

Scale and Specific Needs

The mode of forethought, preparation, and response that defines Mass Gathering Medicine is scalable and adaptable to the scope and specific needs of the gathering in question [6]. In the initial stages of planning, attention to the event type and duration is paramount. Political rallies, musical performances, and sporting events will draw different crowds with variable emotions and intentions. There may be notable celebrities at a rock concert or sporting event, but the security needs of a political event may surpass all other considerations if a sufficiently important dignitary is present (i.e., the President of the United States). Substance use may be more prevalent at a particular concert or music festival and may rouse or pacify a crowd. The planning, preparation, and logistical complexity of an event is also likely to expand with the length and scale of the gathering. Sporting events

can be confined to a single afternoon or evening in a particular arena or stadium or they may engulf the resources and infrastructure of an entire city for weeks at a time – as is the case with the Olympic Games or the World Cup.

Attendees

Mass gatherings are defined chiefly by the sort of people who come together and their intentions in gathering. In some way or another, mass gatherings of all types draw a community [4, 7]. These groups may be united by their allegiance to a specific college or university, their adoration for a particular band, or their dedication to drinking alcohol while horses are racing. No matter the gathering, attention should be paid in preparation for the anticipated demographics of attendees. Is this going to be an event that draws older individuals who are likely to bring comorbidities and chronic medical conditions to the considerations of care, or can a younger, relatively healthy slice of the population be relied upon to attend? Is the presence of alcohol or other intoxicants anticipated (encouraged?) or are there other more pressing considerations [8, 9]? Will the attendees be sedentary or engaged in vigorous physical activity? Finally, it is important to consider the likely or possible influence of the event or act itself on the crowd. Mosh pits, court storming, and the toppling of goal posts may not be preventable, but they can be predicted and planned for in a manner that maximizes the safety of participants and thus reduces the burden on those triaging, transporting, and rendering care both at the event and potentially in local hospitals.

Space, Architecture, Infrastructure

Mass gatherings are impacted heavily by the physical space they occupy. The architecture and location of the space housing a given event will almost certainly influence planning for medical care that can feasibly be delivered on or near the premises. A modern stadium with state-of-the-art electronics and amenities is likely to pose different logistical challenges to the evaluation of patients and potential treatment pathways than a pop-up festival with little to no existing electrical infrastructure or plumbing. Triage and transportation needs are influenced by the location of the event relative to preexisting sites of care in the local community, and the safety and security of both patients and medical personnel are often reliant on

the characteristics of the structure (or lack thereof) in which care is provided. Lastly, although it is not up to medical directors to ensure the structural integrity of the location or physical environment hosting a mass gathering, disaster planning and contingency worst-case-scenario protocols should always consider loss of/damage to the physical environment and communicating infrastructure in the event of force majeure, terrorism, or other potentially catastrophic occurrences.

Weather, Climate, Environment

A reasonable initial question related to the physical space containing a mass gathering is always: Will the event be outdoors? If so, specific attention to the regional climate, historic weather, and plans for unlikely extremes are warranted. Exposure-related conditions including heat stroke, heat exhaustion, dehydration, hypothermia, frostbite, sunburn, and so on should be anticipated. More recently, the COVID-19 pandemic has illustrated the importance of infectious disease precautions. In the case of droplet-transmitted viral illnesses, masking, distancing, airflow/outdoor events, and vaccine status of attendees should be considered. In much the same manner, common-sense public health measures to limit the spread of STIs via widespread availability of condoms is likely to be beneficial if sexual activity is likely – as is the case in the Olympic Athletes Village.

Climate change necessitates the responsibility to consider human impact on the local environment and habitat of existing flora and fauna. Is the event likely to significantly disrupt local plant life, wildlife, waterways, or air quality? If so, mitigation procedures or reconsideration of the scale and/or location of the event are appropriate, if not mandatory.

Preservation of Local Resources

Caring for large groups in mass gathering necessarily requires attention to the variables previously described as well as the local and regional population not participating in the gathering – with the goal of delivering high-quality triage and care of event-goers while preserving the capacity of in-place resources to care for the preexisting local population [3, 10, 11, 12, 13]. Medical staff must also be familiar with the overall event command structure to both recognize and adapt to the ways centralized (usually nonmedical) command may affect triage and transport.

Delivering High-Quality Care

Fixed treatment locations, whether a specified room or rooms in a larger structure, portable tents, prefabricated structures, or trailers have been introduced to allow for enhanced delivery of treatment. Healthcare providers not only staff these fixed locations but can also be stationed throughout larger venues on foot, bicycles, or all-terrain vehicles. The traditional ambulance is also deployed, but largely for transport to a local hospital.

The provision of medical care for any person at an event is the responsibility of the deployment team. This care most often is delivered to patients with lower acuity medical and traumatic issues. This care, delivered by a team including an on-site physician, allows the patient to have their issue addressed and hopefully return to the event. A minority of patients may develop major medical or traumatic issues at the venue. In these cases, the event medical team will resuscitate the patient, with the aim of stabilization, and arrange for appropriate air or ground transport to a definitive care facility, such as a hospital-based emergency department. The location of any event relative to the nearest existing medical infrastructure must be considered with attention to transport logistics to the highest level of care available. Traditional triage is often employed with modifications for dignitaries, celebrities, and athletes. The type and magnitude of medical care delivered by the event medical team is a direct function of the specific mission goals, venue leadership desires, and related resource allocation (staffing numbers, personnel abilities, and equipment). Incorporated into these goals is a consideration of rational medical thought and planning. Certain deployment models are engineered to manage minor issues with the plan of transporting any medical event of significance to a local hospital. Other models are more robust, allowing for enhanced diagnostic and treatment modalities, an approach which requires significantly greater resource allocation. Regardless of the deployment model used, mass event medical care most often represents the first step, or phase, of treatment. Some patients will need follow-up at a later time with a nonevent healthcare provider for the lower acuity issues, while others with more significant medical needs will be transferred directly from the event to a regional hospital for an immediate escalation of care.

Command and Control

Another significant consideration in medical planning as well as the delivery of care to specific patients involves the reality that comprehensive medical care cannot be delivered to some patients and that the event medical authorities will almost certainly answer operationally to the overall venue command structure. Medical staff must be familiar with the overall event command structure to both recognize and adapt to the ways centralized (usually nonmedical) command may affect triage and transport [2, 12]. This command structure must be embraced by all event medical personnel and tends to be a relatively new concept for hospital-based providers.

Disaster Planning

Generally speaking, a distinction has been made in prior studies of Mass Gathering Medicine regarding care rendered as planned at mass gatherings and any emergency response to natural disasters, terrorist attacks, infrastructure failure, or other unforeseen catastrophic events. It is, however, within the purview of mass gathering medicine and prudent for strategic medical planning to create worst-case or disaster scenario plans [14]. Such plans should be revisited and refreshed periodically with attention to evolving local and geopolitics, climate concerns, and so on.

Research and Quality Improvement

As this book intends to define and describe an emerging approach to medical planning and provision of care, it is essential that research and statistical methods be tested and developed with the goals of mass gathering medicine in mind. Exploration, analysis, and application of novel statistical and computing languages to mass gathering medicine, in addition to the continued digitization of both ticketing, crowd surveillance, and the medical and public service record, is sure to push the field forward in addition to raising new ethical and legal questions both with regard to research and the provision of care at events. As researchers are better able to gather, analyze and interpret data from prior gatherings, we anticipate both exciting research and careful insights that will allow for the safest, most efficient delivery of care at mass gatherings.

As noted, until now, Mass Gathering Medicine has been an increasingly important – if ill-defined –

reality in the medical care of communities that continue to gather in increasingly large numbers. Humans will continue to gather in communities and will inevitably require medical care when they do so. With this book, the authors invite us to explore an emerging field of medicine as a means of planning and organizing while providing the highest quality care to communities as they gather in communion today and as our world – and inevitably our gatherings – continue to grow and evolve.

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